STURGEONS OF THE NW BLACK SEA AND LOWER DANUBE RIVER COUNTRIES

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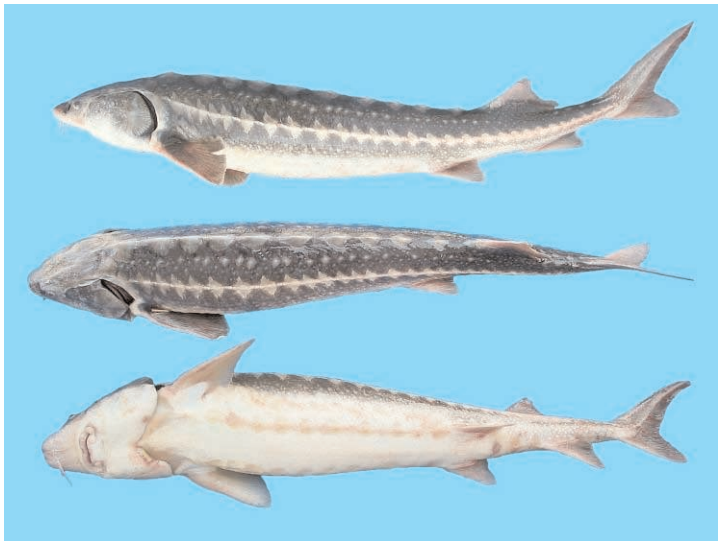
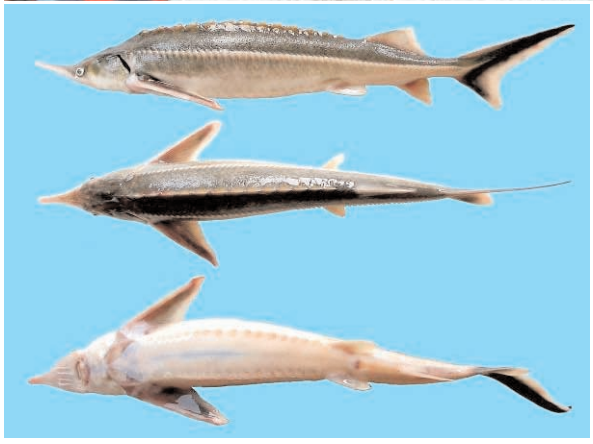
I. Background information on the taxa

1. BIOLOGICAL DATA

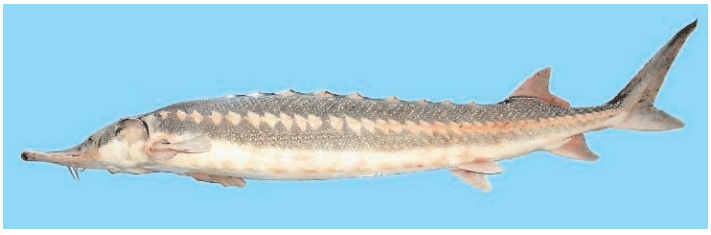
1.1-2. *Scientific* (common names) *and distribution* (only in Eurasia)



Acipenser gueldenstaedti (Russian sturgeon)



Acipenser ruthenus (Sterlet)



Acipenser stellatus (Stellate sturgeon)

Acipenser sturio (Common or Atlantic sturgeon)

Huso huso (Beluga sturgeon)

1.3 Biological characteristics

According to Bloesch J. *et al* (2006) "Acipenseriformes are confined to the northern hemisphere. Biogeographic analysis suggests that the order originated in Europe about 200 million years ago and that early diversification took place in Asia. The majority of species occurs in the Ponto-Caspian region, one third in North America and the remainder in East Asia and Siberia.

Box 1: Summary of high-level sturgeon taxonomy

Class: Osteichthyes (bony fishes)
Subclass: Actinopterygii (ray-finned fishes)
Order: Acipenseriformes (sturgeons and paddlefishes)
Family: Acipenseridae (sturgeons)
Genera: *Acipenser*, *Huso*, *Scaphirhynchus**, *Pseudoscphirhynchus**

* = genus not represented in the Danube River Basin

Sturgeons migrate mostly for reproduction and feeding. Three different patterns of migration have been described:

— *potamodromy* (migration between key habitats within a freshwater riverine and/or lacustrine system)
— *anadromy* (most of the life cycle takes place at sea, but spawning migrations are conducted into freshwater),
— *freshwater amphidromy* (spawning migrations are conducted into freshwater, whereas feeding and growth occur during migration to and from salt water),

Although Acipenseriformes do not have a common life history and variation within and between species is the rule rather than the exception, there are some traits that all sturgeon and paddlefish species have in common. These are summarized below.

Almost all members of Acipenseriformes are endangered or threatened with extinction.

All species reproduce in freshwater or water of low salinity although adults may migrate into brackish or even salt water for feeding. Some even adapt to high levels of salinity during ontogenesis and migrate into full seawater after reaching a certain size, generally remaining on the continental shelf (Danube example: *A. sturio*). Other sturgeon species or races spend their entire life cycle in freshwater (Danube examples: *A. ruthenus*, *A. nudiventris*, resident form of *A. gueldenstaedti*). It has also been found that migratory Ponto-Caspian species mature in freshwater ponds.

Sturgeons exhibit a 'periodic strategy' life-history, which is typical for large fishes with high fecundity and long life spans living in environments with large-scale cyclic or spatial variation. The life cycle of Acipenseriformes is generally quite long with puberty occurring late in life. Individuals spawn repeatedly, but most females do not spawn annually.

Spawning rate is once in 2-11 years for females, and once in 1-6 years for males.

The timing of spawning is highly variable. Most species spawn from spring to early summer over a wide range of temperatures (6 to 25° C). For several diadromous[1] sturgeon species (or winter (or fall) and spring (or vernal) races have been recognized. Fish of the winter race spend the winter in the river or the river mouth, hibernating in holes or deeper river bends, undertaking little or no feeding activity. They spawn far upstream, the year(s) after entering the river. The vernal races do not hibernate and only enter the river when temperatures are rising. Vernal fish mature the same year, lower in the course of the rivers, puberty is reached earlier and they spawn later in the same season. Spawning migration also depends on the flow regime of the rivers.

Studies indicate that the availability of suitable spawning habitat is vital for the reproductive success of Acipenseriformes. Spawning sites are characterized by hard substrates, varying in size from gravel to

1 diadromous = species that migrate between fresh and salt water at some point of their life cycle.

boulders, with many crevices and where water velocity near the bottom is generally low (i.e., boundary flow velocity). These areas are typically in the mainstream of the river, or close to the banks. The water depth at spawning sites varies from a few meters to 26 m and the current velocity ranges from 0.5 to 2.2 m s^{-1} in the water column, allowing for wide dispersal of fertilized eggs.

Almost nothing is known about mating and spawning habits. However, considering the short duration of sperm motility (only one or two minutes), a good degree of synchrony in the release of the male and female gametes has to be presumed. The ova remain fertile after release into freshwater for up to one hour, so that erratic eggs may be fertilized by freshly ejaculated sperm. Likewise, sperm must be diluted rapidly by the high velocity of the river current.

Eggs are adhesive and can be found immediately downstream of the spawning ground. During embryogenesis water velocities in the range 0.5 – 1.5 m s^{-1} have been reported. Hatching occurs after 200-250 hours, depending on the species and water temperature. The size of newly hatched larvae ranges from 6 to 15 mm. The free embryos of several species are pelagic for a few days (Danube examples: A. stellatus 11-12days) and are transported downstream by the currents at a velocity up to 45 cm s-1 or 40 km day^{-1}. After displacement from the spawning ground, the yolk sac larvae settle down, usually on coarse substrate in a much lower water velocity (1 to 5 cm s^{-1}) and start feeding on both planktonic and benthic organisms. The water velocity and substrate requirements for eggs and larvae are different for fertilization, embryogenesis, yolk-sac resorption, first feeding and active exogenous feeding. The habitat requirements for juveniles change with the seasons.

Annual spawning success and recruitment are highly variable and depend on the flow regime during the reproductive period of the spawning female. High flows can create increased bottom velocities which preclude or greatly reduce spawning success. Off-flow regime is also important for the time of egg development, hatching and downstream migration of larvae. Water level fluctuations, due to flow management by hydropower stations can also have negative effects on spawning and reproduction success. Year class strength is determined within the first months of sturgeon life. After the first year, sturgeons are usually no longer subject to predatory pressure.

Particular spawning sites are usually frequented each year. Such site fidelity might derive either from the distinct characteristics of the site or from homing behaviour. Homing fidelity has yet to be proven for sturgeons, but is thought to be a significant factor.

Periods of high flow are an important trigger for the spawning migrations of many acipenseriform species, the higher water levels at

such times enabling fish to pass through river stretches containing rapids or shallows. Any reduction in river discharge during the period of migratory activity of sturgeons diminishes the attractiveness of the river, and thus reduces the number of anadromous spawners, whether those entering from pre-estuarine regions into the main river, or from the main river into tributaries.

Spawning populations of Acipenseriformes show a complex multi-aged structure.
All sturgeons show a strong tendency towards hybridization with other sturgeon species, especially if suitable spawning habitats are lost and animals of different species are confined to only a few suitable sites.

Overview of sturgeon species in the Danube River Basin
It is generally accepted that six species of Acipenseridae are, or were, native to the Danube River Basin.

- *Acipenser gueldenstaedti* (Danube or Russian sturgeon)
- *Acipenser nudiventris* (Fringebarbel or Ship sturgeon)
- *Acipenser ruthenus* (Sterlet)
- *Acipenser stellatus* (Stellate or Starred sturgeon)
- *Acipenser sturio* (Common or Atlantic sturgeon)
- *Huso huso* (Beluga or Great sturgeon)

Other acipenseriform species and hybrids have been introduced into pond- and aquaculture in the Danube Basin, for the production of caviar and sturgeon meat. These include *Polyodon spathula* (North American paddlefish), *Acipenser naccarii* (Adriatic sturgeon), *A. baeri* (Siberian sturgeon) and *A. ruthenus* x *Huso huso* (bester).

In the case of hybrids, there is no clear-cut demonstration of superiority compared to parental growth, food conversion and fecundity, and the use of exotic species and/or genotypes as well as hybrids in aquaculture is questionable, in terms of the risks of escape into open waters and contamination of wild sturgeon populations.

Sturgeon juveniles of various species, as well as hybrids, can also be found in the aquarium or pet trade, where they are sold to hobbyists. Although not used for intentional stocking of river systems, individuals of allochthonous taxa are sometimes released or escape and can occasionally adapt to conditions in the wild outside of their native range (see section 2.4 'Introduction of exotic species and genotypes, alteration of the genetic status of populations').

Diadromy and migration

Of the six sturgeon species native to the Danube Basin, four are – or were – migratory (diadromous) species living in the Black Sea shelf zone and entering the Danube Delta or Danube River itself for spawning: *A. gueldenstaedti*, *A. stellatus*, *A. sturio*, *H. huso*.

Migration of sturgeons can be observed throughout the year in the Lower Danube. However, the three anadromous species (*A. gueldenstaedti*, *A. stellatus*, *H. huso*), exhibit a dual-peaked migration pattern, where fish either enter the river to spawn in the same year (these individuals belong to the 'vernal' or 'spring' race) or over-winter in the river, using deeper stretches of water or depressions in the river-bed, and spawn the following year (these individuals belong to the 'fall' or 'winter' race).

The occurrence of two different races and migration patterns is explained by the longer distances the winter races have to cover to use suitable upstream spawning sites (homing fidelity has not been confirmed as yet), as well as by the duration of migration and overwintering being necessary for ripening of the gonads and ovulation of female spawners. Spawning shoals are often accompanied by immature males.

The dual-peaked migration pattern is documented through the correspondingly two-peaked catching success of commercial fishermen on the Lower Danube River (spring and autumn), indicating that catches might take place in the vicinity of key habitats (spawning / overwintering).

The Danube sturgeons include one exclusively freshwater species (*A. ruthenus*), one species that forms both migratory and freshwater stocks in the Black Sea and Danube Basin (*A. gueldenstaedti*), and one species which occurs only in its freshwater form in the Danube Basin (*A. nudiventris*).

Another important component of the life cycle of sturgeons in Danube River is the dispersal of early life stages, which takes place first through passive drifting and subsequently by active movement of individuals. Dispersal rates and patterns are also influenced by various environmental factors, meaning that individuals of the same species might display considerably different behavioural patterns during their early life stages according to the particular conditions in a given tributary or river stretch.

Reproduction

Four sturgeon species still reproduce in the Lower Danube River (*A. gueldenstaedti*, *A. ruthenus*, *A. stellatus*, *H. huso*).

Traditional spawning sites for anadromous species were situated in the Middle Danube River and major tributaries, such as the Tisza, Sava and Drava Rivers. Due to the blocking of migration routes by the Iron Gates dams these spawning sites can no longer be reached by migratory sturgeons.

The locations of spawning sites in the Lower Danube River under the changed (post-Iron Gates) migratory and hydrological conditions are mostly unknown and subject to current field research. Only two spawning site of *Huso huso* have been identified recently (through catching larvae). There is no information available about the location of spawning sites or the extent of reproduction of potamodromous species/forms (*A. ruthenus*, *A. gueldenstaedti*, *A. nudiventris*) anywhere in the Danube Basin.

Juvenile rearing habitat

Important rearing habitats and nursery grounds of juvenile migratory sturgeons can be found in the Lower Danube River and the Danube Delta, as well as in shallow areas of the continental shelf in the Black Sea.

Feeding

Sturgeons possess tactile barbels located at the front of the mouth, which is protactile, meaning that it can be pushed outwards and forwards, with thickened lips. The animals show a digging behaviour with the help of the rostrum. Eyes are very small relative to the size of the fish and probably do not contribute much to the location and capture of prey.

Most species feed mainly on bottom invertebrates (insects, insect larvae, annelids and molluscs) and also occasionally on bottom fish. Some species reduce or cease feeding during their migration in freshwater.

Huso huso is the only true predator among the six Danube sturgeon species. In the Black Sea it preys mainly on bottom-dwelling and pelagic fish, while in the river it switches to freshwater fish (e.g. members of the cyprinid family).

The following tables summarize key facts and important events about and for the Danube River sturgeon species.

Table 1: Status and characteristic traits of sturgeons from the Danube River as compiled from literature. Grey areas indicate the occurrence of a species in the Black Sea – Danube River system in the given time period according to literature
(❍: no occurrence, ❑: status is unclear; ■: depends on stocking; ◆: stocks recovered due to stocking, legal protection and improvement of water quality; ●: reserves are reduced to a minimum).

Species	***Acipenser gueldenstaedti*** Danube or Russian (migratory form)		***A. gueldenstaedti*** Danube or Russian Sturgeon (resident form)		***A. nudiventris*** (Danube stock) Ship Sturgeon		***A. ruthenus*** Sterlet		***A. stellatus*** Stellate or Starred Sturgeon		***A. sturio*** Common or Atlantic Sturgeon		**Huso huso** Beluga or Great Sturgeon	
Distribution Status														
TIME PERIOD	HISTORIC	CURRENT	HISTORIC	CURRENT	HISTORIC	CURRENT	HISTORIC	CURRENT	HISTORIC	CURRENT	HISTORIC	CURRENT	HISTORIC	CURRENT
Upper Danube River	rare	extinct	❍	❍	rare	extinct		rare ■	rare	extinct	❍	❍	rare	extinct
Middle Danube River		extinct		very rare		very rare		◆		extinct	❑	❍		extinct
Lower Danube River		rare	❑	❑		❑		●		rare	rare	extinct		rare
North Western Black Sea		rare	❍	❍	❍	❍	❍	❍		rare	rare	extinct	rare	rare
Max. length [cm]	236		no information		221		125		218		600		800	
Max. age [yrs.]	33		no information		36 *		24		35		48		> 100	
Reproduction														
Age at maturation [yrs.]	11 – 13		no information		6 – 9		3 – 5		5 – 6		7 – 9		10 – 13	
Masc./Fem.	12 – 16				12 – 14 **		4 – 7		7 – 10		8 – 14 ***		13 – 15	
spawning season	March-Nov.		no information		April-May**		April-May		May-June		May		April-May	
absolute fecundity [eggs female–1]	29.500 – 406.800		no information		200.000 – 1.300.000		7.000 – 108.000		70.300 – 430.000		790.000 – 1.820.000 ***		228.400 – 964.800	
Migration														
pattern	anadromous		potamodromous		potamodromous		potamodromous		anadromous		anadromous		anadromous	
pea /seasonal races	spring-fall		no information		no information		April-May		spring-fall		no information		spring-fall	
Feeding regime														
	benthic organisms (fishes and invertebrates)		benthic organisms (fishes and invertebrates)		benthic organisms (fishes and invertebrates)		benthic organisms (mainly invertebrates)		benthic organisms (fisher and) benthic organisms		benthic organisms (fishes and invertebrates)		marine and freshwater fishes	

1.4 Population:

1.4.1 *Global Population size:*
Actual global population size is very difficult / impossible to estimate.

1.4.2 *Current global population trends:*
___increasing_X_decreasing ___ stable ___unknown

During the last 30 years populations of most / all sturgeon species are declining. This is clearly reflected in the decline of world catch of sturgeons and paddlefish, from 28,000 tonnes in year1978 to less than 2,000 tonnes in year 2002 (Pikitch *et al*. 2005)

1.5 Conservation status

1.5.1 *Global conservation status (according to IUCN Red List)*

_X_Critically endangered	___Near Threatened
_X_Endangered	___Least concern
_X_Vulnerable	___Data deficient

According to IUCN Red List the six species of sturgeons native to the Danube River basin are globally classified as either 'Vulnerable' (one species), 'Endangered' (four species) or 'Critically Endangered' (one species):
- *Acipenser gueldenstaedti* (Russian sturgeon) Endangered
- *Acipenser nudiventris* (Ship sturgeon) Endangered
- *Acipenser ruthenus* (Sterlet) Vulnerable
- *Acipenser stellatus* (Stellate sturgeon) Endangered
- *Acipenser sturio* (Common or Atlantic sturgeon) Critically Endangered
- *Huso huso* (Beluga sturgeon) Endangered

1.5.2 *National conservation status for the case study country (Romania)*
The six species of sturgeons native to the Danube River basin are nationally classified as either 'Vulnerable' (one species), 'Endangered' (three species), 'Critically Endangered' (one species) or 'Extinct' (one species):
- *Acipenser gueldenstaedti* (Russian sturgeon) Endangered
- *Acipenser nudiventris* (Ship sturgeon) Critically Endangered
- *Acipenser ruthenus* (Sterlet) Vulnerable
- *Acipenser stellatus* (Stellate sturgeon) Endangered
- *Acipenser sturio* (Common or Atlantic sturgeon) Extinct
- *Huso huso* (Beluga sturgeon) Endangered

1.5.2 *Main threats within the case study country*

___No Threats
_X_Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
_X_Harvesting [hunting/gathering]
_X_Accidental mortality (e.g. Bycatch)
___Persecution (e.g. Pest control)
_X_Pollution (affecting habitat and/or species)
___Other_____
___Unknown

Habitat Loss / Degradation (human induced): Hydropower damming, navigation, dredging for sand / gravel induced spawning and nursery habitats in the river.

Harvesting [hunting/gathering]: During 1990 – 2000 about 800 professional fishermen fishing for sturgeons in the river; fishery poorly / no regulated

Accidental mortality (e.g. bycatch): by shad fisheries in the river. Low to medium intensity poaching still exist after the commercial harvesting moratorium declard in May 2006.

Pollution (affecting habitat and/or species): Serious heavy metal bioaccumulation has been observed with ageing of specimens, less in beluga (predating on pelagic fish) and more on Russian and stellate sturgeon (feeding on bottom fauna) (Suciu 2004).

2. SPECIES MANAGEMENT WITHIN THE COUNTRY FOR WHICH CASE STUDY IS BEING PRESENTED

2.1 Management measures

2.1.1. *Management history*

During the communist regime (1947 – 1989) the harvesting of sturgeons was strictly controlled by the state. Fishing was permitted only in the sea, using long lines of un-baited hooks. Practically all sturgeon fishing of Romania was concentrated in only one fishing site (St. George), which enabled strict control of the state over harvesting and trade with products derived from sturgeons .

After 1989, during almost 11 years, enforcement of fishery regulations was totally neglected. Over 80 fishing sites along the 860 km of river were established. A new Law on Fishery and Aquaculture was

adopted only in year 2001 (Law 192 / 2001). To protect sturgeons during spawning migration, this act introduced the prohibition system in the Danube River based on successive 2 or 3 month fishing ban, starting in on 15th of February in the Black Sea and continuing in three steps till end of June, at river km 863 (Iron Gates II HP dam). The principle of this prohibition system was to allow access of migrating adults to spawning grounds located upstream.

After the CITES 45th SC meeting held in June 2001 in Paris, Romania and the other Lower Danube and Black Sea basin countries (Yugoslavia, Bulgaria, Ukraine, Turkey, Georgia and Russian Federation) were requested to establish and implement regional management system of sturgeon stocks, including monitoring of status of populations / stocks and joint setting of non-detrimental harvesting / catch quotas.

Two regional meetings on conservation and sustainable use of sturgeons in the region were held in Sofia / Bulgaria (Oct. 2001) and Tulcea / Romania (June 2003).

At the First Regional CITES Meeting of the seven Black Sea and Azov Sea sturgeon range countries (Bulgaria, Georgia, Romania, Russian Federation, Turkey, Ukraine and Yugoslavia) held in Sofia between 23-26 October 2001, participants agreed on establishing of the Black Sea Sturgeon Management Action Group (BSSMAG), formed by 2 - 3 representatives of each country.

The Agreed Conclusions of this first regional meeting could not be signed by the representatives of the seven countries participating in the meeting.

(http://www.indd.tim.ro/rosturgeonsn/index.php?option=com_content&task=view&id=22&Itemid=35)

As agreed, BSSMAG was working mainly as an E-mail dialog group and within non-periodically organized meetings. Two experts of the CITES Secretariat Scientific Support Unit were observers of the e-mail dialog group, receiving CC of each message circulated in the group.

A "Regional Strategy for the Conservation and Sustainable Management of Sturgeon Populations of the N-W Black Sea and Lower Danube River in accordance with CITES" (Annex 1) was agreed in Tulcea during the second Regional Meeting and an Agreement between Fisheries and CITES Management Authorities from Republic of Bulgaria, Romania, Serbia and Montenegro and Ukraine, concerning the implementation of the Regional Strategy, was finally signed in late 2005. The whole process was guided / supervised by the CITES Secretariat.

In December 2001 CITES SA for Acipenseriformes of Romania (Danube Delta National Institute - Tulcea) launched the idea of organizing every year in July and December sturgeon management stake-

holder meetings, with participation of fishery scientists, fishery managers, law enforcement institutions, fishermen associations and CITES administration.

These meetings became regular events during the next years and contributed decisively to systematic improvement of communication and sharing of information on status of populations. The meeting held annually in July / August was to discuss the results of law enforcement activity and the results of monitoring the recruitment from natural spawning in that year, while that held in early December was to discuss the results of annual monitoring of effects of catch quota of the current year and establish the catch and export quota proposal of Romania for the next year.

According to the agreed regional management strategy (objective 1.7.3), BSSMAG had to adopt by consensus non-detrimental regional catch and export quotas for each species based on the results of monitoring system, gradually implemented in countries of the region. This process encompassed examination of monitoring results and quota proposal of partner countries, consultation with national experts, Fishery MA and CITES MA followed by regional negotiations. All this would have been not possible (in only 2-3 weeks time) without the E-mail dialog group working system adopted during the first regional meeting held in Sofia (Oct. 2001).

A key management event was also the launching in July 2003 of the webpage "Sturgeons of Romania and CITES", http://rosturgeons.danubedelta.org, which became since June 2008 www.indd.tim.ro/rosturgeons .

After four years (2002 - 2005) the data gathered by monitoring regularly key status indicators of the populations (age class structure of annual cohorts of adult sturgeons migrating in the Danube River for spawning and the annual natural recruitment / juvenile production index) were used by CITES SA to convince the recently (2005) established National Agency for Fishery and Aquaculture (NAFA) of Romania to agree that continuing commercial harvesting of sturgeon stocks for export would be detrimental to their survival.

Three national expert and stakeholder meetings were held in March and April 2006 to discuss the proposal of CITES SA to declare a 10 year moratorium for commercial catches of sturgeons from the wild in Romania and to adopt a special conservation and recovery programme along with measures for quick development of sturgeon aquaculture.

Finally, in May 2006 Ministries of Environment and Agriculture of Romania issued a joint ministerial order on "conservation of wild sturgeon populations and development of sturgeon aquaculture in Romania" (Annex 2).

The initiative of Romania, taken late, in May 2006, after publication by the CITES Secretariat of catch quotas for the region as agreed in November 2005, could not be adopted by the other three countries in the same year. The next year the quota setting procedure by consensus forced the whole region to adopt zero catch and export quota for sturgeons from the wild.

In June 2006, Romania organized at S?ruleflti (near Bucharest) the third Regional Meeting on Sustainable Management of Sturgeons of N-W Black Sea and Lower Danube River in accordance with CITES. CITES MA of Serbia and Ukraine and Fisheries MA of Serbia, Ukraine and Bulgaria as well as sturgeon experts from the region participated in the meeting. The reasons and consequences of the conservation measures adopted by Romania were discussed and the need for a regionally coordinated supportive stocking programme was agreed in a document called "Recommendations of the Expert Meeting on coordination and implementation of sturgeon stocking programmes for the Lower Danube River and of the North-West Black Sea Region" (Annex 3), signed by experts of all four countries.

2.1.2. *Purpose of the management plan in place*

Already in year 2005 all four countries of the region adopted national management plans deriving from the agreed Regional Strategy of 2003. The purpose of the management plan adopted by Romania in 2004 is to implement the Regional Strategy for conservation and sustainable management of sturgeon population in the region.

2.1.3. *General elements of the management plan*

The main elements of the Management Plan adopted by CITES and Fishery Authorities of Romania are:

(i) improvement of knowledge of actual biology of sturgeon populations spawning in the Danube River;
(ii) progresses in description of their genetic diversity, in artificial propagation and restocking procedures;
(iii) improving monitoring of catches and overall fishery management;
(iv) determining existence of possible sub-populations and adapting the management plan accordingly;
(v) improving national regulations and their implementation / enforcement;
(vi) adaptive management under CITES;
(vii) revisions and implementation of management Plan;
(viii) financing activities of the Plan

2.1.4. *Restoration or alleviation measures*

Since 2005 Romania is implementing a supportive stocking programme of the Danube River with specially produced young sturgeons of endangered species. Conditions are specified in Annex 1 of the joint ministerial Order of May 2006.

2.2 Monitoring system

In February 2002 BSSMAG agreed on a common Regional Monitoring System (Annex 1.2) of effects of current catch quotas on sturgeon stocks migrating for spawning in the Lower Danube River.

2.2.1 Methods used to monitor harvest

Compulsory tagging of every legally captured specimen of sturgeon using commercial tags (Fig. 7 / Annex 4) and reporting the fish on special signed and stored reporting sheets was introduced by a special Order of the Ministry of Agriculture (No. 350 / 2001). Since 2003, the characteristics of every sturgeon captured were posted on-line in a data base included on the webpage http://rosturgeons.danubedelta.org, which became since June 2008 www.indd.tim.ro/rosturgeons.

2.2.2 *Confidence in the use of monitoring*

Since till 2002, catch quotas were established and divided among fishing companies only as weight of fish and caviar, under-reporting of length and weight was clearly visible when analysing distribution the Length – Weight relationship of fish. This situation was corrected in year 2003 by asking the CITES Secretariat to publish catch quotas both as weight of fish and number of specimens (Fig. 1 / Annex 4).

Confidence in the monitoring of harvested sturgeons has improved significantly in since year 2003, when CITES MA adopted the decision to issue CITES export permits only for the caviar obtained from sturgeons included in the data base of catches, where catches were recorded on-line by specialized officers of the two Fisheries administrations. This measure had clearly the effect of bringing most of caviar to the legal market, because of the significantly higher price obtained by both fishermen and caviar processors when the caviar was exported.

2.3 Legal framework and law enforcement:

Conservation of sturgeons was for the first time in Romania specifically addressed by the joint ministerial Order of May 2006 (Annex 2)

3. UTILIZATION AND TRADE FOR RANGE STATE FOR WHICH CASE STUDY IS BEING PRESENTED.

3.1 Type of use (origin) and destinations (purposes)

Meat of wild sturgeons was sold mainly on the local market and is still used by fishermen of remote communities of the Danube delta for consumption in their own families. Caviar was bought by caviar processing companies from professional fishermen and was mainly directed to export. The use of cartilaginous notochord for preparation of special glue has almost disappeared.

Since sturgeon aquaculture has a very short history in Romania (first successful artificial propagation of beluga sturgeon in Romania only in April 2004), there is still no / very little sturgeon meat or caviar originating from local aquaculture on the market. Most sturgeon meat sold now in Romania originates from aquaculture in Bulgaria and Poland.

3.2 Harvest:

3.2.1 *Harvesting regime*

Wild sturgeons were captured in Romania historically (before Second World War) both in the sea (with un-baited hook lines) and in the river (with special drifting trammel nets). Only sexually ripe adults were harvested since all fishing was targeting fish during migration for spawning. Harvesting effort during has significantly grown during the period 1990 – 2005. Even after implementation of regional monitoring system in Romania it was impossible to determine the catch per unit of effort, since number of fishing gears and duration of daily fishing was impossible to record individually.

During the first year of effective implementation of CITES regulations in Romania (year 2001) a number of about 1200 licensed fishermen were recorded. Before closing the commercial fishing of sturgeons from the wild in 2006, the number of fishermen licensed for fishing of sturgeon was reduced to about 600.

Commercial harvesting season was in winter till prohibition during spawning season (March - May) and in fall (Sept – Nov.)

3.2.2 *Harvest management/ control*

Individual catch quotas derived from dividing national quotas, agreed regionally for Romania and published by CITES Secretariat, were distributed to fishing and fish processing companies, to whom fishing right was concessioned by the state. Individual permits for capture of sturgeons by professional fishermen were issued by NAFA Romania at the proposal / request of the fishing companies. Till year 2005 control of fishing was performed by the border police and rangers of the Danube Delta Biosphere Reserve of Tulcea.

Since 2006, NAFA Romania has significantly strengthen its Fishery Inspection Department, which has taken the leading role in surveying the fishing sites were capture of a limited number of live specimens for artificial propagation is permitted, with special authorisation of NAFA. Fishery inspectors tag all sturgeons captured with transponder tags and fill in capture recording sheet for each fish. The data of these recording sheets are centralized in a data bank posted annually on the webpage: http://www.indd.tim.ro/rosturgeonsn/index.php?option=com_content&task=view&id=29&Itemid=43

Most wild adult sturgeons captured alive and tagged after 2006 survive the artificial propagation procedure and are released back in the river: 169 out of 172 captured in year 2007 and 174 out of 188 captured in year 2008. Characteristics and individual PIT tag serial numbers are posted on the webpage.

3.3 Legal and illegal trade levels:

During 2002 - 2006 over 95 % of caviar exported was derived from wild sturgeons captured legally. Most probably that the caviar sold on the local black market was captured illegally.

II. Non-detrimental finding procedure (NDFs)

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFS?

___yes __X_no.

Since no population status data and very little fishery management data were available till 2001, experts of countries of the region agreed during the Sofia meeting (Oct. 2001) that adaptive management by monitoring the effects of current catch quota on the population was the only way forward. At that time it was impossible to know if the catch quotas requested / agreed are detrimental or not to the survival of populations spawning in the Danube River.

One step forward was taken when in 2003, the region was reduced to only four countries of NW Black Sea and the lower Danube River (BG, RO, SR, UA). Turkey and Georgia were literally not having any sturgeons of commercial importance left in their rivers, while Russian Federation and Ukraine were separately managing sturgeon stocks of the Sea of Azov, which we agreed that do not inter-mix with sturgeons spawning in the lower Danube River.

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

Ten population status indicators were adopted in the common Regional Monitoring System (RMS) agreed in February 2002 (Annex 1.2). Nine of them were fishery dependent: (1) Number of fishermen; (2) Number of fishing hours using standard gillnets of 100 m; (3) Number of fish captured; (4) Catch / species / fishing zones; (5) Catch per Unit of Effort; (6) Sex ratio; (7) Distribution of length frequencies / classes; (8) Distribution of age frequencies / classes and (9) Rapid Rural Appraisal (RRA) of captures in 5 selected fishing sites. One indicator was fishery independent: Number of downstream migrant juveniles [CPUE], which has developed during the nine years of monitoring into a true juvenile production index used to evaluate the evolution of recruitment from natural spawning.

Intentionally the process of deciding non-detrimental catch quota was composed of three steps:

1) adopting in year 2001 precautionary catch quota (based on historical levels of catches);
2) monitoring the effect of the quota (and other impacts) via RMS indicators in relation to reference directions (e.g. increase or decrease in the proportion of first spawners and second / third /fourth spawners; annual abundance of YOY from natural spawning as compared with the reference year 2000); and
3) adjust quota according to the results of monitoring.

Although in early 2004, based on the information from the Caspian Sea region (Ivanov, 2000), Romania started a process of adopting of quota sharing criteria system among the four countries of the region, it was impossible to reach an agreement and consequently quotas were adopted by consensus, through negotiations, as compared to quotas adopted by each country in year 2001 and the results of monitoring.

In reality the proportion of implementing the RMS varied very much between countries of the region, from almost no monitoring in former Yugoslavia / Serbia, to various degrees of monitoring the effects only in the river in Bulgaria and only in the Black Sea in Ukraine. Even Romania has failed to monitor indicators (2), Number of fishing hours using standard gillnets of 100 m, and (5), Catch per Unit of Effort, and these were subsequently left out of the RMS.

In this process four of the RMS indicators: 1)number of juveniles [CPUE] migrating annually downstream in the river; 2)distribution of age frequencies / classes; 3)distribution of length frequencies / classes and 4) sex ratio of the adults captured / forming the cohort of the

current year, were considered in descendent order as the most important in reflecting the effect of catch quota adopted for the current year (1) and the status of adult sturgeons in the Black Sea which had reached at least once sexual maturity, as result of fishery exploitation during the last 30 – 40 years (2, 3 and 4).

3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATION OR SAMPLING METHODOLOGIES AND ANALYSIS USED

Data for all fishery dependent indicators (except (2) and (5)) were obtained from the fishery administrations via catch recording system implemented on the webpage. Age class distribution was established by DDNI Tulcea / CITES SA for Acipenseriformes of Romania, by determining age on cross-sections in bony pectoral fin rays collected by professional fishermen. Age was determined independently by three technicians and differences were solved / tackled jointly, tacking in consideration the sex, length and weight of the respective fish.

Data on status and management of sturgeon populations of N-W Black Sea and Lower Danube River were sent every year in late November via BSSMAG among partner countries of the region. The example of Romania for year 2004 is given in Annex 4.

Monitoring of abundance of young of the year (YOY) sturgeons (1.5 – 2 month old / 10 – 30 cm long) on a river bottom area of about 8 ha was developed by DDNI Tulcea already 1997 – 1999, and was systematically conducted since year 2000, at River Km 118, downstream of the port of Reni / Ukraine. A special fishing gear was developed to capture young sturgeons on this nursery site: a 96 ml long, 2.5 m high trammel net with 20 mm mesh size of the middle net. This was drifted downstream on the bottom over 850 m along the right bank of the river at water depth of 6 – 14 m (Table 1).

Table 2: Results of monitoring YOY sturgeons born in the lower Danube River (2000 – 2008)

Data	Nr. of netting	Beluga [No.] [% /CPUE]		Russian sturgeon [No. [%/CPUE]		Stallete sturgeon [No.] [% /CPUE]		sterlet [No.] [% /CPUE]		Total [Nr] [% /CPUE]	
12-14-07 **2000**	8	59	58,42 % 7,375	6	5,94 % 0,75	11	10,89 % 1,375	25	24,75 % 3,125	101	100 % 12,625
26-29-06 2001	16	27	84,37 % 1,687	2	6,25 % 0,125	—	— 0	3	9,38 % 0,187	32	100 % 2,00
10-13-07 2001	8	12	57,14 % 1,5	2	9,52 % 0,25	5	23,82 % 0,625	2	9,52 % 0,25	21	100 % 2,625
Total 2001	24	39	73,6 % 1,625	4	7,6 % 0,167	5	9,4 % 0,208	5	9,4 % 0,208	53	100 % 2,208
19-20-06. 2002	14	59	71,08 % 4,214	3	3,62 % 0,214	—	— 0	21	25,30 % 1,5	83	100 % 5,928
03-25.07 2002	29	16	25,80 % 0,551	10	16,13 % 0,345	2	3,23 % 0,069	34	54,84 % 1,172	62	100 % 2,138
Total 2002	43 1,744	75	51,72 % 0,302	13	8,97 % 0,046	2	1,38 % 1,279	55	37,93 % 3,372	145	100 %
10-26-06 2003	17	0	0 %	0	0 %	0	0 %	0	0 %	0	0 %
9-25-07 2003	18	Hybr ids 5	7.25 % 0.278	0		3	4.35 % 0.167	61	88.40 % 3.389	69	100 % 3.833
Total 2003	35	5	7.25 % 0.143	0		3	4.35 % 0,086	61	88.40 % 1.743	69	100 % 1.971
22-30.06 2004	14	40	70.18 % 2,857	1+2H	0.214		0	17	29.82 % 1.214	60	100 % 4.071
01-23-07 2004	27	29	26.61 % 1,074			5	4.59 % 0.185	75	68.80 % 2.778	109	100 % 4.037
Total 2004	41	69	40.83 % 1,683	3	1.77 % 0.073	5	2.96 % 0.122	92	54.44 % 2.244	169	100 % 4.122
14-17-06 2005	6	73	84,88 % 12,17	1	1,16 % 0,166	0	0 %	12	13,96 2	86	100 % 14,33
05-07-07 2005	5	37	20,11 % 7,4	0	0 %	14	7,61 % 2,8	133	72,28 % 26,6	184	100 % 36,8
Total 2005	11	110	40,74 % 10	1	0,37 % 0,091	14	5,19 % 1,273	145	53,70 13,182	270	100 % 24,55

27-30-06 2006	13	3	0,23	0	0	0	0	0	0	3	0,23
03- 07-07 2006	15	13	0,87	0	0	0	0	0	0	13	0,87
12-14-07 2006	7	2	0,29	0	0	0	0	0	0	2	0,29
Total 2006	35	18	100% 0,51	0	0	0	0	0	0	18	100% 0,51
29-31-05 2007	13	18	1,384	0	0	0	0	4	0,308	22	1,692
05-08-06. 2007	14	5	0,357	0	0	0	0	3	0,214	8	0,571
12-14-06 2007	14	4	0,286	1	0,071	0	0	8	0,571	13	0,928
Total 2007	41	27	62,7% 0,659	1	2,3% 0,024	0	0	15	35 % 0,366	43	100% 1,049
11-13-06 2008	5	26	5,20	0	0	1	0,20	0	0	27	7,40
17-20-06 2008	9	14	1,55	0	0	1	0,111	1	0,111	16	1,778
23-27-06 2008	12	34	2,83	0	0	6	0,50	2	0,166	42	3,499
Total 2008	26 2,846	74	87,06%	0	0% 0,308	8	9,41% 0,115	3	3,53% 3,269	85	100%
TOTAL			**471**		**25**		**48**		**401**		**945**

CPUE = number of fish captured in one netting over the same surface of about 8 ha, at Danube River Km 118.

A total number of 945 YOY sturgeons of four species were captured during the period of nine years (2000 – 2008). All were individually measured length and weight and sampled fin clips for DNA extraction, photographed, tagged with Floy Fingerling Tags (FFT) and released back in the river (Fig. 1).

Due to extreme low water levels, in year 2003 no natural spawning was recorded in beluga sturgeon. Only 5 hybrids of Russian sturgeon female and beluga male were captured during routine monitoring.

Timing of presence of first YOY sturgeons at River Km 118 during the respective year was determined based on timing of spawning and behaviour of early life stages of beluga after hatching in the river (Suciu 2005).

Fig. 1: (Up)
YOY beluga sturgeon captured sampled and tagged with FFT at Danube River Km 118 June11, 2008

(Down) Six YOY beluga sturgeons captured in one netting on June 17, 2008 at Danube River Km 118.

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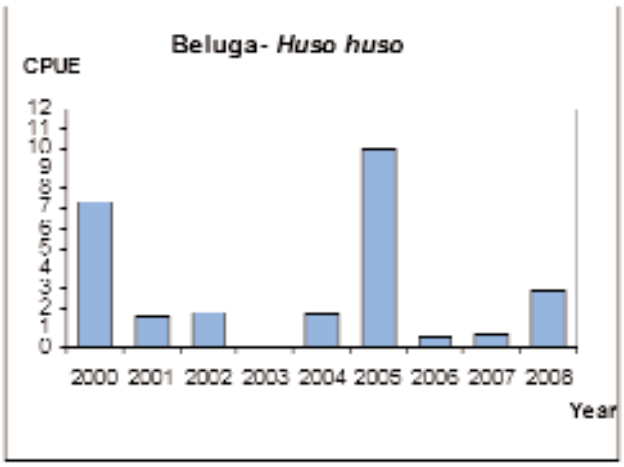
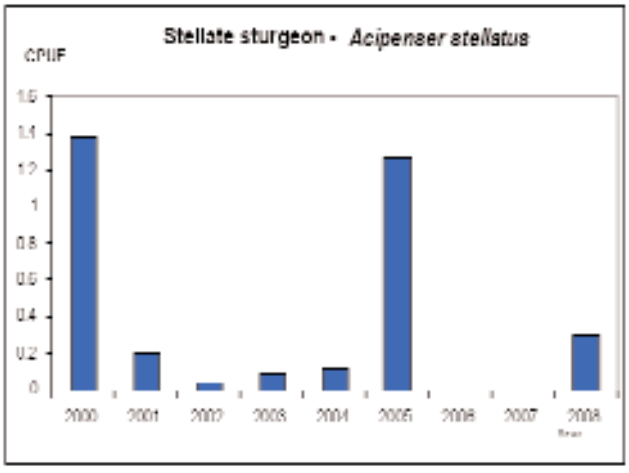
Juvenile production index graphs (Fig. 2) were drawn from these data and are used to evaluate success of natural spawning and natural recruitment.





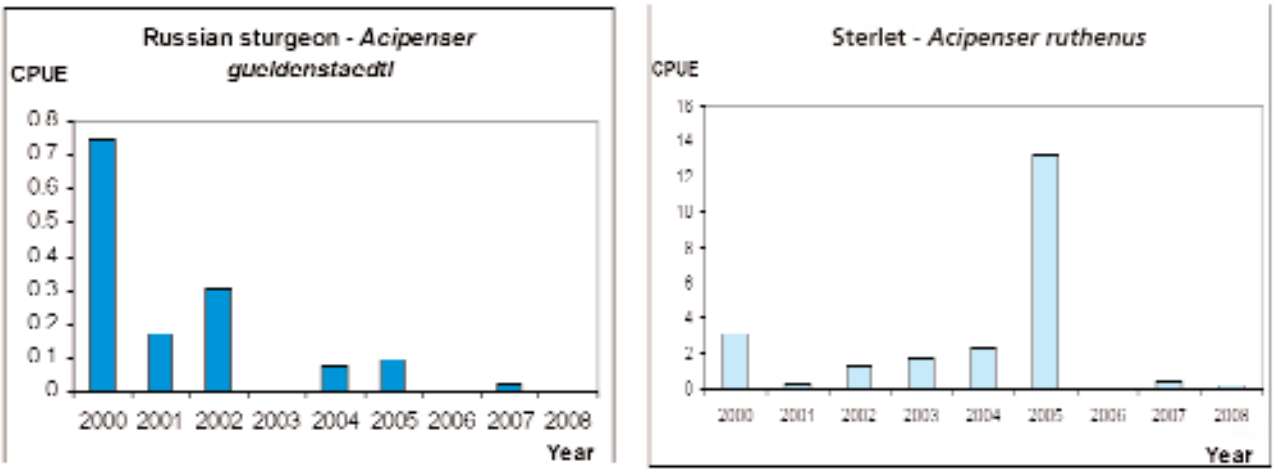


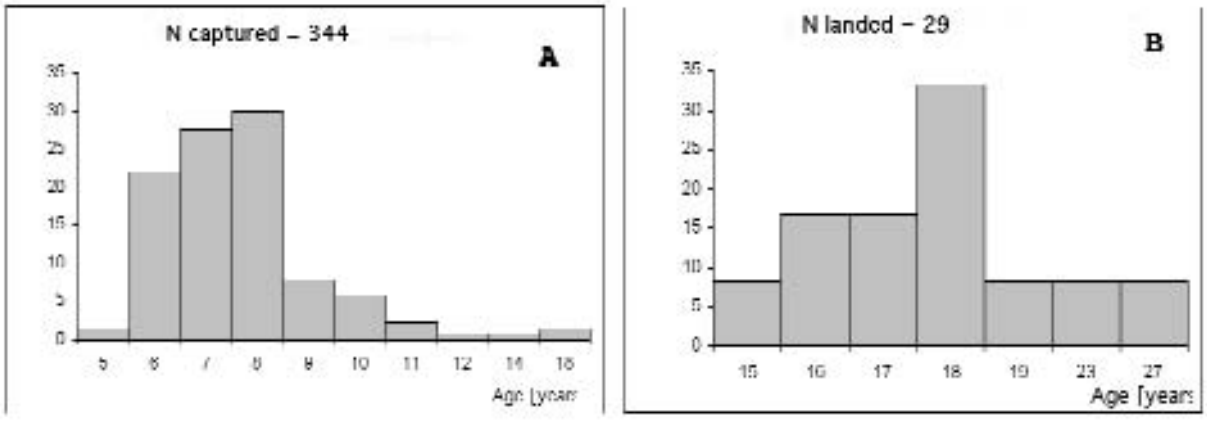
Fig. 2: Juvenile Production Index from natural spawning of sturgeons in the lower Danube River (2000 - 2008)

Low or even missing recruitment during the respective year was linked to small number of adult sturgeons captured during that year, like in Russian sturgeon after 2002 and with repeatedly missing first time spawners in the cohort migrating into the river for spawning in successive years in Russian sturgeon after 2002 and in beluga sturgeon after 2005.

In the Danube River stellate sturgeon females are spawning for the first time ate age of 7 – 8 years, Russian sturgeon females at age of 9 years while beluga sturgeon females at age of 14 years.

Age structure of adults monitored annually (Fig. 3) was used to evaluate the effects of adopted catch quota. We found that the age structure recorded in year 2003 in stellate sturgeon (Fig.3A) could be considered as relatively unaffected by fishery because first spawners (6 – 8 years old) were dominant (over 70%).

Already in year 2003 age structures of Danube sturgeon (Fig.3B) and beluga sturgeon (Fig.3C & D) migrating for spawning in the Danube River were clearly lacking first time spawners (less than 5%).



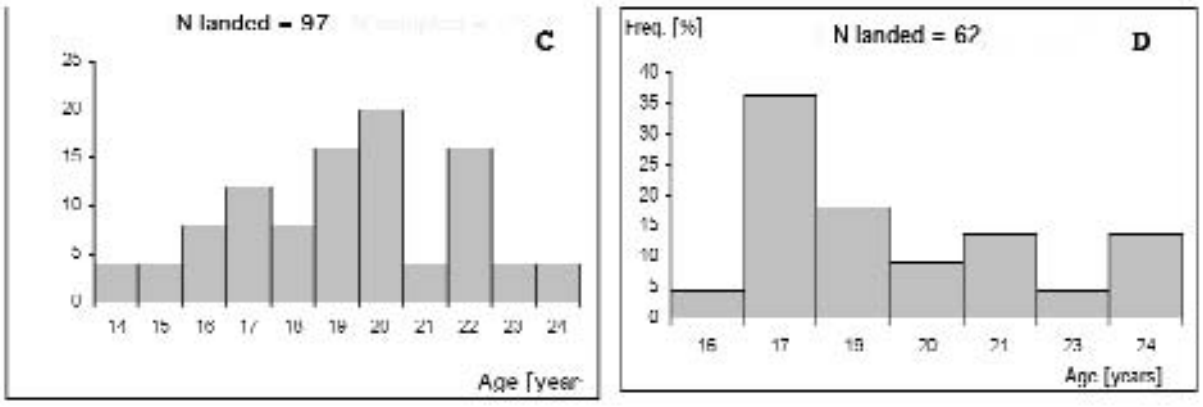


Fig. 3: Age class frequencies in: A- stellate sturgeon males (2003); B – Danube sturgeon of mixed sexes (2003); C - beluga sturgeon of mixed sexes (2003) and D – beluga sturgeon females (2004) landed in Romania (years in parentheses).

The data on missing / very small classes of first time spawners in cohort of adults of Russian sturgeon and beluga migrating in the Danube for spawning was interpreted as clear signal of a whole series of heavily affected year classes of these species, situation caused by uncontrolled over-fishing during 1990 – 2000 (N?vodaru, 1999). This indicator along with poor natural recruitment and increasingly low number of adult specimens captured were the main arguments adopt /declare in May 2006 a ten year moratorium for commercial catches of wild sturgeons in Romania, measure adopted the following year also by Bulgaria and Serbia.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

Implementation of compulsory reporting and recording in the data base on the webpage of all sturgeons captured in Romania resulted in acquisition of the largest number of individual data on sturgeons in the whole history of Romania: 717 specimens in year 2003; 863 specimens in year 2004 and 535 specimens in year 2005. Data quality improved over the years, as already explained in chapter 2.2.2.

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF

The main problem on the elaboration of NDF findings and deciding if continuation of commercial captures for export and domestic use was detrimental to the survival of population consisted in the quantity and quality of monitoring data recorded by partner countries of the region. So, age class structure data provided by Ukraine were based

only on fish captured during experimental trawling in the Black Sea, while natural recruitment data were totally missing in the reports of Bulgaria and Serbia, mainly due to poor / lacking research and monitoring activity on the river.

Also, in Romania it was very difficult / impossible to obtain fishery dependent data on sterlet and all NDF quotas setting process in this species had to rely only on monitoring of natural recruitment via abundance of YOY in the control section at Danube River Km 118.

Monitoring the abundance of YOY sturgeons, as the only fishery independent population status indicator, requested working in extremely difficult conditions on the border with Ukraine (difficult access and supply of fuel, living in tents for almost two month, no electricity and difficult communication).

To correct this situation and provide normal working conditions, the Romanian Ministry of Environment has decided in year 2006 the construction of an International Monitoring Station for Migratory Fish (sturgeons and Danube shad) at River Km 100 / Isaccea. The construction worth 300,000 Euro has been finalized in July 2008 and the Station will be operational in spring 2009. It will provide good working and living conditions for a number of 8 experts from Romania and partner countries of the region.

6. RECOMMENDATIONS

The NDF system adopted by us is applicable only for populations and rivers were natural recruitment still consists the basis for the survival of sturgeon populations (Paraschiv 2006) and genetic diversity and equilibrium of species (Onara 2007) is still little or not heavily disturbed by human impact.

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Annex index:

Annex Number	Title
1	Regional Strategy for the Conservation and Sustainable Management of Sturgeon Populations of the N-W Black Sea and Lower Danube River in accordance with CITES
1.1	Effective breeding number (Ne) of sturgeons to be used in all propagation activities for supportive stocking
1.2	Monitoring system of effects of current catch quotas on sturgeon stocks
2	Order on conservation of wild sturgeon populations and development of sturgeon aquaculture in Romania
2.1*	Effective breeding number (Ne) of sturgeons to be used in all propagation activities for supportive stocking
2.2	Capture recording file for sturgeon brood stock
2.3	Register for the artificial propagation of sturgeon
3	Recommendations of the Expert Meeting on coordination and implementation of sturgeon stocking programmes for the Lower Danube River and of the North-West Black Sea Region
	Status and management of sturgeon populations of N-W Black Sea and Lower Danube River during 2000 - 2004 in Romania

* This annex repeats Annex 1.1 because it was included in both the Regional Strategy (…) (Annex 1) and the Order on conservation of wild (…)(Annex 2).