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CHANGES IN THE FISH FAUNA OF THE RIVER TISZA

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Abstract. The slow transformation of a fauna is a natural phenomenon, but changes over the past 150 years in the River Tisza basin have primarily been the result of human intervention. Factors significantly affecting the structure of fish communities and species are as follows: (1) regulation of rivers to control floods, (2) canalization of rivers, construction of dams and reservoirs, (3) introduction of exotic species, (4) pollution of rivers, (5) increase in water temperature.
Actually number of fish species living in the River Tisza is most probably 68 (in the watershed 70), of which 80% is native, 20% has been introduced. All the species contribute to the unique value of the fish fauna, endemic species in the Tisza watershed, however, deserve special attention: *Scardinius racovitzai* was found and identified exclusively in the thermal pond of Băile Episcopeşti (Püspökfürdő), Romania, on the left bank of the River Crişul Repede (Sebes-Körös). Another unique species is the quasi-endemic Carpathian lamprey (*Eudontomyzon danfordi*), present outside the watershed only in the upper stretch of the neighbouring River Timiş (Temes). This species lived in a number of streams earlier, but has by now disappeared from many places.

Key words: watershed of Danube, regulation of rivers, canalization of rivers, introduction of fishes, pollution of rivers, global warming

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Introduction

Based on the size of its drainage area, the River Tisza – Tisza in Hungarian – is the tenth largest river in Europe. With a source in the Ukraine at a height of 1860 meters above sea level, the river drains the eastern region of the Carpathian Basin. After touching Romania and Slovakia, it meanders slowly over the flat lands of the Great Hungarian Plain and meets the Danube in Serbia. Its major tributaries are the rivers Szamos (Someş), Bodrog, Sajó (Slaná), Körös (Criş) and Maros (Mureş) (Fig. 1).

The full length of the River Tisza in the middle of the 19th century was almost 1400 km. Numerous bends of the river were later cut off in an ambitious regulation project shortening it to a mere 946 km. On reaching Romania the river drops as much as 5 m/km, whereas in the Hungarian Plain it slows down to just a few cm/km. Mean discharge of the river below the mouths of the rivers Szamos and Körös is 330 and 650 cu. m/sec, respectively, and 830 cu. m/sec when it reaches the Danube. Water level and discharge however varies dramatically: at the mouth of the River Szamos it may drop to 45 cu. m/sec and rise to as high as 3770 cu. m/sec in flood season (Lászlóffy 1982).

The average breadth of the riverbed is 200 m, ranging from 100 to 450 m in the plains. Extremes in depth are also common: at fords as shallow as 1 m in drought years, but in sharp bends in flood season the water may run as deep as 25 m. The River Tisza basin is dominated by low lying regions offering fauna varied habitats rich in species and nutrients.

In retrospect

The rich fish fauna of the River Tisza is first mentioned in Gesta Hungarorum, a codex written in Latin in the 12th century. When Hungarian tribes settled in the Carpathian Basin in the late 800s „they saw the land was fertile, abundant in game of all sorts, the Tisza and Bodrog rivers teeming with fish and they conceived unspeakable affection for the land" (Anonymus 1977). Another adage, attributed to the Italian historian Marzio Galeotto, who settled in Hungary, says „two thirds of the River Tisza is water, one third is fish". An obvious exaggeration that may be, but it would certainly not have survived for so many centuries without proper grounds.

The fabulous richness of the river is also apparent from later records. Englishman Edward Brown, for instance, squarely proclaimed in 1673, „the Tisza is the richest river in fish all over Europe". Ferenc Rákóczi (1676-1735), Prince of Hungary, notes in his memoirs that, „the river is so abundant in fish that one can scarcely scoop water from it without catching fish" (cit. Szilágyi, 1992).

Venerable scientist Mátyás Bél, convinced that the anecdotal words of M. Galeotto best describe the rich fish fauna of the River Tisza, quotes him centuries later, as late as 1730 (Deák 1984). Martin Schwartner in his Statistik des Königreichs Ungarn (1798) (Statistics of the Kingdom of Hungary) confirms that the „sluggish River Tisza is renowned for harbouring one of the richest fish faunas not only in Hungary but Europe as well" (cit. Répássy 1902-1903).

There is no reason to doubt the truthfulness of these records, it is however questionable whether they show the full picture of the river. There must have been numerous lean years throughout the centuries that have remained unrecorded: it is „big catches, big fish" that make headlines – true even centuries ago.

Répássy's convincing data of the period between 1834-1899 clearly proves that flood and catch are closely related. In flood years, when water is high, catches are abundant, but when water is scarce, capture also diminishes. Thus lean years constitute an integral part of the full picture about the River Tisza. However, the once legendary richness of the fish fauna mainly attributable to vast flood plains remains unquestionable.

Literature review

Early documents record primarily the quantity of fish, whereas species are rarely listed. One exception is Mátyás Bél's manuscript (1730) describing over thirty widespread and easily identifiable fish species native to the Carpathian Basin, nine of which are listed as natives of the River Tisza (Deák, 1984). Prominent botanist Pál Kitaibel when crossing the river at Tiszafüred in 1797 described seven species, of which two are first recorded (Szerencsés and Pozder 1985).

Heckel's study (1847), translated and supplemented with notes by Kornél Chyzer (Heckel 1863), lists 16 fish species in the River Tisza. At the end of the 19th century Pap (1882) and Czirbusz (1884) name as many as 27 and 30 species, respectively, found in the lower stretch of the river. In his comprehensive handbook of fish fauna in Hungary, Herman (1887) lists 34 species native to the river, Vutskits (1902) describes 41 species.

After extensive research in the Upper Tisza region in the 1920s, Vladykov (1931) found a total of 49 species, of which 44 were native to the upper reaches of the Tisza. Vásárhelyi (1960), based on observations of more than fifty years, lists 56 species.

There have been several papers published over the past twenty years on the fish fauna of the River Tisza and its tributaries. Based on publications by Harka (1985, 1997, 1998), Nalbant (1995), Guelmino (1996), Bănărescu *et al.* (1997, 1999), Györe and Sallai (1998), Harka *et al.* (1998, 1999, 2000, 2001, 2002, 2003), Györe *et al.* (1999, 2001), Sallai (1999), Bănărescu (2002) and Harka and Sallai (2004) the number of fish species living in the River Tisza is most probably 71 and 73 in the whole watershed (Table 1).

Changes in the fish fauna

The slow transformation of a fauna is a natural phenomenon, but changes over the past 150 years in the River Tisza basin have primarily been the result of human intervention. Factors significantly affecting the structure of fish communities and species are as follows:

- Regulation of rivers to control floods
- Canalization of rivers, construction of dams and reservoirs
- Introduction of exotic species
- Pollution of rivers
- Increase in water temperature

1. Regulation of rivers

Hydrographic conditions of the River Tisza were significantly modified by six decades of river regulation initiated in the middle of the 19th century, which had an adverse effect on the majority of fish living in the lower stretches of the river. Cutting off "overgrown" bends and thus creating oxbows reduced the length of the river by 450 km, whereas gradient increased making flood flow much faster. Dikes built along rivers now total more than 4200 km. High waters throughout the centuries had flooded approximately 2 million hectares of flat land on a regular basis and produced ideal conditions for the proliferation of phytophilic species (Fig. 1).

In addition to offering ideal conditions for spawning and the development of fertilized eggs, fry in warm, shallow water grew significantly faster feeding on an abundance of zooplankton. Although

Table 1. Fish species in the watershed of the River Tisza

No.	Species	Presence	No.	Species	Presence
1	*Eudontomyzon danfordi*	+	38	*Rhodeus sericeus*	+
2	*Huso huso*	ex	39	*Carassius carassius*	+
3	*Acipenser gueldenstaedtii*	+	40	*Carassius gibelio*	+
4	*Acipenser nudiventris*	+	41	*Cyprinus carpio*	+
5	*Acipenser stellatus*	ex	42	*Hypophthalmichthys molitrix*	+
6	*Acipenser ruthenus*	+	43	*Hypophthalmichthys nobilis*	+
7	*Anguilla anguilla*	+	44	*Barbatula barbatula*	+
8	*Rutilus rutilus*	+	45	*Misgurnus fossilis*	+
9	*Rutilus pigus virgo*	+	46	*Cobitis elongatoides*	+
10	*Ctenopharyngodon idella*	+	47	*Sabanejewia aurata*	+
11	*Scardinius racovitzai*	(+)	48	*Sabanejewia romanica*	(+)
12	*Scardinius erythrophthalmus*	+	49	*Silurus glanis*	+
13	*Leuciscus leuciscus*	+	50	*Ameiurus nebulosus*	+
14	*Leuciscus souffia agassizi*	+	51	*Ameiurus melas*	+
15	*Leuciscus cephalus*	+	52	*Thymallus thymallus*	+
16	*Leuciscus idus*	+	53	*Hucho hucho*	+
17	*Phoxinus phoxinus*	+	54	*Salmo trutta m. fario*	+
18	*Aspius aspius*	+	55	*Oncorhynchus mykiss*	+
19	*Leucaspius delineatus*	+	56	*Umbra krameri*	+
20	*Alburnus alburnus*	+	57	*Esox lucius*	+
21	*Alburnoides bipunctatus*	+	58	*Lota lota*	+
22	*Chalcalburnus chalcoides mento*	ex	59	*Cottus gobio*	+
23	*Abramis bjoerkna*	+	60	*Cottus poecilopus*	+
24	*Abramis brama*	+	61	*Lepomis gibbosus*	+
25	*Abramis ballerus*	+	62	*Micropterus salmoides*	+
26	*Abramis sapa*	+	63	*Perca fluviatilis*	+
27	*Vimba vimba*	+	64	*Gymnocephalus cernuus*	+
28	*Pelecus cultratus*	+	65	*Gymnocephalus baloni*	+
29	*Chondrostoma nasus*	+	66	*Gymnocephalus schraetser*	+
30	*Tinca tinca*	+	67	*Sander lucioperca*	+
31	*Barbus barbus*	+	68	*Sander volgensis*	+
32	*Barbus peloponnesius petenyi*	+	69	*Zingel zingel*	+
33	*Gobio gobio*	+	70	*Zingel streber*	+
34	*Gobio albipinnatus*	+	71	*Perccottus glenii*	+
35	*Gobio uranoscopus*	+	72	*Proterorhinus marmoratus*	+
36	*Gobio kessleri*	+	73	*Neogobius fluviatilis*	+
37	*Pseudorasbora parva*	+			

+: present in the Tisza River, (+) present only in the watershed of tributaries, ex: extinct

the regulation of the riverbed affected fish population, primarily stagnophilic and reophilic species, it was the loss of spawning grounds in flood plains that had the most detrimental impact on fish proliferation. Not only did levees contain high water, but also blocked free passage for fish seeking spawning grounds – thus the golden age of legendary abundance in fish population came to an end.

2. Canalization of rivers

Dams constructed throughout the River Tisza watershed have also contributed to changes in the environment and fish fauna. Some retain water only in the riverbed, others fill up large reservoirs. There are three dams on the River Tisza: two in Hungary - at Tiszalök (519 river km) and Kisköre (403 river km) – one in Serbia, Novi Bečej (67 river km). In addition, there are quite a few dams of varying sizes on the tributaries.

The natural zonation of rivers is disturbed by the reservoirs built on the upper sections. Near to the reservoirs the fish fauna includes mountain and plain species. In the River Ondava of East Slovakia for example *Salmo trutta fario* L. and *Cyprinus carpio* L., in the upper section of the Rriver Crasna of Romania *Barbatula barbatula* L. and *Lepomis gibbosus* L., in the River Tur *Barbus peloponnesius petenyi* Heckel and *Perca fluviatilis* L. have been collected from the same site. (Harka *et al.* 2000, 2001, 2003).

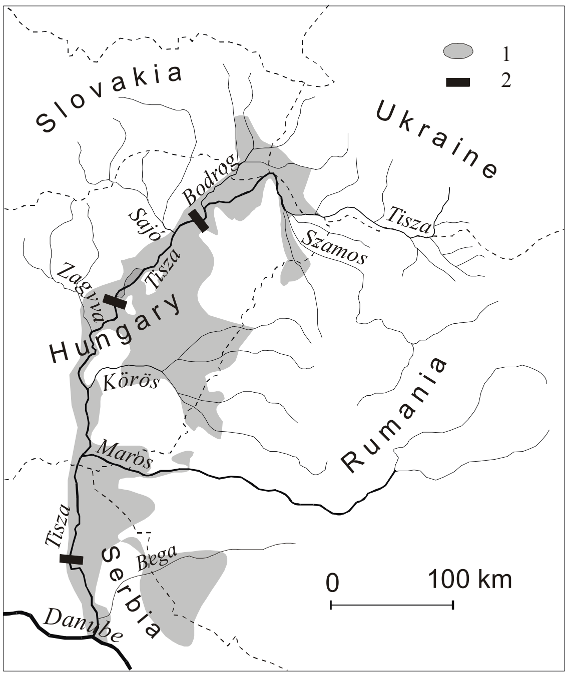

Fig. 1. Map of the River Tisza watershed (1–areas flooded regularly prior to regulation, 2–Hydroelectric dams built after 1950)

Dams in the plains have primarily affected the population, size and ratio of reophilic and stagnophilic species. There were dramatic changes following the construction of the dam at Kisköre, which filled up a reservoir of 127 sq. km between 403-440 river km. As a result there was an unprecedented drop in the population of the reophilic *Acipenser ruthenus* L., *Barbus barbus* L., *Abramis sapa* Pallas whereas *Zingel zingel* L., and *Zingel streber* Siebold, not infrequent earlier, totally disappeared from the region (Harka 1985). Simultaneously, species with a preference to slow moving water proliferated (*Abramis brama* L., *Gobio albipinnatus* Lukasch, *Sander volgensis* Gmelin.), while populations of tolerant, sturdy species (*Rutilus rutilus* L., *Carassius gibelio* Bloch, *Ameiurus nebulosus* Lesueur) boomed at a high rate.

Dams, although not the chief culprits, have also contributed to the disappearance of sturgeons, once a common migratory species in the Tisza.

3. *Introduction of exotic species*

There were numerous attempts to introduce exotic fish species in Europe in the 20th century and quite a few found their way to the Tisza watershed. The first to come were the brown bullhead (*Ameiurus nebulosus*) and the sunfish (*Lepomis gibbosus*) from America, which quickly proliferated in the lower stretches and oxbows in the early years. The largemouth bass does not seem to have found proper habitat in the river, although some specimens are caught sporadically.

In the second half of the last century seven exotic fish species inhabited the watershed of the River Tisza. The first in the line was the German carp (*Carassius gibelio*), initially speading along the Körös River, then appearing in the Tisza and its tributaries in the 1970s with a powerful gradation in some stretches. It was also in the 70s that grass carp (*Ctenopharyngodon idella* Valencienes), silver carp (*Hypophthalmichthys molitrix* Valenciennes) and bighead carp (*Hypophthalmichthys nobilis* Richardson) introduced from the Far East and originally intended for breeding exclusively in commercial fisheries, escaped from fishery ponds and have by now heavily populated the Tisza watershed. With them came the sturdy and rapidly spreading small stone moroko (*Pseudorasbora parva* Schlegel), an unwanted „byproduct" of fish introduction.

Originally a fish species from America and later introduced in the Carpathian Basin via Italy in the 1990s, was the black bullhead (*Ameiurus melas* Rafinesque) that soon invaded the Tisza watershed (Pintér 1991; Harka 1997) as a powerful rival of *Ameiurus nebulosus* Lesueur populations. Early 2001 an epidemic decimated black bullhead populations, but in 2004 the signs of gradation are obvious again. The latest adventive fish species to arrive in the watershed is the amur sleeper (*Perccottus glenii* Dybowski) from the River Amur basin. It first found its way from Aisa to St. Petersburg, Russia in the early years of the last century as an aquarium fish. It is supposed to have spread semi-spontaneously in the River Tisza watershed, where it was first identified in 1997 (Harka 1998).

4. *Pollution of rivers*

Humans have been polluting water ever since they appeared along rivers. Prior to the 20th century the relatively low quantity of mostly organic pollutants was eliminated by the natural biological purification of water which, at that time, remained drinkable in most rivers of the region. Troubles began in the second half of the century with the widespread use of obsolete technologies in industry and agriculture resulting in unprecedented pollution throughout the region. In the 1950s and 60s sensitive species were all but obliterated from the rich fish fauna of the River Bodrog by heavy industrial pollution from Czechoslovakia. Fish species in the rivers Szamos and Sajó also fell victim to pollution resulting in severe degradation of the fauna (Harka 1992, 1995).

Social and economic transformation in the countries along the River Tisza in the late 1980s and early 90s brought about favourable changes. Following the collapse of the so-called Communist heavy industry, sewage emissions dropped so significantly that the water quality of the river received first class ratings all the way down to the mouth of the River Maros.

This favourable tendency came to an abrupt end with the catastrophic cyanide poisoning from the gold mines of the Romanian town of Baia-Mare in February 2000. It was the River Szamos that brought the deadly poison into the Tisza killing approximately 1240 tons of fish in Hungary. Native species worst affected are the economically important carp (*Cyprinus carpio* L.), sheat-fish (*Silurus glanis* L.) and pikeperch (*Sander lucioperca* L.) as well as *Gymnocephalus schraetser*, *Zingel zingel* and *Zigel streber*, rare natural treasures of the region. Damage, however, was more extensive and affected the entire ecosystem.

Cyanide may have disappeared in a matter of weeks from the river basin, but the wounds of nature have not healed completely as species with long life cycles take several years to recover. Fortunately no fish species disappeared from the region and long lasting flood seasons coupled with warm weather in consecutive years after the poisoning brought about favourable conditions in the spawning seasons, which is an encouraging sign for the future.

Toxic waste is dangerous for fish even if it causes no immediate destruction. An infamous case is that of the Romanian River Vişeu, a tributary of the Upper Tisza, continually poisoned with heavy metals by a mine in Baia Borşa. Compared with the unpolluted River Iza, home to 23 fish species, and flowing parallel with the larger Vişeu at a distance of 10-20 km, it harbours only 17 species. The effect of long lasting poisoning is even more striking if the quantities of fish caught in the two rivers are compared: five times as many were netted in the River Iza (Harka *et al.* 2002).

5. Increase in water temperature

Increase in water temperature as opposed to factors discussed above is not entirely of anthropogenic origin, although natural climatic changes are strongly influenced by air pollution. Three other effects – dams slowing down water flow, thermal power stations along rivers and untreated sewage – directly increase the temperature of rivers.

In relation to the complex problem of global warming the impact of rising water temperature on fauna has been investigated only in recent years (Harka *et al.* 2002, Harka and Bíró, manuscript). Warming water appears to encourage the migration of some species from the plains to higher altitudes penetrating the mountain zone of rivers (vertical migration). Others migrate from south to north, significantly extending the borders of their geographical distribution (horizontal migration).

Both tendencies have been observed in the Tisza watershed. Mean annual temperature in the midsection of the main river (Tiszakeszi, 466 river km) has increased from 11.1 to 12.2 C over the past 50 years. (Fig. 2.)

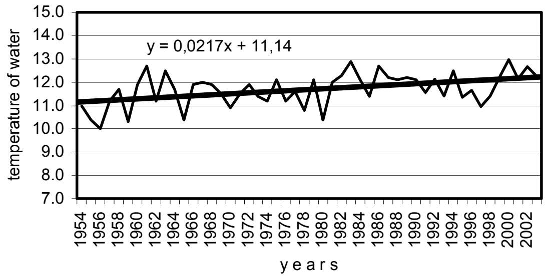

Fig. 2. Changes in the water temperature of the River Tisza at Tiszakeszi, 1954-2003

Prime examples of vertical migration include *Rutilus rutilus, Abramis brama* L., *Chondrostoma nasus* L. and *Perca fluviatilis* that penetrated the higher mountainous reaches of the tributaries (Ardelean *et al.* 2000; Harka *et al.* 2002).

Horizontal migration is characteristic of Ponto-Caspian gobies (*Neogobius fluviatilis* Pallas, *N. kessleri* Günther, *N. melanostomus* Pallas, *Proterorhinus marmoratus* Pallas etc), of which several species have been spreading upriver in the Danube basin over the past decades.

Two goby species, *Proterorhinus marmoratus* and *Neogobius fluviatilis* appear to be spreading in the Tisza watershed (Harka 1990, 1993; Harka and Sallai 2004; Harka and Szepesi 2004a, 2004b; in verb. S. Wilhelm). First to arrive was *Proterorhinus marmoratus* and localities where it has been found so far are recorded in chronological order in Fig. 3.

Treasures in the fish fauna

Scientific research of the fish fauna has identified a total of 71 species in the River Tisza since 1847. *Huso huso* L., *Acipenser stellatus* Pallas and *Chalcalburnus chalcoides mento* Agassiz have not been discovered for half a century, so the number of species is estimated at 68, of which 80% is native, 20% has been introduced. Although two other species are not present in the river, they can be found in the watershed: *Scardinius racovitzai* Müller and *Sabanejewia romanica* Bačescu (Table 1.).

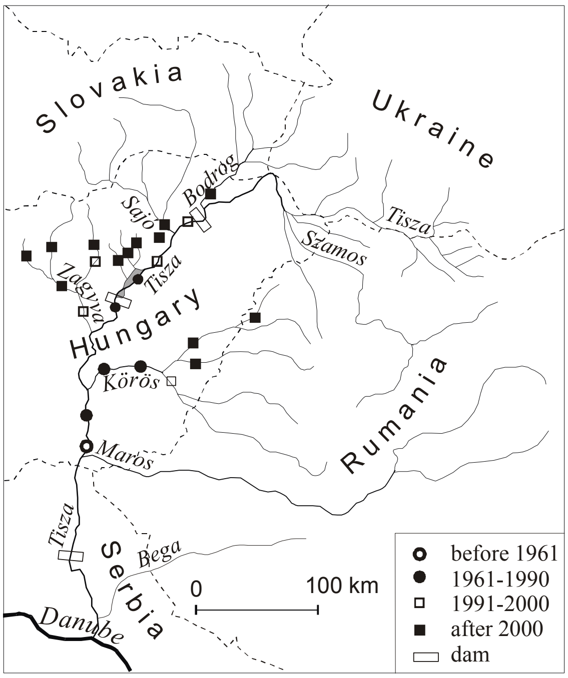

Fig. 3. The distribution of Proterorhinus marmoratus in the watershed of the River Tisza

All the species contribute to the unique value of the fish fauna, endemic species in the Tisza watershed, however, deserve special attention: *Scardinius racovitzai* was found and identified exclusively in the thermal pond of Băile Episcopeşti (Püspökfürdő), Romania, on the left bank of the Crişul Repede (Sebes-Körös) River. Another unique species is the quasi-endemic Carpathian lamprey (*Eudontomyzon danfordi* Regan), present outside the watershed only in the upper stretch of the neighbouring River Timiş (Temes). This species lived in a number of streams earlier, but has by now disappeared from many places. Fig. 4. shows the most important localities where the species has been found over the past 15 years (Terek *et al.* 1987; Nalbant 1995; Koščo and Košuth 1996a, 1996b, 1998, 2000; Bănărescu *et al.* 1997, 1999; Koščo *et al.* 2000; Harka *et al.* 1998, 1999, 2000, 2002 ; Györe *et al.* 1999, 2001; Koščo 2003).

Endemic fish of the Danube basin also represent exceptional natural treasures. They include *Gobio uranoscopus* L., *Gymnocephalus schraetser* L. and *Zingel streber*, species commonly found all over the Tisza watershed. The presence of *Sabanejewia romanica*, however, is limited to a narrow habitat in the Tisza watershed. According to Bănărescu (2002b), the species, native to the northern tributaries of the Lower Danube, can be found in the Tisza watershed only in a few small streams on the left side of the Maros river.

Rutilus pigus virgo Heckel, *Leuciscus souffia agassizi* Cuvier et Valenciennes and *Hucho hucho* L., endemic to the watershed of the Upper and Middle Danube, also live in a very limited area of the Tisza watershed (Fig. 4). *Hucho hucho* has been collected exclusively in the Hungarian and Hungarian-Ukranian stretches of the Tisza (Györe *et al.* 1999, 2001) over the past 10-15 years, although it was stocked in the River Hernád in Slovakia. *Rutilus pigus virgo*, besides being present in the Hungarian and Hungarian-Ukrainian stretches of the Tisza, was also collected in the River Túr in Hungary and the estuary of the River Kraszna (Crasna), another tributary of the Upper Tisza (Györe *et al.* 1999, 2001; Harka *et al.* 2001, 2003).

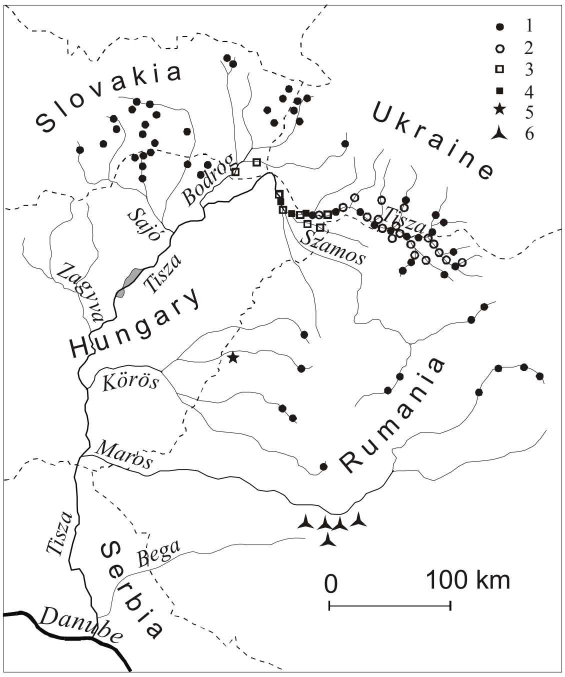

Fig. 4. Important localities where some species of high natural value have been collected over the past 15 years (1–*Eudontomyzon danfordi*, 2–*Leuciscus souffia agassizi*, 3–*Rutilus pigus virgo*, 4–*Hucho hucho*, 5–*Scardinius racovitzai*, 6–*Sabanejewia romanica*)

Leuciscus souffia agassizi is common mainly to the Ukrainian-Romanian stretch of the Tisza and its tributaries in the vicinity (Györe *et al.* 1999, 2001;

Harka *et al.* 2001, 2002, 2003; Koščo 2003; Harka and Sallai 2004)). It is notable that the populations of the three species in the Tisza live at a distance of 250-500 air km from larger, related areas commonly populated by these species. Their isolation further increases their value, but they are also more vulnerable, therefore need more attention and protection.

Among the most treasured imperilled and highly protected fishes of the watershed are the almost extinct ship (*Acipenser nudiventris* Lovetzky), Russian sturgeon (*Acipenser gueldenstaedtii* Brandt and Ratzeburg), Petenyi's barbel (*Barbus pelponnesius petenyi* Heckel), the mudminnow (*Umbra krameri* Walbaum) and the Siberian bullhead (*Cottus poecilopus* Heckel), which reaches the south-western border of its range in this region.

Conservation and proliferation of natural treasures

On large rivers that serve as major waterways like the Danube, Main and Rhine, a chain of dams were constructed in the upper reaches to make them navigable, and smaller rivers are not better off either. Similar in size to the Tisza, the River Dráva (Drau), a tributary of the Danube flowing along the Hungarian-Croatian border is split up by more than twenty dams that severely disturb natural habitat. The free flow of the River Tisza is blocked by dams in the plains only. The natural zonation in the hilly and mountainous regions remains a rare natural treasure in Europe.

Another treasure of the river is the presence of an almost intact natural fish fauna. In spite of the introduction of quite a few exotic species, among them aggressive rivals of native fish, all the originally native species have viable populations with the exception of rare sturgeons and *Chalcalburnus chalcoides mento*.

The survival of valuable species requiring special habitat is attributable to the relatively clean Upper Tisza, where hydrological conditions have not changed significantly, therefore the maintenance of this environment remains top priority.

The survival of the heavily imperilled, disappearing species of *Huso huso*, *Acipenser gueldenstaedtii* and *Acipenser nudiventris* depends on active and dedicated human assistance. Viza 2020 (Sturgeon 2020), an initiative subsidized by WWF Hungary, is aimed at re-establishing sturgeon populations in former habitats by habitat rehabilitation, breeding and stocking and the construction of fish ladders facilitating the migration of the species.

A project started in 2004 aimed primarily at flood control in the Hungarian stretch of the Tisza will also affect fish population. It intends to cut flood peaks by filling up temporary reservoirs built in former flood plains and later emptying them once the flood recedes. Environmentalists are keen on retaining some water in the reservoirs for some 2-3 months, which could to some extent re-establish lost flood plains that were once the cradles of rich fish fauna.

At last, but not least, one must point out the importance of the „green corridor" along the river, home to a rich variety of habitats in the flood plain with oxbows, meadows and forests. Civilized as the Great Hungarian Plain may have become, this unique path for wildlife migration offers safe shelter and plays an important role in maintaining biodiversity.

All the countries involved – Ukraine, Romania, Slovakia, Hungary and Serbia – bear responsibility and have common interest in the preservation of near-natural conditions in and along the River Tisza.

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