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FOOD SPECTRUM AND FEEDING OF *BARBUS CYCLOLEPIS* HECKEL FROM THE MIDDLE STREAM OF MARITZA RIVER (BULGARIA)

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Abstract

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To assess the food spectrum of *Barbus cyclolepis* altogether 101 specimens were investigated. Food of the barbel consists of 14 food components. The occurrence frequency and the index of dominance were the highest for Chironomid larvae with 78.95% and 42.11% respectively. Plant detritus is established as a significant component in the feeding of the species with 55.79% occurrence frequency and 23.16% index of dominance and is the most important nutrient during the summer season. Variation of index of dominance and fullness index during the year is also investigated. The maximum values of fullness index are established in August (4.8%) and the minimum is in November (0.56%). Feeding activity during the breeding season is decreased. The low value of vacuity index (5.94%) shows good feeding conditions.

Key words: Barbus cyclolepis, nutrition, occurrence frequency, index of dominance, fullness index, vacuity index

Introduction

B. cyclolepis is an endemic species for Bulgaria and Balkan Peninsula. In Bulgaria it is spread in the rivers Maritza, Mesta, Struma and their tributaries (Karapetkova and Zivkov, 2006). The species originates from Maritza River (Economidis, 1989). It is a typical rheophilic species, common for upper and middle streams with fast current and gravel bottom. Since 2005 the species is included in IUCN Red List of Threatened Species as a least concern taxon (Crivelli, 2005). It is also included in Bulgarian Low on Biological Diversity under condition of protection and controlled use. Knowledge about biology of the species in all its aspects will allow its better protection.

Data about food spectrum and food habits of *B. cyclolepis* are insufficient and out of date. Only Marinov (1989) gives information about food components in the gut of *B. cyclolepis* from Struma River, without presenting index of dominance, occurrence frequency and any other details.

Maritza River is the second river in length in Bulgaria – 321.6 km. Its catchments area includes 21 084 km^2, and covers 1/5 from the territory of Bulgaria. It is the most high water river in the country.

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Maritza River starts from Rila Mountain leave Bulgaria in Cap. Andreevo and flow into Aegean Sea. The average annual temperature is 12±1°C. http://www.bluelink.net/water/izbr/marica/index_marica.htm

The water of Maritza River is exposed to high anthropogenic influence. Regulation of water level of dam lakes along the river and use of river's water for irrigation lead to sudden changes in water level of the river. From the other hand the River is under a high influence of industrial and municipal waters. All this aspects cause stress to hydrobionts and changes the quality and quantity composition not only of fish populations but also of their food targets.

The aim of the study is to establish the food spectrum and feeding activity of eastern barbel's population in the middle stream of Maritza River.

Material and Methods

Fish were sampled during the period April – November 2006. The material was obtained from the middle stream of Maritza River in the area of Jabalkovo and Popovitza villages (Figure 1). The samples were collected by cast net fishing – size of the eye 15 mm and by electro-fishing gear Samus 725G at output frequency 45 Hz, output duration 0.35 milisec and output power 650 W.

Altogether 101 specimens of *B. cyclolepis* were investigated, 43 of them were male, 51 were female, 2 were juvenile and 5 were sex unidentified.

The standard length (SL), to the nearest 1 mm and the weight (W) to the nearest 0.1g for the specimens up to 10 cm and to the nearest 1 g for the specimens over 10 cm were measured. Digestive tracts were excised and preserved in 4 % formalin. The length of each gut (to the nearest 1 mm) and the weight (to the nearest 0.0001 g) of its contents were measured.

Age was determined on scales at magnification of 17.5x with the aid of projector Dokumator, Lasergerat (manufactured by Carl Zeiss, Jena).

The occurrence frequency (number of digestive tracts with a certain food item against the total number of digestive tracts, expressed as a proportion) of each element in the gut was calculated. The index of dominance (number of guts in which certain food item dominates, against the whole number of investigated guts, expressed as a proportion) was also calculated. To asses the activity and rhythm of feeding of the barbel fullness index (mean total weight of gut content relative to fish weight, in %) and vacuity index (the total number of empty guts relative to the total number guts, in %) were determined.

Results and Discussion

As there are no data about diet and feeding habits of *B. cyclolepis* we compare our results with those obtained for other species of the genus *Barbus*.

Altogether 14 food components are found in the food of the barbel. The occurrence frequency of the particular food components is represented on the Figure 2. The most abundant items are Chironomid larvae, followed by plant detritus and Ephemeroptera larvae. The presence of representatives of *Gamma-*

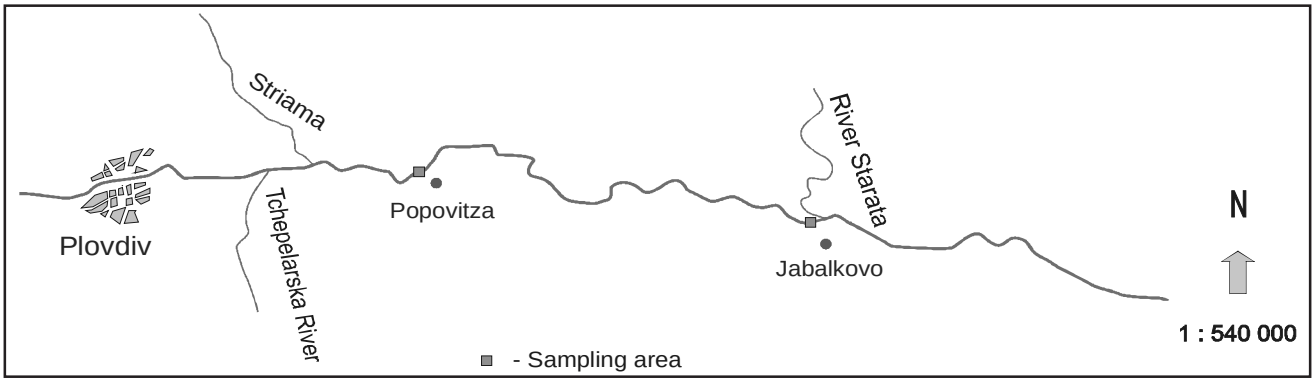

Fig. 1. Sampling sites on Maritza River

ridae and *Trichoptera* is also considerable. Components like mollusks, beatles's larvae and ants are probably accidentally got into the barbels food. It is confirmed by the low percent of their occurrence frequency.

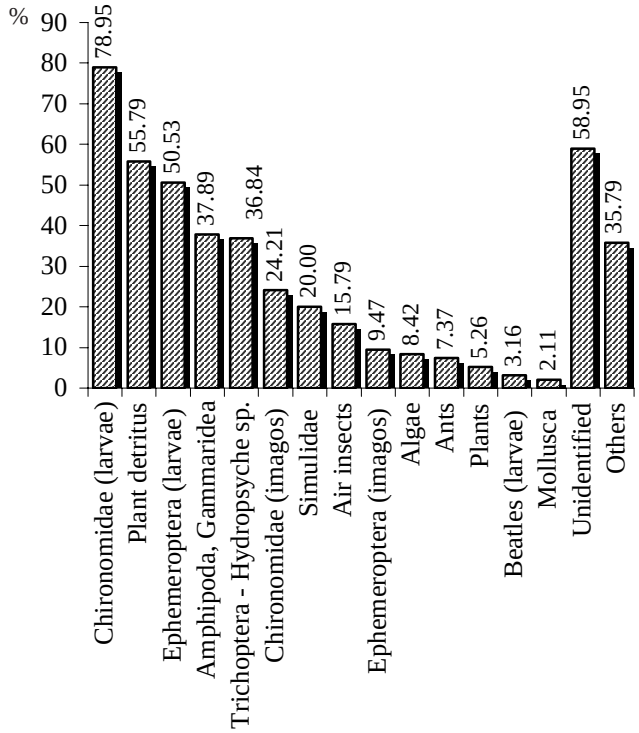

Fig. 2. Occurance frequency of food components in the digestive tract of *B. cyclolepis*, %

The food of *B. cyclolepis* is dominated by Chironomid larvae, followed by plant detritus and Gamarids (Figure 3). The domination of Dipterans larvae in the food of different species of barbels is reported from many authors (Losos et al., 1980; Granado-Lorencio and Garcia-Novo, 1986; Lobon-Cervia and Diego, 1988; Daoulas and Economidis, 1989; Collares-Pereira et al., 1996; Lenhardt et al., 1996; Encina and Granado-Lorencio, 1997; Pires et al., 2001). The high occurrence frequency of plant detritus and its presence as a dominant component in 23.16% of investigated guts shows that it is a significant component in barbels nutrition. Detritus is reported as a dominant component in the food of *B. bocagei* and *B. steindachneri* and as an additional food for *B. comiza* (Encina and Granado-Lorencio, 1997). It is also important in the diet of *B. albanicus* (Daoulas and Economidis, 1989).

Seasonal changes of index of dominance are represented in Table 1. Chironomid larvae and plant detritus are represented during the all investigated seasons as dominant components in the food of the barbel. In summer these are the most important nutrients for the species. Chironomid larvae prevail over the other components in spring and autumn. Values of index of dominance for Gamaridae in autumn are close to those for Chironomid larvae. The domination of both components in autumn season can be explained with the higher caloricity they have.

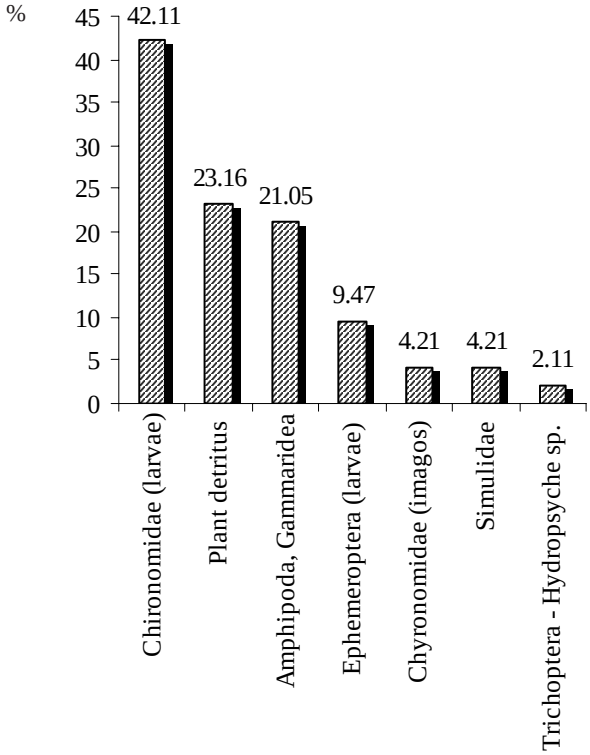

Fig. 3. Index of dominace (%) of food items in the diet of *B. cycloepis*

Changes in fullness index are used to trace out seasonal activity in the feeding of *B. cyclolepis* (Figure 4). The feeding is most intensive during the summer and early autumn and the peak is established in august. The very low feeding activity in November is

Table 1
Index of dominance (%) of different food items in the diet of *B. cyclolepis* during the different seasons

Food component	Index of dominance during the seasons, %		
	Spring	Summer	Autumn
Chironomidae (larvae)	12.6	8.42	21.05
Plant detritus	2.11	16.84	4.21
Amphipoda, Gammaridea		2.11	18.95
Ephemeroptera (larvae)		2.11	7.37
Chyronomidae (imagos)	2.11	1.05	1.05
Simulidae		2.11	2.11
Trichoptera, Hydropsyche sp.	2.11		

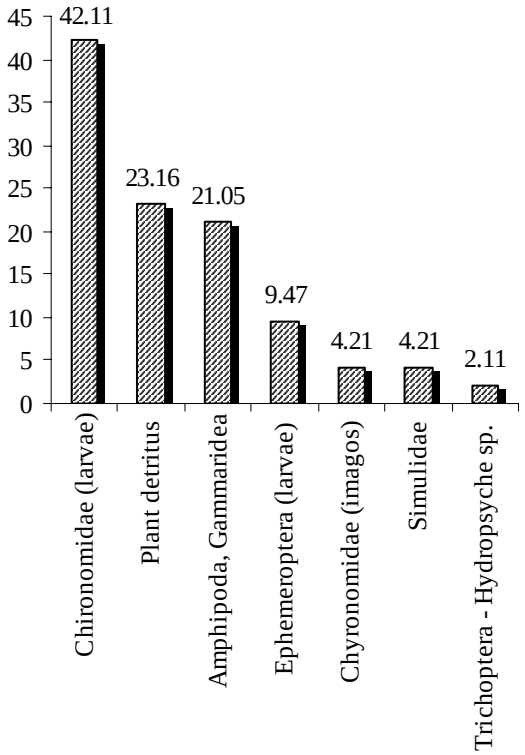

Fig. 4. Seasonal changes in fullness index of B. cyclolepis during 2006

probably a result of falling of temperatures. *B. cyclolepis* is a species, which is not active in the winter. It shoals and spends the winter in deep pools along the river. Lower values of the fullness index in spring are probably due to decreased feeding activity during the breeding season. Indicator of the feeding activity of the fish can also be the vacuity index. From all 101 investigated guts only six (5.94 %) are empty. The low percent of empty guts (less than 10%) shows a good rhythm of feeding and a good nutritional base for the species.

Conclusion

Food of *B. cyclolepis* consists of 14 food components, mainly benthos. The most important nutritional component in its diet is Chironomid larvae. It shows the highest occurrence frequency (78.95 %) and index of dominance (42.11 %). Plant detritus is also a significant component in the feeding of the species and is the most important nutrient during the summer season. Seasonal activity in the feeding of *B. cyclolepis* is established, with a peak in summer, when the fullness index is 4.8 % and very low values in the late autumn (0.56 %). The low values of vacuity index (5.94%) show good feeding conditions.

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