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Biomass of the chironomid larvae (Chironomidae, Diptera) in Vaya Lake (Bulgaria) during the period 2003-2007

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Abstract. The biomass of chironomids in the Vaya Lake during the period 2003-2007 was studied. In the spring and summer of 2004, the biomass was estimated by the highest values, and in the spring and summer of 2006 – the lowest. The species with the greatest participation in the biomass were: *Chironomus riparius*, *Cryptochironomus defectus*, *Chironomus* gr. *plumosus*, *Cricotopus sylvestris*, *Tanytarsus gregarious* and *Cricotopus algarum*. The stations along the central axis of the lake had the highest similarity. Dendrogram of chironomid biomass similarity showed high similarity (greater than 80%) for sites 3, 4 and 12.

Key words: zoobenthos, biomass, coastal lake.

Introduction

Vaya Lake is the largest natural lake in Bulgaria. It is subjected to strong anthropogenic pressure and has undergone significant changes. The present study is concerned with zoobenthos biomass, as an important component and intermediate link in food chains and as a food resource for many fish species.

The first studies on the invertebrate fauna of the Vaya Lake were carried out by Valkanov, A. (1936). Zashev and Angelov (1958) established for Vaya Lake that benthic organisms predominate in the biomass, including larvae of *Tendipes* (= *Chironomus*) *f. salinarius*. During the period 1964 – 1966, Kaneva - Abadjieva, Marinov (1967) and during the period 1967 – 1974 Kaneva-Abadjieva V. (1976) conducted research on the distribution of alimentary zoobenthos in some lakes, including Vaya Lake. The results during this period show that the zoobenthos of the Vaya Lake is mainly built by chironomid larvae.

In all cases, the biomass of this lake was mainly composed of chironomid larvae, whose average biomass for the period amounted to15.484 g/m² (93.2% of the total average biomass). Seasonally, it appears that increased biomass is accompanied by increased density. In total, for the three studied years, a low density and biomass was observed in summer, which is explained by both the eating and the flight of the adult chironomids. The highest biomass, as a rule, was found in spring. Pandourski (2001) studied the macrozoobenthos of the Vaya Lake and found that during the period 1999 – 2000 the group Chironomidae had a large share in the biomass of the Vaya Lake, together with Oligochaeta. The macrozoobenthos reaches its maximum number and largest biomass in the western part of the lake. These parameters turn out to be very low in the sector in front of the industrial zone of Burgas, where a large amount of domestic and industrial wastewater flows. The zoobenthos decreases in an eastern direction.

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The aim of the present study was to investigate the biomass of chironomids in the Vaya Lake during the period 2003 – 2007, as an important food base for fish.

Material and Methods

Zoobenthos were collected with a dredger „type Ekman“ with size 20 x 20 cm - during the period 2003 – 2007 from 12 permanent stations (Fig.1). A total of 167 benthic samples were collected and fixed in 4% formalin. The coordinates of the stations and the species composition of the chironomids we determined were published in 2021)(Nenova, Stoichev, 2021).

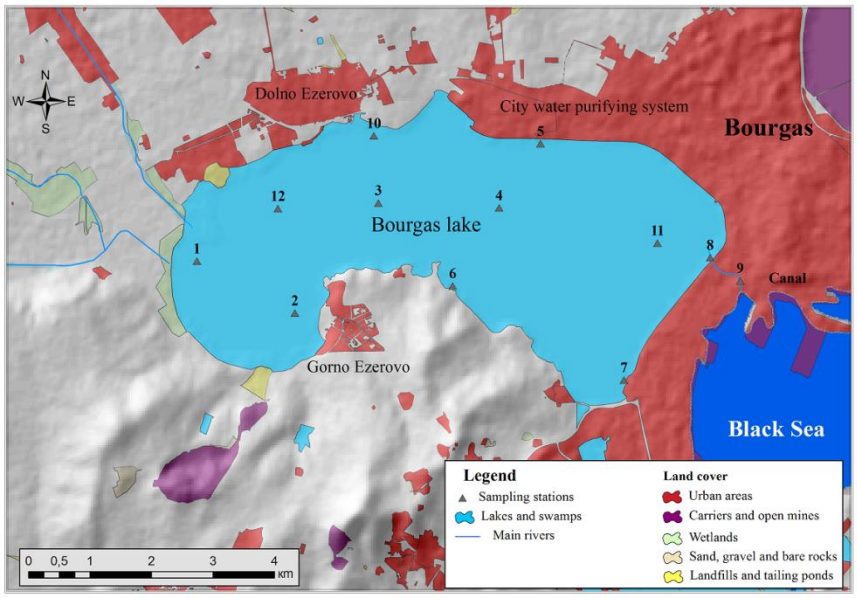

Fig. 1. Map of the Vaya Lake (= Bourgas Lake) with the location of the stations.

Results and Discussion

During the study, a total biomass of chironomids was found to be 979.18 g/m². The largest was in 2004 (485.6 g/m²), followed by 2005 (240.2 g/m²). In the spring and summer of 2004, it was distinguished by the highest values (respectively 144.65 g/m² and 141.18 g/m²), and in the spring and summer of 2006 – only 20.43 g/m² and 23.98 g/m². For August 1999 it was 11.8 g/m² (averaged over all stations). For comparison, the average August biomass in our studies was 9.53 g/m² (averaged over all stations). Kaneva - Abadzhieva and Marinov (1967) established that 60% of the biomass of the zoobenthos falls on chironomids and 40% - on oligochaetes. Pandourski (2001) points out for Vaya Lake during the period 1999-2000 average biomass 5.2 g/m² of Chironomidae for the four seasons. The seasonal dynamics of chironomid biomass was established (Fig. 2).

The results show that the highest density (6475 ind/m²) and biomass (144.65 g/m²) were found in the spring of 2004. The values are also high in the spring of 2005, which confirms the results of Kaneva - Abadzhieva and Marinov (1967) for the highest biomass in the spring. In the spring of 2006, low density and biomass were observed, which can be explained by the possible increase in the amount of fish, which leads to a shortage of food. An increased bird press may also have had an impact. In the autumn season, a certain increase in density and biomass is observed, as a result of the appearance of a new generation and the transition of carp to plankton feeding (Beshovski, 1967). In winter, the quantity and biomass are lower compared to those in autumn. Possible causes may be natural mortality and eating, which may exceed the rate of size increase. The species

Chironomus riparius, *Cryptochironomus defectus* and *Chironomus gr. plumosus* are represented with the greatest participation in Fig. 3.

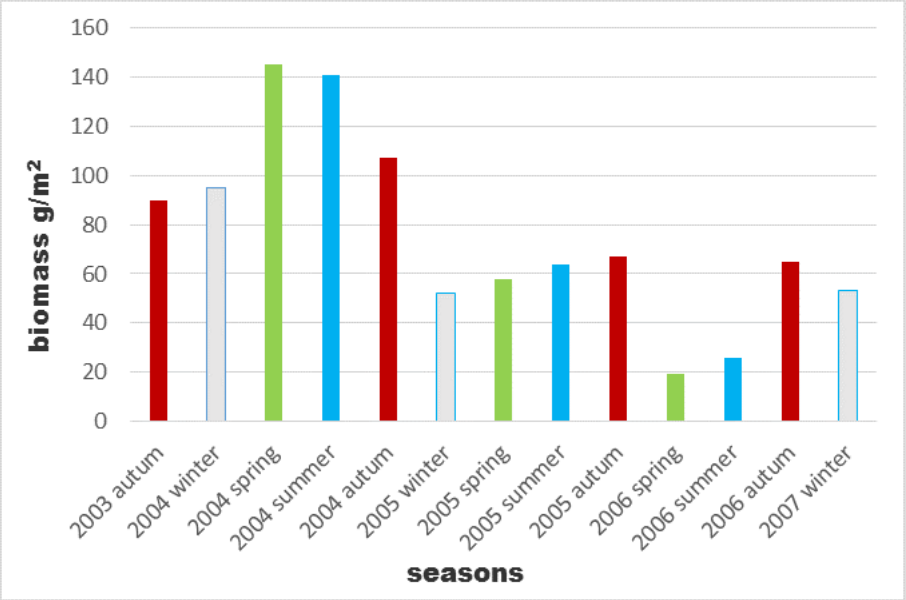

Fig. 2. Seasonal dynamics of chironomid biomass.

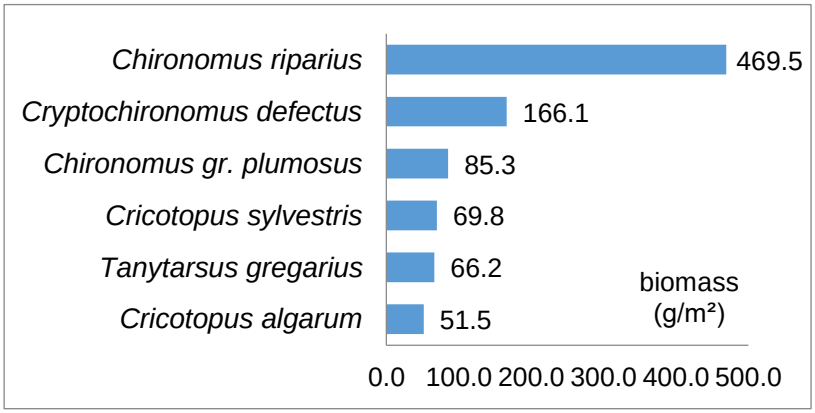

Fig. 3. Chironomid species with the greatest biomass for the entire period.

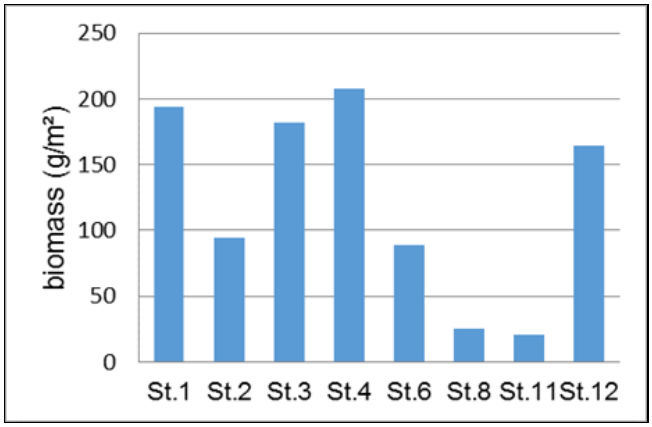

Fig. 4. Distribution of chironomid biomass by station.

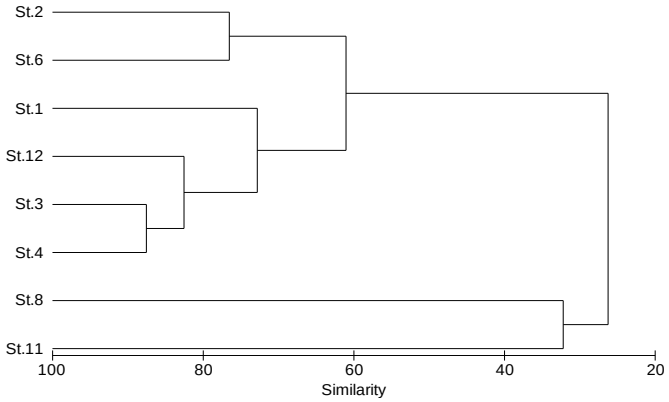

Fig. 5. Dendrogram of similarity by biomass of chironomids (Bray – Curtis index).

The dendrogram shows a high similarity (more than 80%) for sites 3, 4 and 12. They are joined by site 1 with a lower percentage of similarity. The organic-rich waters favour the development of species that are characteristic and develop well in polluted leads. This shows that in the period 2003-2007 pollution-resistant chironomid species developed in Vaya Lake, which gave high biomass compared to previous years. They can be a good food base for many fish.

Conclusions

The total biomass of chironomids determined was 979.18 g/m². The largest was in 2004 (485.6 g/m²), followed by 2005 (240.2 g/m²). The highest biomass was recorded in the stations from the central part of the lake, as well as in the western part of the lake, where the Aitoska and Chakarliiska Rivers flow.

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