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Recent fish faunistical investigations in Hungary with special reference to *Umbra krameri* WALBAUM, 1792

(Pisces: Umbridae)

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Abstract

Umbra krameri WALBAUM was a rather common species in Hungary until vast drainage works started. The paper offers information on the distribution of this species until the end of the 1970s comparing with the present situation. Reasons of the significant decline of *U. krameri* within the last decades are discussed.

Key words: Umbridae, *Umbra krameri*, Hungary, distribution.

Zusammenfassung

Bis zum Beginn umfassender Trockenlegungen war *Umbra krameri* WALBAUM eine in Ungarn weit verbreitete Art. Die vorliegende Arbeit informiert über die Verbreitung dieser Art bis zum Ende der 70er Jahre unseres Jahrhunderts im Vergleich mit der heutigen Situation. Die Ursachen für den signifikanten Rückgang von *U. krameri* in den letzten Jahrzehnten werden diskutiert.

Introduction

The European mudminnow (*Umbra krameri* WALBAUM, 1792) occurs in south-eastern Europe as a Pannonian endemic species and has become a threatened fish nowadays. This fish species has a scattered distribution along the Danube from Vienna to the delta and the lower reaches of the Prut and Dniester Rivers (BERINKEY 1966, LELEK 1980).

Hungary was very rich in *U. krameri* in previous centuries, before vast drainage works started. Figure 1 shows the distribution of *U. krameri* in the 19th century based on literature data (VUTSKITS 1918, HANKÓ 1931, STERBETZ 1956, VASARHELYI 1958, BERINKEY 1966). From most of these habitats *U. krameri* has become extinct. Figure 2 shows the faunistical data of *U. krameri* from 1979 to 1988 (BOTTA & al. 1981, 1984, 1987, KERESZTESSY 1987). In Hungary this species is protected since 1974.

The collection and study of *U. krameri* was part of my faunistical research on Hungarian protected fish species (KERESZTESSY 1992, 1993). Additional data are from a special "monitoring" project in Kis-Balaton Reservoir II. (KERESZTESSY 1994).

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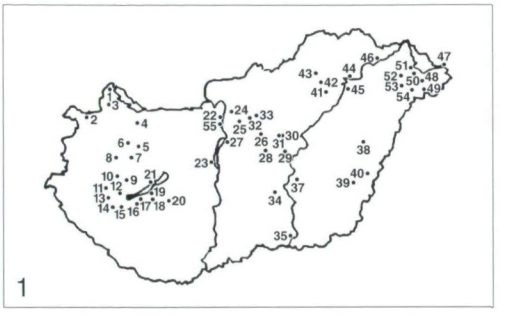
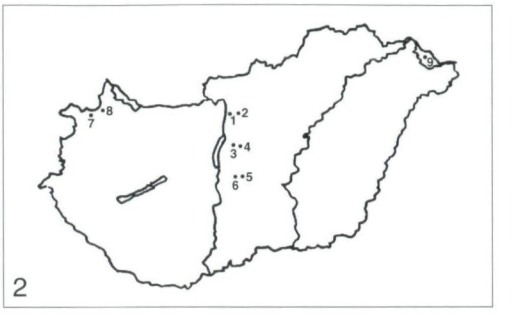
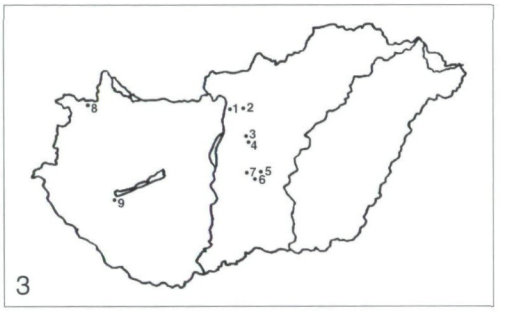
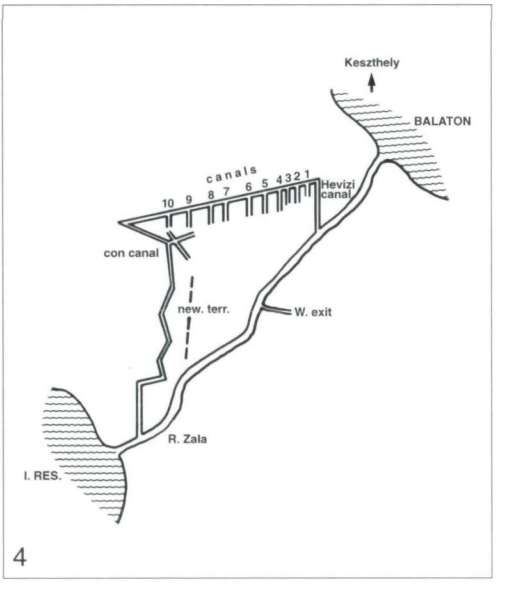








Figs. 1 - 4. (1) Distribution of *Umbra krameri* in Hungary before 1979, based on literature data; for location names and literature sources see Table 1. (2) Location of sampling places studied between 1979 and 1988, see also Table 2. (3) Location of sampling places of the present study, see also Table 3. (4) Map of the Kis-Balaton II reservoir.

Material and methods

Faunistical data were collected from 1988 to 1994. We used a direct ripple current electric fishing research machine (HF-205, Noviki, Hungary, 1,5 A and 110 V) and a quadrangular net 0.9 m long, 0.6 m wide, 2 x 3 mm mesh. In general faunistical work we used different sizes of sline nets, dragnet, etc. In all cases the catch area was 100 m^2 i.e. 50 m long and 2 m wide. In total, we investigated 314 places between 1988 and 1994.

At every fishing place water temperature, current velocity, width, and depth was measured. Further the conductivity of the water was measured with a WTW apparatus (LF-95, Germany), pH was measured with Hanna equipment (ATC Piccolo 2, Italy), and dissolved oxygen with a WTW oxygen sensor (Oxi-96, Germany) or a Merck reagent-kit (111 107 kit, Germany).

We measured total length, standard length, and weight of every fish specimen. About 10 % of the collected fish specimens were preserved in formalin for further research. The age of fish was determined according to the annual rings of the scales and the otoliths.

Table 1. The distribution of *U. krameri* in Hungary before 1979, based on literature data (VUTSKITS 1918, HANKO 1931, STERBETZ 1956, VASARHELYI 1958, BERINKEY 1966).

1.	Lajta	15.	Kis-Balaton	29.	Tapioszele	43.	Igrici
2.	Fert	16.	Kethely	30.	Farmos	44.	Tiszaluc
3.	Hansag	17.	Toszentpal	31.	Nagykata	45.	Tiszadob
4.	Meleger	18.	Buzsak	32.	Egreskata	46.	Bodrogkoz
5.	Barca-stream	19.	Tatarvar	33.	Jaszbereny	47.	Szernye-mars
6.	Hideger	20.	Nagyberek	34.	Jaszkarjeno	48.	Ecsedi-mars
7.	Viztolatoi-spring	21.	Tihany	35.	Szeged	49.	Kocsord
8.	Eger-stream	22.	Romai-furdo	36.	Zimony	50.	Opalyi
9.	Tapolca-stream	23.	Makad	37.	Cibakhaza	51.	Nagydobos
10.	Lesence-stream	24.	Veresegyhaza	38.	Berettyo	52.	Nyirparasznya
11.	Heviz	25.	Alsogod	39.	Sarret	53.	Nyirvaja
12.	Gyenesdias	26.	Rakos-stream	40.	Komadi	54.	Nyimedgyes
13.	Zala	27.	Soroksari Duna	41.	Arokto	55.	Ordog-ditch
14.	Fenekpuszta	28.	Tapioszentmarton	42.	Mezocsat		

Table 2. The faunistical data of *U. krameri* from 1979 to 1988, after BOTTA & al. 1981 (A), 1984 (B), 1987 (C), and KERESZTESSY 1987 (D).

1.	God (A, B, D)	4.	Dunavolgyi Main canal (A, C)	7.	Hansagliget (A)
2.	Szodi-stream (A, B D)	5.	Orgovany-lake (C)	8.	Rabca (A)
3.	Ocsa-canal (A, B, C, D)	6.	Kolon-lake (C, D)	9.	Csaroda (B)

Table 3. Numbers of *U. krameri* in the localities investigated in the present study.

	1988	1989	1990	1991	1992	1993	1994
1. God water gang	4	-	3	1	-	4	-
2. Veresegyhaz						35	-
3. Ocsa canal	12	5	-	-	-	-	-
4. Ocsa lake					36	34	41
5. Kolon-lake					86	12	30
6. Kolon canal						6	3
7. Kulleri canal						15	7
8. Feherto				mass	-	-	-
9. Kis-Balaton					340	54	27

Table 4. Habitat characteristics in different collecting sites; n = number of samples at each locality.

	veget. cover (%)	depth (m)	width (m)	speed (m/sec)	conduct. (µS/cm)	pH (x)	O_2 (mg/l, x)	n
God	40	0.5 - 1	1.5 - 2	0 - 0.3	716	6.8	8.7	38
Veresegzhaz	5	0 - 3	40	0	720	6.7	8.1	4
Ocsa	40	0 - 3	2 - 3	0	746	6.6	6.6	38
Kolon-lake	70	0.5 - 3	-	0	603	6.7	7.6	12
Kolon canal	60	0.8	1	0.2	711	7.0	6.2	8
Kulleri canal	50	0.6 - 1	1 - 2	0.2	604	7.0	6.5	8
Feherto	20	-	15	0	869	7.2	6.8	16

Table 5. Water parameters in Kis-Balaton Reservoir II.

	temperature °C	conductivity µS/cm	O_2 mg/l	pH
Februar	0.5	378	12.2	7.0
March	7.5	615	8.4	7.0
April	10.0	662	3.7	7.1
May	18.8	729	2.1	6.8
June	17.9	839	2.4	6.9
July	17.3	751	1.7	6.9
August	18.3	917	1.3	7.1
September	17.8	890	1.5	6.9
October	15.9	604	1.9	6.7
November	7.0	711	1.7	7.1

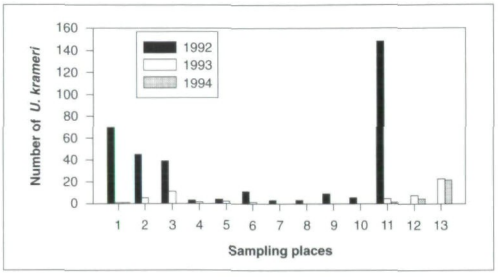
Study area

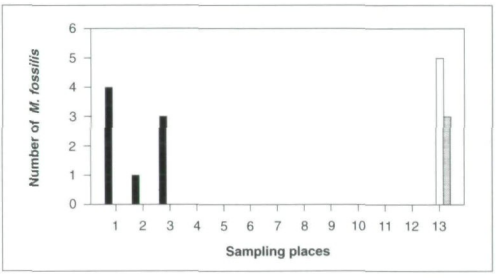
The God water body is a very small canal between an old turf-mine and the Szodi-stream. Veresegyhaz is a typical Hungarian angling lake, in which many fish species were introduced. The Ocsa canal is a part of the Danube and Tisza drainage canal system. In the last few years this canal has dried up. Ocsa lake remained a turf-lake, and it is a protected area. Kolon-lake, as part of Kiskunsagi National Park, is also protected. Kolon and Kulleri canals are connected with Kolon lake. Feherto is a very small lake in the Hansag region. Figure 3 shows the research places, where we studied *U. krameri* from 1988 to 1994. Habitat characteristics are given in Table 4.

Kis-Balaton Reservoir II: Kis-Balaton has an area of approximately 70 km^2, which was drained in the thirties. As a result River Zala and some small canals remained as the only water surfaces. Reservoir I was already finished in 1985 (20 km^2, the average depth is 1,4 m). At the end of 1992 the construction of Reservoir II. began, that is flooding it with water (its surface area will be 50 km^2 and the average depth will be 1.4 m). The faunistical data were collected in small canals (places 1 - 11), the Hevizi canal, connecting canal, the new territory, and the water exit (Fig. 4). The water exit is the place where the water of Reservoir II. flows into the Zala River. The canals have muddy bottoms, the depth varies from 0.5 to 1.5 m, they are rich in organic materials and macrophyts. Before being flooded at the end of 1992, the new territory was a field. Table 5 shows the average water parameters in Kis-Balaton Reservoir II.

Results and discussion

Table 3 shows the number of *U. krameri* in the habitats studied. The research was started in God and in Ocsa in 1988, in Feherto in 1991, in Ocsa-lake, Kolon-lake, and Kis-Balaton in 1992. We have been working in Veresegyhaza, Kolon-canal, and Kulleri-canal since 1993. We were not able to catch any *U. krameri* in Ocsa canal since 1990, as the water of the canal is used for irrigation of the adjoining agricultural land it has frequently dried up due to the drought of recent years. In Veresegyhaza *U. krameri* disappeared due to out-rooting of water plants. In Feherto in 1991 it was found in abundant quantities. The reasons for its sudden, unexpected disappearance from 1992 is not known since the chemical or physical characteristics of water did not change noticeably.





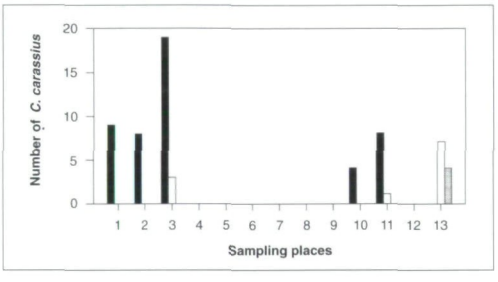


Fig. 5. Changes in the number of three indicator species in Kis-Balaton II reservoir from 1992 to 1994. Sampling places:
1 - 10 = canals,
11 = connecting canal,
12 = new territory, and
13 = water exit (see Fig. 4).

Table 6. Fish communities in different collecting sites; * = protected species; occurance: x = rare, xx = intermediate, xxx = common.

	God	Veres-egyhaz	Ocsa lake	Kolon lake	Kolon canal	Kuller canal	Feherto lake
*Umbra krameri**	x	xx	xxx	xxx	xx	xx	xxx
Esox lucius	x	x		xxx			
Rutilus rutilus		xx					
Scardinius erythrophthalmus		x		xx			
*Leucaspius delineatus**				xxx			
Alburnus alburnus		xxx					
Tinca tinca		x		xx			
Pseudorasbora parva		xx					xx
Rhodeus sericeus amarus		xxx					
Cyprinus carpio		xx					
Carassius carassius			xxx	xx		xx	xxx
Carassius auratus		xx					xx
*Misgurnus fossilis**				x		xx	x
*Cobitis taenia**	x	x					
Ictalurus nebulosus	x						
Lepomis gibbusus	x	xx					
Perca fluviatilis	x	xx					
Proterorhinus marmoratus	xx						

The fish species found in the Kis Balaton II reservoir are listened in Tables 7 and 8. In the first year after flooding (1993) no one-year old *U. krameri* were found (Table 8). The changes due to the flooding were indicated by the population fluctuation of three fish

Table 7. Number of fishes caught in Kis-Balaton Reservoir II from 1992 to 1994; * = protected species.

		canals (1-10)	Hevizi canal	connecting canal	new territory	water exit	total	N/ha
Esox lucius	1992		1				1	100
*Umbra krameri**	1992	192		148			340	34000
	1993	21		4	7	22	54	5400
	1994	1		1	4	21	27	2700
Rutilus rutilus	1992		mass					
	1993					5	5	500
	1994					5	5	500
Alburnus alburnus	1992		mass					
	1993					9	9	900
	1994					6	6	600
Abramis brama	1993					2	2	200
	1994					2	2	200
Tinca tinca	1992		1				1	100
	1993					3	3	300
	1994					2	2	200
Gobio gobio	1994					1	1	100
Pseudorasbora parva	1993					20	20	2000
	1994					14	14	1400
Rhodeus sericeus	1992		mass					
	1993					16	16	1600
	1994					27	27	2700
Carassius carassius	1992	36	4	8		48	48	4800
	1993	3		1		7	11	1100
	1994					4	4	400
Carassius auratus	1994				1	5	6	600
Cyprinus carpio	1994					3	3	300
*Misgurnus fossilis**	1992	7					7	700
	1993					5	5	500
	1994					3	3	300
*Cobitis taenia**	1992		2				2	200
	1994					1	1	100
Silurus glanis	1992		1				1	100
	1993					1	1	100
	1994					2	2	200
Anguilla anguilla	1992		2				2	200
	1993					5	5	500
	1994					7	7	700
Lepomis gibbosus	1992		2				2	200
	1994					5	5	500
Perca fluviatilis	1994					3	3	300

species: *Umbra krameri*, *Carassius carassius* (L.), and *Misgurnus fossilis* (L.). Figure 5 shows the changes in the populations of these three fish species. As a result of flooding the population of protected fishes, such as *U. krameri* and *M. fossilis*, decreased. Stabilisation is expected to take place in about 20 - 30 years.

Low fish diversity was found in the small canals of Kis-Balaton, God, Ocsa-lake and canal, Kolon-lake and canal, Kulleri canal, and Feherto - in typical *Umbra*-habitats. High fish diversity was found at the water exit of Kis-Balaton and the lake of Veresegyhaz.

Table 8. Age-groups of the three indicator fish species from 1992 to 1994.

	1992		1993		1994	
	year	n	year	n	year	n
Umbra krameri	1	164				
	2	130	2	27	2	11
	3	33	3	19	3	10
	4	13	4	8	4	6
Carassius carassius	1	27	1	2	1	1
	2	20	2	7	2	2
	3	9	3	2	3	1
	4	5				
Misgurnus fossilis	2	2	2	2		
	3	3	3	3	3	3
	4	2				

Conclusions

1. The greatest problems for the threatened fishes are: water regulations and changing characteristics of the living and breeding localities, e.g. the outdrying of canals in the territory between the Danube and Tisza or the out-rooting of water-plants in the lake of Veresegyhaz.

2. The reconstruction of original territory must be carried out very carefully and slowly, e.g. in the area of Kis-Balaton *U. krameri* can live with a low quantity of dissolved oxygen, but cannot withstand the sudden flooding. Moreover it cannot breed in the flooded area. As we saw, *U. krameri* could move to a new territory, such as the River Zala, when the flooding started, but it could not breed there.

3. It is very important to protect not only the fishes, but to pay attention to their ecological needs and to protect their whole habitats.

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