

THE FISH SPECIES PARTICIPATION IN OTTERS’ (*LUTRA LUTRA*) DIET IN MARITZA RIVER, WEST OF PLOVDIV TOWN (SOUTHERN BULGARIA)

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Abstract: Six-kilometer stretch of Maritza River was investigated. In the collected otter spraints the fish dominated with 63,89% occurrence and 7 species from all the items. The most “preferred” fish by the otters were *Cyprinus carpio*, *Esox lucius*, *Carassius* spp. and *Barbus cyclolepis*. The river’s segment ichthyofauna was represented by 16 fish taxa. The fish taxa in otters’ diet differed from this one in the river, both as a quantity and species diversity. We suggest some possibilities not excluding each other: 1. Otter prey selection in Maritza River; 2. Feeding of the resident otters in other areas and habitats; 3. Deposition of spraints of vagrant individuals for the area.

Key Words: otter, *Lutra lutra*, diet, fish, ichthyofauna, river.

INTRODUCTION

The otter (*Lutra lutra* L.) is a widely distributed and a typical carnivore along the Bulgarian Maritza River stream (SPIRIDONOV et SPASSOV, 1989; GEORGIEV, 2005). In Plovdiv Town’s stretch of this river GEORGIEV (2006) found that the fish was one of the main prey in the otters’ diet there.

According to the summarized data by ВЕЛЧЕВА & МЕХТЕРОВ (2005) the studies of the ichthyofauna of Maritza River were carried out by КОВАЧЕВ (1921), МОРОВ (1930), ШИШКОВ (1939), ДРЕНСКИ (1951), ЗАШЕВ (1961), МИХАЙЛОВА (1965), КАРАПЕТКОВА et al. (1993), and КАРАПЕТКОВА and ЖИВКОВ (2000). Considering these authors, who worked in the period of 1921-2000 in the river 28 fish species were found. During the last years (till 2004) a trend for dropping of the species diversity and invasion of foreign introduced species was observed (ВЕЛЧЕВА & МЕХТЕРОВ, 2005). According to the data published, 6 species became extinct, 5 became rare and 3 were introduced. After the summarized data, we found that the following fish species occur in the river now *Rutilus rutilus mariza*, *Leuciscus cephalus*,

Aspius aspius, *Chondrostoma vardarense*, *Gobio gobio*, *Barbus cyclolepis*, *Alburnus alburnus*, *Vimba melanops*, *Rhodeus sericeus amarus*, *Pseudorasbora parva*, *Carassius carassius*, *Carassius auratus gibelio*, *Cyprinus carpio*, *Cobitis taenia*, *Esox lucius*, *Perca fluviatilis*, *Stizostedion lucioperca*, *Lepomis gibbosus*, *Gambusia affinis holbrooki*. The species *Petromyzon danfordii*, *Acipenser sturio*, *Anguilla anguilla*, *Scardinius erythrophthalmus*, *Barbus barbus*, *Barbus meridionalis petenyi*, *Abramis brama*, *Tinca tinca*, *Sabanejewia aurata balcanica*, *Silurus glanis*, *Platichthys flesus luscus*, *Proterorhynchus marmoratus* became extinct or they are extremely rare in Maritza River.

Otters are extremely sensitive about the shortages of food, and the decreasing of the fish stocks has a rapid negative consequence on their populations. Which fish species are there and what do otters select as a prey in the habitat is one of the topical questions for otters' ecology and conservation (KRUUK, 2006).

A number of authors have attempted to assess the preference of otters between fresh-water fish species in various areas abroad (CHANIN, 2003). The method for estimation the fish numbers was the electro-fishing and for the otters' diet – the spraint analysis. The results from the otters' prey selection studies differed in areas (THOM, 1997; TAASTROM & JACOBSEN, 1999; LANSZKI et al., 2001; RUIZ-OLMO et al., 2001). The otter selection on the fish prey was mainly studied in West European countries and there was not any information from the Balkans. Accordingly the aim of our study was to estimate the fish species diversity and its quantities in a Bulgarian Maritza River stretch and to compare it with the otter diet there.

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MATERIAL AND METHODS

Our study was carried out during the summer period of 2005 and 2006. Six kilometer stretch of Maritza River (the largest river in Southern Bulgaria) was investigated (Fig. 1). The study area was situated in the western part of Plovdiv Town and it is placed between the "VHVP"-bridge in the east and about the level of the town ring road in the west. The stretch's banks were mostly slant and sandy with some patches of *Salix* spp. Also a few floods occupied by *Typha* spp. were present in the area. Along the whole part of the river in Plovdiv Town there were intense fishing activities of anglers.

The otters' diet was studied by the method of spraint analysis as a minimal number of specimens registered. It was represented as a percent from all the specimens in the spraints found. Total of 59 spraints were collected and analyzed in the laboratory. Some of the information about the otters' diet (this one for the summer of 2005) in this stretch of Maritza River was partly published by GEORGIEV (2006) and

GEORGIEV & STOYCHEVA (2006), and summarized for the spring-summer period in the “large rivers” habitat by the authors.

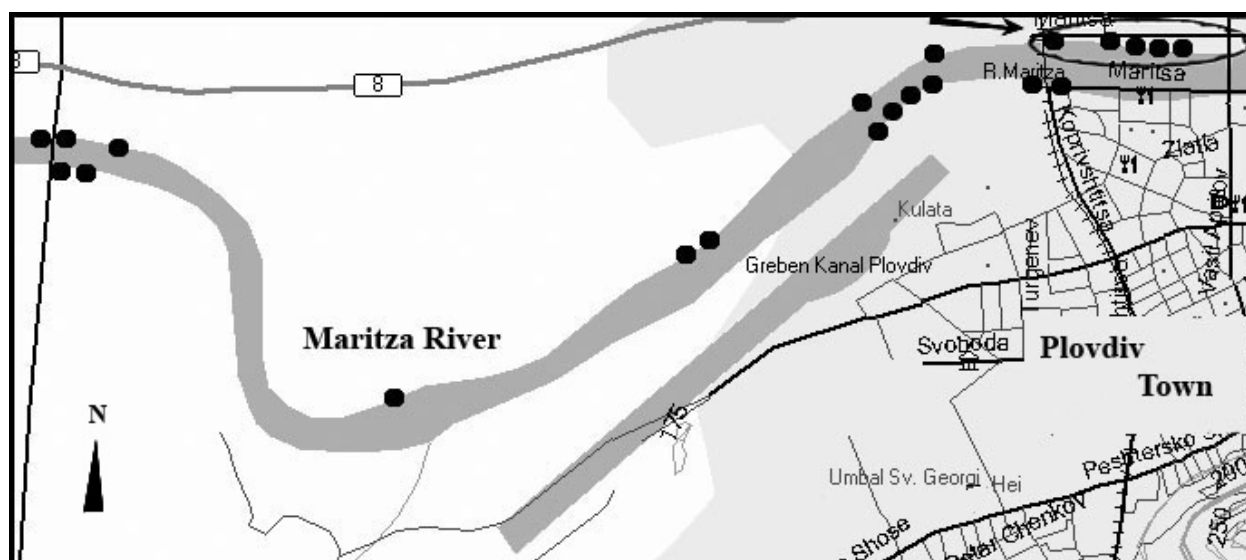


Figure 1. Study area: approximate position of the otter (*Lutra lutra*) sprainting sites from which the analyzed spraints were gathered (closed symbols), and the bank area where the dead fish specimens collection was done (open symbol, pointed by an arrow).

Фигура 1. Район на изследване: приблизително разположение на маркировъчните места на видрата (*Lutra lutra*) от които са събирани анализирани екскременти (отбелязано с черни кръгли символи) и участъкът от брега от който са събрани мъртвите риби (ограден участък, посочен със стрелка).

The study on the ichthyofauna of the river's stretch was carried out by a non-standard method never used in any European otter investigations. During the current repairs of the Maritza River embankments in Plovdiv Town large parts of its basin were dried up. A lot of fish specimens were captured in the shallows and died on the bottom of these river parts. We collected 1056 fresh dead individuals of fish from the dried areas on sand, mud, and in water or littoral vegetation. In spite of the large extract of fish, a disturbance of it could be supposed from the collection of fish specimens by local people or by various predators. However our ichthyological material came mainly from the underside areas of vegetation heaps and we consider that the extract was an adequate one for this Maritza stretch.

The fish taxa were identified using mainly the keys by КАРАПЕТКОВА и ЖИВКОВ (2000) and MARZ & BANZ (1987).

To calculate the otters prey “preference” we used the Ivlevs’s formula (according LANSZKI et al., 2001):

$$E_j = (r_j - n_j) / (r_j + n_j)$$

where r_j is the proportion of a given fish taxa in the diet, and n_j – in the environment.

The diversity of the otter preyed fish and this one in the river, we used the Simpson's index (BEGON et al., 1986):

$$S = 1/B \sum p_i^2$$

where p_i is the proportion of each fish taxa and B is the total number of fish taxa.

To calculate the similarity between otters' diet and the river's ichthyofauna we used the Sorenson quantitative measure (BEGON et al., 1986).

The last two indexes were calculated by the help of the BioDAP computer program (THOMAS & CLAY, 1988).

RESULTS AND DICUSSION

In the food of the otters during the summer in the Maritza River's segment studied there were minimum 72 individual prey items. In the spraints collected the fish dominated with 63,89% from all the specimens. On the second place were the marsh frogs (*Rana ridibunda*) with 15,28%, followed by the water snakes (*Natrix tessellata*, *Natrix* sp.) with 8,33%. Occasionally taken by the otters were the insects (most of them possibly came from the stomach contents of larger prey) as *Coleoptera* spp. (6,94%), adult *Odonata* sp., *Formicidae* sp. (both single specimens, 1,39%). A juvenile individual of *Gallinula chloropus* had also been eaten by the otters (1,39%). The fresh water crab *Potamon ibericum*, often found as otter food remains on these Maritza River banks (GEORGIEV & STOYCHEVA, 2006), was registered here as a single specimen (1,39%).

The fish taxa in the otters' diet differed from this one in the river, both as a quantity and species diversity (Sorenson similarity index = 6,0%), Table 1. There was a weak positive correlation between the fish composition in the Maritza River and in the otters' diet ($r_s = 0,246$). The fish diversity was about two times more various in the river (Simpson's index = 4,770) than this one in the otters diet (Simpson's index = 2,578). There were 16 fish species found in the river stretch, and only 7 in the diet of the otters.

All the fish taxa in the river segment we found were reported for Maritza River, with an exception of *Leuciscus borysthenicus*. This species is a new record for the ichthyofauna of this river. It was determined by the author according the criteria of КАРАПЕТКОВА и ЖИВКОВ (2000): "small mouth, which back end do not reach the vertical line let down from the front edge of the eye".

The species *Esox lucius* and *Cyprinus carpio* were found only in the otters' spraints. Their catch in other areas by otters could be supposed, or they possibly were extremely rare in the river segment under study. Calculating the "preference" index, we respectively estimated the highest levels of "selection" on these two species ($E_j = 1$). The most "selected" of the other fish were *Carassius* spp. ($E_j = 0,95$), and *Barbus cyclolepis* ($E_j = 0,94$). Less "preferred" were *Rhodeus sericeus* ($E_j = 0,62$), and *Rutilus rutilus* ($E_j = 0,21$). Slightly "avoided" were *Cobitidae* spp. ($E_j = -0,18$), and the other fish were totally ignored ($E_j = -1$).

Table 1. The fish in the Plovdiv Town's segment of Maritza River and in the otters (*Lutra lutra*) diet. Legend: *n* – number of individuals registered, % – percent of occurrence.

Таблица 1. Рибата в участъка от река Марица в град Пловдив и в хранителния спектър на видрата (*Lutra lutra*). Легенда: *n* – брой регистрирани индивиди, % – процент на срещаемост.

Taxa	Maritza River		Otters` Diet		Ivlev`s preference index
	n	%	n	%	
<i>Cobitidae spp.</i>	359	34.00	1	2.22	-0.18
<i>Pseudorasbora parva</i>	192	18.18	0	0.00	-1.00
<i>Carassius spp.</i>	169	16.00	27	60.00	0.95
<i>Cyprinus carpio</i>	0	0.00	5	11.11	1.00
<i>Rutilus rutilus</i>	162	15.34	1	2.22	0.21
<i>Rodeus sericeus amarus</i>	116	10.98	2	4.44	0.62
<i>Barbus cyclolepis</i>	15	1.42	2	4.44	0.94
<i>Gobio gobio</i>	14	1.33	0	0.00	-1.00
<i>Alburnus alburnus</i>	10	0.95	0	0.00	-1.00
<i>Leuciscus cephalus</i>	5	0.47	0	0.00	-1.00
<i>Leuciscus borysthenicus</i>	3	0.28	0	0.00	-1.00
<i>Gambusia affinis holbrooki</i>	5	0.47	0	0.00	-1.00
<i>Tinca tinca</i>	2	0.19	0	0.00	-1.00
<i>Chondrostoma vardarense</i>	1	0.09	0	0.00	-1.00
<i>Vimba melanops</i>	1	0.09	0	0.00	-1.00
<i>Aspius aspius</i>	1	0.09	0	0.00	-1.00
<i>Proterorichinus marmoratus</i>	1	0.09	0	0.00	-1.00
<i>Esox lucius</i>	0	0.00	7	15.56	1.00
Total fish specimens	1056	100.00	45	100.00	
Simpson`s diversity index	4.77		2.578		
Sorenson`s similarity index	6.00%				

CONCLUSIONS

Studying the minimal number of individuals in otter spraints in a stretch of the large river Maritza, the fish was main prey recorded in respect to the studies of the preyed individuals both in spraints and food remains reported by GEORGIEV (2006), where the freshwater crabs dominated. This fact suggests more careful interpretations of the prey remain occurrences among otter food remains wherever they are collected. It could be supposed that both spraints and prey remains on feeding sites are

important but they have to be collected only when they are in fresh deposited condition.

Also the fish taxa in otters' diet differed from this one in the river, both as a quantity and species diversity. We suggest some possibilities not excluding each other:

1. Otter prey selection in Maritza River
2. Feeding of the resident otters in other areas and habitats
3. Deposition of spraints of vagrant individuals and resident males (which have very large home ranges: KRUUK, 2006) in the area.

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УЧАСТИЕ НА ВИДОВЕТЕ РИБА В ХРАНАТА НА ВИДРАТА (*LUTRA LUTRA*) В РЕКА МАРИЦА В ЗАПАДНАТА ЧАСТ НА ГРАД ПЛОВДИВ (ЮЖНА БЪЛГАРИЯ)

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(резюме)

Изследвана е ихтиофауната и хранителния спектър на видрата (*Lutra lutra*) в участък от река Марица разположен в западната част на град Пловдив. Проучването е проведено през летния период на 2005 и 2006 година. Установени са различия във видовия и количествен състав на рибата в реката и в храната на видрите, които го обитават и са обсъдени възможните причини за този факт. Установена е по-голям индекс на „предпочитаемост“ на видрите към хранене с 4 вида риба, 1 вид е слабо „предпочитан“, 1 – слабо „избягван“ и 12 са напълно игнорирани. При проучването е установен нов вид риба за ихтиофауната на река Марица.

