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Short communication

FOOD PREFERENCES OF JUVENILE STAGES OF *PSEUDORASBORA PARVA* (SCHLEGEL, 1842) IN THE KIS-BALATON RESERVOIR

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ABSTRACT. The food of *Pseudorasbora parva* juveniles from the Kis-Balaton Reservoir in Hungary was analyzed. Nine food components, among which filtrating Cladocera dominated, were confirmed in the diet of this fish. The highest values of the relative importance index were observed for *Bosmina* sp. at 53.7% (September 1991) and *Daphnia* sp. at 47.6 and 55.5% in July and September 1992, respectively. Due to the presence of this new ichthyofauna representative in Polish waters, it is possible that the pool of fish species which pressure filtrating Cladocera will increase. Additionally, this species may become a food competitor for native fish both in open waters and cultivation reservoirs.

Key words: *PSEUDORASBORA PARVA*, KIS-BALATON RESERVOIR, FOOD COMPOSITION

In order to improve the quality of waters which feed Lake Balaton, a special area known as the Kis-Balaton Protection System was created in 1976-1985 to act as a natural filtration-settling reservoir. Since the creation of the reservoir, studies have been conducted which focus on the physical and chemical properties of its water as well as the characteristics of its phytoplankton, zooplankton (Pomogyi 1990, Bancsi 1991) and ichthyofauna. A total of 31 fish species, including *Pseudorasbora parva* (Schlegel, 1842), was reported in the reservoir (Martyniak et al. 1993).

Pseudorasbora parva is a foreign species in this geographical zone. It was introduced into central Europe along with herbivorous fish in the 1960s (Witkowski 1991, 1996) and has since been spreading in an uncontrolled manner. Currently, it is often present in the ichthyofauna of natural and artificial reservoirs in the majority of European countries (Biró 1972, Žitnan and Holčik 1976, Baruš et al. 1984, Anhelt 1989, Witkowski 1991, Kotusz and Witkowski 1998).

The aim of the present work was to determine the food composition of *Pseudorasbora parva* in the Kis-Balaton Reservoir. Particular emphasize was placed on its potential pressure on filtrating Cladocera which hold an important position in the

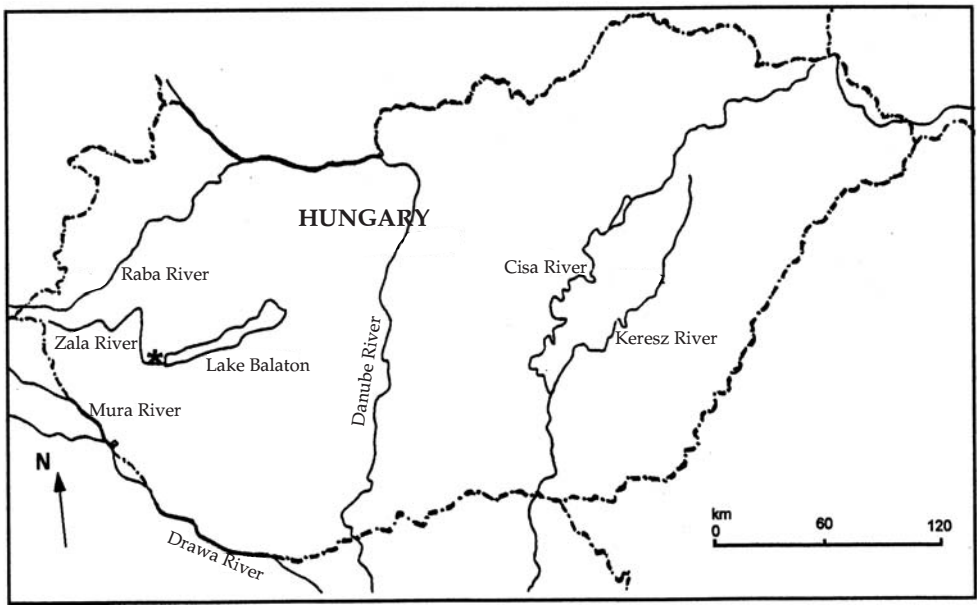

Fig. 1. Location of the Kis-Balaton Reservoir.

trophic pyramid of water ecosystems and are one of the most important elements in many biomanipulation experiments (Shapiro et al. 1975, Shapiro and Wright 1984, Mc Queen et al. 1986).

The materials were collected in 1991 and 1992 in the Kis-Balaton Reservoir located in southwestern Hungary before the mouth of the Zala River into Lake Balaton (Fig. 1). The area of the reservoir is 1,800 ha, its volume is approximately 21 million m^3 and the average depth is 1.2 m. The majority of the reservoir's water surface is covered by higher flora which is dominated by *Potamogeton natans* (L.) and *Potamogeton lucens* (L.). The zooplankton biomass varies annually from 78.3 to 6,512.1 mg m^{-3} and is represented by more than a dozen species, mainly Cladocera. The dominant species is *Daphnia magna* (Straus) (Pomogyi 1990, Bancsi 1991).

Among the 31 registered fish species, white bream *Abramis bjoerkna* L., silver crucian carp *Carassius auratus gibelio* (Bloch), roach *Rutilus rutilus* (L.) and *Pseudoras-*

bora parva, a fish that is not very valuable commercially, dominate in terms of abundance (Martyniak et al. 1993). Fisheries activities are very limited in the reservoir since it is a nature preserve. The average, annual catch is approximately 5 kg ha^{-1}, and the fish species which dominate in these catches are carp *Cyprinus carpio* L., grass carp *Ctenopharyngodon idella* (Val.) and silver carp *Hypophthalmichthys molitrix* (Val.).

The fish for the studies were caught using a fry trawl with a wing length of 15 m and 1.0 mm mesh size netting in the bunt. The catches were made in the shallow, coastal areas of the reservoir. A total of 394 specimens with an average total length (l.t.) ranging from 1.6 to 2.7 cm and an average body weight from 0.08 to 0.41 g were collected in the various samples (Table 1). The entire digestive tracts of the caught fish were prepared and then preserved in a 4% formaldehyde solution. The contents of the digestive tract were diluted with 5 ml of water. A sample of 1 ml was drawn off and transferred to a plankton chamber and each sample was examined three times. The food composition was determined according to the methods proposed by Hyslop (1980).

TABLE 1

Description of the sampled material

Sampling date	Number of samples (indiv.)	Total length (l.t.)			Body weight		
		Range (cm)	Average (cm)	SD	Range (g)	Average (g)	SD
17 September 1991	231	1.0 - 5.8	2.7	0.88	0.01 - 3.36	0.41	0.37
27 July 1992	36	1.1 - 2.3	1.7	0.25	0.01 - 0.19	0.08	0.03
1 September 1992	127	0.7 - 2.8	1.6	0.25	0.01 - 0.43	0.09	0.05

SD – standard deviation

Nine components, mainly invertebrates, were confirmed in the food of *Pseudorasbora parva*. In September 1991, the dominant species in terms of abundance were *Bosmina* sp., *Chydorus* sp. and Copepoda. In samples from 1992, Copepoda (54.2 and 28.8%) and *Daphnia* sp. (16.7 and 28.6%) dominated (Table 2). In 1991, unidentified Insecta dominated (76.1%) in terms of weight, while in samples from 1992 *Daphnia* sp. was the dominant species (July - 92.7%, September - 93.8%) (Table 2). The highest values of the relative importance index in the sample from September 1991 were registered for *Bosmina* sp. (53.7%), unidentified Insecta (17.0%) and *Chydorus* sp. (15.7%). In 1992 (July and September), the relative importance index was the highest for *Daphnia* sp. (47.6 and 55.5%) and Copepoda (39.1 and 26.7%) (Table 2, Fig. 2).

The Kis-Balaton Protection System is a typical habitat for *Pseudorasbora parva*, and is similar to the area of its natural habitat which is typically old river beds, drainage

TABLE 2

Food composition of *Pseudorasbora parva* in the Kis-Balaton Reservoir

Sampling date	Food component	Quantitative share (%)	Weight share (%)	Frequency of occurrence (%)	Index of relative importance (%)
17 September 1991	Rotatoria	2.0	0.1	22.2	0.4
	Daphnia sp.	2.0	6.5	22.2	1.8
	Bosmina sp.	49.9	5.9	100.0	53.7
	Chydorus sp.	22.8	1.6	66.6	15.7
	Leptodora sp.	2.2	3.0	22.2	1.1
	Copepoda	18.4	0.4	50.0	9.1
	Chironomidae	0.3	4.4	11.1	0.5
	Diptera	1.3	76.1	22.2	17.0
	Plant seeds	1.1	2.0	22.2	0.7
27 July 1992	Rotatoria	15.0	1.1	62.5	7.0
	Daphnia sp.	16.7	92.7	62.5	47.6
	Bosmina sp.	9.2	1.7	62.5	4.7
	Chydorus sp.	4.1	0.5	37.5	1.2
	Leptodora sp.	0.8	2.0	18.7	0.4
	Copepoda	54.2	2.0	100.0	39.1
1 September 1992	Rotatoria	7.4	0.1	25.0	1.7
	Daphnia sp.	28.6	93.8	50.0	55.5
	Bosmina sp.	27.2	3.0	50.0	13.7
	Chydorus sp.	6.6	0.4	25.0	1.6
	Leptodora sp.	1.4	2.1	25.0	26.7
	Copepoda	28.8	0.6	100.0	0.8

ditches and canals, ponds and shallow lakes (Witkowski 1991, Adámek and Siddiqui 1997). Its food is very diverse and varies according to the seasons (Adámek et al. 1996) and the size of the fish (Movčan and Kozlov 1978). Generally speaking, *Pseudorasbora parva* juvenile is considered to be a typical planktonofag. It feeds on Rotatoria, Copepoda and, less frequently, on phytoplankton (Kozlov 1974, Adámek et al. 1996). Mature specimens exhibit incredible food flexibility. Muchačeva (1950) reported that food of mature *Pseudorasbora parva* specimens from the drainage area of the Amur River consists of planktonic crustaceans from the families Chydoridae, Leptodoridae and Bosminidae as well as the larvae of Chironomidae. Movčan and Kozlov (1978) reported the food components of *Pseudorasbora parva* from the Dniester, Danube and Dnieper rivers to include algae, fragments of vascular plants, detritus and inverte-

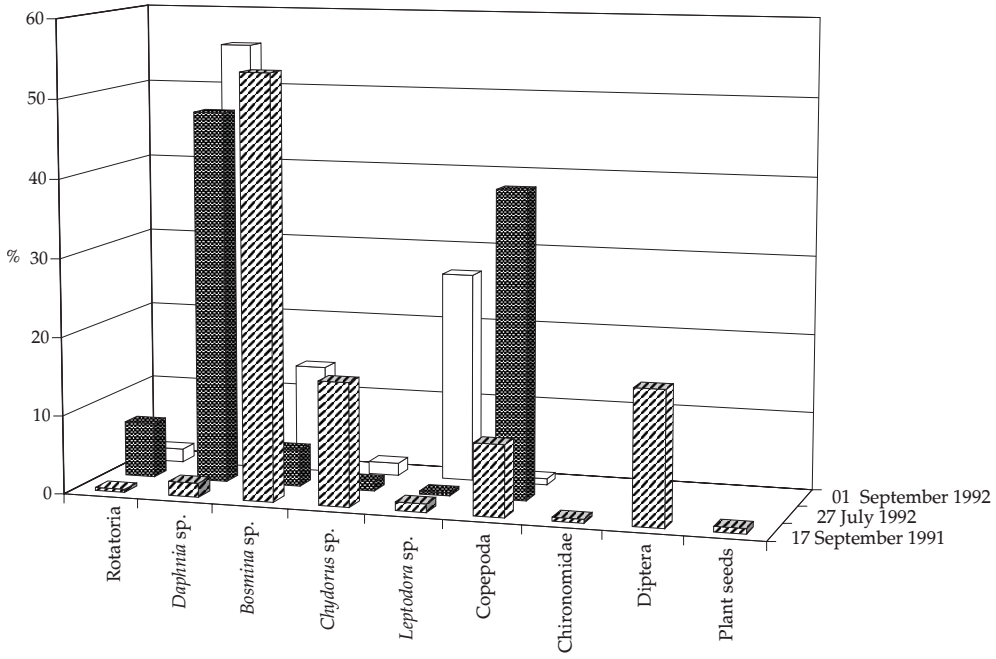

Fig. 2. Values of the relative importance index for particular food components of *Pseudorasbora parva* fry in the Kis-Balaton Reservoir.

brates, i.e. larvae of Plecoptera (*Isopteryx* sp.), Trichoptera (*Limnophilus* sp., *Hydropsyche* sp.) or Chironomidae (*Chironomus* sp., *Cricotopus* sp., *Cryptochironomus* sp.). Giurca (1970) reported that the main food components of *Pseudorasbora parva* included Oligochaeta, Chironomidae and benthic forms of Cladocera. The comparison of the food composition of the Kis-Balaton Reservoir data with that obtained by Adámek et al. (1996) and Adámek and Siddiqui (1997) confirmed that this species prefers invertebrates (*Daphnia* sp., *Bosmina* sp., *Leptodora* sp. and Chironomidae larvae).

It is worth mentioning that *Pseudorasbora parva* is regarded as an important competitor of cultivated fish fry, e.g. carp, grass carp or silver carp, due to the fact that its feeding spectrum can include commercial feeds (Kozlov 1974). Adámek et al. (1996) reported cases of scale or even muscle damage in mature carp and silver carp caused by *Pseudorasbora parva*. Nikolskij (1956) reported *Pseudorasbora parva* pressure on the eggs of other species, for example those of the genus Pseudogobio. Trombicki and

Kachowski (1987) refer to this species as a facultative parasite, while Libosvárský et al. (1990) drew particular attention to the shape of the *Pseudorasbora parva* jaw which predisposes this species to this type of feeding.

The observations described in this paper confirm that *Pseudorasbora parva* has very diverse food preferences and exhibits enormous flexibility in attaining it. The authors believe that this species targets filtrating Cladocera in the Kis-Balaton Reservoir thus limiting or distorting the functioning of the proposed protection system. Due to the presence of this new representative in the ichthyofauna in an increasing number of cultivation reservoirs in Poland, e.g. the Stawno and Ruda Sułowska fish farms (Witkowski 1991) and many others (Kotusz and Witkowski 1998), it is possible that the pool of fish species which put pressure on filtrating Cladocera will increase. Additionally, this species may become a food competitor for domestic fish both in open waters and cultivation reservoirs (Holčik 1991).

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STRESZCZENIE

PREFERENCJE POKARMOWE MŁODOCIANYCH STADIÓW CZEBACZKA AMURSKIEGO *PSEUDORASBORA PARVA* (SCHLEGEL, 1842) ZE ZBIORNIKA KIS-BALATON

Przeanalizowano pokarm narybku czebaczka amurskiego *Pseudorasbora parva* (Schlegel, 1842) złowionego w latach 1991-1992 w zbiorniku Kis-Balaton (Węgry) (rys. 1, tab. 1). Czebaczek jest gatunkiem obcym dla naszej strefy geograficznej. Trafił do Europy Środkowej w latach 60. wraz z rybami roślinożernymi i od tego momentu rozprzestrzeniał się w sposób niekontrolowany. W pokarmie stwierdzono obecność 9 komponentów, wśród których dominowały filtrujące Cladocera. Najwyższe wartości wskaźnika względnej ważności zanotowano dla *Bosmina* sp. - 53,7% (wrzesień 1991) oraz *Daphnia* sp. - odpowiednio 47,6 i 55,5% (lipiec i wrzesień 1992; tab. 2). Presja *Pseudorasbora parva* na filtrujące Cladocera powoduje zatem ograniczenie bądź zakłócenie funkcjonowania zaproponowanego „Systemu Ochrony" Kis-Balaton. W związku ze stwierdzoną obecnością tego nowego przedstawiciela ichtiofauny w wodach Polski, prawdopodobne wydaje się, iż powiększy on pulę gatunków wywierających presję na filtrujące Cladocera. Dodatkowo może stać się też konkurentem pokarmowym ryb rodzimych zarówno w wodach otwartych, jak i w obiektach hodowlanych.

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