FISH AS A BIOLOGICAL INDICATOR IN ASSESING WATER QUALITY OF THE RIVER TAMIŠ

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RIBE KAO BIOLOŠKI INDIKATOR U PROCENI KVALITETA VODE REKE TAMIŠ

Abstrakt

Materijal za istraživanje ihtiofaune Tamiša sakupljen je avgusta i oktobra 2009. u periodu srednjeg vodostaja kao i aprila 2010. godine u periodu visokog vodostaja na lokacijama Sečanj, Banatski Despotovac i Opovo. Prikupljanje uzoraka vršeno je pomoću aparata za elektroribolov i stajaćim mrežarskim alatima dužine od 37 do 100 metara, promera okaca od 45 do 100 mm i dubine 3 do 5 metara. Ovom prilikom evidentirano je 28 vrsta riba iz 8 familija. Prema sastavu ihtiofaune određen je indeks saprobnosti prema Pantle-Buck-u koji iznosi 2.15 i koji ukazuje na to da voda Tamiša pripada drugoj klasi boniteta.

Ključne reči: *ihtiofauna, Tamiš, indeks saprobnosti*

INTRODUCTION

Fish are highly sensitive to changes in the river flow, damming of watercourses, habitat destruction, temperature increase and intensive use of water. Therefore, the water flow, oxygen levels, temperature, aeration and pollution determine the structure of fish fauna. Any change in ecological conditions results in changes within the fish population. Changes in species diversity clearly indicate that significant changes in one or more factors have occurred in the aquatic ecosystem. At the same time the rare and vulnerable species are always in the greatest threat. Endangering or extinction of some species reduces the gene pool of a certain area and for this reason more attention is given to the protection of ecosystems in order to preserve and maintain them for as long as possible.

This paper gives the qualitative and quantitative analysis of the ichthyofauna.

Given the complex research of the Tamiš River (Pujin et al., 1987; Marković et Svirčev, 1998) and the statement that, in the earlier period, there have been changes in the physical, chemical, and biological data, the aim of this paper is to show if the qualitative and quantitative composition and the structure of ichthyofauna have changed, and to indicate the state of water quality based on these data.

MATERIAL AND METHODS

Description of sites

The Tamiš is the longest river in Banat and its basin has the total of 10.352 km^2 (without the Brzava River). After the Tisa River, the Tamiš is the most significant left tributary of the Danube in the Danube basin in Serbia. The Tamiš rises in the north-eastern slopes of Semenic Mountains in Romania and empties into the Danube near Pančevo. The length of the whole river flow is 339.7 km, of which 118 km is in Serbia. The surface of the basin area in Serbia covers 5104 km^2 (Prohaska, 1998).

The Tamiš is characterized by a very imbalanced flow. This can be seen within one year period, as well as by comparing specific years. High water levels appear in late winter and early spring as a result of snow melting, and in summer as a result of heavy rains. At its lower course, the Tamiš is under the influence of the Danube's high water levels. The low waters usually occur in the period from September to October. In the period of low water levels, with its connecting channel near Kuštilj, the Tamiš complements the Begej low water levels. In the dry season, in the whole sector of the Tamiš in Serbia, the water flow decreases to a minimum so that the bed is almost dried out (Prohaska, 1998).

The Tamiš is included in the Main Channel Network of the Danube-Tisa-Danube Hydro-system (OKM HS DTD), which significantly improves its water regime, especially concerning the low water levels.

Material for the research of the Tamiš ichthyofauna has been collected in August and October 2009, during the medium water levels period and in April 2010, during the high water levels period at the locations Sečanj, Banatski Despotovac and Opovo. The samples were collected by using the electrofishing device PERM-MB with an output power voltage 115-565 V (pulse frequency 20-200 Hz; direct current power 650 W, pulsed current power 1200 W), according to electrofishing standards "Water Analysis-Fishing with Electricity" (EN 14011, Cen, 2003) and stake fishing nets 37-100 meters long, having a mesh diameter 45-100 mm and 3-5 meters deep.

For the determination of fish species the following key was used (Vuković et Ivanović, 1971; Simonović, 2001; Pinter, 2002; Harka et Sallai, 2004).

The saprobity index was calculated by the Pantle & Buck Method (1955) (Grginčević et Pujin, 1998) on the basis of the ichthyofauna structure according to the following formula:

$$S = \frac{\sum(h \times s)}{\sum h}$$

where h – estimated frequency of occurrence of each species, and s – saprobic index of each individual species.

RESULTS AND DISSCUTIONS

During the Tamiš research in August-October 2009 and in April 2010, the total of 28 species of fish from 8 families were registered at 3 sites (Sečanj, Banatski Despotovac and Opovo), which is nearly the half of the recorded species in the waters of Vojvodina.

Of the total number of recorded species in Tamiš, 21 are indigenous, and 7 are allochthonous (*Lepomis gibbosus*, *Ameiurus melas*, *Carassius gibelio*, *Hypohthalmichthys molitrix*, *Arystichthys nobilis, Pseudorasbora parva* i *Percottus glenii).* The first two species were introduced from North America and the remaining from the Far East and all have successfully acclimatised.

Table 1. The total proportional ichthyofauna composition of the Tamiš River 2009-2010.

FAMILY AND SPECIES OF FISH	%
Fam. Esocidae	
Esox lucius – pike	1.81
Fam. Percidae	
Sander lucioperca – pike-perch	1.57
Sander lucioperca – Volga pikeperch	0.18
Perca fluviatilis – European perch	0.48
Fam. Centrarchidae	
Lepomis gibbosus – pumpkinseed sunfish	1.57
Fam. Siluridae	
Silurus glanis – wels catfish	1.02
Fam. Ictaluridae	
Ameiurus melas – black bullhead	12.28
Fam. Cyprinidae	
Cyprinus carpio – common carp	1.32
Carassius gibelio – Prussian carp	4.09
Abramis brama – common bream	2.83
Abramis ballerus – blue bream	1.02
Abramis sapa – white-eye bream	0.06
Rutilus rutilus – common roach	6.08
Scardinius erythropthalmus – common rudd	0.72
Alburnus alburnus – common bleak	42.75
Leuciscus cephalus – European chub	0.96
Leuciscus idus – ide	0.42
Hypophthalmichthys molitrix – silver carp	2.71
Arystichthys nobilis – bighead carp	0.18
Aspius aspius – asp	1.99
Blicca bjoerkna – silver bream	4.58
Vimba vimba – vimba bream	0.06
Rhodeus sericeus – Amur Bitterling	7.10
Gobio albipinnatus – white-finned gudgeon	0.06
Pseudorasbora parva – topmouth gudgeon	3.79
Fam. Gobiidae	
Neogobius fluviatilis – monkey goby	0.06
Neogobius marmoratus	0.06
Fam. Odontobutidae	
Perccottus glenii – Chinese sleeper	0.24
TOTAL	100.00

By comparing the Tamiš ichthyofauna composition for the 2009-2010 research period with the data of commercial or sport fishing on the "Tamiš I" in the period 1977-1986, which were published in the plan for improving and exploitation of this fishing area (Pujin et al., 1987), it can be stated that in 2009-2010 following species were not registered: *Leuciscus leuciscus* – common dace, *Ctenopharyngodon idella* – grass carp, *Tinca tinca* – tench, *Chondrostoma nasus* – common nase, *Gobio gobio* – gudgeon, *Barbus barbus* – common barbel, *Pelecus cultratus* – sabre carp, *Carassius carassius* – crucian carp, *Barbatula barbatula* – stone loach, *Misgurnus fossilis* – European weatherfish, *Cobitis elongatoides* and *Gymnocephalus cernua* – Eurasian ruffe; but the following species were recorded which were not present in the previous period: *Pseudorasbora parva*, *Sander volgensis*, *Gobio albipinnatus*, *Neogobius fluviatilis* and *Neogobius marmoratus*. *Carassius carassius* – crucian carp and *Tinca tinca* – tench are almost completely extinct in the waters of Serbia and they are on the list for the Red Book for Serbia.

In comparison to the 90s of the 20th century (Maletin et al., 1998), during the entire research period 2009-2010 *Ctenopharyngodon idella* and *Tinca tinca* were not registered, but *Pseudorasbora parva*, *Percottus glenii*, *Sander volgensis*, *Gobio albipinnatus*, *Neogobius fluviatilis* and *Neogobius marmoratus* were recorded.

Ecological analysis of ichthyofauna in terms of individual contribution showed domination of common bleak – *Alburnus alburnus* (42.75 %) and black bullhead – *Ameiurus melas* (12.28 %). The dominant species are Amur Bitterling – *Rhodeus sericeus* (7.1 %) and common roach – *Rutilus rutilus* (6.08), and they are followed by silver bream *Blicca bjoerkna* (4.58 %), silver Prussian carp – *Carassius gibelio* (4.09 %), topmouth gudgeon – *Pseudorasbora parva* (3.79 %), white-eye bream – *Abramis brama* (2.83 %) and silver carp – *Hypophthalmichthys molitrix* with 2.71% in the individual contribution. The species that have share less than 2% are: asp – *Aspius aspius*, pike – *Esox lucius*, pike-perch – *Sander lucioperca*, pumpkinseed sunfish – *Lepomis gibbosus*, common carp – *Cyprinus carpio*, blue bream – *Abramis ballerus* and wels catfish – *Silurus glanis*.

Based on the ichthyofauna structure, the saprobity index according to Pantle & Buck is 2.15, which indicates that the Tamiš water is in the second class.

CONCLUSION

Based on the research of Tamiš ichthyofauna in the period August-October 2009 and in April 2010 at three sites (Sečanj, Banatski Despotovac and Opovo), the following can be conluded:

-There was total of 28 fish species from 8 families recorded. Of these, 21 are indigenous, while 7 are allochthonous and all have acclimatized successfully.

-Ecological analysis of ichthyofauna in terms of individual contribution showed domination of common bleak – *Alburnus alburnus* and black bullhead – *Ameiurus melas*.

-The saprobity index on the basis of ichthyiofauna structure is 2.15 according to Pantle & Buck, which indicates that the Tamiš water is in the second class.

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