

ICHTHYOFAUNA OF THE SLOVAK PART OF RIVER BODROG

A BODROG SZLOVÁKIAI SZAKASZÁNAK HALFAUNÁJA

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Keywords: lowland river, long-term changes, ecological groups, South-East Slovakia
Kulcsszavak: alföldi folyó, hosszú távú változások, ökológiai csoportok, DK-Szlovákia

Summary

In Slovak part of the River Bodrog, we confirmed the occurrence of 31 fish species by using the methods of beach seining and electro fishing. We found that *Romanogobio vladkovi* (20.72%), *Alburnus alburnus* (18.14%) and *Rutilus rutilus* (15.06%) were the dominant species. More than one half of the ichthyocenosis consisted of species consuming not specific kind of animal food (Ca.1 – 58.1%); most abundant were litophil, species spawning on the open substrate (A.1.3 – 32.4%) and 30% of species were from some group of phytophil species. In relation to the current, the occurrence of neutral and limnophil species was rather high. Index of geographic integrity was 0.90. About one third of the species found is protected by the European and national legislation.

Összefoglalás

Az utóbbi 11 év során elektromos halászgéppel és kerítőhálóval 31 halfaj jelenlétét állapítottuk meg a Bodrog szlovákiai szakaszán. Domináns faj volt a *Romanogobio vladkovi* (20,72%), az *Alburnus alburnus* (18,14%) és a *Rutilus rutilus* (15,06%). A halak több mint felét olyan egyedek alkották, melyek nem speciális állati táplálékot fogyasztottak (Ca.1 – 58,1%), a legnagyobb mennyiségben nyílt aljzaton ivó, litofil fajok egyedei fordultak elő (A.1.3 – 32,4%), továbbá az egyedek majd 30%-a a fitofilek valamelyik csoportjából került ki. Az áramlás viszonylatában aránylag nagy mennyiségben fordultak elő neutrális és limnofil fajok. A geográfiai integritás indexe 0,90-ot ért el. Az egyedek körülbelül harmada az európai és a nemzeti törvények értelmében védett.

Introduction

River Bodrog is very interesting by its spring; it arises at the confluence of two large rivers, Ondava and Latorica. Its length in Slovakia is only about 15 km but it dewater a large area in Medzibodrožie region. Beside the main stream and system of artificial channels, high number of old Tisa dead arms (Tice) with its typical fauna and flora and numerous sand or clay pits are also inhabited by many fish species. These habitats are interconnected with the main stream during the floods.

Preliminary data of the fish fauna of Bodrog are available in the papers of Mocsáry (1878) and Chyzer (1882) that are cited by Vutskits (1918) and later by Vásárhelyi (1960). The more recent data comes from Kirka et al. (1980), Mariassy et Saban (1985), Harka et al. (2000), Koščo et Košuth (2004), Koščo (2008). Ichthyofauna of Hungarian part of the R. Bodrog basin was studied by Harka (2002). The present work supplements these data and summarizes the recent knowledge about the Bodrog fish species.

Material and Methods

Fish were caught mainly by beach seining and electro fishing. Results of the paper represent the summary of our 11 year (1999 - 2009) ichthyological survey in R. Bodrog basin. Structural and quantitative assemblage-characteristics were evaluated based on Losos et al. (1985), the conservation status of fish species was defined by Slovakian red list (Koščo et Holčík 2008) and by national and international legislations, and fish were classified to the ecological guilds by Holčík (1998). The number of native species to the total species number (index of geographical integrity) was calculated by the method of Bianco (1990).

Results

In the course of the survey, 26 samplings were carried out on 8 locations of the main stream of R. Bodrog. In total, 2311 fish belonging to the 31 species were caught. The number of species in each sampling varied from 2 to 14. The eudominant species in the river were Danube whitefin gudgeon *Romanogobio vladykovi* (20.72%), bleak *Alburnus alburnus* (18.14%) and roach *Rutilus rutilus* (15.06%). The values of dominant species were reached by pikeperch *Sander lucioperca*, bream *Abramis brama* and silver bream *Blicca bjoerkna*. 19 species (61.3%) were subrecedent. The highest values of frequency (more than 50%) were achieved by all of the eudominant species and also by dominant pikeperch, followed by Danube spined loach *Cobitis elongatoides* that was present in half of the catches. Up to 9 species (34.6%) we catch only once. (frequency 3.8%) (Tab. 1).

Table 1. Dominance and frequency of individual fish species in Slovak part of Bodrog Rive
1. táblázat. A fajok abszolút és relatív abundanciája és gyakorisága

| Species | Total | Frequency | D (%) | F (%) |
|------------------------------------|-------|-----------|-------|-------|
| <i>Abramis brama</i> | 171 | 10 | 7,40 | 38,46 |
| <i>Abramis sapa</i> | 82 | 13 | 3,54 | 50,00 |
| <i>Acipenser ruthenus</i> | 7 | 1 | 0,30 | 3,85 |
| <i>Alburnus alburnus</i> | 419 | 21 | 18,14 | 80,77 |
| <i>Alburnoides bipunctatus</i> | 3 | 2 | 0,13 | 7,69 |
| <i>Aspius aspius</i> | 67 | 12 | 2,90 | 46,15 |
| <i>Barbus barbus</i> | 2 | 2 | 0,09 | 7,69 |
| <i>Blicca bjoerkna</i> | 128 | 8 | 5,53 | 30,77 |
| <i>Carassius gibelio</i> | 13 | 6 | 0,56 | 23,08 |
| <i>Chondrostoma nasus</i> | 1 | 1 | 0,04 | 3,85 |
| <i>Cobitis elongatoides</i> | 33 | 13 | 1,43 | 50,00 |
| <i>Esox lucius</i> | 5 | 2 | 0,22 | 7,69 |
| <i>Gobio carpathicus</i> | 1 | 1 | 0,05 | 3,85 |
| <i>Gymnocephalus baloni</i> | 12 | 5 | 0,52 | 19,23 |
| <i>Gymnocephalus schraetser</i> | 59 | 8 | 2,55 | 30,77 |
| <i>Leuciscus cephalus</i> | 2 | 2 | 0,09 | 7,69 |
| <i>Leuciscus idus</i> | 1 | 1 | 0,04 | 3,85 |
| <i>Leuciscus leuciscus</i> | 39 | 6 | 1,69 | 23,08 |
| <i>Lepomis gibbosus</i> | 6 | 2 | 0,26 | 7,69 |
| <i>Perca fluviatilis</i> | 96 | 12 | 4,16 | 46,15 |
| <i>Perccottus glenii</i> | 3 | 1 | 0,13 | 3,85 |
| <i>Rhodeus amarus</i> | 9 | 3 | 0,39 | 11,54 |
| <i>Romanogobio vladykovi</i> | 479 | 20 | 20,72 | 76,92 |
| <i>Rutilus rutilus</i> | 348 | 18 | 15,06 | 69,23 |
| <i>Rutilus virgo</i> | 5 | 4 | 0,22 | 15,38 |
| <i>Sabanejewia balcanica</i> | 12 | 6 | 0,52 | 23,08 |
| <i>Sander lucioperca</i> | 189 | 19 | 8,18 | 73,08 |
| <i>Scardinius erythrophthalmus</i> | 1 | 1 | 0,04 | 3,85 |
| <i>Silurus glanis</i> | 1 | 1 | 0,05 | 3,85 |
| <i>Vimba vimba</i> | 2 | 1 | 0,09 | 3,85 |
| <i>Zingel zingel</i> | 6 | 1 | 0,26 | 3,85 |

From the ecological guild point of view we recorded 5 feeding groups in River Bodrog. Proportion of non-specific carnivorous species was more than 50% (Ca.1 – 58.1%), followed with euryphagous species (Eu – 25.8%), three species were piscivorous (Ca.2.1), the rest two species were phytophagous (Tab.2). Totally we recorded up to 10 reproductive guilds. The most abundant were species spawning on the open substrate: lithophil species (A.1.3 – 32.4%) and phytolithophil and phytophil (A.1.4 a A.1.5 – for 19.4%). Notable was that 30% of species were from some group of phytophil species (A.1.5, B.1.4, B.2.5) (Tab. 2). It is related with temporary continuity with alluvial waters, and with slow current, too. It was

confirmed with considerable occurrence of eurytopic species (22.6%), and with three limnophil species, too. There were equable values of reophil A and B group (Tab. 2).

Table 2. The ecological guilds and conservation status of fish species in Slovak part of Bodrog River
2. táblázat. Az előkerült fajok ökológiai guildjei és természetvédelmi státusza

| Species | Ecological guilds | | | | Conservation status | | | |
|------------------------------------|-------------------|--------|----|----|---------------------|--------|--------|--------|
| | | | | | | | | |
| <i>Abramis brama</i> | Ca. 1 | A.1.4 | rB | Li | LC | | | |
| <i>Abramis sapa</i> | Ca. 1 | A.1.3 | rA | Re | NT | | Bern 3 | |
| <i>Acipenser ruthenus</i> | Ca. 1 | A.1.2 | rA | Re | LC | HD 5 | Bern 3 | |
| <i>Alburnus alburnus</i> | Ca. 1 | A.1.4 | e | Et | LC | | | |
| <i>Alburnoides bipunctatus</i> | Ca. 1 | A.1.3 | rA | Re | LC | | Bern 3 | 4b, 6b |
| <i>Aspius aspius</i> | Ca.2.1 | A.1.3 | rB | Re | LC | HD 2,5 | Bern 3 | 4b |
| <i>Barbus barbus</i> | Ca. 1 | A.1.3 | rA | Re | LC | HD 5 | | |
| <i>Blicca bjoerkna</i> | Eu | A.1.5 | rB | Et | LC | | | |
| <i>Carassius gibelio</i> | Eu | A.1.5 | e | Et | | | | |
| <i>Chondrostoma nasus</i> | He.2.2 | A.1.3 | rA | Re | NT | | Bern 3 | |
| <i>Cobitis elongatoides</i> | Eu | A.1.5 | rA | Re | LC | HD 2 | Bern 3 | 4b |
| <i>Esox lucius</i> | Ca.2.1 | A.1.5 | e | Et | LC | | | |
| <i>Gobio gobio</i> | Ca. 1 | A.1.6 | rA | Et | LC | | | |
| <i>Gymnocephalus baloni</i> | Ca. 1 | A.1.3 | rB | Re | VU | HD 2,4 | Bern 3 | 4b, 6b |
| <i>Gymnocephalus schraetser</i> | Ca.1 | A.1.3 | rB | Re | VU | HD 2,5 | | 4b, 6b |
| <i>Leuciscus cephalus</i> | Eu | A.1.3 | e | Re | LC | | | |
| <i>Leuciscus idus</i> | Eu | A.1.4 | rB | Et | NT | | | |
| <i>Leuciscus leuciscus</i> | Ca. 1 | A.1.3 | rA | Re | NT | | | |
| <i>Lepomis gibbosus</i> | Ca. 1 | B. 2.2 | e | Li | | | | |
| <i>Perca fluviatilis</i> | Ca. 1 | A.1.4 | e | Et | LC | | | |
| <i>Perccottus glenii</i> | Ca. 1 | B. 2.2 | l | Li | | | | |
| <i>Rhodeus amarus</i> | Eu | A. 2.5 | l | Et | LC | HD 2 | Bern 3 | 4b |
| <i>Romanogobio vladkyovi</i> | Ca. 1 | A.1.6 | rA | Et | NT | HD 2 | Bern 3 | 4b |
| <i>Rutilus rutilus</i> | Eu | A.1.4 | e | Et | LC | | | |
| <i>Rutilus virgo</i> | Ca. 1 | A.1.4 | rB | Re | VU | HD 2,5 | Bern 3 | 4b, 6b |
| <i>Sabanejewia balcanica</i> | Ca.1 | A.1.5 | rA | Re | NT | HD 2 | Bern 3 | 4b, 6b |
| <i>Sander lucioperca</i> | Ca.2.1 | B.2.5 | rB | Et | LC | | | |
| <i>Scardinius erythrophthalmus</i> | He.2.1 | A.1.5 | l | Li | LC | | | |
| <i>Silurus glanis</i> | Ca. 1 | B.1.4 | rB | Li | LC | | Bern 3 | |
| <i>Vimba vimba</i> | Eu | A.1.3 | rB | Re | NT | | Bern 3 | |
| <i>Zingel zingel</i> | Ca.1 | A.2.3 | rB | Re | EN | HD 5 | Bern 3 | 4b, 6b |

Native – all fish species ratio was 0.90%, only three species were non-native. The index of integrity was 0.90. From the native fish species one species was endangered (zingel *Zingel zingel*), three belongs to vulnerable (Danube ruffe *Gymnocephalus baloni*, yellow pope *Gymnocephalus schraetser*, cactus roach *Rutilus virgo*) and 7 (22.6%) belonged to near threatened (Tab. 2). More than third of the species found were from the Annex (II., IV. and V.) to the Council Directive No. 92/43/EEC, much more were protected by the Bern convention and about one third of the species found is protected by the national legislation of Slovakia (Tab. 2).

Discussion

In comparison with preliminary data (Mocsáry 1878, Chyzer 1882, Vutskits 1918) we note the decreasing of species richness in River Bodrog in the second half of the last century. According to Vásárhelyi (1960) this fact is connected with establishment of industrial companies, mainly in the Slovak part of river basin. Harka (1992) resume long-time results from the Hungarian part of Bodrog basin and state; the decreasing of fish species was not so enormous there. He concluded that the dam at Tiszalök have more impact than pollution. New species were recorded by Hoitsy (1995), too (Tab. 3).

Table 3. Fish species detected from Bodrog river in the last 2 decades
 3. táblázat. A Bodrogból az utóbbi 2 évtizedben kimutatott halfajok

| Species | Hungarian part of Bodrog | | | | Slovak part of Bodrog | | | | Present data |
|---------------------------------|--------------------------|--------------|--------------------|------------------------|-----------------------|-------------------------|--------------------|-----------------------|--------------|
| | Harka, 1992 | Hoitsy, 1995 | Harka et al., 2000 | Harka et Csipkés, 2009 | Kirka et al., 1980 | Mariássy et Saban, 1985 | Harka et al., 2000 | Koščo et Košuth, 2004 | |
| <i>Acipenser ruthenus</i> | + | | | | | | | | + |
| <i>Anguilla anguilla</i> | + | | | | | + | | | |
| <i>Rutilus rutilus</i> | + | + | + | + | + | + | + | | + |
| <i>Rutilus virgo</i> | | | | | | | | + | + |
| <i>Scardinius erythrophth.</i> | | + | + | | | + | + | + | + |
| <i>Leuciscus leuciscus</i> | + | + | | + | | + | | | + |
| <i>Leuciscus cephalus</i> | + | + | + | + | + | | + | | + |
| <i>Leuciscus idus</i> | + | + | + | + | + | | | + | + |
| <i>Aspius aspius</i> | + | + | + | + | + | | | + | + |
| <i>Leucaspis delineatus</i> | + | | | | | | | + | |
| <i>Alburnus alburnus</i> | + | + | + | + | + | + | + | + | + |
| <i>Alburnoides bipunctatus</i> | | | | | | | | | + |
| <i>Blicca bjoerkna</i> | + | | + | + | + | | + | + | + |
| <i>Abramis brama</i> | + | + | + | + | + | + | + | + | + |
| <i>Abramis ballerus</i> | + | + | + | | | + | | + | |
| <i>Abramis sapa</i> | + | + | + | | + | + | + | | + |
| <i>Vimba vimba</i> | + | | | | + | | | | + |
| <i>Chondrostoma nasus</i> | + | + | | + | + | | | | + |
| <i>Tinca tinca</i> | + | + | | | | | | + | |
| <i>Barbus barbus</i> | + | | + | + | + | | | | + |
| <i>Gobio carpathicus</i> | | | | | + | | | | + |
| <i>Romanogobio vladykovi</i> | + | | + | + | + | | + | | + |
| <i>Romanogobio kesslerii</i> | | + | | | | | | | |
| <i>Pseudorasbora parva</i> | | | | | | | | + | |
| <i>Rhodeus amarus</i> | + | + | + | + | | | | + | + |
| <i>Carassius carassius</i> | + | + | | + | | + | | + | |
| <i>Carassius gibelio</i> | + | + | + | + | + | + | + | + | + |
| <i>Cyprinus carpio</i> | + | + | | | | + | | + | |
| <i>Misgurnus fossilis</i> | | | | | | + | | + | |
| <i>Cobitis elongatoides</i> | + | + | + | + | | | | + | + |
| <i>Sabanejewia balcanica</i> | + | | + | + | | | | | + |
| <i>Silurus glanis</i> | + | | | + | | + | | + | + |
| <i>Ameiurus nebulosus</i> | + | + | | | + | + | | + | |
| <i>Ameiurus melas</i> | | | | | | | | + | |
| <i>Umbra krameri</i> | | | + | | | | | + | |
| <i>Esox lucius</i> | + | + | + | + | + | + | | + | + |
| <i>Lota lota</i> | + | | + | | | | | | |
| <i>Lepomis gibbosus</i> | + | + | + | + | | | + | + | + |
| <i>Perca fluviatilis</i> | + | + | + | + | + | + | + | + | + |
| <i>Gymnocephalus cernuus</i> | + | + | + | + | + | + | + | + | |
| <i>Gymnocephalus baloni</i> | | + | + | + | | | | + | + |
| <i>Gymnocephalus schraetser</i> | + | + | + | | + | + | + | | + |
| <i>Sander lucioperca</i> | + | + | + | + | + | + | + | + | + |
| <i>Sander volgense</i> | + | | | | | | | | |
| <i>Zingel zingel</i> | | | | | | | | | + |
| <i>Perccottus glenii</i> | | | | | | | | + | + |
| <i>Proterorhinus marmoratus</i> | | | | + | | | | | |
| Total | 34 | 26 | 25 | 24 | 20 | 19 | 14 | 28 | 31 |

Whole River Bodrog – both Hungarian and Slovak part, was evaluated by Harka et al. (2000); the authors mentioned about 42 fish species, part of them were not catches by authors, but represents the data from Hungarian fishermen. We note only species catches by

authors in overall summary (Tab. 3). The recent data about fish fauna of Hungarian part of River Bodrog were presented by Harka and Csipkés (2009) (Tab. 3).

The list of fish species in Slovak part of Bodrog River (Koščo 2008) we enriched about four new species (sterlet *Acipenser ruthenus*, spirlin *Alburnoides bipunctatus*, Balkan golden loach *Sabanejewia balcanica*, zingel). We did not record brown bullhead, (*Ameiurus nebulosus*) the species common in past, and ruffe (*Gymnocephalus cernuus*), so as. The tubenose goby (*Proterorhinus marmoratus*), the species noted by Harka and Csipkés (2009) (Tab. 3). There are 47 fish species in Bodrog River, according to recent data (Tab. 3). We can confirm the similarity of Hungarian and Slovak parts of Bodrog River. The differences were in occurrence of some reophilous species (cactus roach, spirlin, Carpathian gudgeon, zingel) in Slovak part of river. The Volga pikeperch *Sander volgense*, burbot *Lota lota*, sand gudgeon *Romanogobio kesslerii* and tubenose goby, spreading in the river in the last years were recorded in Hungarian part of Bodrog River (Tab. 3). The differences with comparison with older data are connected with decreasing of some species (sterlet, European eel *Anguilla anguilla*, sun bleak *Leucaspis delineatus*, tench *Tinca tinca*, crucian carp *Carassius carssius*, brown bullhead, European mudminnow *Umbra krameri*), or with spreading of new species (black bullhead *Ameiurus melas*, pumpkinseed *Lepomis gibbosus*, Amur sleeper *Perccottus glenii*, tubenose goby). Most of the fish species in River Bodrog are common in Hungarian and Slovak part of the river.

Acknowledgement

This study is the result of the projects implementation: Excellence Centre of Animal and Human Ecology supported by the Research & Development Operational Programme funded by the ERDF (ITMS: 26220120023, ITMS: 26220120041). The study was funded by the Slovak Grant Agency VEGA projects No. 1/0125/10 and SRDA (APVV)-0154-07.

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A Bodrog Klin nad Bodrogom határában (Ján Koščo felvétele)



A Bodrog Sárospataknál (Harka Ákos felvétele)