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Rediscovery of *Umbra krameri* WALBAUM, 1792, in Austria and subsequent investigations

(Pisces: Umbridae)

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Abstract

A historical review of mudminnow findings in Austria is presented. *Umbra krameri* was regularly found in the eastern part of the country. However, it was regarded extinct since 1975 but rediscovered in 1992. In 1993 and 1994 a survey was conducted in the floodplains of the Danube, downstream of Vienna to the Slovak border, and of the March (= Morava) River, on the right bank. The currently known distribution of the European mudminnow is confined to a 5 km stretch of an old sidearm of the Danube outside the flood control dam. In this area a viable population size was found. 32 other waterbodies, which were apparently similar with regard to physiographical characteristics, were examined but no mudminnows were found. Possible reasons why the species is found in only one small area are discussed.

Keywords: Umbridae, *Umbra krameri*, Austria, distribution.

Zusammenfassung

Ein historischer Überblick über Nachweise des Hundsfisches in Österreich wird präsentiert. *Umbra krameri* WALBAUM war früher regelmäßig im Osten des Bundesgebietes anzutreffen, galt jedoch von 1975 bis zur Wiederentdeckung der Art 1992 als ausgestorben. Im Zuge einer 1993 und 1994 durchgeführten Untersuchung der Augebiete der Donau zwischen Wien und der Slowakischen Staatsgrenze bzw. der rechtsufrigen Marchauen konnte der Hundsfisch lediglich an einem etwa 5 km langen Abschnitt eines Altarmes der Donau nachgewiesen werden. Untersuchungen an 32 weiteren Gewässern, die dem Fundort in physiographischer Hinsicht ähnelten, erbrachten keine Nachweise. Mögliche Ursachen für die eingeschränkte Verbreitung von *U. krameri* werden diskutiert.

Introduction

A brief history of the distribution of the European mudminnow, *Umbra krameri* WALBAUM, 1792, starts with its first description by MARSILI (1726). He stated that the fish was found in the floodplain of the Danube without giving any exact locations. Therefore it is not clear, however most probable, that it was also occurring in the stretch of today's Austria. KRAMER (1756) wrote about the fauna of Lower Austria and mentioned the mudminnow as *Umbra* from the surrounding swamps of the city Bruck, situated in the floodplain of the river Leitha, a right tributary of the Danube east of Vienna

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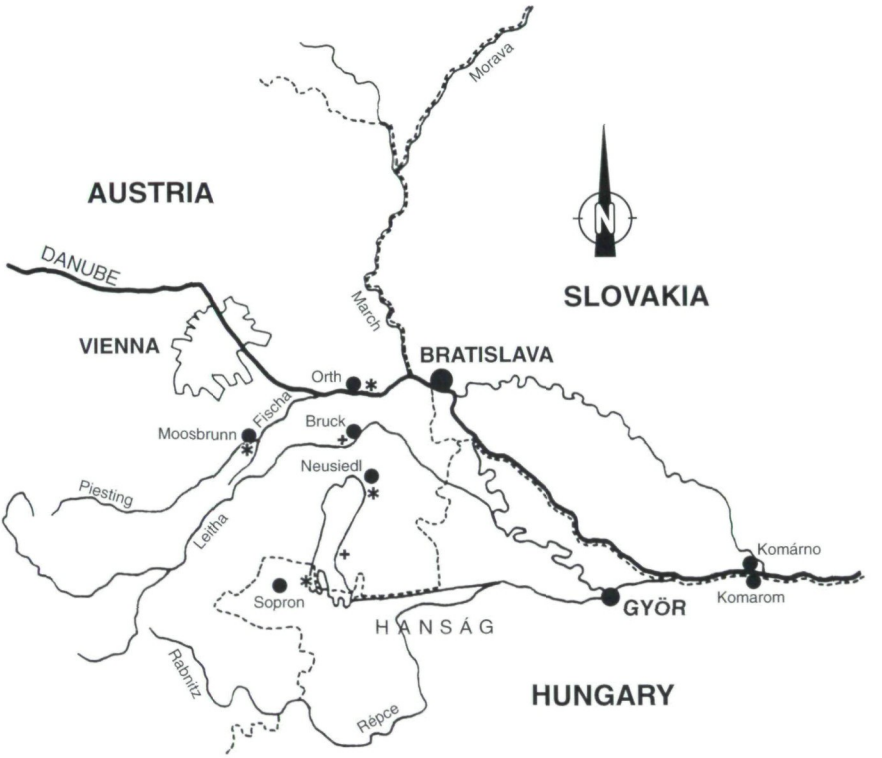

Fig. 1. The area of eastern Austria with findings of *U. krameri*. Places marked with * indicate findings with donated specimens to the Natural History Museum Vienna, those marked with + are findings reported in the literature only.

(Fig. 1). This is the first description which is certainly from Austrian territory. GRONOVIUS (1763) and also WALBAUM (1792) only mention the Danube in general. Later the mudminnow is described several times from Neusiedler See, the area around Bruck, and the nearby village of Moosbrunn, located at the rivers Fischa and Piesting, which are also right tributaries of the Danube (FITZINGER 1832, HANKÓ 1923, HECKEL & KNER 1858, compiled in GEYER 1940 [but not correctly drawn in his distribution map], see Fig. 1).

The mudminnow specimens from the fish collection of the Natural History Museum in Vienna (Table 1) are mostly from the surroundings of Neusiedler See and from Moosbrunn, stemming to a large extent from the 19th century. According to the specimens donated to the museum, findings end in Moosbrunn in 1874, those from Neusiedler See in 1935. However, there are reports of finding mudminnows in the reedbelt of Neusiedler See until 1958 (LEHMANN 1958). There are almost no specimens from the Danube floodplain in the museum. Just one isolated finding on the left bank of the Danube near the village Orth in 1975 (Fig. 1). This represents also the last finding of the mudminnow in Austria. Though it was searched for by many ichthyologists it could not be found, and therefore the species was regarded extinct in Austria (HERZIG-STRASCHIL 1991).

Table 1: Specimens of *Umbra krameri* in the fish collection of the Natural History Museum Vienna (NMW).

Number NMW-	Year	Locality	Country	No. of specimens	Collector
75199	——	Neusiedler See	Austria?	6	–
60709	——	Neusiedler See	Austria?	1	–
60440	1825	Neusiedler See	Austria?	3	–
73559	1825	Neusiedler See	Austria?	5	bought
69732	1825	Danube?	Austria?	3	bought
73560	1827	Neusiedler See	Austria?	4	bought
73562	1840	Moosbrunn	Austria	8	bought
69731	1870	Moosbrunn	Austria	37	–
73564	1874	Moosbrunn	Austria	3	–
10650/652	1874	Moosbrunn	Austria	3	Steindachner
73563	1874	Moosbrunn	Austria	2	Steindachner
73556	1878	Surroundings of Neusiedler See	Austria?	4	Steindachner
73552	1879	Neusiedler See	Austria?	4	Steindachner
73551	1889	Neusiedl	Austria	2	Steindachner
10665/662	1889	Neusiedl	Austria	10	Steindachner
73557	1890	Pond near Neusiedler See	Austria?	3	Steindachner
73558	1890	Surroundings of Neusiedler See	Austria?	6	Steindachner
73561	1890	Surroundings of Neusiedler See	Austria?	5	Steindachner
73554	1890	Surroundings of Neusiedler See	Austria?	8	Steindachner
73555	1890	Buchenhagen at Neusiedler See	Austria?	9	Steindachner
73553	1909	Neusiedler See	Austria?	2	Steindachner
84385	1935	Neusiedler See	Austria?	3	bought
76233	1975	Orth/Donau	Austria	1	Margl
91571	1992	Eckartsau/Donau	Austria	1	Wanzenböck

In 1992 the mudminnow was rediscovered in the Danube floodplain (left bank) east of Vienna (WANZENBÖCK 1992). Although only one specimen was caught, a conservation project was started in 1993 to reveal its actual distribution in Austria, to define its habitat requirements, and to develop measures for propagation.

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Study area

In October 1993 the surroundings of the place where the mudminnow had been rediscovered were examined. This area is an old sidearm of the Danube nowadays cut off by the main floodcontrol dam and is just a chain of shallow ponds during the summer months. In 1994 additional possible habitats were selected along the Danube east of

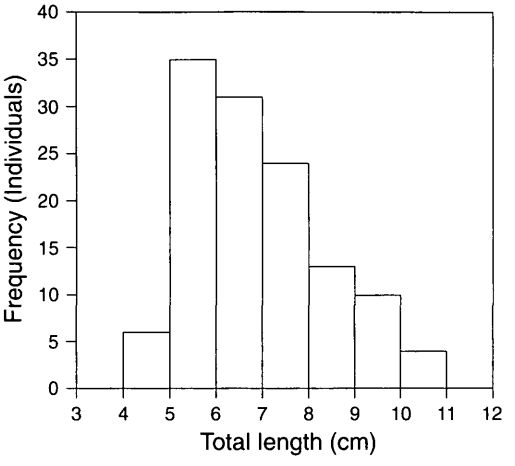

Fig. 2. Length frequency diagramm showing the size distribution of mudminnows caught at locations 2, 3, 6, 7, 9, and 10.

Vienna and along the March River which forms the border between Austria and Slovakia. For this purpose we used a habitat inventory made by KOVACEK-MANN & al. (1991), in which they investigated 250 waterbodies of the Danube floodplain between Vienna and the Slovak border. The characterization of the habitats is based on physiographical measures (e.g. size, depth, structure) and biotic indicators (e.g. coverage of macrophytes). Some of the mudminnow habitats were included in this inventory and we could find apparently similar habitats by means of cluster analysis. As expected, the analysis grouped the habitats where mudminnows were found into one cluster together with eight additional habitats, which were selected for fishing in 1994. The same type of habitat was chosen by studies of detailed maps and by inspection along the March River. Altogether 32 potential habitats were fished and characterized by means of chemical and physiographical variables as well as a plant-sociological study.

Material and methods

It was a problem to get to and into the ponds because of the very soft mud bottom. This is why we had to use special equipment consisting of snowshoes. We used electrofishing with a direct current machine (300 Volts, 1.5 kW). All fish caught were used for length and weight measurements in the field and released immediately after the procedure. Chemical analysis of water samples was done monthly in the field by means of electrodes (WTW, Germany) for temperature, conductivity, pH, and oxygen content, or with a reagent kit (Merck Aqualab 11151, Germany) for titrimetric determination of total and carbonate hardness, or with a pocket reflectometer (RQflex, Merck, Germany) for nitrate content.

Results

In October 1993 mudminnows were found in six out of eleven waterbodies (Table 2, localities 1 - 11). In two of the ponds they were found in low numbers, in two we found

Table 2: Number of specimens of different species caught in various localities. Locality no. 1, 3, 4, 5, 6, 8, 11 were fished in 1993 only. Locality no. 2, 7, 9, 10 were fished in 1993 and 1994 (numbers for specimens, except for *U. krameri* refer to 1994 catches). All other localities were fished in 1994 only. Numbers 1 - 11 are within the area where *U. krameri* was rediscovered (see Fig. 1), the other localities are scattered along the Danube between Vienna and the Slovak border (on both sides of the river) and along the March River (right side).

Species	Locality no.																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Umbra krameri 1993		59	17			1	3		46	14																						
Umbra krameri 1994		42					2		68	5																						
Misgurnus fossilis (L.)		24					5	3	44	1	11			2										16								
Carassius carassius (L.)		17	49		3	6	29	33	94	29				7				5	1									3			
Carassius auratus gibelio (BLOCH)	124	123	8	99	362	19	42	4	156	34	1	1		5				17	1		2	41	22		15	5			13	3	57	6
Tinca tinca (L.)		8	1		4				2	2				1								1							1			
Scardinius erytrophthalmus (L.)		159	1	1	4					1	1	1		1			7	8	5				3				1	250				
Leucaspius delineatus (HECKEL)		1	1			4			1										5							1						
Rhodeus sericeus amarus (PALLAS)		1			22						2																					
Esox lucius (L.)											3			2	7				4	10	11		9	2	13					5		
Perca fluviatilis (L.)		4			12	3					155	1		1			4		2	1	3			1	5				5			
Proterorhinus marmoratus (PALLAS)											2								1				1									
Rutilus rutilus (L.)												1					11	1	35						11							
Alburnus alburnus (L.)		2						2			8								1													
Abramis brama (L.)		1									4								4						1							
Blicca bjoerkna (L.)					1						33						3				1	2			4		11			1		1
Abramis ballerus (L.)																									25		12				12	
Gobio albipinnatus LUKASCH																																3
Aspius aspius (L.)		1									1																					
Leuciscus leuciscus (L.)											2																					
Chondrostoma nasus (L.)											1																					
Cyprinus carpio L.																			1						20							
Lepomis gibbosus (L.)																					7											
Pseudorasbora parva (TEMMINCK & SCHLEGEL)																						6									4	
Cottus gobio L.																							1									
Cobitis taenia L.																									1							

Table 3: Ranges of physicochemical parameters of water samples taken monthly (November 1993 - August 1994) at four habitats of *U. krameri*.

Location no.	conductivity $\mu S\ cm^{-1}$	pH	O_2 %	O_2 mgl^{-1}	total hardness °dH	carbonate hardness °dH	nitrate mgl^{-1}	temperature °C
2	205 - 596	7.3 - 8.3	11 - 130	0.9 - 10.0	6.6 - 19.0	5.8 - 12.0	0 - 1	0.7 - 26.0
7	328 - 715	7.0 - 8.0	10 - 71	1.3 - 8.6	12.0 - 20.0	8.4 - 18.0	0 - 1	0.8 - 21.0
9	307 - 652	7.1 - 8.0	11 - 78	1.3 - 8.0	10.0 - 18.0	10.0 - 16.0	0 - 1	0.8 - 21.0
10	333 - 760	6.9 - 7.9	9 - 76	1.2 - 9.5	11.0 - 22.0	9.2 - 20.0	0 - 1	0.7 - 20.0
Danube	336 - 476	7.7 - 8.5	91 - 149	8.8 - 14.1	8.2 - 15.6	7.0 - 10.6	4 - 12	2.5 - 21.6

moderate numbers, and in the other two mudminnows were present in quite high numbers. Length-frequency graphs (Fig. 2) indicated that several year classes contribute to the population in a balanced way.

In Spring 1994 more or less unchanged population sizes were found in the waterbodies in which mudminnows were found previously (Table 2). In all the additional habitats the result was negative, i.e. no mudminnows were found in any other place (Table 2, localities 12 - 32). Therefore the currently known distribution of the European mudminnow in the Austrian part of the floodplains along the Danube and March River is confined to a relatively short 5 km stretch on the left bank of the Danube near the village Orth.

With regard to the characterization of the mudminnow habitats it is concluded that suitable waterbodies have the following features:

1. They are imbedded in a chain of ponds, some deep enough to ensure a refuge during drought periods or very cold winters.
2. They show minimal influence from the river as indicated by chemical parameters (Table 3) and are mainly fed by groundwater but also show strong seasonal fluctuations in water level.
3. They are highly structured by woody debris and macrophytes and have a deep bottom layer consisting of muddy organic material.
4. They show pronounced oxygen deficiencies, especially during winter and late summer.
5. They have an extensive land-water interface due to well developed swamp vegetation.
6. They are inhabited by certain additional fish species such as *Misgurnus fossilis* (L.), *Carassius carassius* (L.), and *Carassius auratus gibelio* (BLOCH).

Discussion

The results are surprising insofar that mudminnows could not be found at any other place except at Orth although several other places were apparently similar in respect to their physiographical and structural characteristics. However, the habitat inventory by KOVACEK-MANN & al. (1991) was done in summer of 1991 during relatively high water levels caused by an exceptionally high flood of the Danube during this time. This is why water bodies which are apparently similar to the habitats of mudminnows might differ

from these during other water level conditions. Therefore the situation of the areas on a larger scale have to be taken into consideration.

Two of the locations which were fished in 1994 are situated in the vicinity of Vienna, the so-called Lobau. But this area is cut off from the river for a long time and suffers severely from declining groundwater levels. Only a few large backwaters persist even during very dry years. These are heavily stocked with carp and other species for angling purposes. Although the localities fished are close to such waterbodies, and mudminnows potentially could have persisted with regard to water conditions, they might have disappeared because of stocking and resulting increase of competition with other species.

Downstream of Vienna mudminnows were found exclusively outside the main flood control dam. Inside the dam the area might be just too dynamic, i.e. floods can reach the area too often, which could have a negative impact on mudminnow populations. This assumption is supported by the following fact: The places inhabited by mudminnows are within an old sidearm of the Danube and some of its meanders are cut through by the dam. In those parts situated on the river side of the dam mudminnows are absent. The same situation of a highly dynamic floodplain is found on most of the right side of the Danube between Vienna and the Slovak border since there is a riff in the landscape close to the right bank of the river. The situation is different for the floodplain of the March River, since it has the character of a lowland stream with a wide and flat floodplain. In principle this floodplain is (or at least was) suitable for mudminnows as proven by findings on the Slovak (= left) side of the river (KUX & WEISZ 1961, MIŠÍK 1965). There are also flood control dams along this river. On the right side of the river the floodplain is still very dynamic on the river side of the dams. Even moderate floods cover the land and all fish species can distribute over this area. Moreover, regular fish kills are observed in the March River due to pollution by the industry within the watershed. Therefore polluted water can potentially reach the whole area within the dams. Outside the dam most of the waterbodies are in danger of completely drying out during longer drought periods. A few of them, which are larger and permanent, are heavily stocked for angling purposes, which might cause the disappearance of mudminnows due to competition or predation pressure.

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