

## **Fish fauna of the Upper Tisa**

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### *Abstract*

Between the headwaters of River Tisa in Ukraine and the city of Tokaj in Hungary<sup>1</sup>, the reacher of which, including all backwaters, are named “Upper Tisa”, 64 fish species are found. Although 10 species are adventives, their competition is not significant as regards the native fauna.

There are valuable characteristics of these reaches, which are related to well-defined ecological zonations, and there are four species endemic to the Danube Basin, one of which currently lives only in River Tisa catchment and River Timiș in nearby Romania. It is due to the relatively clean water and the variability of habitats that we find a diverse fish fauna. The Upper Tisa runs free of dams and other considerable human impacts, which contribute to the survival of the zonations and natural assets, which are now unique in Europe. The conservation of these natural assets is of common interest to four countries Ukraine, Romania, Slovakia and Hungary.

Keywords: River Tisa, fish fauna, ecological zonation, natural assets

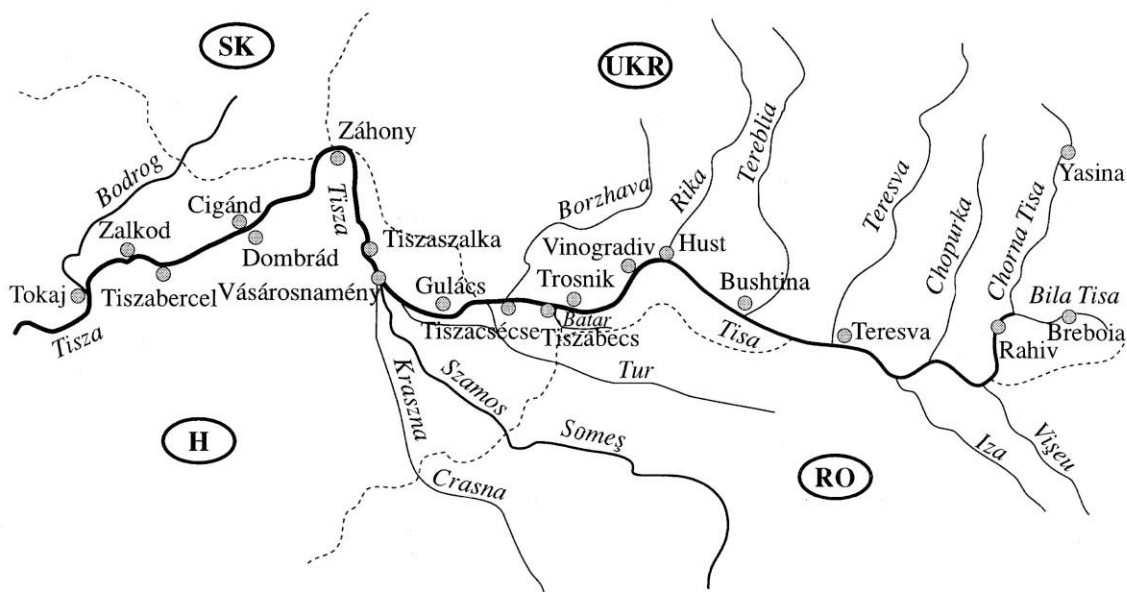
### *Introduction*

River Tisa is the main river of the Carpathian Basin. The studied reach of River Tisa is about 400 kilometres long, but in a hydrological sense only a section of 250 kilometres is considered an upper reach (see Map). There are many publications about its ichthyofauna, in spite of scarce scientific information about the upper section.

In the first important publication, Vutskits (1918), described 25 fish species based on earlier scientific findings (Jeitteles, Chyzer, Herman). His work identified 15 species in the river, 8 in the streams, 2 in the flood plain areas. Vladikov (1931) studied the fish fauna of the Upper Tisa Basin (Ukrainian Carpathians) and reported 49 native and one introduced species. Vásárhelyi (1960, 1961) noted some new data of River Tisa and its tributaries (Teresva, Tereblia).

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<sup>1</sup> The Hungarian name of river is Tisza



In Movchan (1993) the number of fish species identified, including settled species from fisheries, is approximately 60 in the Upper Tisa Basin. Other data has been included by Györe, Sallai, Csikai (1995). With respect to these data, Harka (1997a) noted 51 species along the riverbed, and 5 species in the flood plain area. Bănărescu studied the fish fauna of the Upper Tisa and Teresva and Tereblia tributaries in August 1995. He made his collections from 3 sites of River Chorna Tisa, 4 sites of River Bila Tisa and 5 sites from the Ukrainen and 2 sites of the Hungarian reaches of River Tisa. The bulk of fish data has been collected by Harka, who first collected in 1984, and completed his study of the fish fauna between 1993 and 1994. He examined the Cigánd oxbow in 1985, the Tiszabercel oxbow in 1989, the Gulács oxbow in 1992, and the brook Batár in 1993. The fishing nets were suited to gather fish larger in size than 2-3 cm. He collected information from local sources as well.

## Results

We verified the presence of 64 fish species along the Upper Tisa from the results of our expedition (see Table). We used the taxonomic work by Nelson (1984) as a basis.

### Fam. Petromyzontidae

#### 1. Carpatian Lamprey *Eudontomyzon danfordi* Regan, 1911

This species has been found in both the Chorna and Bila Tisa rivers, except at the source areas and in a short section below their confluence. Fishermen also found a parasitic specimen at Tiszabecs in Hungary in the 1980's.

### **Fam. Acipenseridae**

#### 2. Ship *Acipenser nudiventris* Lovetzky, 1828

According to local sources, 2 species have been identified in the River Tisa, between Záhony and Tokaj (Hungary) as of 1986.

#### 3. Sterlet *Acipenser ruthenus* (Linné, 1758)

This species is generally captured by fishing nets between Vásárosnamény and Tokaj and was found to occur near Tiszabecs as well in 1992 (Györe, Sallai, Csikai, 1995).

### **Fam. Anguillidae**

#### 4. Common Eel *Anguilla anguilla* (Linné, 1758)

This species is migratory, so it can be found everywhere in the Hungarian reaches of River Tisa. It is sometimes seen as far down the river as at Tiszabecs.

### **Fam. Cyprinidae**

#### 5. Roach *Rutilus rutilus* (Linné, 1758)

It has already appeared downstream from Bushtina. It is rare in the upper parts, and is abundant nearby Tokaj. We found the species in the lower reaches of the rivers Tersva and Tereblia, farther from the mouth of brook Batár and in each of the studied oxbows (Gulács, Cigánd, and Tiszabercel).

#### 6. Danubian Roach *Rutilus pigus virgo* (Heckel, 1852)

Five specimens of this roach species could be collected between Tivadar and Lónya in 1994-95 (Györe, Sallai, Csikai, 1995).

#### 7. Grass Carp *Ctenopharyngodon idella* (Cuvier et Valenciennes, 1844)

Occasionally gathered by local fishermen in the riverbeds, but only in small quantities. It settles into the backwaters, mainly to forage amongst the hydrophytes. We collected this species from the Cigánd oxbow.

#### 8. Rudd *Scardinius erythrophthalmus* (Linné, 1758)

We found large quantities of this species in the Gulács oxbow, the Cigánd oxbow and the Tiszabercel oxbow. It is not found in River Tisa.

#### 9. Dace *Leuciscus leuciscus* (Linné, 1758)

The abundance of this species decreases drastically towards the middle and lower regions of the Danube Basin. Its being supplanted is observable in the waters of the Upper Tisa. We found only seven young specimens near the mouth of River Terebia, in the Ukrainian reaches. It is rare in the Hungarian reaches, though a few specimens have been found in the section between Tiszabecs to Tokaj.

#### 10. Souffia Chub *Leuciscus souffia* Risso, 1826

This species deserves special interest, since the populations inhabiting the Upper Tisa and its tributaries are widely isolated and distant from those living in the other areas of the Danube basin (Germany to Croatia). *L. souffia* has been recorded in the Upper Tisa drainage area by Vladykov, who mentions its occurrence in River Tisa and five northern tributaries, among which Teresva and Tereblia. It has later also been found in the three southern tributaries of Tisa from Romania (Vişeu, Iza, Săpânța).

Only two specimens have been collected at Vinogradiv in 1995. It is abundantly found in River Iza at the present time, according to Zoltán Sallai (verbal comm.).

11. Chub *Leuciscus cephalus* (Linné, 1758)

It is abundantly found in River Tisa both in Ukraine and Hungary as well as in the rivers Teresva and Tereblia, and in the brook Batár.

12. Ide *Leuciscus idus* (Linné, 1758)

It does not occur in Ukrainian reaches. It can be found in small quantities in Hungarian stretch. Györe, Sallai, Csikai (1995) collected this species near Tiszabecs in the more fast-flowing reaches. It also inhabits the Cigánd oxbow.

13. Minnow *Phoxinus phoxinus* (Linné, 1758)

This species can be found downstream from Jasinia in River Chorna Tisa, downstream from Breboia in River Bila Tisa and from Rahiv to Bushtina in River Tisa.

14. Asp *Aspius aspius* (Linné, 1758)

It cannot be found in the Ukrainian reaches. We collected it throughout the Hungarian reaches from the Ukrainian border to Tokaj, as well as in the Cigánd oxbow and in the Tiszabercel oxbow.

15. Belica *Leucaspius delineatus* (Heckel, 1843)

We found the largest population in the Cigánd oxbow and the Tiszabercel oxbow, but we also collected specimens from the brook Batár. Györe, Sallai, Csikai (1995) found it below Tiszabecs in the more fast-flowing reaches.

16. Bleak *Alburnus alburnus* (Linné, 1758)

This is a species found very abundantly in River Tisa, except for the uppermost reaches. It is rarely found at Rahiv, but its population increases towards the lower reaches. This species is abundantly found in the lower reach of River Tereblia, in the brook Batár, and also in the three examined oxbows.

17. Rifle Minnow *Alburnoides bipunctatus* (Bloch, 1782)

This species is abundantly found in River Tisa from Rahiv to Tiszacsécse. Downstream from this section it is rarer. We did not find this species below Záhony. We collected it from the tributaries Teresva, Tereblia and brook Batár, too.

18. White Bream *Blicca bjoerkna* (Linné, 1758)

It always resides downstream from Tiszacsécse, but sometimes it can be found in Tiszabecs, too. It has a considerable population living in the Gulács and Tiszabercel oxbows.

19. Bream *Abramis brama* (Linné, 1758)

It can be found in the whole Hungarian reach, though it becomes abundant only near Tokaj. Considerable populations live in each of the examined oxbows.

20. Blue Bream *Abramis ballerus* (Linné, 1758)

It can be found in the whole Hungarian reach, but it is rare in the more fast-flowing parts. In spite of this, it was discovered in the rapid waters below Tiszabecs, too (Györe, Sallai, Csikai, 1995)

21. White-eyed Bream *Abramis sapa* (Pallas, 1811)

It can be found in the whole Hungarian reach. It is a rheophylic species and it was found to be the most abundant among the *Abramis* species in the Upper Tisa.

22. Vimba Bream *Vimba vimba* (Linné, 1758)

We observed this species downstream from Vinogradiv. This species is abundant in the upper reaches of River Tisa in Hungary, it is rare near Tokaj. We collected specimens from River Tereblia and brook Batár as well.

23. Knife *Pelecus cultratus* (Linné, 1758)

This species lives mainly in the lower and middle reaches of rivers. It is rare in waters of the Upper Tisa. In spite of this, it can sometimes be found in the Hungarian reaches.

24. Nose *Chondrostoma nasus* (Linné, 1758)

This species can be found downstream from Rahiv throughout River Tisa. It has been found in large quantities near the Ukrainian-Hungarian border, between Tiszabecs and Tizsacséce particularly. This species is not rare in the lower reaches of the river.

25. Tench *Tinca tinca* (Linné, 1758)

This is a stagnophylic species, therefore it does not live in the river as it had been expected. We found the species living in the Gulács oxbow and the Tiszabercel oxbow.

26. Barbel *Barbus barbus* (Linné, 1758)

Only a few specimens were found downstream from Bushtina in the Ukrainian reaches. It can be found throughout the Hungarian reaches. This species is very abundant, especially between Tizsacséce and Záhony.

27. Petényi's Barbel *Barbus peloponnesius petenyi* Heckel, 1847

This enduring population lives from Rahiv to Tizsacséce, but the abundance of specimens found is not as high as in the Romanian rivers. It was also found in the lower reaches of rivers Chorna Tisa and Bila Tisa.

28. Gudgeon *Gobio gobio* (Linné, 1758)

Small numbers of this species gather regularly in the riverbeds of River Tisa between Vinogradiv and Tizsaszalka. It is very rare downstream, but is not absent. We also collected this species in the Tereblia and Batár brooks.

29. White-finned Gudgeon *Gobio albipinnatus* Lukasch, 1933

It has its large number of specimens found everywhere from Vinogradiv to Tokaj and in the brook Batár as well, but it did not appear in rivers Teresva and Tereblia.

30. Long-whiskered Gudgeon *Gobio uranoscopus* (Agassiz, 1828)

Vladykov (1931) did not record this species in the Tisa, only from two tributaries: in River Shopurka (where we were not sampling) and in River Teresva. We did not find this species in River Teresva. We collected it only downstream from Trosnik in River Tisa, but it is most likely that this species can be found upriver, too. It lives only between Tiszabecs and Tizsacséce in the Hungarian reaches, but it has a stabile population in this reach (Harka, 1996).

31. Pacific Gudgeon *Gobio kessleri* Dybowski, 1862

It can be found everywhere from Bushtina to Tokaj. This is the most abundant Gobio-species between Tiszabecs and Tizsaszalka, but it has become less abundant downstream from Záhony.

32. Stone Morocco *Pseudorasbora parva* (Schlegel, 1842)

We did not find this species in River Tisa, but we found it in a canal at Tiszabecs and in the Cigánd oxbow.

33. Bitterling *Rhodeus sericeus amarus* (Bloch, 1782)

This species can be found throughout the reaches, downstream from Trosnik in River Tisa, and in River Tereblia as well. It is abundant in the brook Batár and in oxbows (Gulács, Cigánd, Tiszabercel).

34. Crucian Carp *Carassius carassius* (Linné, 1758)

This species has become less abundant in the Middle-Danube Basin in the last two decades. Naturally it never has been abundant in the upper reach of the rivers. During the floods it was able to move into the riverbed from the backwaters. Vásárhelyi (1960) had described this species as a common fish in the Upper Tisa region, but we have not been able to detect it yet. According to local sources, this species has already gathered in the Tiszabercel oxbow as of 1989.

35. German Carp *Carassius auratus* (Linné, 1758)

This species can be found throughout the Hungarian reach of the river, and in all three examined oxbows as well. Its concurrence had an important role in the decrease of Crucian Carp.

36. Carp *Cyprinus carpio* Linné, 1758

This species can be found downstream from Tiszabecs in the Hungarian reach, although it is rare in the most rapidly flowing reaches. It inhabits the Gulács oxbow, the Cigánd oxbow and the Tiszabercel oxbow.

37. Silver Carp *Hypophthalmichthys molitrix* (Cuvier et Valenciennes, 1844)

This Far-Eastern species has become semi-acclimatized to the river. For some years it has managed to reproduce in the Upper Tisa. Györe, Sallai, Csikai (1995) collected its young offspring downstream from Tiszabecs. It can be found throughout the Hungarian reaches and it turned up in the Gulács oxbow as well.

38. Spotted Silver Carp *Aristichthys nobilis* (Richardson, 1845)

It does not reproduce in the River Tisa and tributaries, but occasionally it finds its way into the natural flowing waters from the ponds. Fishermen sometimes catch it in the river downstream from Tiszabecs. This species also inhabits the Gulács oxbow.

## **Fam. Cobitidae**

39. Stone Loach *Orthrias barbatulus* (Linné, 1758)

This species has been found in large quantities downstream from Jasinia in River Chorna Tisa, downstream from Breboia in River Bila Tisa, from Rahiv to Vinogradiv in River Tisa, and in River Teresva.

40. Weather-fish *Misgurnus fossilis* (Linné, 1758)

This stagnophylic species was not found in the riverbed (we were able to find it during the recent heavy flood), but we also collected it from the Gulács and the Cigánd oxbows.

41. Spined Loach *Cobitis taenia* Linné, 1758

This species cannot be found in Ukraine, but it is present in the Hungarian reaches. It is relatively rare at Tiszabecs but is more abundant towards Tokaj. It is abundant in the brook Batár and the Tiszabercel oxbow.

42. Balkan Loach *Sabanejewia aurata* (Filippi, 1865)

This species can be found downstream from Bushtina. Its population varies with time and space, but it lives in large quantities without any fluctuations in the Hungarian reaches.

### **Fam. Siluridae**

#### 43. Sheatfish *Silurus glanis* Linné, 1758

This species can be found throughout the Hungarian reaches and has economic importance. It is rare in the upper reaches but is more abundant in the lower reaches. It also inhabits the Tiszabercel oxbow.

### **Fam. Ictaluridae**

#### 44. Brown Bullhead *Ictalurus nebulosus pannonicus* (Harka et Pintér, 1990)

This European catfish subspecies can be distinguished from the American prototype by the smaller number of rays in the anal fins and by the roughness of the frontal surface of the spine (Harka and Pintér, 1990). It is rare in the Hungarian reaches. We did not find any specimens in the riverbed, but we found a large population in a developmental canal. This species appeared downstream in the riverbed (Györe, Sallai, Csikai, 1995). It has a considerable population in the oxbows examined.

#### 45. Black Bullhead *Ictalurus melas* (Rafinesque, 1820)

This catfish species was introduced to Hungary from Italian rivers in 1980. Presently its population increases. It appears in Romania as well (Harka et al. 1988). We first noticed it in spring 1997 (Harka, 1997b) and already it was found in the upper reaches upstream from Tokaj in 1998.

### **Fam. Salmonidae**

#### 46. Grayling *Thymallus thymallus* (Linné, 1758)

We were able to collect this species only at Jasinia in River Chorna Tisa, but its presence has been established in River Tisa, as a specimen of this species has turned up near the border in Hungary (Györe, Sallai, Csikai, 1995).

#### 47. Huchen *Hucho hucho* (Linné, 1758)

The occurrence of this species in the Upper Tisa was mentioned by Herman (1887), and then by Vásárhelyi (1960). It can also be found in the rivers Teresva and Tereblia (Vásárhelyi, 1961). According to our information, this fish can be found in the Ukrainian reach of River Tisa, but we were unable to find any specimens. More specimens were found in the upper reaches of Hungary over the last few years (Györe, Sallai, Csikai, 1995).

#### 48. Brook Trout *Salmo trutta m. fario* Linné, 1758

This species is abundant in the rivers Chorna Tisa and Bila Tisa and in a short section below their confluence. A few specimens were found in the Hungarian reaches, mainly in the upper area.

#### 49. Rainbow Trout *Oncorhynchus mykiss* Walbaum, 1792

This salmon was introduced and propagated artificially and now the mountainous tributaries of the Upper Tisa is populated with their offspring. Fishermen have reported finding this species in their nets.

### **Fam. Umbridae**

50. European Mud-minnow *Umbra krameri* Walbaum, 1792

As expected, this species was not found in the riverbed, but it is abundantly found in the common flood-areas and stagnant waters of River Tisa and River Bodrog. Hoitsy (1995) noticed it in large quantities in a 10-km section far upriver from Tokaj, at Zalkod.

### **Fam. Esocidae**

51. Pike *Esox lucius* Linné, 1758

This species is rare in the most rapid waters, but it can be found throughout the Hungarian reaches and in the Batár brook as well. Particularly high numbers of this species live in the backwaters and the oxbow lakes (Gulács, Cigánd, Tiszabercel).

### **Fam. Gadidae**

52. Burbot *Lota lota* (Linné, 1758)

It can be found throughout the Hungarian reaches. This species is relatively populous in the upper reaches though is rare downstream. It was not found in the brooks and oxbows.

### **Fam. Cottidae**

53. Bullhead *Cottus gobio* Linné, 1758

This species can be found in the lower reach of rivers Chorna Tisa and Bila Tisa to their confluence, but it is missing from their upper reaches. It is abundant from the confluence of the two rivers down to Rahiv. This fish is rarer downstream but it is present at Bushtina. We also collected this species from River Teresva, 4 km above the mouth of the river.

54. Siberian Bullhead *Cottus poecilopus* Heckel, 1836

We collected this species from the source of the rivers Chorna Tisa and Bila Tisa to their confluence at Rahiv. This species is abundant in the upper reaches of these rivers (where it is the single member of the genus), though downstream it becomes increasingly rare, being replaced by *C. gobio*.

### **Fam. Centrarchidae**

55. Common Sunfish *Lepomis gibbosus* (Linné, 1758)

We managed to collect this species only in the Hungarian reaches between Tivadar and Tokaj. We also found it in the Cigánd oxbow and the Tiszabercel oxbow.

### **Fam. Percidae**

56. Perch *Perca fluviatilis* Linné, 1758

This species can be found everywhere downstream from Vinogradiv in River Tisa, where the water has high velocity. It was also found in the brook Batár and in all three examined oxbows.



57. Ruffe *Gymnocephalus cernuus* (Linné, 1758)

We collected this species in the brook Batár at Tiszaabecs and in the riverbed of the Tisa below Tiszacsécse. We also found it in the Cigánd and the Tiszabercel oxbows.

58. Balon's Ruffe *Gymnocephalus baloni* Holcik et Hensel, 1974

We found this ruffe species downstream from Tiszabecs. It is a rheophylic species, which is rare in the backwaters, therefore we could not find it in the oxbows.

59. Yellow Pope *Gymnocephalus schraetzer* (Linné, 1758)

This ruffe species was not found in the Ukrainian reaches, but it can be found in the Hungarian areas. Though it would not be considered rare between Tiszabecs and Tiszacsécse, larger numbers occurred farther downstream.

60. Pike-perch *Stizostedion lucioperca* (Linné, 1758)

This species can be found throughout the Hungarian reaches and it can be considered important for fishing. It is relatively rare between Tiszabecs and Tiszacsécse, while downstream it becomes more abundant. The floods of 1998 have created favourable conditions for its reproduction, therefore we were able to gather large quantities of its offspring.

61. Volga Pike-perch *Stizostedion volgense* (Gmelin, 1788)

This pike-perch species can be found only rarely downstream from Tiszabecs. We collected only a single specimen near Dombrád in 1998.

62. Zingel *Zingel zingel* (Linné, 1758)

This species can be found throughout the Hungarian reaches and it is relatively abundant between Tiszabecs and Záhony. It is rarer near the Tokaj region.

63. Streber *Zingel streber* (Siebold, 1863)

In the freshwaters of the Danube Basin the populations of this species have declined recently, but it can be found downstream from Bushtina in the Upper Tisa. It is abundantly found from Vinogradiv to Tiszaszalka, but it is rare (?) in the downstream reaches.

### **Fam. Eleotrididae**

64. Amur Sleeper *Perccottus glehni* Dybowski, 1877

Russian aquarists have introduced this species from the Amur region into Europe. This fish was first released into ponds and lakes near Moscow in the 1950s and it has spread spontaneously into Central Europe. We found specimens of this species in the middle reaches of River Tisa, Hungary (Harka, 1998). We also found it near Tokaj in summer 1998. It lives primarily in the backwaters of the flood area, but it spreads aggressively in the rivers, too.

## ***Discussion***

The gradual transformation of the environmental elements has resulted in the formation of distinctive ecological zonations. The Trout zone, the Grayling zone, the Nose zone, the Barbel zone, the Bream zone and the Ruffe-Plaice zone follow each

other respectively, downstream from the springs into the main rivers of Europe. Except for the Ruffe-Plaice zone, all of the others can be found in Upper Tisa.

1. *Trout zone*: River Chorna Tisa, River Bila Tisa and the short upper reach of River Tisa at Rahiv belong to this zone. The stony bed, rapid current (1,5-2 m/s), low water temperature (below 13°C) and high oxygen content (10-12 mg/dm<sup>3</sup>) are unique to this zone. In addition to the eponym *Salmo trutta m. fario*, also *Eudontomyzon danfordi*, *Phoxinus phoxinus*, *Orthrias barbatulus*, *Cottus gobio* and *Cottus poecilopus* are abundant fish in this zone.

2. *Grayling zone*: This zone stretches from Rahiv to Hust along River Tisa. The bed is stony and pebbly, the velocity of the water is 1,1-1,5 m/s, water temperature stays below 16°C, and oxygen content is 9-10 mg/dm<sup>3</sup> in this zone. Its characteristic fish are the eponyms *Thymallus thymallus* (Which is rare here) moreover *Barbus peloponnesius petenyi* and *Leuciscus souffia agassizi*.

3. *Nose zone*: It has been formed only in rivers that exhibit a gradual transition between their mountain and lowland reaches. This zone is from Hust to Tiszacsécse in River Tisa. In this zone the bed is covered by small riverstone, the velocity of the current is 0,7-1,1 m/s, water temperature stays below 20°C even in the summer, oxygen content is 8-9 mg/dm<sup>3</sup>. Its characteristic fishes are the eponym *Chondrostoma nasus*, which can be very abundant here. Other fish species include *Hucho hucho*, *Alburnoides bipunctatus* and *Gobio uranoscopus*.

4. *Barbel zone*: This zone extends from Tiszacsécse to Záhony. The bed is gravelly or coarse-grain sand, the velocity of the water is 0,5-0,7 m/s, water temperature does not rise above 20°C even during the summer, oxygen content is 7-8 mg/dm<sup>3</sup> in this zone. In addition to the eponym *Barbus barbus*, characteristic fish species are *Acipenser ruthenus*, *Leuciscus leuciscus*, *Vimba vimba* and *Gobio kessleri*.

5. There is no *Bream zone* that could be considered natural in the upper reaches of the river. This zone formed after the Tiszalök Dams were put into operation in 1954. The Barbel zone, which extended to Tokaj before the dam construction, has transformed into a Bream zone in the reaches under Záhony, as a consequence of the rising water. The bed is made up of fine-grain sediments, sand or mud. Water temperature can reach 23-25°C in the heat of the summer, velocity is below 0,5 m/s, oxygen content is only 5-6 mg/dm<sup>3</sup>. In addition to the eponym *Abramis brama*, its characteristic fish are: *A. sapa*, *A. ballerus*, *Cyprinus carpio*, *Gobio albipinnatus*, *Silurus glanis*, *Stizostedion lucioperca*.

The regular sequence of zones edges have become confused in many European rivers due to the effect of dam construction, which were built in the upper reaches of the rivers. It is well known that in order to make the important waterways of large rivers (Danube, Maine, Rhine) more navigable in their upper areas, many river barrages were built so as to increase water depth. There is less information about the smaller rivers, but they do not seem to be in a better condition. More than twenty dams hinder the formation of the natural conditions along River Drava, which similar in size to River Tisa. The zonation of the Upper Tisa is a natural value, which has become unique in the European continent.

In addition to zonation, another significant aspect, which may be of even higher value is the completeness of natural fish fauna. Despite the introduction of other non-endemic species which now co-occur and compete with the native species, those species native to the area are able to maintain viable populations. The unpolluted water of the Upper Tisa and the unchanging hydrographic conditions have played a decisive role in the survival of these valuable species. In addition to trying to preserve the ecological conditions, we continue our efforts for the survival of this valuable fish fauna.

From 64 species which compose the fish fauna, 10 are adventives, while the other 54 native species comprise the real natural value of fish fauna and some of them deserve distinctive attention.

1. *Eudontomyzon danfordi*. This species occupies a limited area. It is an endemic species of the Carpathian Basin. It lives only in the upper reaches of the Tisa and Timiș catchment. It has received protection in Hungary, is registered in the Ukrainian Red Book, and considered a threatened species by European valuation (Lelek, 1987).

2. *Acipenser nudiiventris*. Originally this species lived near the banks of the Black and Caspian Seas, and it swam upriver only to spawn in these rivers. The populations now living in the Danube Basin have changed their way of life and they live always in fresh water. It is rare and protected in Hungary and is a vulnerable-endangered species in Europe.

3. *Rutilus pigus virgo*. The prototype of this species, *R. pigus pigus*, is native to the waters of North-Italy. *R. pigus virgo* is an endemic sub-species of the Danube river-system. It is a rare and threatened species by European listing. It received protection in Slovenia previously. It is not protected in Hungary but its protection is expected.

4. *Leuciscus souffia agassizi*. The Upper Tisa population of this species which lives 6-700 km from its main distribution area has different characteristics brought about by its isolation. These tributary reaches signify the easternmost borders of the areal of *L. souffia agassizi*. This species is considered to be vulnerable-endangered in Europe and has been registered in the Ukrainian Red Book. Although only stray specimens could be found in Hungary, it has received Hungarian protection.

5. *Phoxinus phoxinus*. This species is a vulnerable species in Europe. This fish is sensitive to changes in its environmental conditions, therefore it has disappeared from many previously inhabited territories. For this reason it has received protection in Hungary.

6. *Leucaspius delineatus*. This species is a rare and vulnerable species in Europe. Because of its small size it does not have economic importance. However, increased pollution throughout its habitats threatens its existence. It has received protection in Hungary.

7. *Alburnoides bipunctatus*. This species is characteristic of the sub-mountainous and hilly reaches of rivers. It is a vulnerable-endangered species in Europe. It has received protection in Hungary. Established populations live in the Upper Tisa.

8. *Barbus barbus*. This cyprinid species, after which the Barbel zone is eponymously named, lives in the hilly and plain reaches where the river flows within its bed. It is a vulnerable species in Europe. This fish is sensitive to water quality

(pollution) and retires from reaches which are flooded as a result of dam operation. It is not rare in Hungary, but in Ukraine has been registered in the Red Book.

9. *Barbus peloponnesius petenyi*. The prototype of this species is native to southern Greece. The centre of the expanding distribution of this sub-species is the Danube Basin, and it also lives in the Upper Tisa river-system. It has an important natural value, and has received protection in Hungary. It is registered in the Hungarian Red Book.

10. *Gobio albipinnatus*. This species lives in Central- and Eastern-Europe, mostly in the catchment area of rivers running into the Black and Caspian Seas. It is rare in Europe, is protected in Hungary, and has recently become more plentiful in River Tisa.

11. *Gobio uranoscopus*. The centre of its relatively small area is the Danube Basin. The literature contains much useless and inaccurate data about its distribution. This species has been described as living in rivers in which it is most unlikely to survive. Probably these observations are records of the similar *G. albipinnatus* and *G. kessleri*. It is a rare and vulnerable species by European valuation. It is protected in Hungary.

12. *Gobio kessleri*. The centre of its distribution is the Danube Basin, therefore it has a great natural value here. It is recorded as a rare and vulnerable species in Europe and is protected in Hungary. It is relatively abundant in the Carpathian Basin including the Upper Tisa, because here the Barbel zone of rivers keep original characteristics.

13. *Orthrias barbatulus*. This species is a rare and threatened species of European listings, and is protected in Hungary. It is still abundant in the mountainous and hilly creeks, and its protection serves to keep the population viable.

14. *Misgurnus fossilis*. This species lives in marshy type habitats, but floods have served an important role in sereading and in maintaining its habitat. This species can be found across Europe, though it is a rare and vulnerable species. It is protected in Hungary.

15. *Cobitis taenia*. This species ranges widely and is less sensitive to environmental conditions. It is rare in Europe but abundant in the river-system of Tisa and within the Carpathian Basin. The protection of this species serves its preservation in Hungary.

16. *Sabanejewia aurata*. This is an Aralo-Poncho-Caspian species, which also is presently expanding into the Carpathian Basin. It is a rare and vulnerable species in Europe. It is relatively abundant in the upper section of River Tisa and is included in the list of protected species in Hungary.

17. *Thymallus thymallus*. This fish is characteristic of the Grayling zone. It is a vulnerable species in Europe, is protected in Hungary and is registered in the Ukrainian Red Book. Recently, it has only been observed in the upper section of River Tisa in Hungary.

18. *Hucho hucho*. It is an endemic species of the Danube river-system. It is an endangered species under European listing, strictly protected in Hungary and registered in the Ukrainian Red Book. Two habitats were known in Hungary, one of which was the reaches of River Danube in the Szigetköz, downstream from Bratislava. The Gabčíkovo Dam has had considerable impact on the environmental conditions of

River Danube which is probably why this species has now only a single stable habitat in the Upper Tisa.

19. *Salmo trutta m. fario*. This species is a vulnerable species in Europe and has been registered in the Ukrainian Red Book. Its ranging offspring which arrive from mountain rivers, can be found regularly in the Hungarian reaches of the Upper Tisa.

20. *Umbra krameri*. Originally, this species lives in the backwaters, canals and oxbows of the flood plains, appearing in the rivers during high floods only. It lives in very few suitable habitats outside the Danube Basin. It is a vulnerable-endangered species by European listing. It has received protection in Hungary and has also been registered into the Hungarian Red Book.

21. *Lota lota*. This species ranges widely but it has become increasingly rare in the Danube Basin. The species recommended in the Romanian Red List. It has mostly disappeared from streams and creeks by the present time, but is still not rare in the upper section of River Tisa.

22. *Cottus gobio*. This species ranges in Europe and it is listed as a vulnerable species. It has been given protection in Hungary, but it is abundant in the Ukrainian reach of the Upper Tisa. Sometimes the two *Cottus* species occur together in the same habitats in the rivers Chorna Tisa and Bila Tisa.

23. *Cottus poecilopus*. This species is a rare and vulnerable species by European listing. It does not have a permanent population in Hungary, even though occasional specimens found here are protected. Its stable populations can be found in the rivers Chorna Tisa and Bila Tisa, which have a great natural value.

24. *Gymnocephalus baloni*. This is a Ponto-Caspian species. Mostly it can be found in larger rivers. It is a vulnerable species in Europe and has received protection in Hungary.

25. *Gymnocephalus schraetzer*. This is an endemic species of the Danube Basin. It is an endangered species in Europe and has received protection in Hungary. It has a large and stable populations in River Tisa, which represent a considerable natural value.

26. *Zingel zingel*. This species is distributed within a small area the centre of which is the river-system of Danube. It is endangered under European listing, it has been registered in the Ukrainian Red Book and is protected in Hungary. Its natural habitat has become smaller and smaller within its area, because it is forced to withdraw from river reaches flooded as a result of damming. It is still relatively abundant in the Upper Tisa.

27. *Zingel streber*. The Danube Basin is the centre of its habitat, like for its relatives. It is an endangered species in Europe, has been registered in the Ukrainian Red Book and is protected in Hungary. This species is more sensitive to the damming of rivers, because it can breed only in the river reaches with moving water and its food organisms live in alluvial deposits rolled by rivers. The populations of this species represent a major natural value in the Upper Tisa region.

Among the listed fishes, 4 species or subspecies are endemic to the Danube Basin. Six species have a narrow range of distribution and find their centre of area here. Ten species have been registered in the Red Book of one or more counties, 23 species are protected in Hungary, and even more are rare and threatened species in

Europe. The unique natural values of the Upper Tisa region extend also to organisms other than fish. A high respect for these species is apparent throughout the region. The preservation and protection of this unique and complex value is of common interest to all four neighbour countries: Ukraine, Romania, Slovakia and Hungary.

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Table: Fishes of the Upper Tisa

	Presence of the fish species	U k r a i n e					H u n g a r y					
		Chorna Tisa	Bila Tisa	Teresva	Tereblia	Tisa 1	Tisa 2	Batar Brook	Tisa 3	Tisa 4	Tisa 5	Backwaters
1	<i>Eudontomyzon danfordi</i>	+	+			+			(+)			
2	<i>Acipenser nudiventris</i>										(+)	
3	<i>Acipenser ruthenus</i>								+	+	+	
4	<i>Anguilla anguilla</i>									+	+	
5	<i>Rutilus rutilus</i>							+	+	+	+	+
6	<i>Rutilus pigus virgo</i>									+		
7	<i>Ctenopharyngodon idella</i>									+	+	+
8	<i>Scardinius erythrophthalmus</i>											+
9	<i>Leuciscus leuciscus</i>				+				+	+	+	
10	<i>Leuciscus souffia agassizi</i>						+					
11	<i>Leuciscus cephalus</i>			+	+	+	+	+	+	+	+	
12	<i>Leuciscus idus</i>								+	+	+	+
13	<i>Phoxinus phoxinus</i>	+	+	+	+	+						
14	<i>Aspius aspius</i>								+	+	+	+
15	<i>Leucaspius delineatus</i>							+	+			+
16	<i>Alburnus alburnus</i>			+	+		+	+	+	+	+	+
17	<i>Alburnoides bipunctatus</i>				+	+	+	+	+	+		
18	<i>Blicca bjoerkna</i>								+	+	+	+
19	<i>Abramis brama</i>								+	+	+	+
20	<i>Abramis ballerus</i>								+	+	+	
21	<i>Abramis sapa</i>								+	+	+	
22	<i>Vimba vimba</i>				+		+	+	+	+	+	
23	<i>Pelecus cultratus</i>								+	+	+	
24	<i>Chondrostoma nasus</i>					+	+		+	+	+	
25	<i>Tinca tinca</i>											+
26	<i>Barbus barbus</i>						+	+	+	+	+	
27	<i>Barbus peloponnesius petenyi</i>	+	+	+		+	+	+				
28	<i>Gobio gobio</i>				+		+	+	+	+	+	
29	<i>Gobio albipinnatus</i>					+	+	+	+	+	+	
30	<i>Gobio uranoscopus</i>					+		+				
31	<i>Gobio kessleri</i>					+	+		+	+	+	
32	<i>Pseudorasbora parva</i>											+

Tisa 1: Rahiv - Hust

Tisa 3: Tiszabecs - Tiszacsécse

Tisa 5: Záhony - Tokaj

Tisa 2: Hust - Tiszabecs

Tisa 4: Tiszacsécse - Záhony

+: presence, (+): rarity

Table continue

	Presence of the fish species	U k r a i n e					H u n g a r y				
		Chorna Tisa	Bila Tisa	Teresva	Tereblia	Tisa 1	Tisa 2	Batar Brook	Tisa 3	Tisa 4	Tisa 5
33	<i>Rhodeus sericeus amarus</i>				+		+	+	+	+	+
34	<i>Carassius carassius</i>										+
35	<i>Carassius auratus</i>							+	+	+	+
36	<i>Cyprinus carpio</i>							+	+	+	+
37	<i>Hypophthalmichthys molitrix</i>							+	+	+	+
38	<i>Aristichthys nobilis</i>							+	+	+	+
39	<i>Orthrias barbatulus</i>	+	+	+		+					
40	<i>Misgurnus fossilis</i>										+
41	<i>Cobitis taenia</i>						+	+	+	+	+
42	<i>Sabanejewia aurata</i>					+		+	+	+	
43	<i>Silurus glanis</i>							+	+	+	+
44	<i>Ictalurus nebulosus pannonicus</i>							+	+	+	+
45	<i>Ictalurus melas</i>									+	
46	<i>Thymallus thymallus</i>	+						(+)			
47	<i>Hucho hucho</i>					+	+	+	+		
48	<i>Salmo trutta m. fario</i>	+	+			+		+	(+)		
49	<i>Oncorhynchus mykiss</i>							(+)	(+)		
50	<i>Umbra krameri</i>										+
51	<i>Esox lucius</i>						+	+	+	+	+
52	<i>Lota lota</i>							+	+	+	
53	<i>Cottus gobio</i>	+	+	+		+					
54	<i>Cottus poecilopus</i>	+	+			+					
55	<i>Lepomis gibbosus</i>							+	+	+	+
56	<i>Perca fluviatilis</i>						+	+	+	+	+
57	<i>Gymnocephalus cernuus</i>						+		+	+	+
58	<i>Gymnocephalus baloni</i>							+	+	+	
59	<i>Gymnocephalus schraetzer</i>							+	+	+	
60	<i>Stizostedion lucioperca</i>							+	+	+	+
61	<i>Stizostedion volgense</i>								+	+	+
62	<i>Zingel zingel</i>							+	+	+	
63	<i>Zingel streber</i>					+	+	+	+	+	
64	<i>Perccottus glehni</i>									+	

Tisa 1: Rahiv - Hust

Tisa 3: Tiszabecs - Tiszacsécse

Tisa 5: Záhony - Tokaj

Tisa 2: Hust - Tiszabecs

Tisa 4: Tiszacsécse - Záhony

+: presence, (+): rarity