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**RESEARCH AND
PROTECTION PROGRAMME**

RARE SPECIES IN THE DANUBE RIVER

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ABBREVIATIONS

CITES	Convention on International Trade in Endangered Species of Wild Fauna and
CMC	Convention on the Conservation of Migratory Species of Wild Animals
CU	Conservational unit
DHA	Docosahexaenoic acid
DRB	Danube River Basin
DRBMP	The Danube River Basin Management Plans
DRPC	Danube River Protection Convention
EN	Endangered
EPA	Eicosapentaenoic acid
EU	European Union
EUSDR	EU Strategy for the Danube Region
HPP	Hydropower plants
IAD	International Association for Danube Research
ICPDR	International Commission for the protection of the Danube River
IUCN	International Union for Conservation of Nature
LC	Least Concern
NGO	Non-government organization
V	Vulnerable
WFD	Water Framework Directive
WWF	World Wide Fund for Nature

ABSTRACT

The Danube river basin is the most international river basin in the world as well, being the second largest river basin in Europe, connecting various countries, bringing together major diversity of the animal species, which are located in the area. Throughout the extent of the river, there are around hundreds of various fish species including plants, animal species, mammals, breeding birds, dozen reptiles, and amphibians. Even though the Danube river is a host to various species, the area is facing major difficulties not only based on natural causes, but also to man-made changes such as width, water depth and flow velocity followed by the construction of dams, weirs, and canals.

Those are essential prepositions, which are creating unsafety environment resulting to endangering and destruction of species habitats, which is a serious impediment for the conducting of a normal life cycle, and life span. It can be observed through the years that the habitats along the Danube river basin are decreasing, creating not only prepositions for endangerment and destruction but the extinction of fish species as well with the emphasis on sturgeons. Sturgeons are considered as a natural heritage of the Danube River Basin (DRB) and for the last ten years' experts have noticed the decreasing of their population, which has become a serious basin-wide issue that got the attention of the Danube countries and the European Commission.

Based on the different prepositions, which led to this situation such as overbuilding, illegal fishing, trading, and poaching. Additional causes are overexploitation, climate change, and pollution, which is the reason in the last decade or more people have put their time and effort for the creation of preventing measurements and applying them. Those measures, procedures, strategies, and projects that have been executed or are in the process of execution highlight the importance of the sturgeon species.

The project's main focus is on the preservation of habitats, increasing the populations, protection, and support of the species. These activities are recognizing the importance of preservation of the environment and the improvement of the species habitats.

EU Strategy for the Danube Region (EUSDR) seeks to create synergies and coordination between existing policies and initiatives taking place across the Danube Region.

The Priority Area 6 “To preserve biodiversity, landscapes and the quality of air and soils” helps improve the status of all species and habitat in the Danube region, involved in the process of restoration of at least 15% of degraded ecosystems. Thus the increasing of habitats will comply with the restoring of the status of the species, living in the Danube region.

International Commission for the protection of the Danube River (ICPDR) Sturgeon Strategy¹ is working towards ensuring the sustainable and equitable use of water and freshwater resources in the Danube River Basin. ICPDR has become a platform for cooperation of water management in the Danube River Basin. It has the political and administrative level of national “line ministries competent for water management and the protection of waters” together with stakeholders and NGOs, thus actively shaping water cooperation at the Danube wide level².

Sturgeon 2020³ is a program for the protection and rehabilitation of Danube sturgeons. The mentioned program was developed aiming to ensure viable populations of sturgeons and other indigenous fish species by 2020”, it is as a framework for action, and it is based on the Sturgeon Action Plan. The program combines environmental aspects with social and economic measures. The program aim is not only to bring benefits to the sturgeon population but also to contribute to the improvement of the economic situation of the stakeholders. The enclosed measures are protection, restoration of migration routes, supportive stocking programs, economic alternatives to sturgeon fishery, fighting illegal fishing, and the caviar black market, ecological education, harmonization of legislation, and law enforcement.

Various methods and approaches have been under consideration and implemented for the rebuilding of the species habitats and to create better conditions for a normal life span. Those programs and strategies are covering the ecological and natural aspects of continuing the life of the endangered species, preventing the habitats and species of endangerment, creating possibilities to extend the life span of the emphasized species- sturgeons.

¹ ICPDR Sturgeon Strategy

² ICPDR Sturgeon Strategy- 5.1 ICPDR and sturgeon conservation activities

³ The strategy to implement the Program “Sturgeon 2020”

The aim of the present research is to introduce the rare river species, emphasizing the sturgeon species, including presentation of models, which goals it is to preservation of sturgeon species, and addressing the possibility for establishing a natural spawning.

The main focus of the present study is to present, research and analyze rare river species within the area of the Danube river basin with emphasize of the sturgeon species, which currently are on the verge of extinction. In the study will be present the causes behind the endangered and extinguish conservation status of the species representatives, which is of a key importance for the study, including specification of the target rare species with leading focus on sturgeons.

The study itself will observe the area in the Danube's river cross border region Negotin-Montana. The study will present models for the prevention of sturgeon species that will descriptively suggest specific strategies and methods that will work towards the main idea of preservation and protection of the endangered representative of the sturgeon species. Those models, strategies and methods will present various options to increase the endangered species population, creating and improving the conditions for the conduction of a full life cycle. The study seeks to explore the opportunities to establish a natural spawning for the sturgeon fishes, which have various factors that need to be taken into consideration such as reproduction biology, environmental conditions, and facilities, where the spawning will take place.

The study presents the rare river species, including information about the species such as physical and ecological features, current conservation status, habitats, etc., located in the Danube river in the cross-border region Negotin- Montana. Furthermore, the study consists of a presentation of a different modes, which are focused to prevent the extinction of the sturgeon species and to improve the current circumstances of the habitats, which will improve the species life span, continuing and preservation of the rare species with an emphasis on the sturgeon species. Lastly, the study will explore the possibility to develop a natural spawning, where the fish can reproduce. This way the endangered species will have the opportunity to continue their life span and implement their full life cycle, which will overcome the obstacles that are currently facing.

I. INTRODUCTION OF RARE RIVER SPECIES IN THE DANUBE RIVER BASIN

The Danube river is the second largest river in Europe covering an area of 5 640 km² which flows over nearly 3 000 km from the Black Forest to its delta in the Black Sea, crossing Europe from west to east, making it an international river. The Danube river is passing nine countries – Germany, Austria, Slovakia, Hungary, Croatia, Serbia and Montenegro, Bulgaria, Romania, and Ukraine. Thus, the river connects the West, Central, and East European countries. The Danube Basin is considered to be divided into three regions- the Upper Danube, the Middle Danube and the Lower Danube. The Upper Danube extends from the Black Forest to the Devin Gate below Vienna, the Middle Danube from the Devin Gate to the Iron Gate where it passes in the Southern Carpathians and the Balkan Mountains and finally the Lower Danube through the Romanian and Bulgarian low- lands.

The Danube river is the second largest river in Europe and it is the twenty-first in Europe with a discharge of 6 500 m³ s⁻¹ at its mouth. The multi-purpose use of the river is of vital importance for the more than 82 million people inhabiting its 817 00 square kilometers. The use of the catchment and the river itself had had powerful collisions on the environmental conditions of the river-floodplain system (Khaite et.al. 2000; Bloesch 1999, 2001).

The Danube river is built on various diversity of habitats and ecosystems, which makes it unique and extremely valued for its geographical and ecological input. There are still some parts of the Danube river, which remains untouched, preserving habitats and species. Those areas are considered with high ecological value, including a one-of-a-kind heritage. In general, the level of biodiversity is higher than the lower reaches of the river, which can be explained by the human impact, and access.

The Danube river consists of around a hundred fish species. From the diversity of fish specimens, some of them are presently considered rare, endangered, or on the verge of extinction. The highly endangered fish species have been listed on an EU-wide register, and are called FFH species. The impact that is influencing the environmental habitat leads to the disconnection of the aquatic environment from the spawning ground, which is resulting in a decrease in specimen population.

Some fish representatives are put against the peril of illegal fishing and trade of goods. The study's geographical focus is on the cross-border region Negotin- Montana, which is the area where the three-border area between Serbia, Bulgaria and Romania meet.

Negotin, Serbia is a town and municipality in the Bor District of north-eastern Central Serbia. Montana, Bulgaria is a town and the center of an administrative region Montana, situated in north-western Bulgaria.

The Danube River Basin is inhabited from various fish species and five sturgeons, it is also a housing to rare birds like the white pelican, white-tailed eagle and the black stork, including also to river species such as Nase (*Chondrostoma nasus*), the Danube salmon (*Hucho Hucho*), the Schraetzer (*Gymnocephalus schraetser*) and the European eel (*Anguilla anguilla*). The listed specimens are considered rare because there is a reduction of their population and some of them are considered critically endangered based on the fact that they are experiencing challenges having a normal life cycle. The species are facing obstacles that are resulting not only because of the changes of nature but also because of manmade prepositions that are disturbing their existence such as width, water depth and flow velocity, construction of dams, weirs, and canals. The created obstacles are not only creating prepositions for the impossible conduction of a life cycle and reproduction process, which is resulting to the decreasing population of the species representatives.

1.1. IDENTIFICATION OF INDIVIDUALS

The classic method of species identification for sturgeons is the determination by morphometric characteristics. Individuals of two subspecies of the American Atlantic sturgeon displayed 15 different nucleotid-polymorphisms in a 203 bp fragment of the mitochondrial control region (D-loop), of which three allowed a differentiation between the two subspecies displayed 15 different nucleotid-polymorphisms in a 203 bp fragment of the mitochondrial control region, of which three allowed a differentiation between the two subspecies.

1.2. THE DANUBE SALMON (HUCHO HUCHO)

The Danube salmon or Huchen, is the largest representative of the Salmonidae family in Europe. The Danube salmon can be found across the territories over twelve countries, including Germany, Austria, Slovakia, Poland, Czech Republic, Romania, Slovenia, Western Ukraine, Bosnia-Herzegovina, Montenegro, Croatia, and Serbia. The Danube salmon has experienced a serious decrease of the population that began over 100 years ago because of human-made activities such as overfishing, pollution, and construction, which create difficulties for the Danube salmon to reach the spawning grounds. For the Danube salmon the biggest threat is the hydropower plants (HPP), which severely alter the natural flow regime of rivers.

This situation results in destroying habitats. Additionally, weirs and dams interfere with the migration routes of the Danube salmon and its prey. Furthermore, looking through all the obstacles that the fish specimens are facing, the IUCN Red List of Threatened Species considered them as Endangered (EN).

Huchens are an iteroparous spawner, which means that they attempt continuously to spawn and it is a process that is going throughout their adult stages. The Danube salmon life span can reach up to 20 years, they start eating fish at an early stage based on which they are considered top predator in the river system which they are inhabiting. The species feeds on fish, amphibians, reptiles, water birds, and small mammals. Throughout the years the Danube salmon had been recorded to reach 60 kg, even though currently specimens over 30 kg are considered quite rare. The Danube salmon have a slender, cigar-shaped body, and its broad mouth has a dense arrangement of teeth. Male Danube Salmon are sexually mature from age four, and female representatives become sexually mature at age five.

Huchens are an iteroparous spawner, which means that they repeatedly attempt to spawn and continue throughout their mature stages. During the spring the female Danube salmon lay eggs on the bottom grits of mountain rivers. Furthermore, after successfully hatching the small salmon develop extremely fast, within a year they are almost 13 cm in length, and by the end of their second year, they are almost doubling their size. Currently, the Danube salmon population is closely connected to the stocking with farmed fish.

It is not so often to observe an inhabitant that are self-sustainable, considering that the spawning grounds across the Balkan region can be found, despise the fact that they are quite hard to recognize or identify them. Usually stocking occurs with some populations being dependent on artificial reproduction and stocking programs.

1.3. EUROPEAN EEL (ANGUILLA ANGUILLA)

The European eel is situated in the parts of the Atlantic Ocean that are closer to the north, in the freshwater in Europe, Northern Africa, England, Island, and the Baltic sea. It can be also found along the coastal areas of the Black Sea, Mediterranean Sea, and the Sea of Azov. During the past years, the European eel representative can be located on the Danube River and other river basins and coastal lakes.

Based on the fact that there is plenty of immense draining of the marshlands, many habitats are no longer occupied by the fish species even though it can be observed the fact that the species reappears, unfortunately, it is only one per record. According to the IUCN Red List of Threatened Species, The European eel has been listed as Critically endangered (CR) based on the decreasing population percentage, which is less than one.

The European eel is a catadromous fish, thus meaning that they are born and spawn at sea, but afterward, they migrate into inland waters for the implementation of their feedings and growing stages, which are outstanding and can be recognized by the changes that occur on the appearance characteristic. During their larva stage, which can last from seven months up to three years, the baby eel can be drifting around the sea. Afterward, their body transforms into the second stage of the life cycle, where the fish body becomes translucent, which means that it is see-through, this is the reason why people also refer to the eel during this change as “glass eels”. When the fish species enter the freshwater systems, they experience another transmutation that brings back the color of the eel's body.

This phase of the eels is identified as the "yellow eel". During their final transformation, the species can be distinguished by the color change that appears on the eel's body as a metallic gleam and big eyes. Thus being their final transmutation and following being sexually mature to reproduce and lay eggs in the sea.

The normal lifespan of the individual can reach up to 80 years and grow up to 130 cm in length. The inhabitants of the European eel have diminished drastically and are considered critically endangered.

Experts can't designate only a single reason for those unpropitious circumstances, because it is a combination of a mixture of factors. Even though it is not given a specification of the causes, it is understood by the preponderance that the barriers to migratory paths such as dams and hydroelectric turbines are a severe proposition, attending to the weakening of the specimens, including nature changes such as climate change, pollution, diseases, and parasites have also taken a toll on the situation. It is also of high importance to mention that the habitat loss together with the exploitation of the European eel for food which does not benefit the decreased numbers of this population.

IUCN has recommended the monitoring and conservation efforts in order for the recovery of the European eel to be successful, which is a good way to present the human acknowledgment of the importance of the conservation process caused by manmade activities.

1.4.THE SCHRAETZER (GYMNOCEPHALUS SCHRAESTER)

The Schraetzer is or the striped riffe can be found in changeless huge rivers such as the Danube drainage. The Schraetzer life expectancy is 10 to 15 a long time greatest. The fish species are procreating during the spring seasons. The female Schraetzer can lay around 8 000 eggs that are kept on the wide strip on the ground and are connected to the stones. Grown-ups' agents of the example happen in bunches on the bottoms of enormous rivers.

The Schraetzer feeds on tiny animals such as dragonfly hatchlings amid nighttime, but it can feed at daytime as well. The Schraetzer is encountering a negative affect from the river direction, comprising of dams and weirs, that lead to environment misfortune. The Schraetzer is or the striped riffe can be found in permanent large rivers such as the Danube drainage. Additionally, the water pollution problem also has a destructive collision to the Schraetzer species, which is creating prepositions, and obstacles for the conduction of their normal and full life cycle.

Considering the conservation measures that were undertaken the Schraetzer was included in Annexes II and IV of the Biological Diversity Act (2002). Furthermore, the IUCN Red List of Threatened Species considers the Schraetzer as a specimen of Least concern (LC).

1.5. COMMON NASE (CHONDTROSTROMA NASUS)

The Common Nase or Sneep is situated in the mountain waters, hill areas and in the Danube river. The Common Nase has a slender body with a high back that has recognizable lips because they are round, thick, and firm. body length can reach up to 60 cm. with a weight of up to 1.5 kg. The Common Nose has a snout that is extremely interesting and creates the illusion of a nose- like appearance. The fish species back is dark green, the dorsal fin is gray, and the other fins are orange.

The Common Nase fishes are circulating in groups and it is easy to monitor them due to their appearance because when the sun is shining through the water a silver reflection appears. These fish representatives are inhabiting the bottoms, where they are surrounded by cold water, and strong water flow. Many species use the tributaries of the Danube river as a spawning area, which can be difficulty for the Sneep to reach because there were dams built.

The Common Nase lives in the deep water grounds which are situated in the high regions, which makes finding food mainly consisting of algae growing's, extremely difficulties and leads to innumerable flipping of rocks and small stones.

The Common Nase average life expectancy is between 10 to 15 years. They reach sexual maturity around the age of 3 and 4 years old, while their body length is 15-17 cm. The Common Nase spawn during the spring season when the water is above 5-celsius degrees Each female lays about 50 000 to 100 000 eggs that are instantly fertilized. The incubation period is ten days. The Common Nase life span is facing the problem of dam construction. They are experiencing difficulties reaching their spawning ground based on the fact that are having obstacles along the way, which makes the spawning process extremely hard, but not impossible.

The IUCN Red List of Threatened Species considered them as Least Concern (LC).

II. INTRODUCTION OF RARE RIVER SPECIES WITH EMPHASIS ON STURGEONS IN THE DANUBE RIVER BASIN

Sturgeons have a rich history which identifies them as representatives of the eldest fish families that were recorded. Sturgeons are acknowledged as the fundamental heritage of the Danube River Basin. They are valued throughout the whole world based on their qualities and abilities, including their surrounding sensitivity, which is used to designate a healthy river based on the fact that they are growing slow. Even though that they have survived through the centuries they are experiencing difficulties to continue their lifeline.

Sturgeons are a victim of habitual loss, which is based on natural phenomena, but also because they are experiencing issues such as overbuilding, illegal fishing, trading, and poaching. Other causes that are partially a result of the above-mentioned issues are overexploitation, climate change, and pollution. Furthermore, sturgeons are listed within the most threatened group of animals on the IUCN Red List of Threatened Species with more than eighty-five percent of the species.

Located in the Danube River Basin are six native sturgeons, which are widely recognized as the most precious based on their present wild population. The Serbian part of the Danube River was inhabited with six representatives of the sturgeon species- beluga (*Huso huso*), Atlantic sturgeon (*Acipenser sturio*), Russian sturgeon (*Acipenser gueldenstaedtii*), stellate sturgeon (*Acipenser stellatus*), ship sturgeon (*Acipenser nudiiventris*) and sterlet (*Acipenser ruthenus*).

On the other side the Bulgarian part of the Danube River was also inhabited with six representatives of the sturgeon species- beluga (*Huso huso*), Atlantic sturgeon (*Acipenser sturio*), Russian sturgeon (*Acipenser gueldenstaedtii*), stellate sturgeon (*Acipenser stellatus*), ship sturgeon (*Acipenser nudiiventris*) and sterlet (*Acipenser ruthenus*). Currently, only five out of the six sturgeon representatives can be observed in the territory with a conservation status as Endangered (EN) and as Least Concern (LC) considered by the IUCN Red List of Threatened Species. Ship Sturgeon (*Acipenser nudiiventris*) was never abundant in the Danube River basin.

The last reported catch of Ship Sturgeon was in the Hungarian part of the Middle Danube in 2009. There have been no documented catches since October 2003. Ship Sturgeons Are Critically endangered and they are listed as extinct in Bulgaria.

Most Danube sturgeon species spawn from spring to early summer over a wide range of temperatures (6 to 25° C). Some races enter the river in spring and some in autumn or winter. Fish of the winter race spend the winter in the river, hibernating in holes or deeper river bends. They spawn far upstream the year after entering the river. The spring races do not hibernate and only enter the river when temperatures are rising. The two forms of behavior do not represent different species, but different strategies for the pre-spawning migration.

Observations on some populations show that sturgeons visit the same spawning sites every time when they enter the river for spawning. The “site fidelity” may derive from the fact that sturgeons survive in the river due to genetically imprinted early life stage survival strategy adapted to the location in a particular reach of the river. The life cycle of Acipenseriformes is very long with puberty occurring late in life. Individuals spawn repeatedly, but most females do not spawn annually.

Sturgeons have also shown a tendency towards hybridisation with other sturgeon species. This occurs even more when spawning habitats are lost and different species are confined to *only a few suitable sites or when one species is rare compared to another species*. The adjustments happening at the Danube Basin region and the river profile can have an enormous impact on the aquatic environment, resulting in the creation of prepositions in which the fish species are not able to reach their spawning grounds. This is a key reason for the resulting in the reduction of aquatic habitats, which creates obstacles for the implementation of a full life cycle, especially the representation process.

Observed changes are the width, depth of the water, and flow velocity. The natural environment is interrupted by the erection of dams, dikes, weirs, and canals that are position in contradiction of the natural and normal water flow. Meanwhile, in the Lower Danube river is situated one of the three of the world's sturgeon specimens.

Usually, sturgeon representatives are anadromous, which means that they hatch and spawn in freshwaters, and afterward relocate to the sea for foraging, often it takes up to ten or more years before they relocate back into the rivers to primary reproduction. Anadromous species, each of them incorporated in the assembly of freshwater fishes, are known from numerous fish families, including lamprey. Sturgeon's appearance has not changed much through the years, even though they are extremely old and ancient species, who are Osteichthyes fishes, meaning that they are very bony fishes. They have cartilage bone structure. Sturgeons features are with a long nose and underneath there is a mouth, which has no teeth, but four whiskers whose purpose is to act as a bait for funding crustaceans. It has bony plates that cover the head and five longitudinal rows of similar plates along the body, which are used for protection against predators, who are trying to attack and harm them.

Compared to other fish families, fish representative sturgeons do not have scales, instead, they have smooth and thick layers of skin. Furthermore, the human influence has brought additional complications that can be observed over the river region, including activities such as over-exploitation, illegal fishing, trading, and poaching. Considering surgeons value because they have vast production of fish eggs per specimen and the positive utility that comes from the meat quality, leading to overexploitation of the endangered species and being targets of illegal fishing and poaching. Additional causes are climate change, and pollution, which can be resolved with methods and strategies aimed to improve the aquatic conditions and preservation of the species.

There has been improvement of the water quality in the Danube has improved over the years but there are still improvements that are desired. Under EU WFD there is a program along that measures the whole Danube River District, which monitors physical, chemical and biological conditions in the Danube and its tributaries, and provides an annual overview of pollution levels as well as long term trends for water quality in the basin. Following those activities overtime me, the environmental condition will improve and the observance of habitat loss will decrease reduce.

In 1994 the Danube River Protection Convention (DRPC) was signed in Sofia, Bulgaria and came into force in 1998.

All parties that have signed the Danube River Protection Convention agreed to cooperate on fundamental water management issues by taking "all appropriate legal, administrative and technical measures to at least maintain and where possible improve the current water quality and environmental conditions of the Danube river and the waters in its catchment area, and to prevent and reduce as far as possible adverse impacts and changes occurring or likely to be caused.". Following the prevention measurements, the authorities in Bulgaria announced in 2011 a one-year ban, which was later extended until the end of 2015 and then for another 5 years as well.

In Serbia, a complete permanent fishing ban on five sturgeon species was introduced in 2005 through the "Rulebook on declaration and protection of strictly protected and protected wild species of plants, animals and fungi". Sterlet can still be caught with restrictions – individuals longer than 40 cm and not during the spawning period (March 1 – May 31). However, control of Sterlet catches is inadequate and there is an evident drop in population size and average individual size due to overfishing. Except in sporadic catches, the larger sturgeon can only be found in the remaining 17,5 km of the Lower Danube River below the Iron Gates II dam. Even though sturgeon specimens are facing a great deal of challenges, different organizations, programs, and strategies have emphasized the need to improve the surrounding environment for the sturgeons, which main aim is to prevent habitat loss, increasing of the sturgeon population and delimit the illegal fishing and trading of sturgeons.

The positive impact that is expected to be reached is to put the sturgeon out of the extinction, endangered environment, and to provide a safe, clean and natural environment for the conduction of the full life cycle of the species representative.

2.1. BELUGA STURGEON

The beluga can live up to 100 years and it is one of the largest predatory fish species because it eats other fishes and during its life span very rarely confronts natural predators. Beluga sturgeons approach maturity later than other fish species- the male at 12-14 years, and the female at 16- 18 years.

The generation period is four to five years. The Beluga used to reach up to 8 meters in length and 3.2 tons in weight.

In the Danube River the hugest registered fish was a beluga sturgeon, about 1 ton and 8 meters long (Antipa 1909, Bănărescu 1964, Otel 2007) but normally the body size of apprehended individuals does not exceed 3 m and 300 kg (sturgeons and catfish). The diminished individual dimension of fish in catches is obvious as an effect of overfishing, which became more aggressive in the last century.

The great beluga sturgeon is apprehended to sustain several hundred pounds of caviar; which worth can be extremely high. In the process of spawning, the beluga can be under great exposure to become a target to illegal fishing, which happens whit harpoons and nets. This had led to extreme overexploitation from which more than 90% of the population has declined. Currently, the Beluga sturgeon is considered a critically endangered species on the IUCN Red List of threatened species.

2.2. STELLATE STURGEON

Stellate Sturgeon (*Acipenser stellatus*) is also known as Starry Sturgeon, because of the distinctive star-shaped bone plates on its body. The Stellate has various scutes along its body- lateral, ventral, dorsal fin rays, and anal rays. The Stellate is easy to be recognized because the head and nose take up to 25% of the whole length of the fish. It is quite interesting that the Stellate's skin is combination of two colors, which creates pleasant view and another feature that can help distinguish this particular fish species.

The main color of the skin is bluish to black with a creamy white ventral, which is the underneath part of the specimen, including strong scutes, meaning that there are bony plates on the skin with a yellowish-white color. The Stellate sturgeon keeps its color throughout the years and does not change. The Stellate Sturgeons are with slim bodies weighting from ten to twenty and can reach up to 200 but their regular size is fifty to a hundred cm.

The Stellate sturgeon is one of the main sturgeon species famous for producing caviar, together with the Beluga and Russian Sturgeon. Thus, is the reason why they are target of overfishing, legal and illegal trade of caviar and other causes such as river pollution and especially pollution of spawning grounds may seriously impact on sturgeon populations. Stellate Sturgeons are listed as Critically Endangered.

2.3. RUSSIAN STURGEON

The Russian sturgeon is also known as the diamond sturgeon or Danube sturgeon. Previously the Russian sturgeon was the most widely distributed from sturgeon species in the Danube River.

It is about the same size as the common sturgeon and is found particularly in the rivers filling the Black and Caspian seas, where the species migrate for spawning. In the past, the Russian sturgeon could have been found frequently in the Danube river that is along the Bulgarian territory.

Under natural conditions, the Russian sturgeon reaches maturity- for males at 8- 13 years, and 10-16 for females. Some of the reported issues for the rapid decrease of this fish's population for the past few years are overfishing, pollution, and destruction of spawning habitats. This population decline and the resulting increase in world caviar prices have brought about the need for sturgeon aquaculture and protection.

In recent years, more than a few attempts were made to initiate Russian sturgeon culture in ponds; however, farmed caviar from this species is not yet available in significant amounts.

Currently, the Russian Sturgeon is considered a vulnerable species on the IUCN Red List of threatened species.

2.4. ATLANTIC STURGEON

Atlantic Sturgeon are a long-lived species and can reach an age of 60 years. There used to be stocks of Atlantic sturgeon in Europe and in the Baltic Sea. There were also landlocked populations of Atlantic sturgeon in Lake Ladoga and Onega in Russia. Unfortunately, all of these populations are now extinct due to poaching and overfishing.

The International trade of Atlantic sturgeon is now restricted under the Convention on International Trade of Endangered Species (CITES). Atlantic sturgeon have been known to reach up to 800 lbs. or 370 kg and have been measured up to 14 ft. or 4.3 meters in length.

Atlantic sturgeon is currently present in 32 of the 38 historical rivers known to have sturgeon populations along the Atlantic coast of the United States. In the Danube River and North-western Black Sea, it is believed to be extinct. considered as a Critically endangered species on the IUCN Red List of threatened species.

They have also been known to exist in northern Canadian rivers in Labrador and Newfoundland and also in the Northern Gulf of Mexico in Bermuda and French Guiana. They can occur in small groups or swim alone.

They inhabit the shallow waters of the continental shelf down to a depth of 50m and also coastal brackish waters. They enter large river systems to spawn. Atlantic sturgeon eats crustaceans, worms and mollusks.

2.5. STERLET STURGEON

The Sterlet is the smallest of the sturgeon species in the Danube River Basin, which exclusively inhabits freshwater habitats, and it is the only sturgeon that inhabits two continents. The Sterlet or the Albino sturgeon, it is acknowledged to be the most leisurely growing representative of the sturgeon, and it is quite suitable for a more diminutive basin based on the fact they grow up to 1.2m length and that is achieved throughout a large diapason of time. Based on their petit sizes that in particular conditions can reach 60 cm with a weight of 16 kg, it is believed that they are really suitable for gardens ponds.

The Starlets features consists of scutes and scutical lines with the same body color as the surrounding skin. The Sterlet's snout is long and pointed with fimbriated barbells and lower lip that is split. The color of their body can change from dark brown to grey, sometimes it can be seen with a dark green tint on the back, and with white fin edges and belly.

Currently, the Sterlet sturgeon is considered as a vulnerable species on the IUCN Red List of threatened species.

The Serbian Ministry of Environmental Protection this year implemented a ban on fishing one of the critically endangered Danube sturgeon species, the sterlet (*Acipenser ruthenus*). Alongside existing permanent and temporary restrictions on catching and selling wild sturgeon in Ukraine, Bulgaria and Romania, this creates the unity of all sturgeon species to be under protection in the whole Lower Danube region. Even though sturgeon population in the Middle Danube has become dependent on stocking measures, they are considered as insufficient to compensate the impact of unsustainable fishery and other negative factors (Vassilev 2006).

Furthermore, all of the five sturgeons' species has been observed and had shown decreased numbers throughout the years which brought mass attention to their caused and there was and is still proceeding an international and global involvement for the preservation of this ancient and precious fishes. The decreasing number of the sturgeon populations have created many international connections and partnerships that are fighting for the sturgeons' rights to be able to conduct their stages without being threatened or being in the verge of extinction.

III. ENDANGERING FACTORS IMPACTING THE STURGEON SPECIES

According to IUCN sturgeons are considered to be the most critically endangered species because they are collided with various factors that are influencing their life span and development. Even though they have been surviving the changes of the world for millions of years they are currently experiencing difficulties surviving the progressive and modern life that were forced onto them by the human race.

The factors that are impacting the sturgeon population can be divided into two categories- the first one is environmental change caused by the action and influence by people and the second one is environmental change caused by natural ecological processes which are reciprocating. The actions and impact of the human population is interfering with their natural habitat and disables them to continue their natural development and fully execution of their life cycle which is consisting of the following stages: early life stages, out-migration, on- growing, returning to spawning site and reproduction.

Sturgeons have long life cycle that can continue over 100 years taking into account that they are species who mature late.

The environmental changes caused by the action and influence by people are the following- overexploitation, illegal fishing and trading, poaching, overbuilding, blocking of migration routes, habitat lost, pollution, hybridization and loss of genetic diversity. Overexploitation of sturgeons is one of the major issues for the population decreasing during the 20th century. This occurrence is determined on the late sexual development of the representatives of the sturgeon species which takes place between the 6th and 20th year of the sturgeons' life span.

Based on this fact the fishes are exposed to higher vulnerability because the maturity period is long and the spawning process is irregular- every seven years. The high demand for sturgeons' meat and caviar, including their high economical and market value is a preposition for illegal fishing and trading. Even though, there is a lot of effort to prevent any form of illegal fishing and trading, it can be observed that there is a present of a black market. Poaching can also be distinguished in the countries territories which is a key threat when they are releasing of sturgeons in the basins and in general.

Sturgeons are extremely sensitive to their surroundings and if they sense that their habitat is being altered it can impact their processes of spawning, wintering and feeding, resulting to their endangerment and potential extinction. The habitat change in the Danube river basin has affected strongly the sturgeon population because the river has been straightened and channelized, including building of dikes along the banks to prevent overflow, which has resulted to a loss 80 percentage of the natural floodplains and wetlands which are inseparable part of the river system.

The overbuilding has taken its peak when was built the hydroelectric dams- the Iron Gate I and Iron Gate II, which are defining the border between Serbia and Romania. The dams are blocking all access for reaching the migration routes. This is creating navigation problems for the sturgeon species to reach their migration routes and spawning areas, which is having a negative effect of their population and reproduction processes.

Furthermore, sturgeons' hybridization and loss of genetic diversity is another issue that is occurring in the life of the sturgeons. Sturgeon cultivation is important for both industry and aquaculture but it has also negative side, considering the preservation of natural genetic and genetic diversity, which can result in decreasing of the natural genetic material and preservation. Hybridization species are already existing and they have indication that they might not adapt when are being released in the river basin and can cause severe ecological problems, including becoming a threat to the native sturgeons.

The environmental change caused by natural ecological processes are defined as the interactions between the inhabitants- plants and animals, and the non-living elements like climate or rocks. Those processes are important for the perpetuation of a healthy ecosystems and are supporting the long-term persistence of biodiversity.

Many kinds of ecological processes sustain biodiversity, including climatic processes, primary productivity, hydrological processes, formation of biophysical habitats, interactions between species, movements of organisms and natural disturbance regimes.

IV. MODELS FOR PRESERVATION OF THE STURGEON SPECIES

It is clear that the aquatic environment is changing based on natural and human impacts, which have negative influence of the inhabitants of that area. People cannot do much about the changes occurring in climate change itself but rather they can take control of their actions, which are prepositions that creates obstacles for the conduction of a normal life span.

The natural resources have been overused in such ways that left the environment suffering from pollution and habitat loss, which is influencing the quality of the aquatic species surroundings. The erection of a different water barriers has resulted to be an obstacle for some species to the area, where they are spawning, which leads to a reduction of fish population, because they don't have the opportunity to reproduce.

Sturgeons value is wildly knowing as extremely high based on the positive aspects of the fish eggs and meat, including the profit of the spawning, which is resulting in making the sturgeons vulnerable during their whole life span but especially when they are spawning. Overexploitation is another major issue that has a negative impact on the sturgeon population because they have high economic value and their fish eggs and meat are considered as a delicacy, which has many positives impacts to a person's body.

Furthermore, this is the reason for the sturgeons' high interest and searchability. Even though most caviar comes from aquaculture facilities that are following measurements and approved standards for production, there is still a percentage that comes from illegal fishing and poaching, which is reducing the sturgeons' population and it is an obstacle for the continuing of the specimens' lifeline.

The Danube River Basin Management Plans (DRBMP) developed under the EU Water Framework Directive (WFD) is working for the improvement of environmental conditions for all flora and fauna in the Danube region.

The Danube countries need to take under action measurements that will provide a clear passage for the migration of the fish species up and down the stream, ensuring the reproduction of the population by protecting their normal conduction of life cycle and reproduction in their own natural habitat, which is including a viability and integration of migration routes. Thus meaning that there should be proper conditions for spawning including appropriate ecology and water quality along the routes, where the fish species are spawning and the areas, which the fish nurseries are located.

The restoration of the migration routes for the fish species is caused of manmade construction of dams.

The hydroelectric dams- the Iron Gate I and Iron Gate II, which are defining the border between Serbia and Romania. While they ensure reliable and sustainable energy for the region, it has a negative influence on the sturgeons, which is migrating in the Danube River Basin. The dams are blocking all access for reaching the migration routes and the tributaries of the Drava, Sava and Tisza rivers, all of which are vital spawning and nursery grounds for migratory fish.

The ICPDR has considered this problem and expedited the improvement of terms of recommendation for a practicability study to investigate the possibilities for allowing fish migration through the dams. Assembled in the 1970s and 1980s, they make up the biggest hydropower dam and reservoir system along the entire Danube. The compensation of the migration area through the dams would recreate passage to 800 km of the sturgeon's common habitat and reproducing grounds in the Middle Danube, therefore would improve their current freshwater area and can have a positive outcome of population recovery.

The potentiality to produce artificial migration routes can also present challenges, regarding the reception of the distinct route from the fish species keeping in mind that the wild populations are genetically connected to the habitats they were born in. Considering there is a chance that the sturgeons will decline the synergy of their original route, there is a chance that they may endure the artificial solution, regarding their migration manner and the current limitations.

There are examples from other river systems, in which the sturgeon species have adapted the artificial route into their spawning route.

This solution will create the prepositions for the careful and auxiliary interruption to the free-flowing river, which indicate that even the best solution for the migration process will be successful to a specific length, because of the selectiveness of the fish species to endure and adjust the foreign decision for the conducting of their migration routes. Reclaiming the migratory routes can drastically improve the population figures, but the above-mentioned risk circumstances will prevail because the artificial route will always have risk factors that cannot be excluded base on the fact that it is out of our reach of the people capability; sturgeons may refuse the suggested routes or it can be applied a selective method of usage.

This arrangement will unmistakably progress the fish species situation, but for the conservation of the kinds as a whole, it needs to be worked on the variety of weak links and factors such as pollution, overfishing, illegal fishing and trade, poaching, etc., that are causing the decreasing of their population, and to be looked at as a whole process with more than one activity, which is helping for the conservation of the fish species.

All risk factors need to be removed or the percentage of them to be as low as possible.

Establishment of an ex-situ facility for migratory species is another approach towards the sturgeons' preservation, which will be followed by and in-situ monitoring that will help to observe the species behavior along the Danube region and its tributaries. This approach is also recognized by the process of conservation breeding, as already register of enraptured sturgeons envisioned by the Sturgeon Action Plan under the Bern Convention.

The point of this approach is to create captive life-cycle assemblies, which will provide insurances of the species existence. The process is increasing the population numbers by releasing juveniles to adapt in the wild conditions, which creates the opportunities for natural wild spawners. This way the specimens are maintaining the genetic identity and diversity, which is occurring in the natural environment and spawning processes.

For the reproduction process there is also another option, which is consisting of cryobanking preservation. This method takes genetic resources from fish species, keeping them in suitable conditions and environment, which afterward with the help of a different biotechnologies creates preservation of a biodiversity kind that is assisting the procreation processes.

The cryopreservation is ensuring to secure a genetic material preservation of endangered specimens' that can be used for representative samples and reconstruction of the original strain, population or biodiversity. This approach needs to be individually prepared for each specimen based according to their characteristics, biology, needs and specifications otherwise the cryobanking would not be successful.

Cryopreservation of the endangered species semen will maintain hatchery projects, and according to studies about the sustainability of the natural assets. According to studies for sturgeons' successful cryopreservation, the execution of the process, particularly the techniques and used methods for implementation in addition to avoid side and negative effects.

There is a need of a specific species technology, which will be developed during the research and analysis. Furthermore, the biodiversity preservation is aimed towards improvement of population, habitat, spawning process, conditions and environment, which will ensure the successful prolonging of the reproduction process of sturgeon specimens'.

Those models have the aims to preserve the natural life cycle in natural habitat and environment, which will increase the sturgeon population and will ensure that the extinguish process is prevented. The approaches are focus to exterminate the risks and weak links that are creating misbalance of the surgeons' life span. Application of united strategies and measurements throughout the Danube river basin will ensure the involvement of all countries in the same cause to preserve the sturgeon kind such as the National Action Plan on Sturgeons.

European Action Plan on Conservation of Sturgeons, Danube-wide Action plan, etc.

4.1. BIODIVERSITY PRESERVATION FOR STURGEONS: IMPELEMENTATION IN THE REGION OF NEGOTIN

Republic of Serbia possess high genetic, species, and ecosystem diversity. The highland and mountainous regions of the Republic of Serbia, as a part of Balkan Peninsula, are one of six European biodiversity centers. The cumulative amount of identified species in Serbia is 4,082 including 125 aquatic species with 10 identifies as endangered.

Species that are already threatened are particularly vulnerable to the impacts of climate change such as phenological which influences the species life cycle; observed changes in the physiology, behavior and morphology of species; loss of existing habitats and appearance of new habitats that are unfamiliar to the species; etc.

Negotin is a town in Serbia located near the borders between Serbia, Romania and Bulgaria, the town is surrounded by Timok and Danube and hills Vidrovac, Badnjevo and Bratujevac. Serbia is applying a law that is regulating the protection and preservation on nature, biological, geological, and landscape variety as an integral part of the environment that is called Law on Nature Protection.

The Law for Environment Protection maintains the complete practice of environmental preservation which guarantees the human right to live and develop in a healthy environment as well as balanced economic growth and protection of the environment in the Republic. The system of environmental protection comprises measures, circumstances and means for sustainable management, preservation of natural balance, integrity, heterogeneity and quality of natural values and conditions for survival of all living beings; prevention, control, compression and rehabilitation of all kinds of environmental pollution; sustainable management of natural values and environmental protection.

Applicable is as well the EU 2020 Biodiversity Strategy that is focus to prevent the biodiversity loss and improvement of the status of the species, including their habitats and ecosystems for the next ten years, participating in the global campaign for preventing biodiversity loss. A step towards the preventing of the biodiversity loss will be to apply measurements for control and monitoring near the Municipality of Negotin that will provide essential information and statistic for the aquatic species which will include not only the endangered fishes but all of them. The provided information will present an inside statistic on regular basics about the passage through a monitored and controlled section of the river, leading to an actual statistic on the endangered species in the Danube river.

All the information that is gathered will be processed in addition to create a joint policy in the cross-border region which will be prepared with GIS technologies.

The Ministry of Environment and Spatial Planning presents state management ventures associated with the policy of protection and sustainable use of natural resources; examinations in the area of sustainable use of natural resources and environmental protection; nature protection, founding and implementation of protection of natural areas important for the Republic of Serbia; establishment of environmental protection conditions in spatial planning and construction; approval of transboundary trade in protected plant and animal species; all other activities stipulated by law.

The Ministry of Environment and Spatial Planning has competence over the conservation and development of biodiversity and protected areas; monitoring and sustainable use of biodiversity and landscape; internal and international trade in endangered and protected species of wild flora and fauna.

4.2. BIODIVERSITY PRESERVATION FOR STURGEONS: IMPLEMENTATION IN THE REGION OF MONTANA

Montana is located between the heights of the Balkans and the Danube floodplain, the Montana district is in the north-west of Bulgaria. In Bulgaria the Environment Protection Act has the following purposes for preservation of the natural habitat types representative of the Republic of Bulgaria and Europe and habitats of endangered, rare and endemic plant and animal species within a National Ecological Network; conservation of the protected plant and animal species of the flora and fauna of the Republic of Bulgaria, as well as of those as are subject to use and trade; conservation of the genetic resources and the diversity of plant and animal species outside the natural surroundings thereof; regulation of the introduction of non-native and the reintroduction of native plant and animal species into the wild; regulation of trade in specimens of endangered species of wild flora and fauna; conservation of centuries-old and remarkable trees.

A hatchery for the endangered species will contribute for the successful reproduction of the sturgeons under artificial conditions.

A key component is the correct timing for the release of the fishes in the river basin which hides the risks of refusal or inability of the fish to adapt to the unfamiliar habitat. A positive impact is anticipated for the increasing of the population that will improve the biodiversity in the region and the reproduction of the sturgeon species which will ensure the survival of the specimens.

For the awareness aspect of the biodiversity preservation of sturgeons that will be implemented in the region of Montana will be establishment of an educational center that will implement a training program including two practices for the safeguard of biodiversity and river species. The program's central purpose is in the scope of 'Protection of biodiversity', the students will obtain professional abilities to analyze possible threats and solutions. The educational center will present possibilities for the improvement and acclimatization of new information, skills and approach towards biodiversity conservation.

The above-listed practices for biodiversity protection of the threatened fish species will sustain the stabilization of the sturgeon population generating opportunities for the preservation of the threatened individuals. Moreover, it will raise awareness towards the endangered species and preparing professional in the field of biodiversity.

V. POSSIBILITIES FOR ESTABLISHING OF NATURAL SPAWNING

One of the most important processes in the life span for every specimen is the reproduction process, which is ensuring the successful continuation of the particular lifeline. Based on the fact that currently sturgeons are still experiences difficulties migration and blocked routes that are leading to their spawning areas. Even though they are measurements that being considered for the improvement and fixing of these particular issues it will take time, and time is something valuable and precious for the sturgeon population because there is a high demand for their fish eggs and meat although their reproduction is not on the same pace, creating a gap that is hard to fill, resulting to decreasing of the population.

There are few approaches for breeding and production of cultivated fish species that are depending on the reproduction biology and environmental conditions.

Those methods can be divided into three categories according of their specification- natural propagation, semi-natural propagation, and artificial propagation.

The natural reproduction of the fish species, which defines the practice of female and male splices arranged together in a breeding area, as an example a small pond or an enclosure where they have the opportunity and the surrounding to spawn with natural means. The current method is managed by a series of environmental circumstances that can depend on the needs of the fish species. It is of a key importance that it will be taken into consideration while creating a natural spawning, the natural environmental factors such as temperature, depth, wave exposure, water quality and velocity, vegetation composition, adjustments for the eggs habitat. It needs to regards not only the biology and traits of the species but also the substrate requirements and preferences of each specimen, including their spawning behavior which can be reflected in building nest or guarding their offspring's.

Most Danube sturgeon species spawn in the period from spring to early summer over a wide range of temperatures (6 to 25° C). Some races enter the river in spring and some in autumn or winter. Fish of the winter race spend the winter in the river, hibernating in holes or deeper river bends. They spawn far upstream the year after entering the river.

The spring races do not hibernate and only enter the river when temperatures are rising. The two forms of behavior do not represent different species, but different strategies for the pre-spawning migration. Observations on some populations show that sturgeons visit the same spawning sites every time when they enter the river for spawning. The “site fidelity” may derive from the fact that sturgeons survive in the river due to genetically imprinted early life stage survival strategy adapted to the location in a particular reach of the river.

The life cycle of Acipenseriformes is very long with puberty occurring late in life. Individuals spawn repeatedly, but most females do not spawn annually.

Sturgeons have also shown a tendency towards hybridization with other sturgeon species. This occurs, even more, when spawning habitats are lost and different species are confined to only a few suitable sites or when one species is rare compared to another species.

There is no information about the exact location of key sturgeon habitats within the Danube River basin.

A key component is the suitable spawning habitat for the reproduction of sturgeons. Spawning sites are often hard surfaces covered with clay, gravel, boulders, and featuring many crevices, where larvae find protection from predators or floods. The location of spawning sites varies according to the hydro-morphological characteristics of the different reaches of the river.

The water depth at spawning sites varies from a few meters to 26 m and the required current velocity is quite high, allowing for wide dispersal of fertilized eggs. Eggs are adhesive and after dispersing from spawning grounds, settle to the bottom, usually on coarse substrates in a much lower water velocity. They remain there until they develop into larvae and start feeding. Flow regime and water temperature are important factors in the development of early life stages of sturgeons.

Water level fluctuations, due to flow management by hydropower stations, can have negative effects on the spawning and reproduction success of adults.

The possible establishment of natural spawning will have a positive effect on the sturgeon population because when the process of natural hybridization reveals the depressed state of the sturgeon spawning based on the obstacles that sturgeons are facing during the spawning period and additionally the possibility that when they reach the spawning grounds they cannot find a partner of their own species and are forced to hybridize with other fish species individuals.

This can result in the further distortion of the endangered species. A natural spawning establishment will provide the sturgeon species with controlled environmental conditions and prepositions for the successful spawning process.

CONCLUSIONS

The Danube river basin is a host to a multifariousness of animal species and it has a great ecological system. The habitats that are along with the are along the river's length are home to a hundred different fish species as well as plants, animal species, mammals, breeding birds, dozen reptiles, and amphibians.

The Danube river has a remarkably essential mean for the animal population and with the current situation consisting of generated by man-made adjustments such as width, water depth plus flow velocity tailgated by the installation of barriers, weirs, and waterways, are tangible prepositions for imperiling and disruption of the variation of species habitats, and it is an obstacle for leading a normal life cycle and life span.

The initiated measurements will have a positive difference in the preservation of the sturgeons in the Danube river basin, but a fundamental element is that the cross-border regions are operating together for this meaningful purpose because the safety methods to strengthen and rescue their population should be accomplished by each side that is joined to the Danube river.

In this way guaranteeing collaboration between the cross- border countries will make the improvement extraordinary faster and more proactive, because the measurements and strategies will be followed by all stakeholders. In the past, many projects were implemented by cross-border cooperation under EU programs that focused on the preservation of natural biodiversity emphasizing the preservation of the endangered habitats and inhabitants.

Working towards the solutions of the causes, resulting in the decreasing population and the endangered factors, establishment of natural spawning grounds, and monitoring of the species, the sturgeon population will have a fair chance of reproducing, bringing their population number higher, and have a complete life cycle. Different approaches have been considered and executed for the restoration of their habitats and the implementation of the increasing conditions for a normal life span, ecological and natural terms of continuing the life of the endangered species.

As a conclusion sturgeons are an ancient species that are experiencing difficulties with the conduction of their normal life span, trying their best to get over the obstacles created by nature and human-made changes.

In 1997, they were placed under the species protection system of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). With the cooperation between the stakeholders, cross-border countries, governments, EU strategies, and measurements, and promoting awareness about the topic, the sturgeon population will make a progress toward stability considering their population number and their habitat environment, and improvement of the conduction of their life cycle.

The implementation of the strategies and measurements for the preservation of the sturgeon fishes is already in progress, which is resulting in an improvement of their situation, even though they are still facing difficulties as overexploitation, loss of migration routes and habitats, genetic changes.

Sturgeons are extremely valuable species that need to be protected because not only do they have high prices and quality that they offer, but also because they are an ancient specimen that originated over 200 million years ago. Years ago sturgeon fishing helped many families economically and provided them with income that they could invest in properties, education, improvement of lifestyle, etc.

Historically, the countries of the Caspian and Black seas and beyond have long relied on significant revenues from the sturgeon industry. Sturgeons specimen needs a lot of time to recover from environmental and human pressures and changes based on their long life-cycles, late maturity, and long intervals between spawning.

Sturgeons are considered valuable indicators of river health, as well as of the alteration of specific habitat types, the continuity of riverine and habitat ecology, and the changes in hydrology. In the past decade or so, a variety of organizations, programs, and strategies have highlighted the importance of environmental improvement for the sturgeon species, aiming the prevention of habitat loss, decrease of sturgeon population, restrain the illegal fishing and trading of sturgeons. The positive impact that is expected to be reached is to put the sturgeon out of the extinction,

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