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Faunistic and ecological investigations of the free-living freshwater nematode fauna of the Koprinka Reservoir (Central Bulgaria)

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Abstract. The study gives for the new information for hydrofaunistic investigation of the Koprinka Reservoir. A total of 22 free-living freshwater nematode species were found for the period 2020, 2021. Nematode fauna and environmental factors were tested by statistical analyses. The species *Monhystera stagnalis*, *Monhystera filiformis* and *Dorylaimus stagnalis* were found in all six stations of the reservoir.

Key words: Nematoda, fresh water, ecology.

Introduction

The Koprinka reservoir is 7 km west of the town of Kazanlak and 35 km northwest of Stara Zagora. The lowest level of the reservoir is 356 m above sea lavel, the maximum is 391 m. The maximum depth near the impounding dam 35 m. Koprinka reservoir has three branches - Koprinski, Dunavski and Gyurlya, oriented on a north-south axis. Previous data on the zoobenthos of the reservoir were given by Dimitrov & Lyudskanova (1967) and Stoichev (2001).

First information about free-living nematode fauna in Bulgaria was given by Valkanov (1934) who reported 13 species and 6 genera. Further data about freshwater nematodes were given by Russev (1979) who reported two more species from the Bulgarian stretch of the Danube River. The latest studies (Stoichev 1996, 1998) report 61 free-living nematode species. Stoichev (2001) give informations from free-living freshwater nematode in Koprinka reservoir who report 9 free living nematods species. Abiotic parameters of habitat (sediment type, water depth, water temperature, concentration of dissolved oxygen, quantity of food available) have a significant influence on nematode distribution and abundance (Pehoffer 1989, Traunspurger 1996). The present study gives the new information about the free-living freshwater nematode fauna of the Koprinka Reservoir (Fig.1) and its relation to the environmental factors.

Material and Methods

The material was collected in 2020, 2021. A total of 40 samples from the dam and coast were collected. The results were adjusted for 1 m2. The nematode samples were rinsed on sieves, with mesh. and fixed in 4% formalin. Nematodes were identified according to Gagarin (1981) and measured on the basis of the formula of De Man (1886). The monograph of Loof (1999) was also used to determine the nematodes. The samples were collected from 6 sites in the dam and coast. (Fig. 1): 1. East; 2. Middle; 3. West; 4. Koprinski branch; 5. Dunavski branch; 6. Gyurlya branch.

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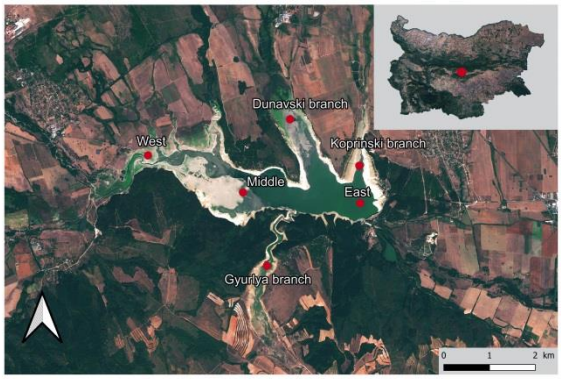

Fig. 1. Map of Koprinka Reservoir with the location of the sites (stations) (based on a Sentinel 2 images, created by Geopolymorphic Cloud.)

Results and Discussion

A total of 22 free-living freshwater nematods species were found (Tab.1). The species *Monhystera stagnalis*, *Monhystera filiformis* and *Dorylaimus stagnalis*, were found on all sites. The Nematoda diversity in Zhrebchevo Reservoir (Stoichev & Danova, 2012), 26 species, was close to the species number in Koprinka Reservoir-22 . While Stambolijski Reservoir the species number is lower, 11 respectively (Stoichev 1996). The results from the dominance analysis of the species (pF, DF and Dt in %) are shown in Tab.1. According to the obtained frequency of presence data, a classification was applied for the first time by Stoichev (1996) where found species fall into three of the four groups: 1. Very frequently found species (pF >50 %) *Monhystera stagnalis, Monhystera filiformis and Dorylaimus stagnalis*, 2. Frequently found species (pF 10–50 %) *Eudorylaimus carteri, Plectus cirratus, Rhabditis filiformis, Tobrilus gracilis*, 3. Rarely found species (pF 1–10 %) *Tripyla glomerans, Monhystera sp.*, *Dorylaimus* sp.*-total 14 species*, 4. Very rarely found species (pF <1 %).

Beside species with high values of frequency of occurrence and range of dominance (*Monhystera stagnalis, Monhystera filiformis, Dorylaimus stagnalis*), also species with high values of range of dominance and low frequency of occurrence and frequency of dominance can be found (*Eudorylaius carteri, Rhabditis filiformis, Pectus cirratus)*. The present data establish stenobiontic character of some species as well. The abundant development of these species is possible only in narrow limits of the environmental conditions. Out of this limits they cannot be found or they are quantitatively scanty. At the places with great selfpurificational capacity, a well composed and usually constant qualitative composition can be found.

Tab.1. Nematoda species by stations and dominant analysis (pF%, DF% and Dt%).

TAXA	STATIONS						Dominant analysis		
	1	2	3	4	5	6	pF%	DF%	DT%
Monhystera stagnalis Bastian, 1865	x	x	x	x	x	x	89,58	72,91	81,39
Monhystera filiformis Bastian, 1865	x	x	x	x	x	x	85,41	79,16	92,68
Monhystera sp.				x			2,08		
Dorylaimus stagnalis Dujardin, 1848	x	x	x	x	x	x	95,83	77,08	80,43
Dorylaimus sp.	x						2,08		
Paradottilaimus sp.	x						2,08		
Mesodorilaimus sp.		x					2,08		
Eudorylaimus carteri (Bastian, 1865) Andrasy, 1969			x	x			31,25	18,75	60,00
Eudorylaimus sp.		x					2,08		
Cylindrolaimus communis De Man, 1880			x				2,08		
Cylindrolaimus sp.			x				2,08		
Plectus cirratus Bastian, 1865			x	x			29,16	10,41	35,69
Plectus assimilis Butshchlii, 1873			x				2,08		

Plectus sp.			x				2.08		
Rhabditis filiformis Butschlii, 1873	x	x					10,41	8,33	80,01
Rhabditis sp.			x				2,08		
Tripyla glomerans Bastian, 1865	x		x	x			4,16	2,08	50,00
Tobrilus gracilis Bastian, 1865	x		x	x			14,58	6,25	42,86
Tobrilus sp.		x					2,08		
Enoploides fluviatilis Micoletzky, 1923		x					2,08		
Enoploides sp.	x						2,08		
Prodesmodora sp.	x						2,08		

Distribution of free-living freshwater nematodes in connection with their nutritional patterns

In the present study we distinguish four groups of free-living fresh water nematodes.

Group A - specialised detritophagous. This group is represented by nematodes having a small mouth chamber with no "teeth" inside. Their main food consists of detritus. They inhabit algae and macrophytic periphyton in sludge and sand.

Group B - non-specialised detritophagous. The nematodes in this group have a well developed mouth chamber with no teeth inside. Their food consists of large detritus. These species are frequently found in sand and sludge abunding in detritus.

Group C - phytophagous. They have a well developed mouth chamber with little teeth inside. Besides detritus, their food consists of algae, mostly Diatomeae. These species are frequently found in sand and sludge abunding in detritus.

Group D - carnivorous. These nematodes have a well developed mouth chamber with strong maxilla and teeth. Their food consists of algae, and carnivorous nutritional patterns are charactristic for many among them. Habitats preferred by them are sludge and sand. They can also be found on clay. Table 1 shows fresh water nematodes found in Bulgaria, according to their labial apparatus structure. The table indicates, the largest share being for the representatives of non-specialised detritophages -14 nematods species, followed by specialised detritophages - 4 species, phytophages - 2 and the carnivorous - 2 nematods species.

Tab. 2. Distribution of free-living freshwather nematodes from Bulgarian inland waters by type of nutritional pattern. A = specialised detritophagous, B = non-specialised detritophagous, C = phytophagou, D = carnivorous.

TAXA	A	B	C	D
Monhystera stagnalis Bastian, 1865		x		
Monhystera filiformis Bastian, 1865	x			
Monhystera sp.	x			
Dorylaimus stagnalis Dujardin, 18		x		
Dorylaimus sp.		x		
Paradorylaimus sp.		x		
Mesodorylaimus sp.		x		
Eudorylaimus carteri (Bastian, 1865) Andrassy, 1969		x		
Eudorylaimus sp.		x		
Cylindrolaimus communis De Man, 1880	x			
Cylindrolaimus sp.		x		
Plectus cirratus Bastian, 1865	x			
Plectus assimilis Bütschlii, 1873		x		
Plectus sp.		x		
Rhabditis filiformis Bütschlii, 1873		x		
Rabditis sp.		x		
Tripyla glomerans Bastian, 1865		x		
Tobrilus gracilis Bastian, 1865			x	
Tobrilus sp.			x	
Enoploides fluviatilis Micoletzky (1923)				x
Enoploides sp.				x
Prodesmodora sp.		x		

The present study reveals the stenobiontic character of some of the species. The abundant development of these species is only possible in narrow limits of the environmental conditions. Outside these limits they cannot be found or they are in low quantity. The Nematoda community in the ecosystem of Koprinka Reservoir is composed of species with high ecological valence, as well as species with different level of specialization and adaptation to the environmental conditions . Free-living Nematoda play an important ecological role mainly as primary consumers, displaying saprophagous or bacterivorous feeding habits, and take part in controlling the nutrient cycling of the reservoir.

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