# MANAGEMENT STRATEGIES IN PROTECTION AND RESTORATION OF STURGEON BIODIVERSITY IN BULGARIA

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## STRATEGIJE UPRAVLJANJA U ZAŠTITI I OBNAVLJANJU BIODIVERZITETA JESETRSKIH RIBA U BUGARSKOJ

***Abstrakt***

Jesetarske ribe su širom sveta najugroženije vrste. Šest vrsta jesetarskih riba su bile autohtone za Crno more i Dunav: moruna (*H. huso*), ruska jesetra (*A. guldenstaedti*), pastruga (*A. stellatus*), kečiga (*A. ruthenus*), sim (A. nudiventris) i Atlanska jesetra (A. *sturio*). Sada se za samo četiri sigurno smatra da se razmnožavaju u donjem delu Dunava. Atlanska jesetra je nestala iz regiona. Iako se javljaju retka obaveštenja od strane ribara da je ulovljena A. Nudiventris to treba da se potvrdi. Tokom poslednjih 60 godina u Dunavu i Crnom moru je pod jakim antropogenim uticajem došlo do nekih negativnih promena u strukturnim i funkcionalnim parametrima vodenih ekosistema. Zbog velike komercijalne vrednosti proizvoda od jesetarskih riba, posebno kavijara, pritisak od krivolova i ilegalne trgovine je takođe ostao snažan. Sadašnja osmatranja u donjem delu Dunava indikuju da su sve populacije jesetarskih riba blizu nestajanja. U ovom članku sumiraju se nacionalni i međunarodni pokušaji da se zaštite jesetarske ribe u Bugarskoj. Navodi se sistem mera za održivo upravljanje i zaštitu koji se primenjuje tokom poslednjih 10 godina u Bugarskoj i kritička ocena njihove efikasnosti.

***Ključne reči****: jesetarske ribe, Bugarski deo Dunava i akvatorija Crnog mora*

## INTRODUCTION

The order *Acipenseriformes* includes approximately 25 species divided into two families *Acipenseridae* and *Polyodontidae* (B i r s t e i n, 1993). The Danube River and the Black sea region are inhabited from six sturgeon species: Russian sturgeon (*A. gueldenstaedti*, Brandt et Ratzeberg*,* 1833), Ship sturgeon (*A. nudiventris,* Lovetsky, 1828*)*, Stellate sturgeon (*A. stellatus*, Pallas, 1771*),* Sterlet (*A. ruthenus*, L., 1758*)*, Atlantic sturgeon (*A. sturio*, L., 1758*)* and Beluga (*Huso huso*, L., 1758).

Sturgeon species of the Black Sea basin have been well known as ancient and high valuable species, which have a strong economical and social impact on the life of the human population along the Danube River and the remaining rivers of the Black Sea Basin. From the middle of XX century the volume of the annual catches of sturgeons in the Lower Danube River has steadily decreased and this has been a clear signal of the unfavourable status of these populations (B a c a l b a s a-D o b r o v i c i, 1997; B a c a l b a s a-D o b r o v i c i and P a t r i c h e, 1999; R e i n a r t z, 2002; P a r a s c h i v and S u c i o, 2006). Nowadays all sturgeon species in Bulgarian waters have drastically decreased in number (V a s s i l e v and P e h l i v a n o v, 2003; B l o e s c h at al., 2006) and two of them *A. sturio* and *A. nudiventris* seemed to be extinct (B a c a l b a s a-D o b r o v i c i and H o l č i k, 2000).

The reasons for this situation are well known. First of all, sturgeon' life history was characterized by a long-live span, late maturity, intermittent spawning frequencies and long migratory movements (A m b r o z, 1964; B e m i s at al., 1997). On the other hand, negative human impact such as long standing over-fishing, increased fishing pressure (more fishermen and more effective fishery equipment), destruction of the migration ways and water pollution resulted in drastic decrease of their number. After the construction of the Iron Gate I dam (1972) and Iron Gate II dam (1984) the spawning migrations of sturgeons into the Upper and Middle Danube were interrupted and the Lower Danube remained the only "sturgeon" river in the Black Sea basin of a high significance for the reproduction of sturgeons in this region. In the past, the main spawning places of Beluga were located between rkm 1866 and rkm 1766 in the contemporary Slovak-Hungarian stretch (H e n s e l and H o l c i k 1997). Nowadays, the main spawning place of Beluga is located about 1000 km downstream under the Iron Gate II dam, between rkm 863 and rkm 755 (V a s s i l e v, 2003).

Several studies on the Danube sturgeons revealed that the population structure of sturgeons was seriously damaged (C e a p a at al., 2002; V a s s i l e v and P e h l i v a n o v, 2003; L e n h a r t d t at al., 2006; P a r a s c h i v and S u c i o, 2006). The endangered status of sturgeon species worldwide has placed them within the focus of attention of the multiplicity of nature-protection organizations. In that way, in 1996, in the Red Book (IUCN, Red List of Threatened Animals) all sturgeon species were included. Since 1 April 1998, all the species of the order *Acipenseriformes* were in the list of species under the Convention of International Trade with endangered species of wild flora and fauna (CITES Appendix II). In the Bulgarian Red Book of endangered species *A. nudiventris* is included*,* as too rare species, as well as *A. sturio,* which has been considered as already extinct.

In the end of 90$^{s}$, the Lower Danube countries started elaboration and implementation of different programmes for investigation, conservation and restoration of the sturgeon stocks (N a v o d a r u and S t a r a s, 2002; R a i k o v a at al., 2004; L e n h a

r d t at al., 2005; R e i n a r t z, 2006). An attempt for co-ordination of the activities on conservation and restoration of the Danube sturgeons was the Sturgeon Action Plan, accepted in December 2006 (B l o e s c h at al., 2006).

The aim of this study is to outline the current status of the wild sturgeon populations in the Bulgarian part of the Danube River and the Black Sea and the management practices applied in Bulgaria with the aim of protection and restoration of the sturgeon populations.

## MATERIALS AND METHODS

The National Agency of Fisheries and Aquaculture at the Ministry of Agriculture and Food provided statistical data about sturgeon catches, aquaculture production and restocking activities during the last 20 years. A total of 31 published sources, personal communications, and authors' own observations were used in this study. The taxonomy of fishes was based on the review of E s c h m e y e r (2006).

## RESULTS

### *Recent State of Natural Sturgeon Stocks in the Bulgarian Part of the Danube River and the Black Sea Aquatory*

Sturgeons have been the object of commercial fishing activities in Bulgaria for centuries on end - mainly in the Danube River (about 90 % of the total catch) and less in the Black Sea (remaining 10 % mainly along the Northern coast near Romania and to the South of Sozopol).

According to Drenski (1928) statistics about sturgeons catch started to be kept in Bulgaria since 20$^{ies}$ of the last century. During the period 1920-1926 catches in the Bulgarian sector of the Danube River varied from 30 MT to 72 MT, an average of 51 MT per year (Fig. 1). In 1942 about 64 MT were caught. During 1945-1949 the average catches of sturgeons were 32.5 MT per year. The most fishes caught were *A. gueldenstaedti* and *A. stellatus* (Fig. 2), which comprised respectively 50.8% and 43.4% of the total catches. *H. huso* was only 5.8%. In the period 1960-1974 catches showed an increasing tendency and the average total catch for every one 5-years period varied from 150.5 to 196.5 MT (31.5 to 43.3 MT per year), i.e. no significant change was observed in the total quantity of the catch. Changes occurred only in the dominance of the caught species (Fig. 2). The considerable changes in the structure of catches was one of the first signals for disturbance of sturgeons stocks. *A. ruthenus* was the fish mostly caught in that period. It comprised 58.3% of the whole catch, followed by *A. gueldenstaedti* - 28,7%, *A. stellatus* - 8.5% and *H. huso* - 4.6%. The total catches of fish from the Danube River were about 600 MT per year during the 80-s (according to the official statistics data of the state companies). The estimated evaluation of sturgeons catches during the 80-s reached about 80 MT, and 80 % of them were *H. huso*.

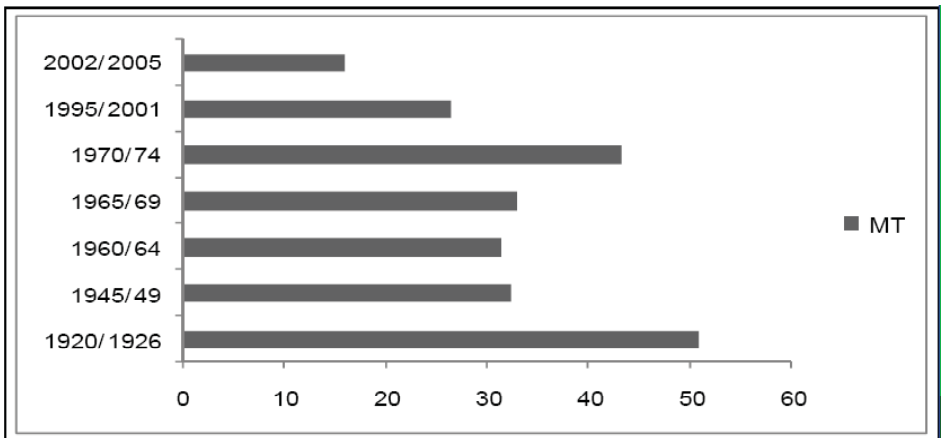


**Figure 1.** Annual catches (MT) of sturgeons in the Bulgarian part of the Danube River from 1920 till 2005 (Source: NAFA).

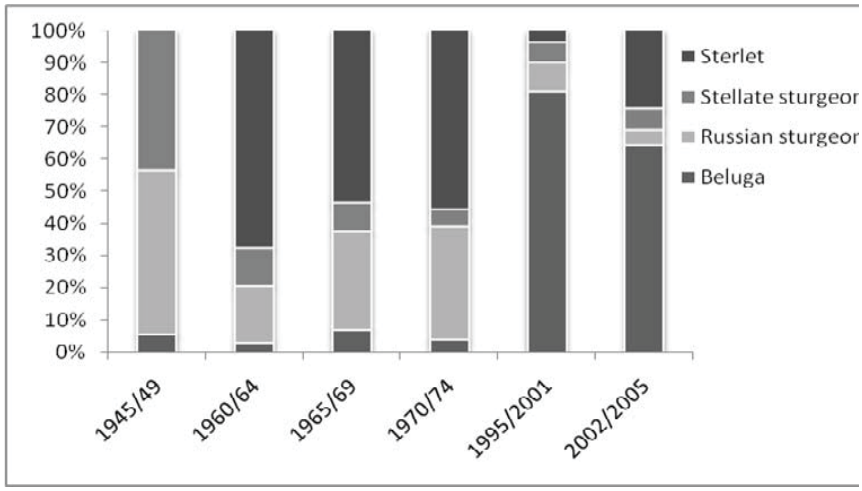


**Figure 2.** Species distribution (%) of sturgeon catches in the Bulgarian part of the Danube River from 1945 till 2005 (Source: NAFA).

During the last 10 years sturgeon catches drastically decreased and reached levels from 26 MT for the period 1995-2001 and 26 MT for the period 2002-2005 (Table 1, Fig. 1). The tendency established during the 80-ies that *H. huso* would be dominant in the catches has been preserved during the last 10 years, as well. For the period 1995-2001 it has represented 81.12% from the total catch of sturgeon species (Fig. 2). The share of *A. gueldenstaedti* and of *A. stellatus* was 8.91 and 6.39%, respectively, and that of *A. ruthenus* was the lowest – 3.57%. Although the tendency for a decrease in the catches, for the period 2002-2005 *H. huso* took again the first place in sturgeons catches with more than 64.5% from the total catches (averige catch 16 MT per year) (Fig.2). The share of *A. gueldenstaedti* and of *A. stellatus* was between 4.7 and 6.6%, and that of *A. ruthenus* was 24.3%, i.e. it marked an increase by about 6.8 times as regards the previous period. In total, about 80 % of all sturgeon species catches was done in the region of Lom and Vidin (570-850 rkm).

**Table 1**. Annual catches (MT) of sturgeons in the Bulgarian part of the Danube River from 1995 till 2005 (Source: NAFA).

| Year | Beluga | Russian sturgeon | Stellate sturgeon | Sterlet | Tolal |
|---|---|---|---|---|---|
| 1995 | 13,6 | 0,9 | 0,1 | 0,1 | 14,7 |
| 1996 | 23,5 | 1,7 | 0,5 | 0,8 | 26,5 |
| 1997 | 30,7 | 3,6 | 0,2 | 0,8 | 35,3 |
| 1998 | 31,2 | 5,3 | 3,7 | 1,2 | 41,4 |
| 1999 | 27 | 4 | 6 | 1,5 | 38,5 |
| 2000 | 18,4 | 0,9 | 1,4 | 1,6 | 22,3 |
| 2001 | 6,6 | 0,16 | 0,03 | 0,66 | 9,1 |
| 2002 | 9,9 | 1,2 | 1,7 | 2,8 | 15,6 |
| 2003 | 8,21 | 1 | 1,3 | 4,5 | 14,1 |
| 2004 | 9,9 | 0,5 | 0,5 | 3,4 | 14,3 |
| 2005 | 13,2 | 0,3 | 0,7 | 4,8 | 18,9 |
| Total | 192,21 | 19,56 | 16,13 | 22,16 | 250,7 |

From the data published, together with the total tendency for sturgeon species catches decrease in the region of the Danube River, the following dynamics of catches according to different species was established: For the period (1945-2005) *A. gueldenstaeti* and *A. stellatus* lost their leading role (respectively 50% and 43% from the total sturgeons catch, Fig.2) and nowadays their catches are less than 7% (Fig.3). *A. ruthenus* showed the strongest dynamics as regards the share of catches, having in mind that for a period of 15 years now, between 1960 and 1975, it has dominated in the catches by about 58% of the total catches (Fig.2), after which there followed a period of a considerably decrease of its share from the total catches quantity up to 5% and a new increase up to 20% during the last 2-3 years (Fig.3). The Beluga catches were strongly changeable, as well. Until the 80-s, *H. huso* catches were insignificant and represented hardly 5% of the total catches (Fig.2). During the last 20 years its share has reached approximately 80% of total catches (Fig.3). By this, it is considered that the Russian sturgeon and the Stellate sturgeon, are not important for the black caviar yield, which has been produced mainly from Beluga because of its higher quality and market price, respectively.

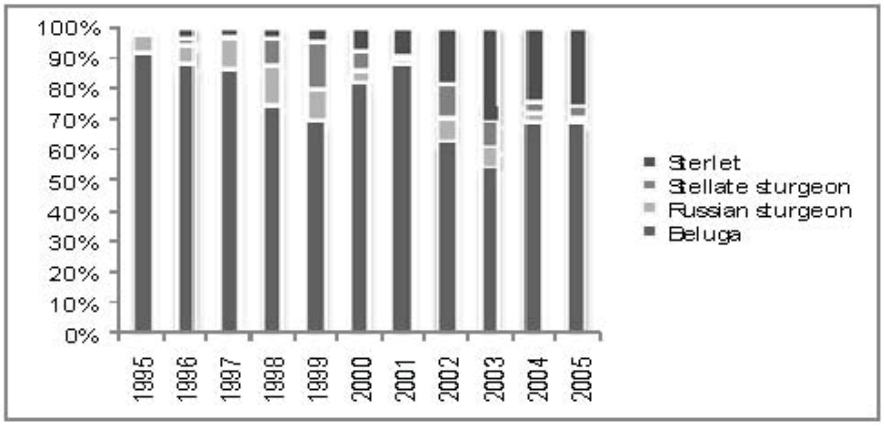


**Figure 3.** Species distribution (%) of sturgeon catches in the Bulgarian part of the Danube River from 1995 till 2005 (Source: NAFA)

In total, the Black Sea catches of sturgeon species have been considerably lower than that of the Danube River, by 3-4 times at an average, however during some year (2003-2001) during which there have been 15-30 times lower (Fig.4). Nowadays the estimated sturgeon catches in the Black Sea have been no more than 15 MT annually (Table 2). The catches of *H. huso* considerably prevail (Table 2) - 77 %, *A. gueldenstaedti* comprises 15%, while the *A. stellatus* catches are the lowest - only 7.5%. *H. huso* has been usually caught at the South – in the region of Ahtopol -Tzarevo - Rezovo by baited hooks. At the North (near to the Romanian border) the usual catch has been of Russian sturgeon and rarely of *A. stellatus*. There are several cases when sturgeon species can be caught in fixed trap nets, but this, however, happens occasionally. The female sturgeons caught in the Black Sea are mostly at an early stage of maturity and consequently of no commercial value.

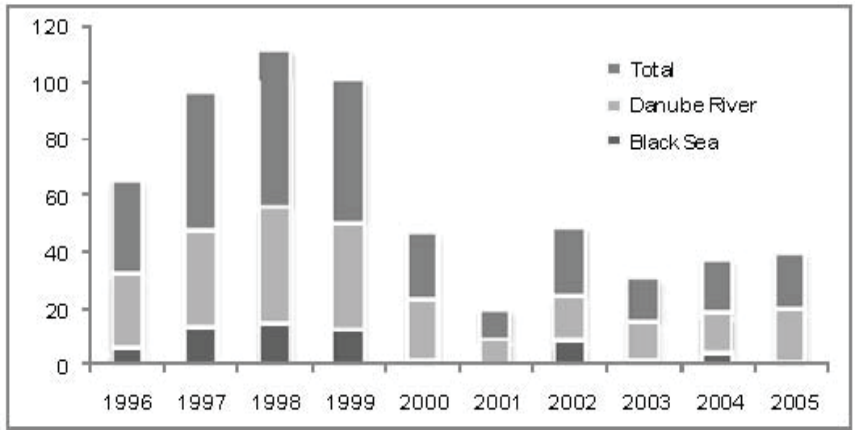


**Figure 4.** Sturgeon catches (MT) in the Bulgarian part of the Danube River and the Black Sea for the period 1995-2005 (Source: NAFA).

**Table 2**. Sturgeon catches (MT) by species in the Bulgarian part of the Black Sea for the period 1995-2005 (Source: NAFA).

| Year | *H. huso* | *A.gueldenstaedti* | *A. stellatus* | Total |
|---|---|---|---|---|
| 1996 | 5,3 | 0,7 | - | 6 |
| 1997 | 11,5 | 1,8 | - | 13,3 |
| 1998 | 12,3 | 2,2 | - | 14,5 |
| 1999 | 10 | 2 | - | 12 |
| 2000 | 0,9 | - | 0,3 | 1,2 |
| 2001 | 0,3 | - | - | 0,3 |
| 2002 | 3,5 | 2 | 3 | 8,5 |
| 2003 | 0,6 | - | 0,3 | 0,9 |
| 2004 | 2,5 | 0,5 | 1 | 4 |
| 2005 | 0,6 | - | - | 0,6 |
| Total | 47,5 | 9,2 | 4,6 | 61,3 |
| Average | 4,75 | 0,92 | 0,46 | 6,13 |

**Management strategies concerning the endangered Sturgeons in Bulgarian Waters**

**Restocking activities**

The restocking of the Danube River is an alternative way to mitigate the negative human impact on the sturgeons population in the region. By the end of the 1990s, in connection with different conservation projects and in order to fulfil CITES recommendations concerning the protection of sturgeon stocks, attempts have been made in Bulgaria for artificial propagation and production of restocking material from sturgeons. In 1998, juvenile *A. gueldenstaedti* produced in the fish farm "Perpen Chobanov" (in the village of Boljartsi) have been released into the river near Rousse (rkm 493) (Z l a t a n o v a, 2000; V a s s i l e v, 2005).

Since 2003, the restocking has been done according to an Order of the Minister of Agriculture and Forestry and the Minister of the Environmental protection and Waters, which has obliged the person who have received black caviar export quotas, to make the restocking of the Danube River according to their own choice, with *H. huso*, and/or Russian sturgeon, having in mind that per 1 kg of caviar exported the minimum number of fish for restocking is 30 and the maximum not more that 120.

For the period 1998-2005, more than 711 000 sturgeons were released into the Danube River - about 670 000 of Russian sturgeon, their weight varying from 10 to 1 000 g, 37 000 of Beluga, having weight from 20 to 500 g, and 2 125 Sterlets, having weight from 15 to 100 g (Table 3). The share of Russian sturgeon represented 94.5% of all fish released in the river, of the Beluga was 5%, and of the Sterlet it was only 0.3%.

**Table 3**. Restocking from Danube River with sturgeons for the period 1998-2007 (Source: NAFA).

| Year | Releasieng place on Danube River | |
|---|---|---|
| | Vidin rkm 790 | Svishtov rkm 570 |
| 1998-2001 | | |
| Russian sturgeon | 0 | 200.000 |
| 2002 | | |
| Russian sturgeon | 42300 | 20230 |
| Sterlet | 1000 | 1125 |
| 2003 | | |
| Beluga | 5300 | 0 |
| Russian sturgeon | 115500 | 45817 |
| Sterlet | | |
| 2004 | | |
| Russian sturgeon | 67000 | 144126 |
| 2005 | | |
| Beluga | 31950 | 0 |
| Russian sturgeon | 0 | 35000 |
| 2006 | | |
| Russian sturgeon | 2000 | 0 |

During the period 2006 and 2008, caviar export quotas for Bulgaria were not released by CITES, and because of which, the companies exporters of caviar were not obliged to restock the Danube River. For that period only 2 000 Russian sturgeon having an average weight of 5 g were released.

Since 2008, the restocking of the Danube River has been set as the main task within the framework of the National Program for Support of the Stable Growth of Fish Resources. According to that Program, in 2009 the Danube River is going to be restocked with 30 000 Russian sturgeon and 20 000 Beluga, for which the financial support required has been ensured by IARA. A very important requirement according to this Program is the restocking to be done by using little fish, produced by spawners having a proved Danube origin. This fact has not always been taken into consideration in restocking during the last years, when restocking has been done by using both native and hybrid species. This has been confirmed by R e i n a r z (2002) and V a s s i l e v (2005), who mention that Siberian sturgeons (*A. baeri*), Adriatic sturgeons (*A. naccarii*) and hybrids grown in the fish farms as the object of the aquaculture were released into the Danube.

Considerable attention has to be paid also on two extinct species restocking - Ship and Atlantic sturgeon. The results from the implementation of the project of the Ministry of Environment and Water, concerning restocking events with spur in the Danube River have been unsatisfactory.

**Aquaculture development**

The significant decrease of sturgeon catches and the implementation of different restriction for their catch have promoted a serious interest for artificial rearing of sturgeons for the production of both - meat and caviar. The beginning of sturgeon aquaculture in Bulgaria has been set in 1995, when the first sturgeon fish farm has been built. The farm is situated in the Southern part of Bulgaria near the city of Plovdiv at a distance of more than 300 km from the Danube River. In 2001 the second sturgeon fish farm has been established - "Beluga", which is located directly on the banks of the Danube River near the town of Vidin, at rkm 790. Besides in these two specializing sturgeon fish farms, small sturgeon quantities are reared in other places in the country, as well. To 2005, the officially registered sturgeon fish farms have been 5, but some more of them have been in the process of projection and construction, mainly nets cage farms. Nowadays, Esetra Commerce Ltd., Beluga Ltd. и Aquamash Ltd. have been the main producers of restocking material, of fish for consumption and of caviar from sturgeon species in the country.

While in the past it was mainly to the fertilized eggs import, mainly from Russia – Krasnodar and Astrakhan, that producers relied on in order to obtain stocking material, nowadays it is from sexually mature specimen, completely grown in the fish farms.

The main object for rearing has been the Russian sturgeon (Table 4 and 5). Beluga, Stellate sturgeon and Sterlet have been reared in smaller quantities. The production of stocking material has been done in tanks till the fish weight has reached 5-20 g. After that, it should be moved into nets cages and during the first year the juveniles usually reach weight of 300-500 g. The fish for consumption should be reared mainly in cage farms. The greatest cage farm in the country is located at the "Kardzhali" dam-lake, where water temperature throughout the greater part of the year is 20-23$^{o}$C, and the oxygen rate is about 6 mg.$1^{-1}$. During the second year of its rearing, the Russian sturgeon reaches an average weight of 2-3 kg. During the third year, the males and the females are separated by using of ultrasonography, at an average weight of the specimen of 4-5 kg. The sex determination without using ultrasonography can be done also during the fourth year, at weight of 6-7 kg, in this case for a sex dimorphism can be used the white coating on the heads of the male fish, which appear as regards their sexual maturity. The males have been realized as fish for consumption, at the home market mainly, and the total quantity of fish from all sturgeon fish farms in the country sold has been about 80 t. The females have been reared up to their sexual maturity, and caviar can be produced from single 6 years old fish, while all 9 years old fish can be used for caviar production. The first quantities of caviar produced from Beluga, grown in aquaculture are also available. The total quantity of caviar from aquaculture in the country is about 2-2.5 t.

In 2003, because of its fast growth and high commercial value, the paddlefish (*Polyodon spathula*, Walbaum, 1792) was introduced in Bulgaria (H u b e n o v a at al., 2004). It has been designed mainly for rearing in the inland water bodies, mostly in dam-lakes. During the first year it can reach an average weight of 150-200 g, during the second, when reared in ponds or dam-lakes it can reach weight of more than 2 kg (H u b e n o v a at al., 2007).

**Table 4**. Production of sturgeon's stocking material (number) from aquaculture (Source: NAFA).

| Species | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|
| Beluga | 0 | 21380 | 7.230 | 112.960 | 0 | 0 |
| Sterlet | 0 | 0 | 6.100 | 155.550 | 0 | 0 |
| Russian sturgeon | 65.000 | 205.606 | 108.440 | 49.550 | 64320 | 24897 |
| Stellate sturgeon | 0 | 0 | 0 | 385 | 0 | 839 |
| Paddlefish | 0 | 0 | 32.500 | 445 | 0 | 0 |
| (Russian x Siberian) | 0 | 0 | 0 | 55.000 | 0 | 0 |
| Total: | 65.000 | 226.980 | 154.270 | 373.890 | 64.320 | 25.736 |

**Table 5**. Production (MT) of market-size sturgeons from aquaculture (Source: NAFA).

| Species | 2002 | 2003 | 2.004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|
| Beluga | 0 | 3,4 | 3,7 | 21,5 | 27,66 | 46,16 |
| Sterlet | 0 | 0,3 | 0,1 | 2,2 | 2,5 | 4,58 |
| Russian sturgeon | 80 | 144 | 6,7 | 281 | 113,46 | 142,8 |
| Stellate sturgeon | 0 | 0 | 0 | 0 | 15,11 | 2,1 |
| Paddlefish | 0 | 0 | 2,3 | 0,05 | 0,005 | 0,007 |
| Total: | 80 | 147,7 | 12,8 | 304,75 | 158,7 | 195,6 |

**Legislation Framework**

Active procedures on a legislation level concerning sturgeon species in Bulgaria have been undertaken at the end of 1995 hardly, when the following laws, acts and orders have come consecutively into force:

- Order by the Minister of Agriculture and Forestry and by the Minister of Environmental Protection and Waters from 2003, which binds the right for caviar export with the obligation to restock the Danube River with 30-120 sturgeon fingerlings against the export of one kg of caviar.
- The "Action Plan for Sturgeons in the Bulgarian Parts of the Danube River and the Black Sea" (Raikova at al., 2004), which was elaborated in 2004.
- The Law of Fisheries and Aquaculture (State Gazette, No. 94/11.2005). According to the Article 35, Paragraph 6 of this Law the catches by using bottom hooks from 01.12.2007 was forbidden.
- The Biodiversity Act (State Gazette from 10.2005), Appendix 2 and 3 have included the ship sturgeon and the Atlantic sturgeon as endangered species and their catches have been forbidden.

- Order by the Minister of Agriculture and Forestry and by the Minister of Environmental Protection and Waters from 2006, which disallows sturgeon catches in the Bulgarian Black Sea aquatory.
- Order by the Minister of Agriculture and Food for yearly moratorium of sturgeon catches in the Bulgarian section of the Danube River.

In an international aspect the following events and acts have been significantly effective:

- Meeting of the Black Sea countries on protection and sustainable management of the sturgeons populations in the Black Sea Basin organized by CITES Secretariat and the Ministry of Environmental Protection and Waters in Bulgaria, in 2001
- Regional Strategy for sturgeon management developed by Bulgaria, Romania, Serbia & Montenegro and the Ukraine in 2003
- Interdiction imposed in November 2005, by the Government of the USA on caviar import from Beluga from the countries of the Danube, the Black Sea, and the Caspian Sea regions (Bulgaria, Georgia, Rumania, the Russian Federation, Serbia & Montenegro, Turkey and the Ukraine)
- National Action Plan for sturgeon management in fishery waters by Serbia & Montenegro (Lenhardt at al., 2005)
- 10-years` catch moratorium implemented since May 2006 by the Romanian Government
- Action Plan for Conservation of Sturgeons in the Danube River Basin 2006.

## DISCUSSION

The current unfavourable status of sturgeon populations in the Danube River and the Black Sea was a result of a combined effect including: over-exploitation, poaching, habitat loss and disruption of spawning migration (B l o e s c h at al., 2006). The first data about catches decline were reported at the beginning of the XX century. One century later, regardless of the increased fishing pressure as a result of the improved fishing equipment and the increased number of fishermen, the tendency for catches decline has been preserved. The investigations showed clearly that the structure of sturgeon populations was drastically disturbed and some sturgeon species were completely extinct. There are several reasons for the long-term delay of adequate measures implementation for protection and restoration of sturgeon stocks in that region. First, this is the high economical value of sturgeon' caviar and meat and the great demand for them at the world market. Second, this is the policy of the respective authorities in Bulgaria, which was directed towards the protection of the socio-economical status of the population dealing with sturgeon species catches. The analysis, however, showed that despite the high profitability of this kind of activity, only a small percentage of the people makes their living on sturgeon catches.

We should also report the fact that the official statistic reports concerning real catches have not always been correct. The Danube fishery statistics in Bulgaria, as well as the fisheries statistics as a whole, has been destroyed for about 10 years during the transition period. There is also lack of data about the poacher' catches and these catches can exceed many times the legal ones (B a c a l b a s a-D o b r o v i c i and P a t r i c h e, 1999; V a s s i l e v and P e h l i v a n o v, 2003).

After the period of approximately 10 years since the first activities for protection and conservation of sturgeon populations have been started, the measures implemented have turned to be rather insufficient to have a positive effect upon the status of sturgeon

populations. The different instruments used by the Bulgarian authorities for catches interdiction during the breeding season, the gear restriction, the minimum size requirements, as well the restrictions imposed by CITES, such as the quotas for caviar have not lead to the achievement of the effect desired. One of the main reasons for that has been the considerable delay in the implementation of these measures. It is only in 1995 that the former State Fisheries Inspectorate (now the Agency for Fisheries and Aquaculture) managed to implement for the first time the Fishing Licensing System and to renew the collecting of data for the Danube River and the Black Sea fisheries. Now this process has been placed under the regulation of the new Fisheries and Aquaculture Act (2005) but it should be implemented more efficiently.

Nowadays, serious hopes have been reposed in the implementation of a complete interdiction for catches by all Danube countries. A moratorium has been implemented since May 2006 by the Romanian Government, which has been in conformation with the Action Plan for the Conservation of Sturgeons in the Danube River Basin (2006) and this might turn to be the only means to avoid the complete extinction of sturgeons in the Danube River (B l o e s c h at al., 2006).

The results expected, however, can in no case be observed very soon, and the moratorium implemented could be efficient only at condition that the poacher` catches would be terminated. There are, however, some prerequisites that it would continue still. At first, the reason for this is the insufficient number of staff and financial means, for control of the interdictions and limitations keeping. Another significant prerequisite this is the keeping of quotas for caviar export from sturgeon aquaculture. This regime hides in itself the real danger for selling at the market caviar from wild fish populations, which have been presented as produced in the fish farms. The investigations at a biochemical level (gen markers), available up to this moment, as well as the lack of adequate labeling and control of products, cannot give sufficient grounds to hope that this change can be avoided.

The future of sturgeons restocking activities in Bulgaria, which during the last years have not been systematic and the quantity of the released fish has not been enough, has been unclear. The estimated quantity of restocked juveniles has varied within weight borders, but it has decreased rapidly during the last two years because of the zero-trade quotas for caviar export from wild populations. The lack of adequate wild bred stock at the existing hatcheries in the country has unscored the priority of conserving the existing mature fish over other options (hatchery supplementation) whose benefits have been less reliable and less immediate. But the production of stocking material has still been relatively expensive and has imposed financial support from the Government – a problem still waiting for its solution. It is considered that sturgeon aquaculture has been a significant part for solving this problem and the increase of sturgeon aquacultures is the way for restoration of the natural population through mitigation of fishing pressure. It is well known that captive sturgeon populations are an alternative source of marketworthy aquaculture caviar (P i k i t c h at al., 2005).

Considerably capital investments in research programs are necessary, as well, directed towards increasing the efficiency of sturgeon production, enhancing the survivability of released individuals, tracing of survivability and migrations by mans of tagging of the released specimen, etc.

## CONCLUSIONS

In conclusions the analysis done has shown the necessity of adequate measures directed towards: increasing the control upon sturgeon species protection on behalf of the authorized bodies of fishery control of IARA and the National Forestry Management, with the purpose of terminating poacher` catches; increasing the quantities of restocking material, mainly from Beluga, accompanied by its tagging and tracing of its survivability up to reaching a different age; the growth of the sturgeon aquaculture and the increase of the production capacity and efficiency; development of programs for support for the fish farms in the country, producing stocking material, for example financial support by the Government, low-interest credits, structural funds financial support by the EC; protection of the regions, where spawn sites of sturgeon can be found; investigations concerning sturgeon populations status (age-and size structure), identification of the different species on the basis of gen markers, with the purpose of termination the poacher trade, etc.

The strengthening and harmonization of the national legislation and the implementation of the Action Plan for Conservation of Sturgeons in the Danube River Basin should be directed towards achievement of the main purpose of AP – sustainable management and restoration of the natural habitats and migratory movements of the sturgeons. Together with the already existing national and international instruments, the AP might provide important instruments and mechanisms to avoid the complete extinction of the sturgeons in the Danube River and the Black Sea.

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