

Past and current status of sturgeon in the Serbian part of the Danube River

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Serbian part of the Danube River used to be inhabited with six sturgeon species: beluga (*Huso huso*), Atlantic sturgeon (*Acipenser sturio*), Russian sturgeon (*Acipenser gueldenstaedtii*), stellate sturgeon (*Acipenser stellatus*), ship sturgeon (*Acipenser nudiventris*) and sterlet (*Acipenser ruthenus*).

Atlantic and ship sturgeon

The problem of the absolute decline and the beginning of the complete extinction of the Atlantic sturgeon and the ship sturgeon from the Danube River occurred in the middle of the 20th century (Ristić, 1963). The last specimens of the Atlantic sturgeon, in this part of the Danube River, were recorded during the period 1948-1954, two in 1948, one in 1950, one in 1952 and two in 1954 (Ristić, 1963). The ship sturgeon population is considered to be in the process of disappearing on the territory of Serbia. The last findings in 20th century were in period 1948-1954, when only 5 individuals were recorded (Ristić, 1963). The only recent record of the ship sturgeon was in October 2003 (Simonović *et al.*, 2005).

Beluga, Russian and stellate sturgeon

Stellate sturgeon and Russian sturgeon were once common in the fishermen catch. Maximum of the Russian sturgeon catch, for the last 50 years, was in 1975 (17,6 t) and for the stellate sturgeon in 1965 (8,6 t). Today, together with the Atlantic sturgeon, they are protected by the Decree on Natural Rarities ("Official Gazette of the Republic of Serbia", no. 50/93).

Maximum of the beluga catch for the last 50 years were in 1966 and 1975 (20,7 t). Nowadays, beluga catch is regulated by the Decree of Placing Under Control Use and Trade of Wild Flora and Fauna ("Official Gazette of Republic Serbia", No 31/2005) as well as by CITES Convention, which came into force in Serbia in 2002. Research conducted during 2001 showed that in catch were still present 47 (female) and 35 (male) years old individuals (Lenhardt *et al.*, 2005).

Sterlet

The sterlet catch in Serbia were, for the last 50 years, largest in 1963 (72.9 t) and in 1988 (80.0 t). Unfortunately, due to political and economic situation in Serbia, from the beginning of the last decade of 20th century, sterlet catch statistics were not reliable and this problem is still present. This situation, together with the catch of sterlet under the prescribed length, has negative influence on the state of sterlet populations in waters of Serbia and inhibits proper management of this natural resource.

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Dam construction and hatchery development

The Danube River regulation in the Djerdap region in the period 1890-1896 (Petrović, 1998), construction of the dams “Djerdap I” in 1970 and “Djerdap II” in 1984, as well as over-exploitation are the key factors leading to the decline of the sturgeon populations in Serbian part of the Danube River.

From 1947 to 2000 the main user of fishing territory on the Danube River where migratory sturgeon species are caught, was fishing company “Djerdap” from Kladovo. A modern and well equipped “Center for production of fingerlings” was built as a compensation for decrease of migratory ways by construction of “Djerdap I” dam (Sekulić, 1999). Due to political and economical changes in Serbia and change of holders of fishing rights, which since 2001 became Enterprise “Srbijašume”, all activities connected to catch and artificial spawning of sturgeon species stopped. A private hatchery of sturgeon species “Feniks” was established in 2003 upstream from “Djerdap II” dam, and it is still active in sturgeon rearing. Locations of both hatcheries, dams “Djerdap I” and “Djerdap II”, as well as distribution of sturgeon species in Serbian waters, are presented on Figure 1.

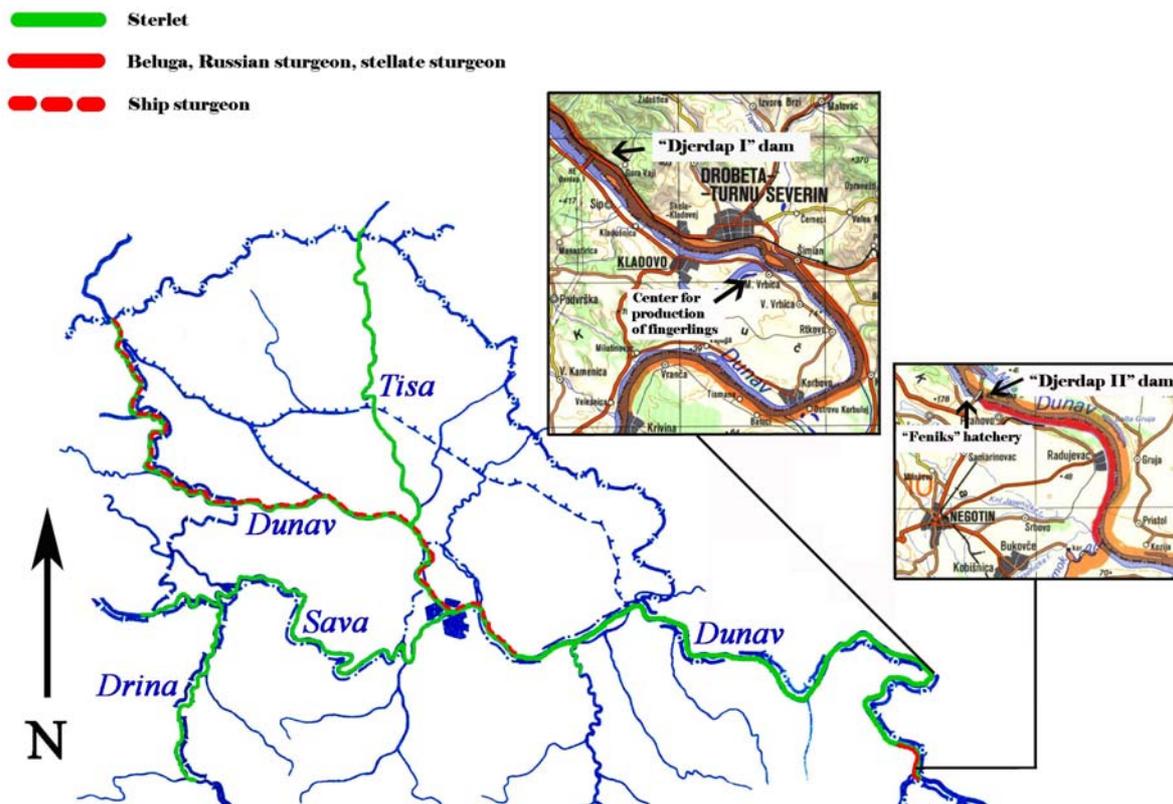


Figure 1. Distribution of sturgeon species in Serbia

Sturgeon catch

During the period from 1958 to 1969 there were 15 localities on which fishing of beluga, Atlantic sturgeon and stellate sturgeon was performed. During the period 1970-1983 this number was reduced to 9 localities as a consequence of construction of “Djerdap I” dam, while construction of “Djerdap II” dam led to further decrease to only 2 localities for catch of migratory sturgeon species (Stamenković, 1991). Nowadays only one locality for beluga fishing exists, and it is situated on Danube River section downstream from “Djerdap II” dam with length of approximately 3 km.

Credible sturgeon catch statistical data for this part of the Danube River exists only for period 1958-1996, when ransom stations for caught fish existed, and gathered data were sent from there to Serbian Institute of Statistics. These data were gathered and published (Lenhardt *et al.*, 2004a; Lenhardt *et al.*, 2004b), and they show significant decrease in stellate sturgeon catch after construction of “Djerdap I” dam, and in Russian sturgeon catch after construction of “Djerdap II” dam. Catch analysis for mentioned period showed the existence of oscillations in annual catch amounts. Since there was only sufficient data for beluga and Russian sturgeon, modeling of changes in catch was performed for these two species (Lenhardt *et al.*, 2006a). The oscillation periods for beluga and Russian sturgeon were 21.89 and 27.12, respectively. Russian sturgeon extinction was estimated around the middle of the century, while beluga extinction was estimated approximately at middle of the millennium. Extinction risks for beluga and Russian sturgeon, predicted by Lenhardt *et al.* (2006a), were based only on catch statistics with catch time-series of 38 years to monitor changes in abundance of mature part of beluga and Russian sturgeon population. Involvement of parameters of life history and ecology, as well as demographic approach, could provide better estimation of extinction risk for this species.

Paddlefish

In spring of 2006, several specimens of North American paddlefish (*Polyodon spathula*) were caught downstream from “Djerdap II” dam (Lenhardt *et al.*, 2006b). Aquaculture of paddlefish, whose native range is Mississippi River basin, exists in Romania and Moldavia since 1992, while three years ago it was established in Bulgaria as well. There are data that this species has already established population in open waters of Russia (Elvira, 2000). This represents another potentially negative effect on migratory sturgeon species of Lower Danube River basin, since introduction of exotic fish species could cause unpredictable and irreversible ecological consequences which often appear long after introduction (Britton & Davies, 2006).

Conclusions

Bearing in mind everything presented above, Action plan for sturgeon species management in fishery waters of Republic Serbia (Lenhardt *et al.*, 2005) was developed. Action plan is in accordance with all existing relevant international conventions and national legislation.

Joint action of all stakeholders (state representatives, scientists, holders of fishing rights, fishermen and private sturgeon hatcheries) is necessary if sturgeon species problem are to be successfully resolved. The main problem is that sturgeon recovery, as well as their extinction, is multi-decadal affair.

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