

## STUDY OF MIGRATORY STURGEON CAPTURES IN ROMANIAN SIDE OF DANUBE RIVER MIGRATION OF FISHES IN ROMANIAN DANUBE RIVER, № 3

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**Abstract.** Study of fish captures could bring out valuable information on tendencies in stocks dynamics as well as on the level of “fishing pressure” on natural fish population. Decreasing amount of annual captures of marine migratory sturgeons that migrate in Danube River for spawning indicates a decline of natural stocks of these species. Present paper tries to show the main aspects of sturgeons fished in Romanian sector of Danube River, to discuss some relevant aspects that could help people to understand the real issues on this topic better and eventually find the best way to stop the decreasing tendency of wild population of three very interesting species of sturgeons: beluga (*Huso huso* Linnaeus, 1758), Russian sturgeon (*Acipenser gueldenstaedti* Brand, 1833) and stellate sturgeon (*Acipenser stellatus*, Brandt, 1833).

**Keywords.** *marine sturgeons, migration, capture dynamics, stocks, protection*

### Introduction

The worldwide number of sturgeons is estimated about 10 000 to 100 000 adult individuals [2] which probably decreases rapidly. Approximately three quarters of worlds’ sturgeon catching depend on only three species: beluga (*Huso huso* Linnaeus, 1758), Russian sturgeon (*Acipenser gueldenstaedti* Brand, 1833) and stellate sturgeon (*Acipenser stellatus*, Brandt, 1833). Space distribution of these species is restricted to hydrographical basins of Caspian Sea, Azovean Sea and Black Sea and the main amount of these sturgeons captures belongs to few countries: some states of former Soviet Union, Iran, Turkey, Ukraine, Serbia and Montenegro and Romania. Responding to the decreasing tendency of sturgeon stocks (which is a consequence of over-fishing, losing of reproduction spots because dam constructions and probably changes in fresh water quality – pollution, changes in water level – and habitat degradation in optimal spawning places in rivers), some sturgeon populations from the Caspian Sea and Azovean Sea were artificially preserved through repopulation programs. It is estimated that at the moment more than 30 percent of the total amount of sturgeon spawners in Caspian Sea and almost all adult sturgeons in Azovean Sea are descendants of the individuals introduced by human action [5]. Having a natural access to a large sector of Danube River on almost 1075 km, Romania should also have an active and positive role in working out adequate politics concerning sustainable exploit and preservation of sturgeon’s resources in collaboration with all the interested river-side countries. The last couple of decades should be considered as the most unfortunate period of sturgeon-related activities.

### Materials and methods

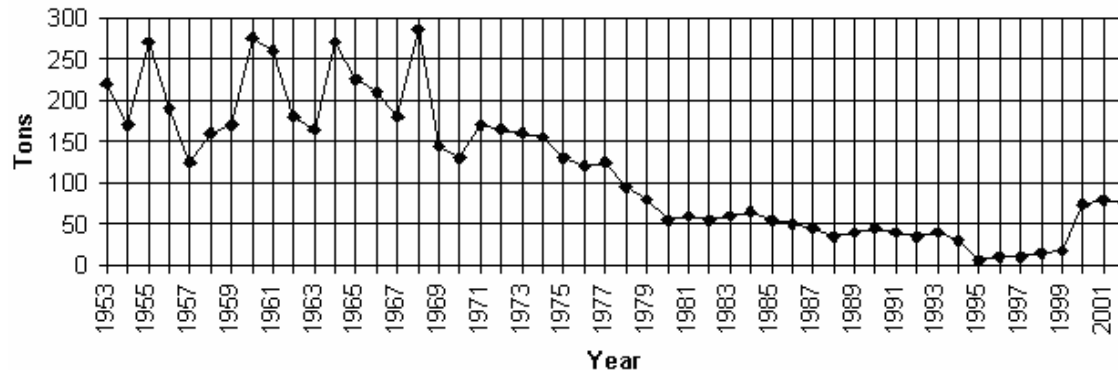
From 2000 to 2001 several expeditionary fishings had been performed, in order to collect samples from different locations on Romanian sector of Lower Danube River. Most of them took place in the middle of migration seasons in the fall and spring and

also in extra-season, mainly focused on the best places known as preferred sturgeon spawning sites as km 102–103, km 155, km 186, km 23, km 309 and two branches of Danube. We also used data and information from other upstream places. We used special sturgeon drift bottom gillnets and appropriate boats operated by two or three fishermen as catching gears – the same tools and fishing methods used by commercial fishermen. The evaluation of the captures was based on data obtained from both the official national statistics and experimental fishing. We also used a rough method for estimating the number of sturgeons by dividing the amount of mass capture at the estimated individual medium weight for each species of sturgeon. Average individual weight has been calculated in case of 170 individuals: 45 beluga, 50 Russian sturgeon and 75 stellate sturgeon individuals using a representative number for each class of age. We also used some information gathered from individual fishermen, fishing companies and interested non-governmental organizations in order to have a better idea on the size of poaching and black market of sturgeons.

## Results

The graph of the total annual amount of sturgeons caught on the Romanian side of Danube River in the last 50 years (*Fig. 1*) shows that the tendency of decreasing captures started in the late 60's.

In the next period, from 1981 to 1993 the quantity of caught sturgeons has been relatively constant with registered values around 50 tons with extremes of maximum 54 tons in 1985 and minimum of 38 tons in 1988.

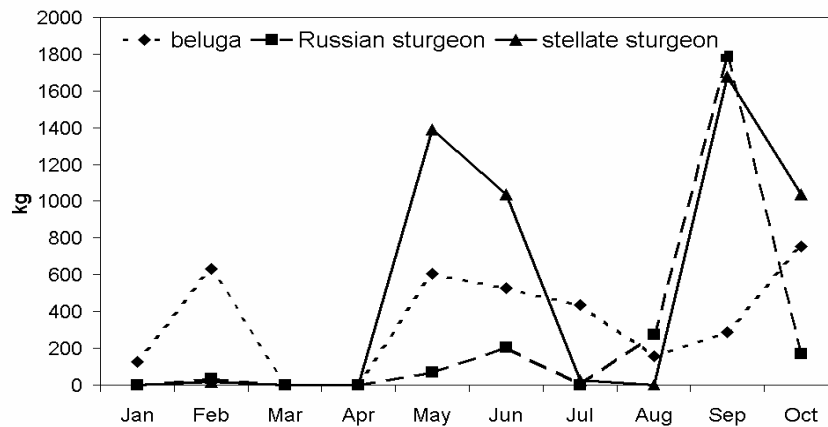


**Figure 1.** Sturgeons capture dynamics in Romanian sector of Danube River (1953–2002)

The official data from the period of 1994–1999 should not be considered as credible amounts. Captures of only 5 to 18 tons registered in that time can not be real. Catches around 60 to 80 tons, that have been registered in the last couple of years of fishing monitoring, could be considered as realistic quantities. However, at this time, the level of yearly captures has dropped almost to the third compared to the 50's and 60's (when the average level of capture exceeded 200 tons per year) and halved if we consider the 70's amounts (average around 150 tons). In the last decade, the trend of decreasing intensity of sturgeons' migration in Danube River should be a consequence of increasing fishing efforts.

Study on the captures of sturgeons in different seasons shows three distinctive peaks registered in February, May and September–October (*Fig. 2*). The maximal values

corresponding each species of sturgeons are quite different This observation could bring out some information about the yearly intensity of migration, supposing that the fishing effort is constant. There are two aspects to be underlined. First, this observation confirms the existence of two migration periods: one in the spring season that could be significant even earlier, in some winter months and the second in the fall, that starts actually at the end of the summer and has its maximal intensity in September and October. Second, this particular statistical data shows that for all species the peak of capture was registered in the fall season, which brings out the idea that even if sometimes the intensity of fall migration could be higher than that of spring, usually the migration in first part of the year is more important.



**Figure 2.** Monthly dynamics of sturgeons capture in Romanian sector of Danube River

The different species' relative mass percentage from the total amount of capture registered in 2001 shows a dominance of beluga (BE): 38.5%, followed by stellate sturgeon (SS): 35.2% and Russian sturgeon (RS): 26.3%. In the last decade, the proportion of these species varied greatly (*Table 1*).

Official statistics did not contain any data regarding to the number of different species of sturgeons caught in the Romanian sector of Danube, so we tried to find out the number of caught individuals belonging to the different species by dividing the mass data with the approximate average values of individual weight (*Table 2*).

Comparing the estimated number of sturgeons in different years, we will find a very different structure of the total annual capture. In 2000/2001, total number of caught sturgeons has been estimated at 7119/7238 (100%) individuals with the following percentage of the different species: beluga 3.1%/3.5%, Russian sturgeon 27.8%/32.1% and stellate sturgeon 69.1%/64.4%. Even if in other years has been small differences, there lies an evident fact that beluga, the most valuable sturgeon, has a very low

**Table 1.** Percentage of different species from total amount of yearly sturgeons capture (1992–2001)

species	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
<b>beluga</b>	24.3	22.4	55.8	43.0	56.6	17.2	57.4	30.7	35.6	38.5
<b>Russian sturgeon</b>	13.7	11.0	32.2	17.2	17.3	39.6	12.8	23.2	24.3	26.3
<b>stellate sturgeon</b>	62.0	66.6	18.0	38.8	26.1	43.2	29.8	46.1	40.1	35.2

**Table 2.** Number of sturgeons estimated on conventional average weight and the mass amount of capture (2000–2001)

species	capture (kg)		average weight (kg)	average fish number	
	2000	2001		2000	2001
<b>beluga</b>	26182	30623	120	218	255
<b>Russian sturgeon</b>	17842.5	20936	9	1982	2326
<b>stellate sturgeon</b>	29513.5	27940	6	4919	4657

proportion: about 3–4% in the structure of all sturgeons caught in Low Danube River. It is supposed that their stocks in Black Sea has been also decreased. During the 2000 and 2001 expeditionary fishing campaign we have caught a total number of 170 sturgeons. Structure of this experimental capture has been relatively close to the estimated one: beluga: 2.9%, Russian sturgeon: 25.1 and stellate sturgeon: 72.0%. This confirms the accuracy of our estimation based on official statistic data. Fish meat of all species of sturgeons is quite appreciated on the Romanian market, but their roes are the most valuable: the commercial product is usually called “caviar”, which is a luxurious product worldwide. Because the credibility of statistical data regarding the real amount of caviar obtained from sturgeon captures is very low, we also tried to estimate these quantities (Tab.3) using biological information on sex ratio and average weight of female gonads.

**Table 3.** Estimation of the amount of caviar in total yearly capture of sturgeons in 2000 and 2001.

species	estimated fish number		sex ratio	estimated females number		average gonad weight (kg)	roes (caviar) (kg)	
	2000	2001		2000	2001		2000	2001
<b>beluga</b>	218	255	0.44	96	112	20.0	1920	2240
<b>Russian sturgeon</b>	1982	2326	0.54	1070	1256	2.3	2461	2888.8
<b>stellate sturgeon</b>	4919	4657	0.50	2460	2329	1.4	3444	3260.6
<b>total</b>	7119	7238	—	3626	3697	—	7825	8389.4

As a result, our estimate is that the total amount of caviar obtained from sturgeons caught in Romanian side of Danube should be about 8 tons per year and beluga caviar (the most appreciate caviar) represents approximately 25% of total. These values do not evidently include the amount of poaching roughly estimate at about 30–40% of total annual capture.

## Discussion

Beluga is considered to be the most valuable migratory sturgeon that comes in Danube River only for reproduction. Older individuals prefer an earlier migration in spring season that starts in the winter months. Medium sized individuals migrate mainly in the fall, and the younger spawners migrate at the end of spring. Russian sturgeon migrates upstream Danube River in the fall and spring but the most important season are the spring months (March–May) rather than fall (September–October) [6]. However, we have found that at least some times the migration in the fall could be more intense. In the spring time, the migration may last till late June and because this species is well adapted to fresh water, a group of biologists consider, that some biological forms of Russian sturgeon remain all year long in Danube River [4]. Stellate sturgeon swims upstream for reproducing either in the fall or in the early spring. It is supposed that

individuals that migrate in the fall will spawn also in the spring [3] because their degree of gonad maturation is inferior compared with the adults that migrate in the spring (usually at the beginning of March). The spawning usually takes place at the end of May in deep locations with a high water current. There have been sites which juvenile individuals use to crowd for feeding such as some spots from km 16 to km 60 on the Branch of Sfântu Gheorghe and also – but not so often, in some sites from km 770 to km 780, situated upstream. Analyzing all data and information available on all three species of sturgeons it can be found that different sized juveniles (till 14.5 cm and 45 gram) remain in Danube River for longer periods which demonstrates a long spawning time and also that maybe not all fish arrived in the spring return in the same year for feeding into Black Sea. Some of the sturgeon juveniles could stay for passing winter season in the favourable areas of Danube or Danube River Branches. The study of the captures brings out interesting information concerning the intensity of the migration if we consider a relatively constant fishing effort. Between 1950 and 1975, Romanian official statistics showed an amount of capture that ranged from 150 tons to 290 tons per year, the average of that period being almost 230 tons compared to the total quantity to be less than 80 tons per year in 2000 and 2001. The annual amount of capture began to decrease in the middle of 70's. This is the period, when the building of hydro energetic plants “Iron Gates” on Danube River started (1969) and the plant started to work (in 1975). Therefore the free access to the best reproduction sites became inaccessible to the sturgeons, After all, these huge dams did not have specially designed passing ways or similar facilities that would allow sturgeons to pass upstream. As a result, captures have probably started to drop to the unusual low levels in the decade started in 1969. The decreasing tendency of captures remains an evident fact until 1980. In this period the amount of the annual capture have dropped from about 170 tons in 1971 to 52 tons in 1980. From 1981 to 1992 registered data show a relatively constant period from the point of view of annual capture, with a low average capture level of about 50 tons, but no more than 60 tons. After that period statistic data apparently indicate a tremendous fall of the sturgeons capture. From 1994 to 1999 there are registered values of only 5 to maximum 18 tons. That could be considered as a catastrophic decline of sturgeons' migration, but in our opinion these data should be treated with caution. Official statistics lack the information about the real amount of capture and are of a very low credibility. In the last years there has been an evident tendency of increasing capture: in 2000 and 2001: the level of annual captures were about 72–73 tons. Not having any certain data regarding changes in the fishing effort there is a risky idea supposing a natural increase of sturgeon stocks. Our unverified information drives to the supposition of a higher fishing effort than before, as a result of less respecting rules and regulations on fishing and also inadequate control and security on this field. It is interesting to underline that recent age and size structures of all species are quite different when compared actual data with older information. Ecological meaning of this fact is not very clear: it could be either a start of the enhancement of sturgeon populations that migrate in Danube River for reproduction or par contraire one more indication of the real tendency of decreasing number of mature individuals.

## Conclusions

The main reason of stocks decreasing in the last years relates to the long social, economic and political crisis that involves an increasing number of fishermen into legal or

illegal sturgeons catching, which means a lesser respect of fishing rules and a very active black market for fish products. To these factors, the less quantified effects of Iron Gates dams, hydrologic regulation buildings, pollution and the bad management of sturgeons' fishery have to be added. As a result, the annual capture of sturgeons dropped dramatically. There is clear evidence of rapidly decreasing amount of yearly capture of sturgeons in Romanian Danube River in the last few decades. As the statistic data show, the annual level of sturgeon's capture has been dramatically decreasing since 1975, the year in which hydro energetic plant "Iron Gates II" on Danube River started to work. Also, the dam had been significantly modified the hydrological dynamics of Danube River as well upstream and downstream with a major change of local biotopes and aquatic communities. Even when the credibility of last decade's statistic data are very low and also other information on the annual level of sturgeon's capture are quite questionable, there is a certain tendency that the number of the mature individuals of these species that come into Danube River for reproduction are decreasing and the individuals still coming become smaller and younger. Because we do not have any related data on sturgeon populations in Black Sea, it could only be supposed that the major causes of this tendency are important habitat changes related to the way of migration and spawning sites, high pressure of commercial fishing, the very high level of poaching and also (maybe) environmental modifications in Black Sea ecosystem related to nutritional spectrum of sturgeons over there.

For the better knowing of the dynamics of main species of sturgeons that enter Danube River for reproduction, there is a need of more focused studies to be done on this topic, not only from Romanian part but also by other riverside countries, to cooperate with all available data on their ecology in the frame of a wide open strategy concerning monitoring, mitigation and stock protection policies, and mainly, to efficiently put in practice the adequate strategy.

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