HISTORICAL ASPECTS OF THE DEVELOPMENT OF FISH COMMUNITIES IN THE "PERUĆAC" RESERVOIR

ALEKSANDAR HEGEDIŠ[1], BRANISLAV MIĆKOVIĆ[1], MIROSLAV NIKČEVIĆ[1], MIRJANA LENHARDT[2], MILICA PUCAR[1], MARIJA SMEDEREVAC-LALIĆ[1]
[1]*Institute for multidisciplinary research, Kneza Višeslava 1, Belgrade*
[2]*Institute for biological research "Siniša Stanković", Bulevar Despota Stefana 142, Belgrade*

ISTORIJSKI ASPEKTI RAZVOJA ZAJEDNICE RIBA U AKUMULACIJI „PERUĆAC"

Abstrakt

Akumulacija „Perućac" je nastala pregrađivanjem rečnog korita reke Drine betonskom branom. Radovi na izgradnji brane vršeni su od 1952. do 1962. godine. Brana je duga 461 m i visoka 93 m. Izgradnjom brane stvoreno je akumulaciono jezero dugo oko 52 km, sa dubinom do 85 m i širinom od 60 do 1800 m. U jezerskom basenu akumulira se oko 340 miliona m^3 vode. Prosečan godišnji proticaj Drine na mestu gde se nalazi brana je 349 m^3/sek (Stanković, 2005). Sa druge strane, akumulacija „Perućac" predstavlja glavnu ribolovnu vodu na teritoriji Nacionalnog parka „Tara".

Struktura naselja riba u akumulaciji „Perućac" je tokom godina pretrpela mnoge promene. Naselje riba u akumulaciji u početku je formirano na bazi vrsta koje su naseljavale reku Drinu pre pregrađivanja i formiranja jezera. Njega su do 1978. godine činile autohtone salmonidne (5,1 %) i ciprinidne ribe (94,9 %). Prema raspoloživim podacima to naselje je gotovo u potpunosti devastirano prilikom pražnjenja jezera 1978. godine (Kosorić, 1979). Interesantno je da neke od tada registrovanih ciprinidnih vrsta (potočna mrena *Barbus peloponnesius*, nosara *Vimba vimba*, krkuša *Gobio gobio*, pliska *Alburnoides bipunctatus*, crvenperka *Scardinius erythrophthalmus*) više nisu beležene u kasnijim godinama. Može se reći da one danas ne naseljavaju jezero ili su vrlo retke. Stanje koje je zatečeno 2007. godine predstavlja riblju zajednicu koja je formirana na bazi ishodnih autohtonih salmonidnih i ciprinidnih vrsta i vrsta koje su u jezero unete poribljavanjima. Abundancija autohtonih ciprinida je značajno smanjena na račun akcidentalno unetih Percida (grgeč, *Perca fluviatilis*) i Centrarchida (sunčica, *Lepomis gibosus*). Stanje u 2010. godini predstavlja nastavak ovog procesa u kome Percide i Centrarhide preuzimaju dominaciju po brojnosti. Slična situacija se zapaža kada je u pitanju

masena zastupljenost pojedinih familija riba. U početku u zajednici riba su po biomasi dominirale autohtone ciprinide i salmonide. Kasnije, nakon poribljavanja, značajnu ulogu u ihtiocenozi imaju Percidae, Siluridae (som *Silurus glanis*) i Centrarchidae.

Glavni razlozi za unošenje šarana i soma su svakako bili ribolovnog karaktera, a u cilju povećanja raznovrsnosti ribolovno značajnih vrsta. Međutim, poribljavanja šaranom vršila su se sa jednogodišnjom mlađi prosečne mase tela oko 50 g. Nažalost, praksa je pokazala da je sasvim uobičajeno da se prilikom isporuke takve mlađi u transportnim tankovima nađe nekoliko procenata jedinki vrsta koje nikako ne bi trebalo unositi u ribolovne vode (sunčica, grgeč, babuška *Carassius gibelio*). U tom slučaju bandar i sunčica, zahvaljujući velikom reproduktivnom potencijalu, nakon nekoliko godina postaju vrlo značajne i po brojnosti i po biomasi i igraju vrlo važnu ulogu u jezerskoj ihtiocenozi. Tako ove dve vrste po brojnosti 2007. godine čine oko 40 %, a 2010. godine i preko 50% naselja riba. I po biomasi ove dve vrste imaju velikog značaja za naselje riba čineći oko 21 % masenog udela. Negativan uticaj ovako formiranog naselja posebno se odražava na salmonidne ribe čija se zastupljenost konstantno smanjuje: 5,1 %, 2,7 %, 0,3 %, po brojnosti, odnosno 9,6 %, 3,5 %, 0,4 % po biomasi, respektivno po godinama. Som kao glavna predatorska riba, iako sa značajnim masenim udelom koji se u vremenu povećava, nema dovoljnog populacionog kapaciteta da značajnije utiče na regulaciju brojnosti nepoželjnih vrsta kao što su bandar i sunčica.

Ključne reči: *zajednica riba, brana, Akumulacija „Perućac"*

INTRODUCTION

In Serbia, a significant number of reservoirs with different primary purpose have been formed: exploitation of hydro power potential, water supply, protection from erosion, etc. Fish community in reservoirs are formed by species that inhabited the river that was dammed, and the species that were introduced by restocking. The „Perućac" reservoir is no exception. This lake was created by constructing a concrete dam on the Drina river bed. The works on the construction of the dam were carried out between 1952 and 1962. The dam is 461 m long and 93 m high. The dam created a reservoir, 52 km long, between 60 m and 1800 m wide and with the maximum depth of 85 m. Around 340 million m^3 of water are accumulated in the lake basin. The average annual flow of the Drina river, in the area of the dam, is 349 m^3/sec (Stanković, 2005). On the other hand, „Perućac" reservoir represents the main fishing water on territory of the National park „Tara". This article analyses the development of the ichtyocenosis in this reservoir, since 1978 until the present.

MATERIAL AND METHODS

Samples of the fish fauna were taken during August, September and October 2007 and 2010. In order to determine the abundance (number proportion) and mass proportion in the fish community, the samples in the reservoir were collected using fish nets, with the following characteristics:

- pelagic gillnets 50 m x 6 m, mesh size 45 and 70 mm,
- pelagic trammel net 50 m x 4 m, mesh size 80 mm,
- benthic gillnets 20 m x 2 m, mesh size 20 mm, 60 m x 3 m, mesh size 30 mm,

30 m x 1,5 m, mesh size 50 and 60 mm,
- benthic trammel nets 30 m x 1,5 m, mesh size 40 and 60 mm.

Nets were set in the evening and raised the next morning (12 hours), and during the day (5 hours). Identification of species was made according to the key for identification of fish species „Fish of Serbia" (Simonović, 2001). The data about the fish community structure from 1978 were obtained from Kosorić (1979).

RESULTS

Over the years, the structure of the fish fond in the „Perućac" reservoir has undergone many changes. The fish community in the reservoir was initially formed from species that inhabited the Drina river before the construction of the dam and formation of the lake. Until 1978, the community consisted of native salmonid (5,1%) and cyprinid (94,9%) fish species (Fig. 1). According to available data, this community was almost completely devastated when the lake was emptied in 1978 (Kosorić, 1979). It is interesting that some of than registered cyprinid species (brook barbel *Barbus peloponnesius*, vimba bream *Vimba vimba*, gudgeon *Gobio gobio*, schneider *Alburnoides bipunctatus*, rudd *Scardinius erythrophthalmus*) are no longer recorded in the later years. It can be said that they do not inhabit the lake any more or that they are very rare.

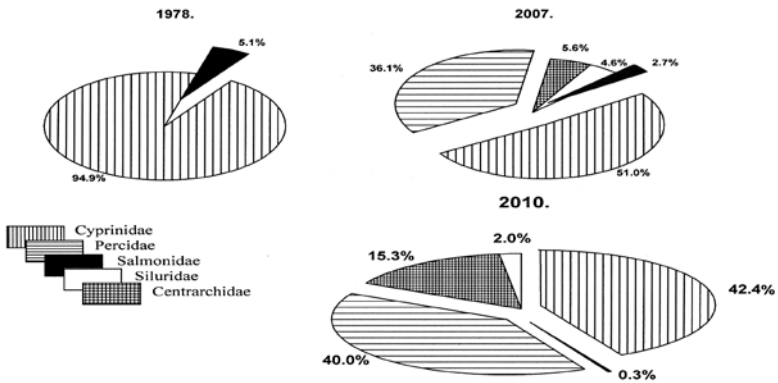

Figure 1. The structure of fish community in „Perućac" reservoir: the abundance of fish families between 1978 and 2010.

The data about the re-establishment and development of the fish community between 1978 and 2007 were not available, and the state of the fish community in 2007 was formed based on the original native salmonid and cyprinid species and the species who were introduced into the lake by restocking (Hegediš i Mićković, 2007). The abundance of indigenous cyprind species was significantly reduced due to the accidental introduction of percid species (perch, *Perca fluviatilis*) and Centrarchids (pumpkinseed, *Lepomis gibosus*). The state in 2010 demonstrates a continuation of this process in which percid and centrarhid species assume the dominance in number (Fig. 1) (Hegediš *et al.*, 2010). A similar situation is observed regarding the biomass distribution of certain fish families (Fig. 2). At the beginning, the fish community biomass was dominated by the indigenous cyprinids and salmonids. Later, after stocking, a significant role in ichthyocenosis have

Percidae, Siluridae (wells *Silurus glanis*) i Centrarchidae.

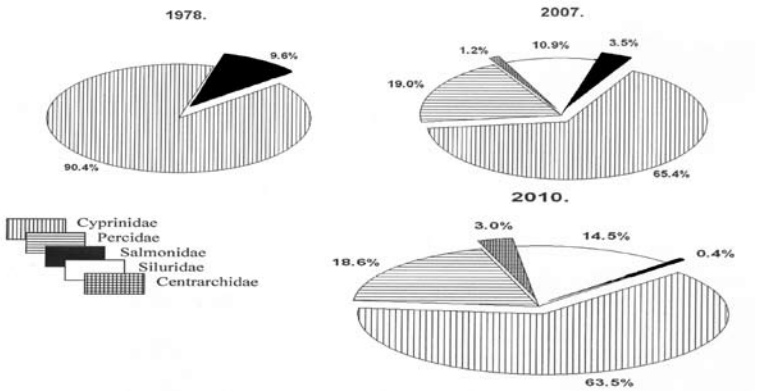

Figure 2. The structure of fish community in „Perućac" reservoir: mass proportion of the fish families between 1978 and 2010

Also, significant changes have occurred from the aspect of cyprinid species. It was mentioned that five of the original nine species from 1978 cannot be longer recorded in the community, but five new cyprinid species appeared, which had been introduced by restocking. Carp *Cyprinus carpio* and tench *Tinca tinca* have the status of target species, while prussian carp *Carassius gibelio*, whiteye bream *Ballerus sapa* i roach *Rutilus rutilus* were accidentally introduced into fish community of the lake.

DISCUSION

The construction of waterworks facilities for water supply or the exploitation of hydro power resources inevitably leads to significant changes in the conditions of inhabitation of all aquatic organisms, including fish. Damming rivers and forming reservoirs, in addition to fragmenting the river flows, leads to a series of consequences for the fish population: running waters are replaced by still waters; the migratory routes of local populations are disrupted; normal regimes of water temperature, pH values, oxygen levels are altered, and new aquatic organisms appear, thus changing the characteristics of trophic structure in aquatic ecosystems etc. Defining reservoirs as potential fishing waters directs fishing management towards restocking, according to species that are important for fishing and the economy: carp, catfish, pikeperch, northern pike. With the desired species, accidentally are introduced undesirable ones, and with the later developments of ichtyocenosis this could present a big problem, not only in terms of fishing use, but from the aspect of maintaining good water quality.

The main reasons for the introduction of carp and catfish were definitely because of the fishing, in order to increase the diversity of important fishery species. However, the restocking of carp was done with one-year fry of an average body weight about 50 g. Unfortunately, the practice has shown that is quite common that after the delivery of such fry in transport tanks, a small percentage of individuals of species that should not be introduced into the fishing waters could be found (pumpkinseed, perch, prussian carp *Carassius gibelio*). In this case, eurasian perch and pumpkinseed, due to a large reproductive potential, become very significant after a few years, both in number

and biomass, and play an important role in the lake ichthyocenosis. Thus, these two species constituted 40% of the total number of fish species in 2007, and in 2010, that number was over 50%. The biomass of these two species has great importance for the fish community, making about 21% of total biomass. The negative impact of such a community has particularly been reflected apon salmonid fish, whose presence has been steadily reducing: 5,1 %, 2,7 %, 0,3 %, by number, or 9,6 %, 3,5 %, 0,4 % by biomass, respectively per year. Catfish, as a major predatory fish, although with significant biomass portion which increases in time, do not have such population capacity to significantly influence the number of non-target species, such as pumpkinseed and eurasian perch.

According to Richa *et al.*, (2009) ichtyocenosis od „Perućac" reservoir is now in dynamic and unstable „perch-phase", and the introduction of roach and whiteye bream could enhance the transfer of fish community, through a transit „perch-roach-phase" into a highly stable „cyprinid-phase".

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REFERENCES

Hegediš, A. i Mićković, B. (2007): Srednjoročni program unapređenja ribarstva na području Nacionalnog parka „Tara" za period 2008. – 2012. godina. Institut za multidisciplinarna istraživanja i NP „Tara", Bajina Bašta, Beograd. 74 str.

Hegediš, A., Mićković, B. i Nikčević, M. (2010): Studija o posledicama na riblji fond u akumulaciji „Perućac" nakon dugoročnog pražnjenja vode i načinima njihove sanacije. Institut za multidisciplinarna istraživanja i NP „Tara", Bajina Bašta, Beograd. 40 str.

Kosorić, Đ. (1979): Studija ribarstva sa procjenama štete kao posljedice pražnjenja vodene akumulacije „Bajina Bašta". Sarajevo. 178 str.

Riha, M., Kubečka, J., Vašek M., Seda, J., Mrkvička, T., Prchalova, M., Matena, J., Hladik, M., Čech, M., Draštik, V., Frouzova, J., Hohausova, E., Jarolim, O., Juza, T., Kratochvil, M., Peterka, J. and Tušer, M. (2009): Long-term development of fish populations in the Rımov Reservoir. Fisheries Management and Ecology, 16, 121–129.

Stanković, S. (2005): Jezera Srbije. Zavod za udžbenike i nastavna sredstva, Beograd. 244 str.

Simonović, P. (2001): Ribe Srbije. Biološki fakultet, Zavod za zaštitu prirode Srbije i NNK, Beograd. 260 str.