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Species composition of Chironomidae (Diptera) in Vaya Lake

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Abstract. The species composition of one of the main zoobenthos groups in Vaya Lake - Chironomidae (Diptera) in the period 2003 - 2007 was studied. A total of 27 taxa were identified, of which 18 species from 11 genera were identified and 9 taxa at the level of sp. The results showed a change in the species composition of chironomids compared to the period 1953 - 1957 (Zashev and Angelov, 1959) when the only systematic studies of the lake so far were performed.

Key words: zoobenthos, salinity, eutrophication.

Introduction

Zashev and Angelov (1959) found that in the period 1953-1957 benthic organisms predominated in Vaya Lake. According to the authors, the larvae of *Tendipes* (= *Chironomus*) are one of the most important benthic organisms as food for industrial fish species in the Vaya Lake. The group of marine species is more abundant than freshwater species. The data of Vulkanov (1936) and Zashev and Angelov (op.cit) show also the widespread distribution of euryhaline marine forms. Kaneva - Abadjieva & Marinov (1967) refer to the Vaya Lake the so-called chironomid type, during the period 1964 - 1966. The authors establish the dominance of the freshwater complex, which they explain with the already manifested during this time trend of sweetening of the lake waters. They found that the zoobenthos is composed mainly of chironomid larvae. 5 of 7 identified macrozoobenthos species belonging to Chironomidae. Kaneva-Abadjieva (1976) does similar research. Pandourski (2001) identified three macrozoobenthos groups for the period 1999–2000, one of which is the larvae of Chironomidae. The results show that the species richness of zoobenthos decreases in the eastern direction and towards the industrial zone of Burgas, where large amounts of industrial and domestic wastewater are discharged. Studies during this period show that the ecosystem of the Vaya Lake and its benthic community are extremely sensitive to increased anthropogenic pressure from east to northeast, and every increase in pollutant emissions leads to an increase in the bottom area with low nutritional potential for fish populations.

This article presents the results of the study of the species composition of chironomids in Vaya Lake, in the conditions of changing ecological environment and almost broken connection with the sea. The results are compared with the established species composition in the period 1953 - 1957.

Material and Methods

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Zoobenthos were collected with a dredger „type Ekman“, with size 20 x 20 cm - during the period 2003 – 2007 from 14 permanent stations (Fig.1). The station coordinates are determined with the Etrex Summit GPS receiver (GARMIN): 1 (N42°29.655, E27°20.925); 2 (N42°29.194, E27°22.085). 3 (N42°30.160, E27°23.082), 4 (N42°30.113, E27°24.518); 5 (N42°30.674, E27°25.013), 6 (N42°29.428, E27°23.961), 7 (N42°28.593, E27°25.988), 8 (N42°29.665, E27°27.021), 9 (N42°29.458, E27°27.376), 10 (N42°30.750, E27°23.032), 11 (N42°29.796, E27°26.394), 12 (N42°30.114, E27°21.888), 13 (N42°29.340, E27°25.344) и 14 (N42°30.312, E27°25.758).

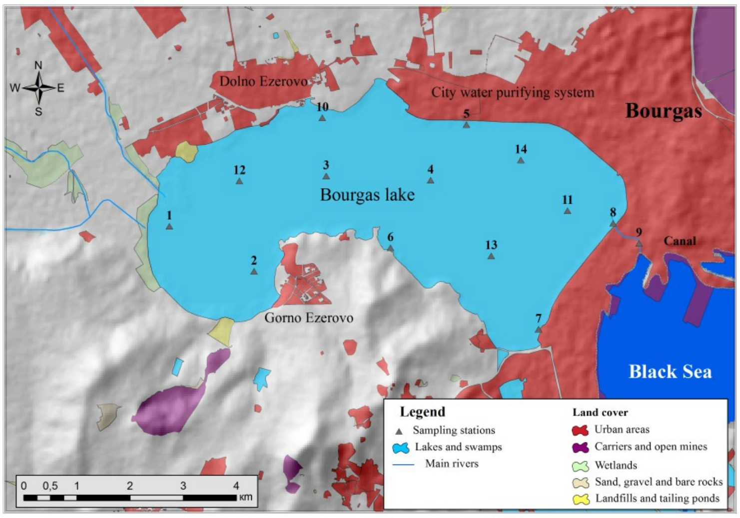

Fig. 1. Map of the Vaya Lake with the location of the stations.

A total of 167 benthic samples were collected and fixed in 4% formalin. The zoobenthos was sorted under a stereomicroscope and determinate. To evaluate the diversity of the zoobenthos in the Vaya Lake α-diversity indices are used.

Results and Discussion

As a result of our research, a total of 27 taxa from the family Chironomidae (order Diptera) were identified, of which 18 species from 11 genera were identified, and 9 taxa are at the level of sp. The α-diversity indices show that most species of chironomids are found in stations 1 (17 species), followed by st. 2 and st.12 (12 species each), st. 4 (11 species), st. 3 and st.11 (9 species each) and st. 6 and st. 8 (8 species each).

Some of the most common species in Lake Vaya are *Chironomus riparius* (Meigen, 1804) (pF = 44.31%) and *Chironomus gr.plumosus* (Linneus, 1758) (pF = 25.15%). *Ch. riparius* is found in almost all stations. *Ch. gr.plumosus* is found in the stations located near the central longitudinal axis of the reservoir, where the bottom is most homogeneous (st.3,4,12,13,14,15). In the summer of 2004 it was also found in st. 6; in the summer of 2006 - and in st. 11, and in the spring of 2006 - and in st. 2. Kovachev, Uzunov (1975) found that *Chironomus plumosus* is resistant to acute phenolic intoxication. Scholz & Zerbst-Boroffka (1998) note a very high tolerance of the species to hypoxia, which explains its distribution in all parts of the lake. *Cryptochironomus defectus* (Kieffer, 1913) (pF = 29.94%), was found in all stations of the lake, even at low oxygen content (3.01 mg / l), which shows that the species adapts well to bottom conditions of the whole lake. *Cryptochironomus gr.defectus* (Kieffer, 1913) (pF = 3.59%) was noted in the central lake stations (4,12,13,14,15), which is related to its preferences for life in the flat and free from higher vegetation bottom of the central stations. *Cricotpous algarum* (Kieffer, 1911) (pF = 19.76), and *Cr. sylvestris* (Fabricius, 1794) (pF = 20.36%) were distributed throughout the lake. *Cr. bicinctus* (Meigen, 1818) (pF = 0.60%), *Cr. annulator* (Goetghebuer, 1927) (pF =

1.20%), *Cr. fuscus* (Kieffer, 1909) (pF = 2.40%) and *Cricotopus* sp. (pF = 4.19%) were found mainly in the western part of the lake, where *Potamogeton pectinatus* and reeds grow. Marques et al. (1999) state that the spread of the genus *Cricotopus* cannot be related to pollution levels. Most of the species are mining forms and feed on floating leaves of aquatic plants. *Tanytarsus gregarius* (Kieffer, 1909) (pF = 19.76%.) is among the most common species. It is found throughout the lake in st. 2 it is found at very low oxygen content (1.55 mg / l) and in st. 12 (2.48 mg / l). *Eukieferiella gracei* (Edwards, 1929) (pF = 7.19%), *Eukieferiella clypeata* (Thienemann, 1919) (pF = 0.60%), *Eukieferiella similis* (Goetghebuer, 1939) (pF = 2.40%) and *Eukieferiella* sp . (pF = 1.80%) are established only in st. 1. *Tvetenia calvescens* (Edwards, 1929) (pF = 3.59%) was found mainly in 2005 in st.1 in winter, st.3 in spring and stations 2 and 8 in autumn. It was also noted in the autumn of 2003 in st. 2 and in the summer of 2006 in st. 1. *Tvetenia* sp. (pF = 4.79%) was recorded in st. 1, 2, 8, 12. The results show that chironomids are relatively well represented in Vaya Lake. Finding a large part of them in the severely deteriorated conditions of lake hypertrophy, at extremely low oxygen levels, as well as in conditions of high organic load, leads us to believe that many of the identified species (genus *Chironomus*) could be considered as bioindicators of water pollution. Kovachev & Stoichev (1999) indicate that many of these species are typical of lakes with an initial degree of eutrophication. Organic waters are conducive to the development of species that are characteristic and thrive in polluted waters. The increase in the number of species of chironomids and the identification of low salinity species in our research is a reflection of the fact that the connection with the sea is almost cut off due to the clogging of the canal, and rivers and precipitation bring additional fresh water.

Tab. 1. Species composition of Chironomidae in Vaya Lake during the two periods: 2003 - 2007 and 1953 - 1957 (sign "-" - missing species for one or the other period).

Species composition (2003 - 2007)	**Species composition (1953 - 1957)**
Chironomidae (Diptera, Insecta) - larvae	
Chironomus riparius (Meigen, 1804)	-
-	*Chironomus f.l. salinarius* (Kieffer 1915)
Chironomus gr. plumosus (Linnaeus,1758)	*Chironomus gr. plumosus* (Linnaeus,1758)
-	*Chironomus f.l. anthracinus* (Zetterstedt, 1860)
Chironomus sp.	-
Cricotopus (I) sylvestris (Fabricius, 1794)	*Cricotopus gr. sylvestris*
Cricotopus (C) algarum (Kieffer, 1911)	-
Cricotopus (C) bicinctus (Meigen, 1818)	-
Cricotopus (C) fuscus (Kieffer, 1909)	-
Cricotopus (C) annulator (Goetghebuer, 1927)	-
Cricotopus sp.	-
-	*Procladius sp.*
Cryptochironomus defectus (Kieffer, 1913)	-
Cryptochironomus gr. defectus (Kieffer, 1913)	-
Cryptochironomus sp.	-
Demicryptochironomus vulneratus (Zetterstedt, 1838)	-
Dicrotendipes nervosus (Staeger, 1839)	-
Endochironomus tendens (Fabricius, 1775)	-
Endochironomus sp.	-
Eukiefferiela gracei (Edwards, 1929)	-

Eukiefferiella similis (Goetghebuer, 1939)	-
Eukiefferiella clypeata (Thienemann, 1919)	-
Eukiefferiella sp.	-
Glyptotendipes sp.	-
Polypedilum pedestre (Meigen, 1830)	-
Polypedilum sp.	-
Tanytarsus gregarius (Kieffer, 1909)	-
Tanytarsus sp.	-
Tvetenia calvescens (Edwards, 1929)	-
Tvetenia sp.	-

Conclusions

The results obtained from our studies showed changes in the species composition of the chironomids, compared with the results of the studies conducted in the period 1953-1957 by Zashev and Angelov (1959) (Tabl. 1), which is mainly due to the disconnected chanal with the sea, the imbalance in the proper trophic levels, and the hypertrophication of the lake. Influences that alter the physico-chemical parameters of the environment or alter the balance in the zoobenthic community may lead to the disappearance of some species and the emergence of others. Of course, environmental factors interact, which explains why the same species may behave differently in different habitats and have different seasonal distributions.

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