WWF

REPORT

DCP

2016

SAVING STURGEONS

A global report on their status and suggested conservation strategy

together possible™

The report is a joint effort of the WWF network.

It was written by Ralf Reinartz (consultant) and Polina Slavcheva (WWF Danube-Carpathian Programme) and coordinated by Polina Slavcheva. Special thanks to Esther Blom (WWF-Netherlands), Judy Takats (WWF-US), Lin Cheng and Jinyu Lei (WWF-China), Alexander Moiseev (WWF-Russia), Vesselina Kavrakova, Stoyan Mihov and Ekaterina Voynova (WWF DCP-Bulgaria), Cristina Munteanu and George Caracas (WWF DCP-Romania) and Samantha Ampel for their contributions.

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WWF is one of the world's largest and most experienced independent conservation organisations, with over 5 million supporters and a global network active in more than 100 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

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The Danube Delta, an important sturgeon area.

FOREWORD FROM DEON NEL WWF INTERNATIONAL

WWF has a long and proud history of working to preserve species that are especially important for either their ecosystems or people.

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Sturgeons certainly belong in this category, alongside elephants and tigers. This impressive 250-million-year-old group of fish, a contemporary of the dinosaurs, has captured the imagination of kings, scientists and poets since ancient Persia and been an important source of livelihood for communities through recorded history.

The value of sturgeon products, and caviar in particular, has been rising since the Middle Ages – both commercially and culturally. Inevitably this has resulted in overfishing. In addition, over the past decades habitat loss and migration barriers due to dams have accelerated the steep decline.

Now up to 23 of the 27 sturgeon and paddlefish species are on the brink of extinction, mostly in the Ponto-Caspian region – the global hotspot of sturgeon biodiversity. Sadly the most dramatic global declines occurred only within the past three decades, with drops in catches of over 99 per cent indicating catastrophic population losses. Moreover, sturgeons' long life cycles and late maturity make it hard for the species to recover from the continued pressures of overexploitation, habitat loss and modification.

Now is the time, if ever, to take urgent actions to reverse this trend. Overexploitation can be addressed by leading the future transformation of markets, working to guarantee better law enforcement, and engaging with local fishing communities to make sure they understand the need for conservation and have alternative income sources during the time sturgeon stocks need to bounce back. We must also maintain and restore key habitats and migration routes, undertake conservation-oriented stocking in areas where needed and, last but not least, gain public support by communicating the extraordinary history and current status of sturgeons. A concerted, international conservation approach can help these archaic giants of the water remain a source of pride and livelihoods for centuries to come.

Deon Nel
Global Conservation Director
WWF International

PART I.
THE EXTRAORDINARY STURGEONS

On the white sand of the bottom
Lay the monster Mishe-Nahma,

Lay the sturgeon, King of Fishes;
Through his gills he breathed the water,
With his fins he fanned and winnowed,
With his tail he swept the sand-floor.

There he lay in all his armor;
On each side a shield to guard him,
Plates of bone upon his forehead,
Down his sides and back and shoulders
Plates of bone with spines projecting.

A fragment from “The Song of Hiawatha”,
an 1855 epic poem by Henry Wadsworth Longfellow
inspired by Native American legends

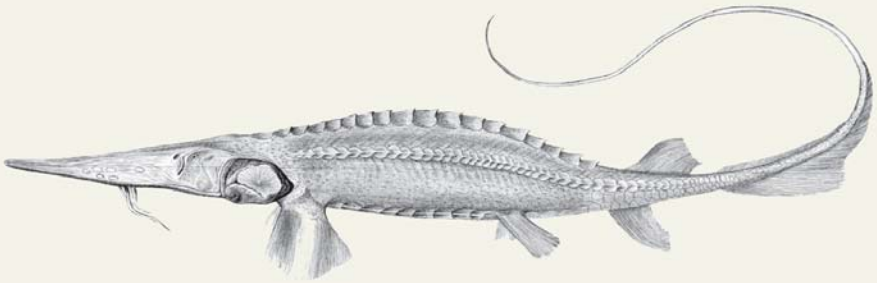
© PHYLLIS RACHLER

SOME EXTRAORDINARY FACTS AND FIGURES ON STURGEONS

Origin: Sturgeons and paddlefishes, also referred to scientifically as Acipenseriformes or acipenseriform species, are a group of ancient fish originating from the late Triassic period more than 200 million years ago, when dinosaurs still roamed the Earth. Their appearance has changed little since the breakup of the supercontinent Laurasia, their place of origin, which included most of the lands now making up the continents of the Northern Hemisphere. This is why scientists call them living fossils. Sturgeons do look like species coming from the dawn of time: they are covered with bony plates called scutes, which make them appear covered in armour. Victorians made jewellery out of these and set them in silver and gold.

200+ MLN

STURGEONS ORIGINATED MORE THAN 200 MILLION YEARS AGO AND ARE AMONG THE OLDEST AND LARGEST FISHES IN EXISTENCE



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100 YRS

STURGEONS CAN LIVE TO BE 100 YEARS OLD

Range: Nowadays, there are 25 sturgeons and 2 paddlefish species and they are confined to the Northern Hemisphere. Most of them are in the Ponto-Caspian Region, which is home to 11 of the sturgeon species; a third is in North America and the rest – in Western Europe and Asia.

Some of the world's largest and oldest freshwater fishes are in this group, with lengths of over eight metres, weight of over a metric ton and individual ages exceeding 100 years.

3,000 KM

STURGEONS CAN TRAVEL UP TO 3,000KM TO SPAWN

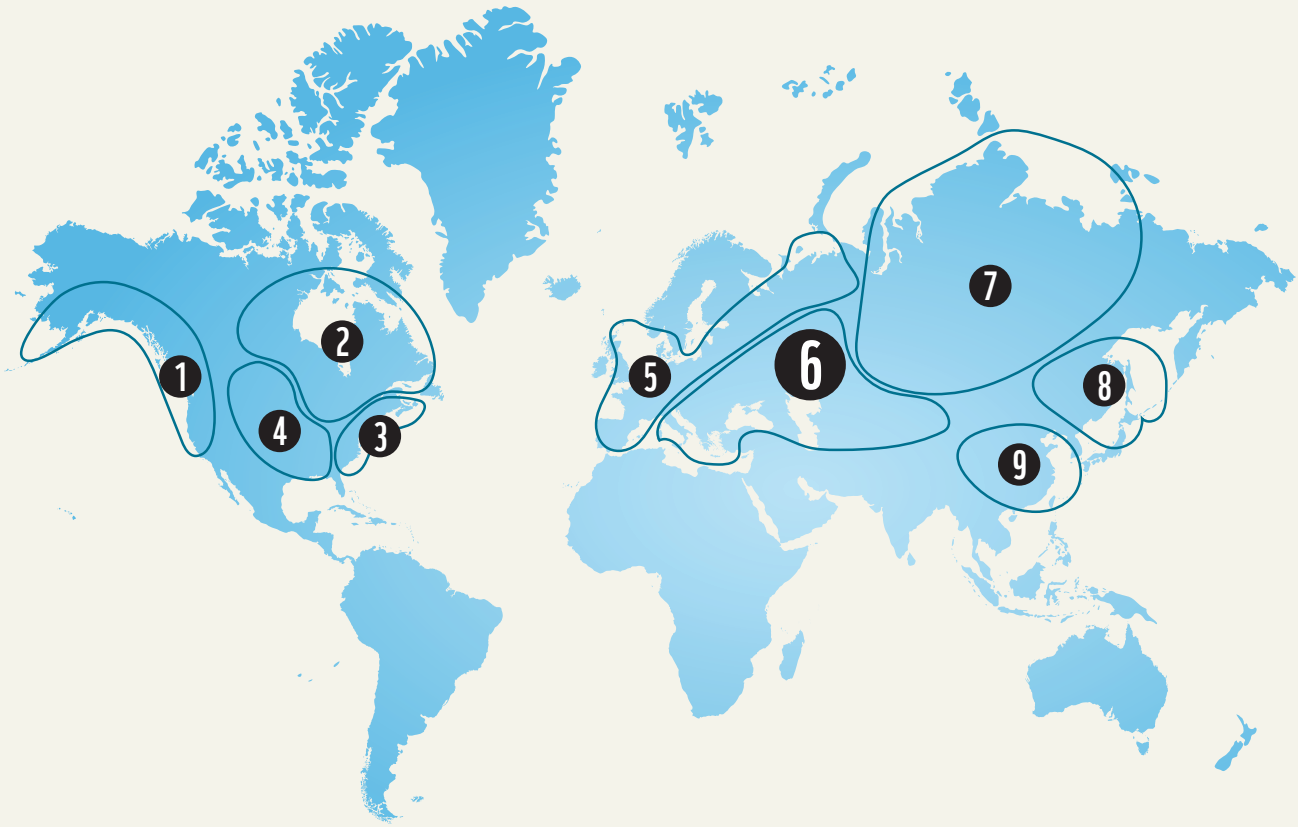
Habitat and life cycle: Sturgeons usually live in freshwater, coastal waters and inner seas. They migrate mostly in order to spawn and feed. Scientists still debate on the ancestral migration pattern of Acipenseriformes. Today's species and populations can be potamodromous (have a freshwater life cycle), anadromous (have a life cycle in both fresh- and saltwater, but spawn in freshwater), and display even more complex migration patterns.

Their salinity tolerance differs, but all sturgeons spawn in freshwater and migrate long distances between different habitats to feed, grow, spawn and overwinter. Sturgeon spawning migrations can be quite long and sometimes exceed 3,000 kilometers. Their time of spawning is highly variable. Some Acipenseriformes spawn in spring and others in fall.

1.5 T

STURGEONS CAN WEIGH UP TO 1.5 TONS

Feeding: Most sturgeons feed on benthic organisms found on the bottom of water bodies, like molluscs, invertebrates and small fishes, but there are also true predators among the sturgeons, as well as a specialized plankton feeder.



STURGEON RANGE[1]

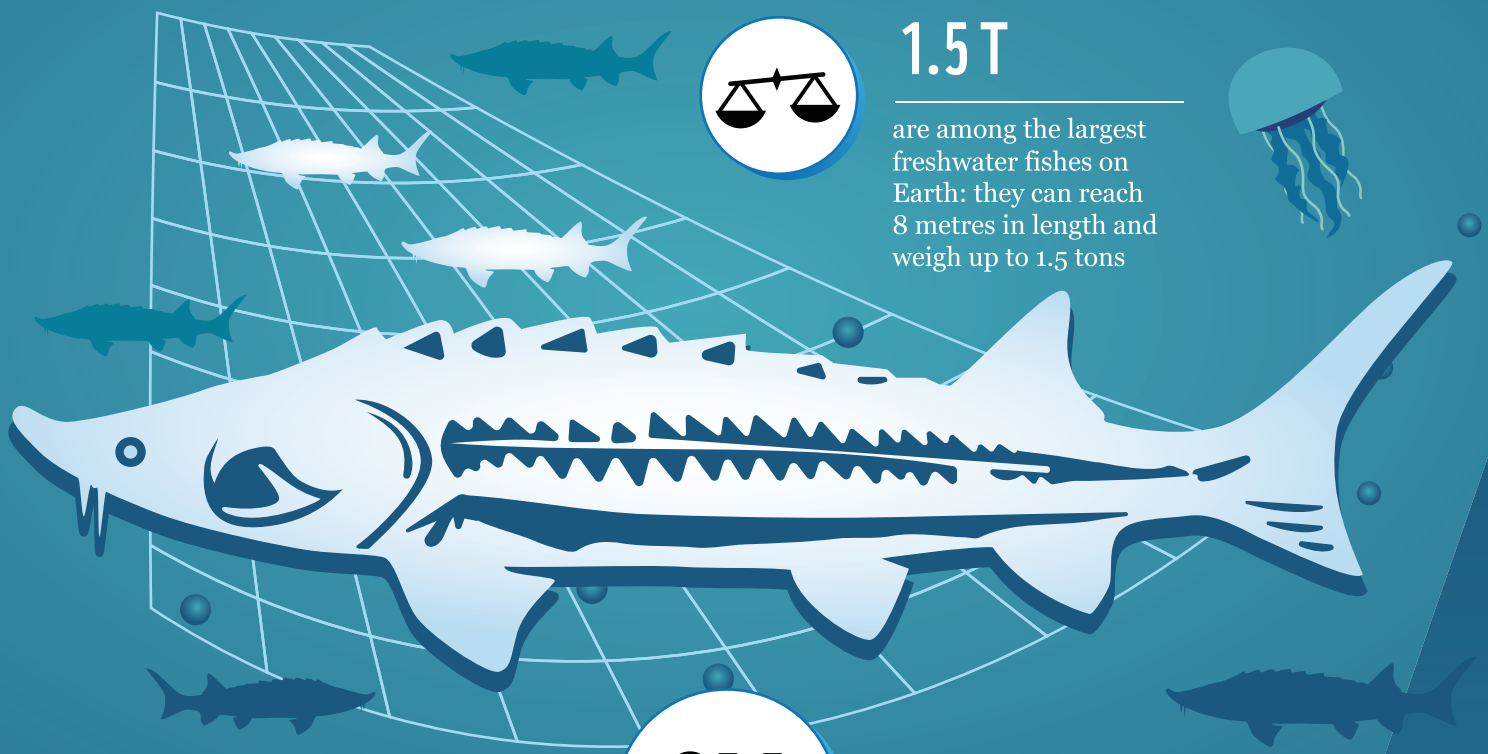
[1]According to Bemis, W.E. and Kynard, B. 1997.

1. THE NORTHEASTERN PACIFIC 2. THE GREAT LAKES, HUDSON BAY & ST. LAWRENCE RIVER 3. THE NORTHWESTERN ATLANTIC 4. THE MISSISSIPPI RIVER & THE GULF OF MEXICO 5. THE NORTHEASTERN ATLANTIC, INCLUDING THE WHITE, BALTIC AND NORTH SEAS 6. THE PONTO-CASPIAN REGION, INCLUDING THE MEDITERRANEAN, AEGEAN, BLACK, AZOV, CASPIAN & ARAL SEAS 7. SIBERIA & THE ARCTIC OCEAN 8. AMUR RIVER, THE SEA OF OKHOTSK & THE SEA OF JAPAN 9. CHINA

Ecological value: Sturgeons are flagship species in their rivers and adjacent seas. Their sensitivity to environmental pressures due to their slow growth and maturity makes them valuable indicators of healthy rivers, as well as of the alteration of specific habitat types, the continuity of riverine and habitat ecology, and the changes in hydrology.

A species on the brink: Although they survived the dinosaurs, today sturgeons are on the brink of extinction. The main reason is our increasing demand for caviar, their unfertilized roe that has become the epitome of luxury food, coupled with habitat loss and migration barriers caused by human activities.

STURGEONS:



1.5 T

are among the largest freshwater fishes on Earth: they can reach 8 metres in length and weigh up to 1.5 tons

8M

23 of 27

are the most critically endangered group of species on Earth. According to the IUCN, 23 of 27 species are on the brink of extinction

200 MLN

are among the oldest freshwater fish on the planet. They originated more than 200 million years ago when dinosaurs still roamed the Earth and have remained almost unchanged since then

sturgeon caviar is among the most expensive wildlife products

occur mostly in the Ponto-Caspian region; a third are in North America and the rest – in Western Europe and Asia

100 YRS

can live over 100 years and take up to 15 years to mature

are very sensitive to environmental and human pressures, which makes them good indicators of healthy ecosystems

3,000 KM

can migrate up to 3,000 kilometres to spawn

STURGEONS IN CULTURE AND HISTORY

Sturgeons have had a special place in culture and history as early as ancient Egypt, Greece and Rome.

Sturgeons have had a special place in history as early as ancient Egypt, Greece and Rome. They were depicted in Egyptian temples and on coins in 600 BC Carthage and have made frequent appearances on postage stamps and coats of arms as well ever since. Some accounts suggest they were so rare in ancient Athens that a bowl of sturgeon meat on the market sold for one hundred sheep and a bull. The Roman poet Ovid called sturgeons “the noble fish”, Aristotle spoke of their medicinal values and the use of their swimbladders in wine clearing, and Pliny the Elder mentioned their importance in his “Natural History”. There were marble plates of sturgeons at the Roman fish market and trumpets are said to have announced their arrival on the table during special feasts, like the banquet to celebrate Rome’s defeat of Carthage in the Punic Wars. In 15th century Arles in France, it was not trumpets, but tambourines that proclaimed the catching of the first male sturgeon for the season, which was paraded through the city to the arch-bishop’s house.

The Roman poet Ovid called sturgeons “the noble fish” and Aristotle praised their medicinal values.

Trumpets are said to have announced the arrival of sturgeons on the table at historical feasts.

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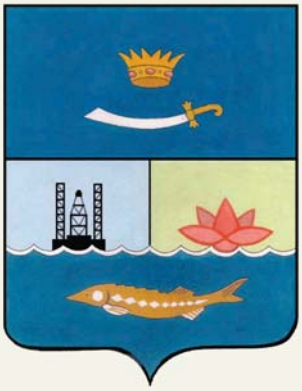
Sturgeon monument in Astrakhan, the centre of Russian caviar production since the 16th century



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Coat of Arms with sturgeon of Ikrianinsky Region, Astrakhan District

Sturgeons could have been the origin of some Loch Ness stories.

Just as in Ovid's time sturgeons were "the noble fish", they became known as "the royal fish" in 14th century England because King Edward II decreed that any sturgeon caught in the country should be handed over to him; the Danish and Spanish kings followed suit with the same request. In Scotland, sturgeons are also believed to have been the origin of some Loch Ness stories.

Historically, the word caviar was used to refer only to sturgeon roe, but caviar was not always a luxury food. This image is believed to have developed with the expansion of Ponto-Caspian markets that began in the Middle Ages.

Despite this long and colourful presence in human history, it was long before sturgeon caviar became the luxury item we know now. It was the conversion of Russia to Christianity in the 10th century and the gradual development of Russian fisheries that first fostered caviar consumption and then slowly rebranded it from a peasant's food to one coveted by aristocrats. During the long periods of fasting that could last for as many as 200 days a year, the Russian Orthodox Church advised replacing meat with caviar and kvass, a cider-like product of low alcohol content. It was much cheaper at the time to buy the sturgeon roe than the meat.

Today, a monastery in Kostroma on the Volga River still has frescos celebrating sturgeons. But it was not before the grandson of Genghis Khan, Batu Khan, conquered the fisheries of the Black and Caspian seas in the 13th century that the trade name "caviar" became known for granulated caviar, which is prepared today using essentially similar methods. With the expansion of the Black Sea and Caspian Sea markets over the centuries, caviar consumption grew in prestige – although in some areas in Europe peasants would feed it to their pigs until as late as the 1860s and American bars in the early 20th century would offer it as a free snack with your drink.

But once the Industrial Revolution made it possible to ship caviar long-distance without it turning sour on the way, there was nothing but wars that could temporarily limit the rising consumption of sturgeon products – and their prices.

Today, caviar from the most rare and top-quality beluga sturgeon can reach a retail price of €10,000 per kilogram. Prices skyrocketed with the depletion of the Caspian resources in the 1980s and continued to grow after the break-up of the Soviet Union, which used to provide some 90 per cent of all caviar traded internationally.

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Tajikistan postage stamp

GLOBAL STATUS TODAY

"This widespread evidence of decline alerts us to the fact that despite protective fishing regulations, sturgeons are still in trouble due to historic fishing, current illegal fishing and habitat degradation. This is alarming given their unique lineage and particular vulnerability."

Dr. Kent Carpenter, Global Marine Species Assessment Director at the International Union for the Conservation of Nature (IUCN)

99%

GLOBAL STURGEON CATCHES DROPPED BY OVER 99% IN THREE DECADES

© RALF GEMECKE

Sturgeon caviar is sometimes called black gold, but it can cost much more than gold.

23 OF 27

UP TO 23 OF THE 27 STURGEON SPECIES ARE ON THE BRINK OF EXTINCTION, MOSTLY IN THE PONTO-CASPIAN. THEY ARE THE MOST ENDANGERED GROUP OF SPECIES ON EARTH

4

FOUR STURGEON SPECIES ARE PERHAPS ALREADY EXTINCT

World sturgeon catch reached its peak in 1977 at 32,000 tons and was never matched again. A steep decline began soon afterwards. By 2007, catches in the Russian fishery – the main source of sturgeon products globally – had collapsed by over 99% to less than 150 tons. This is mostly due to overfishing, which is most drastic in the Caspian Sea, but also to the erection of dams.

To prevent a further decline of the species, in 1997 the whole Acipenseriformes order was placed under the species protection system of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Today, up to 23 of the 27 sturgeon and paddlefish species, or 85 per cent, are on the brink of extinction, mostly in the Ponto-Caspian region – the global hotspot of sturgeon biodiversity. The IUCN considers them more critically endangered than any other group of species: up to 17 species, or 63 per cent, are listed as Critically Endangered, the Red List's highest category of threat, and four species within this category are even Possibly Extinct. Up to six more are either Endangered or Vulnerable, adding up to 23 species threatened with extinction.

COMMERCIAL IMPORTANCE

Sturgeons have always had a significant commercial and social value. Communities in sturgeon range states like Azerbaijan, Bulgaria, Iran, Romania, Russia, Serbia, Ukraine and China, have thrived thanks to sturgeon fishing for centuries.

Along the Lower Danube, you can still meet people for whom catching a single sturgeon with roe helped turn their fortune, fund university education, or buy an apartment.

Countries of the Caspian and Black seas and beyond have thrived on sturgeon fishing for centuries.

The sturgeon industry has historically provided signifi cant revenues for countries of the Caspian and Black seas and beyond. From 1976 to 1991, for example, caviar exports generated an average annual income of some €21 million for Iran and €17 million for the Soviet Union.

Today, Iran and the Russian Federation continue to be the main caviar exporters and the EU, USA and Switzerland – the main importers. In 2011, caviar worth an estimated €28 million was imported into the EU.

28 MLN

IN 2011, CAVIAR WORTH €28 MILLION WAS IMPORTED INTO THE EU - AMONG THE MAIN CAVIAR IMPORTERS GLOBALLY

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Our increasing demand for sturgeon caviar, which has become an epitome of luxury food, is among the main reasons sturgeons are being driven to extinction.

© DANUBE MUSEUM OF FISHING AND BOAT BUILDING

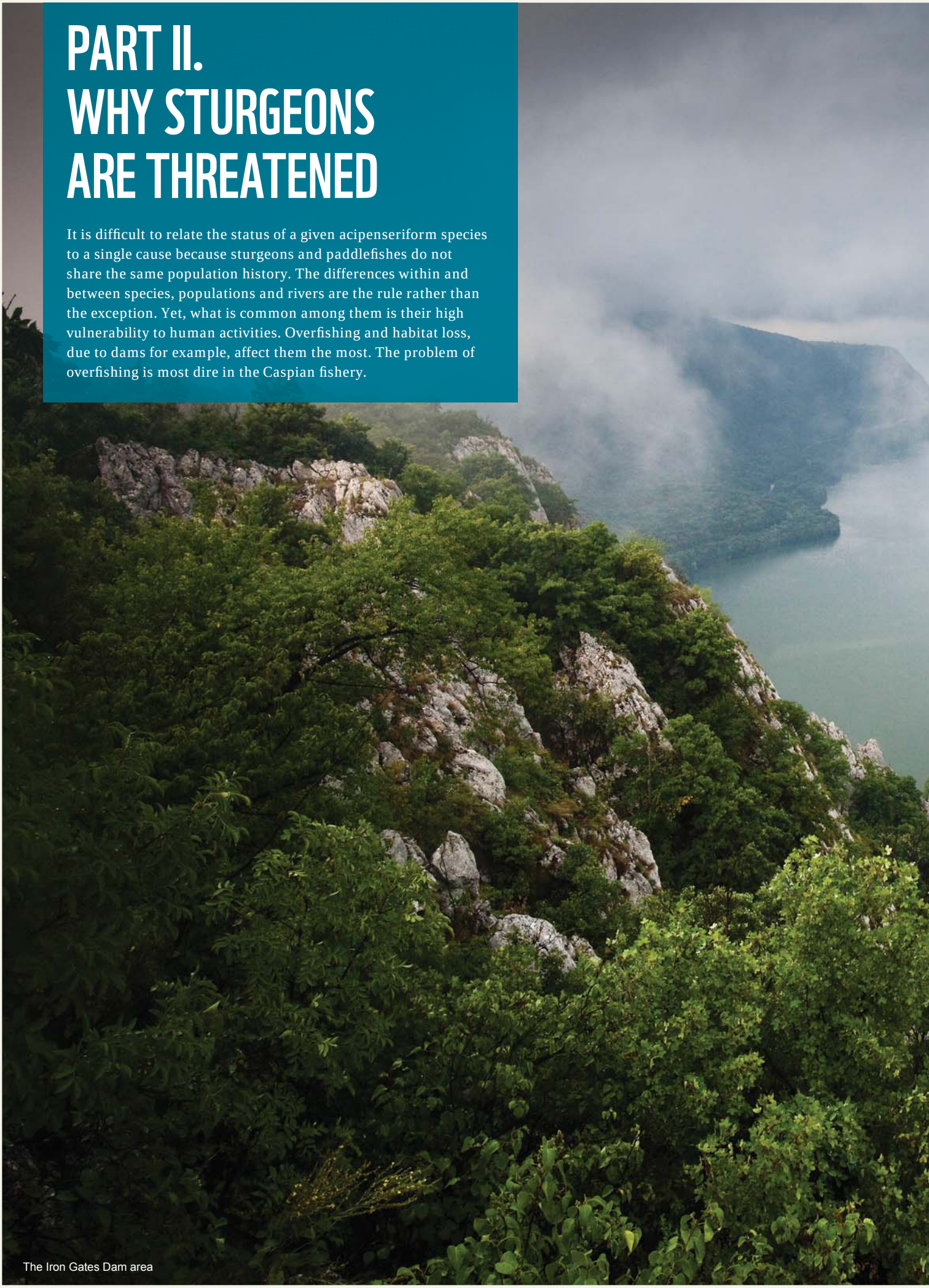
Communities in sturgeon range states have thrived thanks to sturgeon fishing for centuries, but today most sturgeon species are on the brink of extinction.

© DANUBE MUSEUM OF FISHING AND BOAT BUILDING

Along the Lower Danube, you can still meet people for whom catching a single sturgeon with roe helped turn their fortune.

PART II. WHY STURGEONS ARE THREATENED

It is difficult to relate the status of a given acipenseriform species to a single cause because sturgeons and paddlefishes do not share the same population history. The differences within and between species, populations and rivers are the rule rather than the exception. Yet, what is common among them is their high vulnerability to human activities. Overfishing and habitat loss, due to dams for example, affect them the most. The problem of overfishing is most dire in the Caspian fishery.



The Iron Gates Dam area

© RUBEN SMIT-WWF-WILD-WONDERS-OF-EUROPE

Because of their slow growth and late maturity, sturgeons take very long to recover from overexploitation.

OVEREXPLOITATION

- The females of many sturgeon species, as a source of valuable caviar, have long been extensively fished and poached. Males are also killed and checked for roe because male and female individuals look the same in most species
- Sturgeons' seasonal migrations are predictable, so they are easy to catch
- Fisheries often do not make a difference between the species of a different conservation status within the same water system
- Spawning populations are extremely sensitive to overexploitation and take very long to recover from it because the life cycle of Acipenseriformes is quite long and the fish mature late: females take 10 to 20 years and males – from 5 to 15. Populations also depend on individuals that do not spawn annually
- Spawning populations have a complex, multi-aged structure. There may be seven-year intervals between the two spawning migrations of one female and the depletion of cohorts, or group of fish born in the same year, has recurring, long-term impact on reproduction
- Because of the very high fishing pressure in rivers and adjacent seas, immature individuals are also caught, poached, or end up as bycatch in other fisheries

20YRS

FEMALE STURGEONS CAN TAKE UP TO 20 YEARS TO REACH REPRODUCTIVE AGE

7YRS

THERE MAY BE SEVEN-YEAR INTERVALS BETWEEN THE TWO SPAWNING MIGRATIONS OF ONE FEMALE

© RALF GEMECKE

Hook lines are illegal in most waters, but sometimes still used by sturgeon poachers.

Physical barriers like dams disrupt spawning migrations and confine sturgeons to remnants of their original area.

Water pollution and siltation can negatively impact spawning sites, the physiology and fertility of spawning fish, the development of embryos and the abundance of sturgeon food.

Navigation in rivers with high traffic is also a threat due to the impact of propellers.

LOSS OF MIGRATION ROUTES AND SUITABLE HABITAT

- Sturgeons and paddlefishes depend on the availability and accessibility of distinct life cycle habitats (e.g. spawning sites). This is why populations are most severely affected by habitat fragmentation, like the disruption of spawning migrations by damming, habitat modification and destruction.
- The species' annual spawning success depends on favourable flow regimes during the reproductive period. Periods of high flow are an important trigger of the spawning migrations of many Acipenseriformes. However, sustained high flows, for example through hydropower dam operation, can preclude or greatly reduce spawning success. This is why natural hydrological conditions are important for sturgeon populations, but these are often jeopardized by anthropogenic changes to flow regimes or water abstraction
- Water pollution and siltation can also negatively impact spawning sites, the physiology and fertility of spawning fish, the development of embryos and the abundance of benthic invertebrates that are food for most sturgeons
- Navigation itself becomes a considerable threat (especially for juveniles) in rivers with high traffic due to disturbance and the impact of propellers

"Sturgeons have survived dramatic changes over the past 250 million years only to face the serious threat of becoming extinct as a direct result of human activities. Illegal catches, overfishing, the breakup of migratory routes and pollution have driven almost all species to the brink of extinction. The latest Red List assessment shows an increasingly alarming status of the natural populations."

Dr. Mohammad Pourkazemi, Chair of the IUCN Species Survival Commission Sturgeon Specialist Group

Introducing exotic species and genotypes, even the same species from a different catchment area, can negatively impact natural populations.

GENETIC FACTORS

- All sturgeons can hybridize with other sturgeon species and forms. Therefore, the introduction of exotic species and genotypes (even the same species from a different catchment area) can negatively impact the natural population (outbreeding depression)
- For populations that are already diminished, suffer from overexploitation and/or loss of migration routes and habitat, their reduced numbers become a threat in themselves. The population can perish due to genetic bottlenecks (sharp drops in numbers), the Allee effect (the reduced probability that the late maturing fish will find reproductive partners), or by catastrophic incidents like fish die-offs or the introduction of a contagion into the system.

STURGEON THREATS

OVEREXPLOITATION

Sturgeons are often caught and traded illegally due to the high price and rarity of caviar

Immature individuals are also caught or end up as bycatch in other fisheries

Since males and females look similar in most sturgeon species, both are caught for caviar

Predictable, seasonal migrations make sturgeons easy to catch

Fisheries often do not distinguish between the species of different conservation status within one water system

The depletion of cohorts, or group of fish born in the same year, impacts reproduction long-term

It is hard for sturgeons to recover from overfishing because of their long life cycles, late maturity and big intervals between spawning migrations (up to seven years)

LOSS OF MIGRATION
ROUTES AND HABITAT

Navigation in rivers with high traffic is also a threat due to the impact of propellers

Physical barriers like dams disrupt spawning migrations and confine sturgeons to remnants of their original distribution area

Human changes to water flow regimes or water abstraction also affect spawning. Periods of high flow trigger the spawning migration of many species, but sustained high flow can preclude or greatly reduce spawning success. Therefore, natural hydrological conditions are important

Sturgeons are also sensitive to habitat changes like channelization, river straightening and dike building. Altered habitats can immediately impact their spawning, wintering and feeding success

Water pollution and siltation can negatively impact spawning sites, the physiology and fertility of spawners, the development of embryos and the abundance of sturgeon food

GENETIC CHANGES

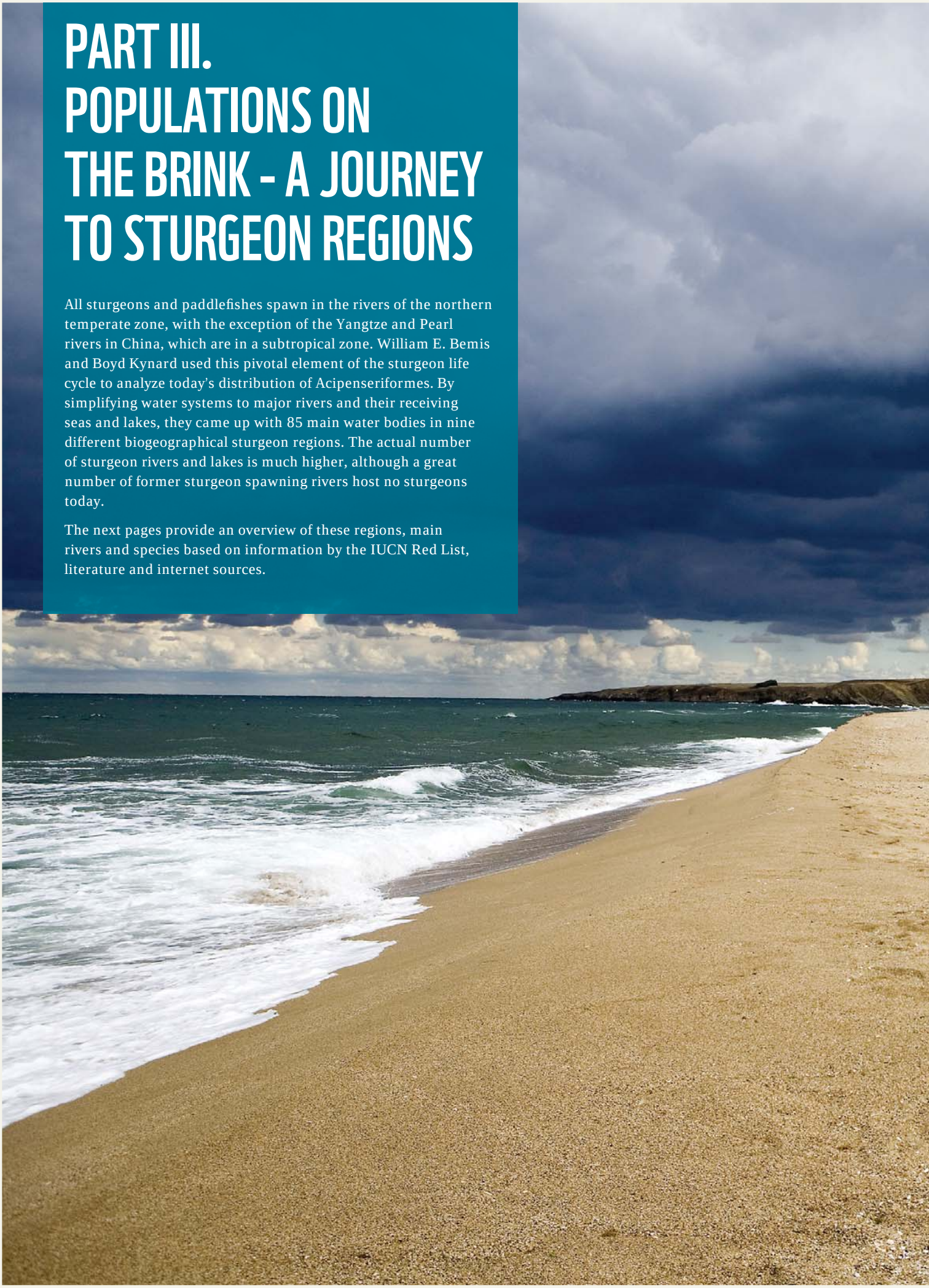
Introducing exotic species and genotypes from other watersheds can greatly reduce reproductive success

Inbreeding, genetic bottlenecks, and the reduced probability that the late maturing fish will find reproductive partners (Allee effect), can also reduce natural reproduction

PART III. POPULATIONS ON THE BRINK - A JOURNEY TO STURGEON REGIONS

All sturgeons and paddlefishes spawn in the rivers of the northern temperate zone, with the exception of the Yangtze and Pearl rivers in China, which are in a subtropical zone. William E. Bemis and Boyd Kynard used this pivotal element of the sturgeon life cycle to analyze today's distribution of Acipenseriformes. By simplifying water systems to major rivers and their receiving seas and lakes, they came up with 85 main water bodies in nine different biogeographical sturgeon regions. The actual number of sturgeon rivers and lakes is much higher, although a great number of former sturgeon spawning rivers host no sturgeons today.

The next pages provide an overview of these regions, main rivers and species based on information by the IUCN Red List, literature and internet sources.



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The Black Sea

EXTINCTION & THE IUCN RED LIST CATEGORIES

A species is extinct when there is no reasonable doubt that the last individual has died.

A species is categorized as “extinct in the wild” if it is known only to survive in cultivation, in captivity, or as a naturalized population outside the past range. Sometimes the term “functionally extinct” is used, meaning that some individuals remain in the wild but these are either too old or too dispersed to revitalize the species. The IUCN Red List classifications determine the relative risk of extinction based on a series of rigorous criteria. Classifications can be made for a species’ entire population, as well as for subspecies and geographical subpopulations.

The classifications include:

- **Critically endangered:** Extremely high risk of extinction in the wild
- **Endangered:** Very high risk of extinction in the wild
- **Vulnerable:** High risk of endangerment in the wild
- **Near threatened:** Likely to become threatened in the near future, unless threats are addressed

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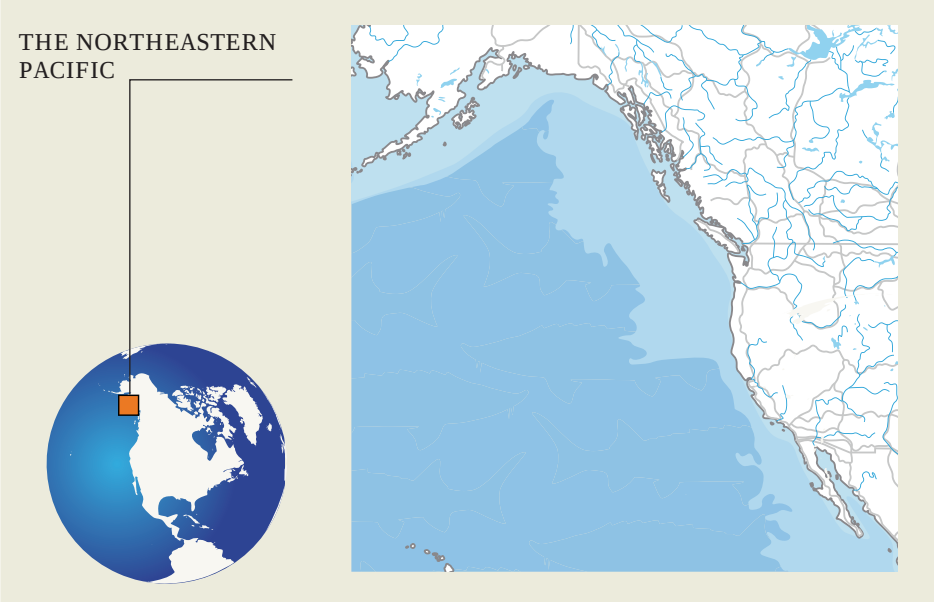
Fraser River

THE NORTHEASTERN PACIFIC

This region includes the North American Pacific Coast, including the Gulf of Alaska and the major river systems of the Fraser, Columbia, Rogue, Klamath and Sacramento rivers.

Sturgeon species: Two sturgeon species occur in this region: North America's largest freshwater fish, the white sturgeon (*Acipenser transmontanus*), and the green sturgeon (*Acipenser medirostris*).



The white sturgeon (*Acipenser transmontanus*)

Physique and life cycle: This species can reach up to 6.7m in length, weigh more than 800kg and live more than 80 years. Their populations are both potamodromous (freshwater) and anadromous (living in the sea and migrating in freshwater to spawn).

Status: The conservation status of the North American West Coast population is considered of Least Concern, but some subpopulations are of conservation concern:

1. A recent analysis using a population dynamics model for the Nechako River subpopulation has indicated a more than 50 per cent probability of extinction in the wild within the next 20-30 years if the current decline rates continue. This subpopulation is Critically Endangered.
2. The subpopulation from the upper Columbia River is showing major signs of recruitment, or recruitment failure. It is assessed as Critically Endangered.
3. The Kootenai River subpopulation has been in general decline since the mid-1960's and the remaining wild subpopulation is comprised primarily of adult sturgeons older than 2 years, with very little recruitment observed in the wild since the mid-1970's. It is currently assessed as Endangered.
4. The Upper Fraser River subpopulation has a restricted range and is estimated to have no more than 250 mature adults remaining. This subpopulation is Endangered.
5. The Fraser regional subpopulation has declined substantially since the 1980s and is assessed as Vulnerable.

IUCN Red List status: Least Concern

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White sturgeon

The green sturgeon (Acipenser medirostris)

Physique and life cycle: This species can attain a length of up to 2.9m, weigh more than 160kg and reach an age of 75 years. This species is anadromous and spends most of its life in near-shore marine and estuarine waters from Mexico to Southeast Alaska.

Status: The species is considered Near Threatened. Although the estimated population size is above the thresholds for any of the threat categories, it is not large (34,000 to 166,000 adults and sub-adults), and the total number of mature individuals is unknown. The estimated number of spawning females in the Klamath River, for instance, is only 760 to 1,500 per year. Four out of seven (57 per cent) of known spawning locations have been lost within the last three generations.

Threats: The green sturgeon is not subject to overfishing and habitat fragmentation as other sturgeon species. However, given the species' characteristics and limited number of spawning sites, it is considered likely that it would quickly become threatened if current conservation efforts are withdrawn.

IUCN Red List status: Near Threatened.

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Green sturgeon

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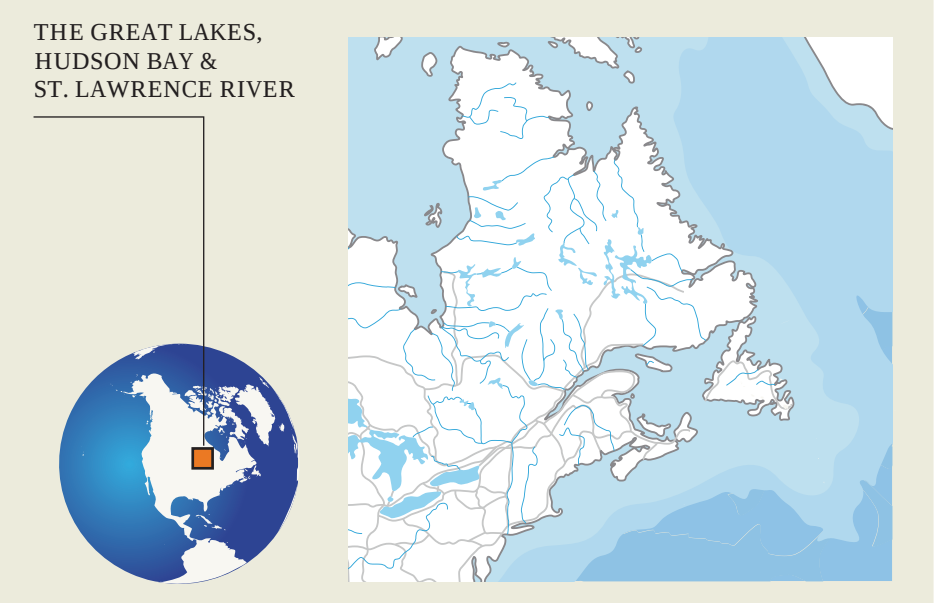
Columbia River

THE GREAT LAKES, HUDSON BAY & ST. LAWRENCE RIVER

This region lies in the northern part of the North American continent. It includes the Hudson Bay, the Gulf of St. Lawrence, the Great Lakes (Superior, Huron, Michigan, Erie and Ontario), the Hamilton Inlet, Lake Winnebago and the connected major river systems of the rivers Churchill, Nelson, Albany, Moose, Rupert, Fox, Menominee, St. Lawrence, Ottawa and St. Maurice.

Sturgeon species: Two sturgeon species naturally occur in this region: the lake sturgeon (*Acipenser fulvescens*) and the Atlantic sturgeon (*Acipenser o. oxyrinchus*).



The lake sturgeon (*Acipenser fulvescens*)

Physique and life cycle: The lake sturgeon can reach up to 2.4m in length, weigh up to 140kg and live as long as 95 years. It is a potamodromous species.

Status: The largest part of the global population of lake sturgeons occurs in this area. Numerous management and recovery plans are in place among and between the states and provinces that share the boundary waters. Most sturgeon threats in the area are understood and essential conservation measures are being implemented. Well-regulated sport fisheries occur throughout the northern part of the range and Canada manages modest commercial fisheries in the Ontario and Quebec provinces. The populations of lake sturgeon are being monitored and assessed and most appear to be increasing. Based on all of the above information and IUCN definitions, the species is currently not threatened and is categorized as Least Concern.

IUCN Red List status: Least concern.

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Lake sturgeon

The Atlantic sturgeon (*Acipenser o. oxyrinchus*)

Physique and life cycle: This subspecies can reach 4.3m in length, 370kg in weight and live to be 60 years. It is an anadromous species.

Status and threats: The Atlantic sturgeon occurs in three biogeographical regions. Atlantic sturgeon populations in this region are currently lower than their historic levels, but reproductive populations still exist. Throughout the 20th century, the Atlantic sturgeon's breeding habitats have been adversely impacted by dams, siltation, channel maintenance (dredging) and water pollution. Although there are still habitat and water quality concerns in several locations, the vast majority of formerly occupied habitats remain available to this species. Management measures for the species are in place, so the current population is increasing. Still, the species is assessed as Near Threatened because of the levels of past population declines, as well as uncertainties about the overall stock health and the time needed for population recovery.

IUCN Red List status: Near Threatened.

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Atlantic sturgeon

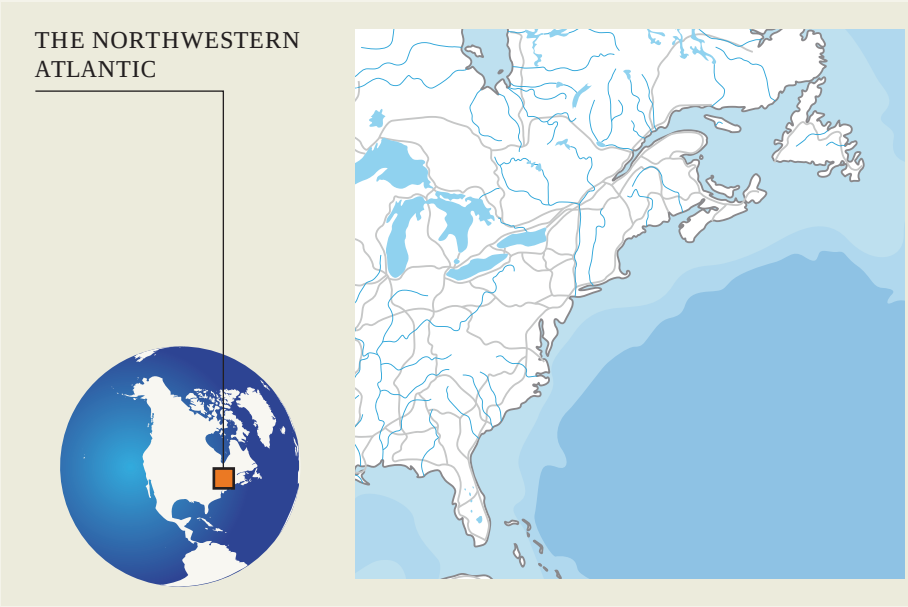
Hudson bay near mouth of Churchill River

© KEAN MOYNIHAN / WWF-CANADA

THE NORTHWESTERN ATLANTIC

This region includes the North American East Coast and the rivers St. John, Kennebec, Androscoggin, Merrimack, Connecticut, Hudson and Delaware, as well as the Chesapeake bay system (including the Potomac and Susquehanna rivers). The rivers Santee, Savannah, Altamaha and St. John are the main ones flowing into this part of the Atlantic Ocean.

Sturgeon species: The region is home to 2 sturgeon species, the Atlantic Sturgeon (*Acipenser o. oxyrinchus*) and the shortnose sturgeon (*Acipenser brevirostrum*).



The Atlantic sturgeon (*Acipenser o. oxyrinchus*)

Status: Reproductive populations still exist in at least 14 Atlantic Coast rivers in the United States (from the state of Maine to the state of Georgia) and several other rivers in Canada, like St. Lawrence and St. John. The Atlantic sturgeon is listed as Near Threatened because of the levels of past population declines, as well as uncertainties about the overall stock health and the time needed for population recovery.

The Atlantic sturgeon occurs in three biogeographical regions. For more information, see the entry on the Atlantic sturgeon on pages 29 and 43).

IUCN Red List status: Near Threatened.

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Atlantic sturgeon

The shortnose sturgeon (*Acipenser brevirostrum*)

Physique and life cycle: This species can grow up to 1.4m in length and 45kg in weight and live up to 67 years. It is considered to be amphidromous: it regularly migrates into estuarine/marine areas for feeding and growing and spawns in freshwater.

Status: The shortnose sturgeon is considered Vulnerable. This is because its population decreased by an estimated 30 per cent over the past three generations and there are some irreversible losses to its habitat, as well as continued concern about the impact of pollution and water-based development on the population.

The species is sympatric in U.S. and Canadian Atlantic coastal rivers and estuaries with the larger Atlantic sturgeon (A. o. oxyrhinchus), i.e., it occurs in the same geographical area. Historically, the two species were harvested commercially for their meat and caviar, but no species differentiation was recorded in the data on catches. Today, there are no legal fisheries for this species.

Threats: The principal threats to the survival of shortnose sturgeons are habitat loss and degradation. Direct mortality is caused by the impact and injury on cooling water intake screens, dredging, and the incidental capture in other fisheries.

IUCN Red List status: Vulnerable.

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Shortnose sturgeon

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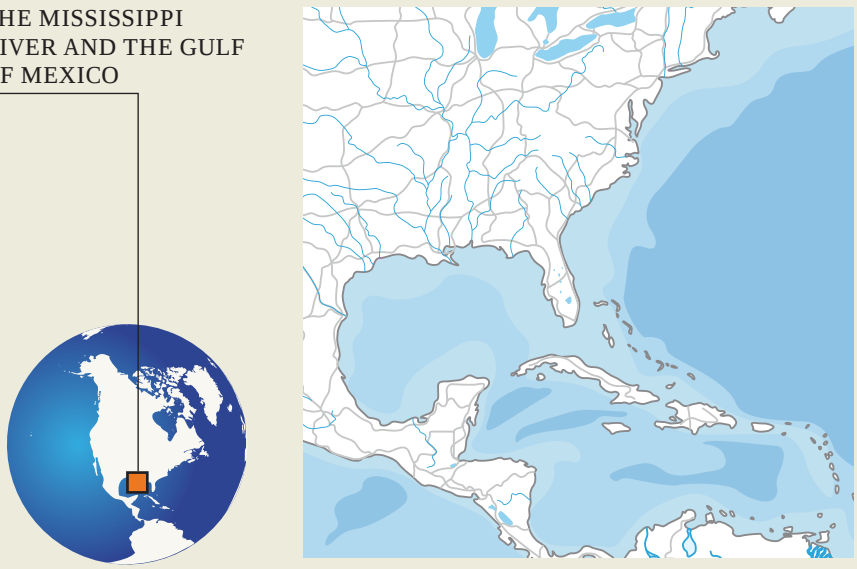
Delaware River

THE MISSISSIPPI RIVER AND THE GULF OF MEXICO

This region includes the Gulf of Mexico and the major river systems of the Suwanee, Apalachicola, Alabama and Mississippi rivers, including the Missouri, Ohio, and Tennessee rivers.

Sturgeon species: Six species of sturgeons are native to this region: the lake sturgeon (*Acipenser fulvescens*), the Gulf sturgeon (*Acipenser oxyrinchus desotoi*), the paddlefish (*Polyodon spathula*), the pallid sturgeon (*Scaphirhynchus albus*), the shovelnose sturgeon (*Scaphirhynchus platorynchus*) and the Alabama sturgeon (*Scaphirhynchus suttkusi*).



The lake sturgeon (*Acipenser fulvescens*)

Unlike the lake sturgeon population in the Great Lakes biogeographical region to the north (see p. 28), the subpopulation of the Mississippi and Missouri river basins is considered Vulnerable. The reason is the lack of concerted basin-wide or interstate plans to manage or restore the populations. The sturgeon stocks are believed to be stable, but relatively small compared to their levels in the late 1800s, prior to development of modern locks, dams and reservoirs. Although extensive migrations have been reported, the stocks are fragmented and the spawning habitats are disrupted by anthropogenic development and adverse water quality. Except for a few, well-regulated and short-duration sport fisheries in select tributaries, catching lake sturgeons in this biogeographical region is banned, but some illegal harvest has been reported. The causes for the decline of this subpopulation are known and, for the most part, irreversible due to the extent of habitat degradation. Restocking efforts using cultured fish are modest and fragmented, but the results of Missouri Department of Conservation restockings are encouraging.

IUCN Red List status: Vulnerable.

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Lake sturgeon

The Gulf sturgeon (*Acipenser oxyrinchus desotoi*)

Physique and life cycle: This is a subspecies of the Atlantic sturgeon and may reach 2.4m in length and 100kg in weight and live to become 40 years old. It is an anadromous sturgeon.

Status and threats: Gulf sturgeons are listed as Vulnerable due to extensive harvesting in the past. Today, catching Gulf sturgeons is illegal. The subspecies continue to be threatened by habitat disturbances, like dam construction, dredging, dredge spoil disposal, groundwater extraction, irrigation, other surface water withdrawals, and flow alterations. Contaminants, primarily from industrial sources, also contribute adversely to individual fish health and population declines.

IUCN Red List status: Vulnerable.

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Gulf sturgeon

© MICHEL GÜNTHER / WWF-CANON

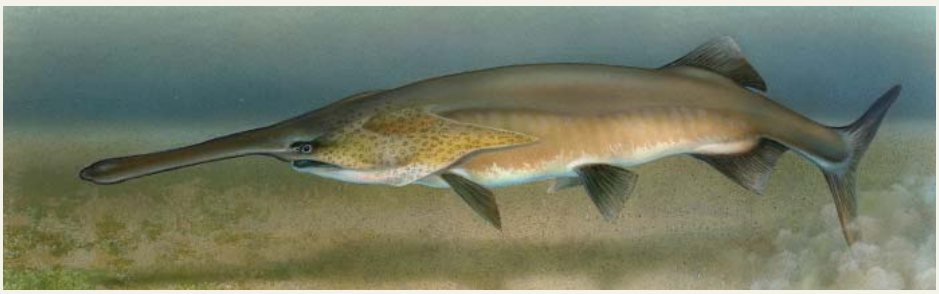
Gulf of Mexico

The paddlefish (*Polyodon spathula*)

Physique, life cycle and feeding: This acipenseriform species species thrives in freshwater only and grows up to 2.3m in length and 90kg in weight. It can live up to 55 years. This fish feeds on zooplankton, which it filtrates out of the water.

Status: It is believed that an overall population reduction of at least 30 per cent may occur within the next 10 years or three generations due to actual or potential levels of exploitation and the effects of introduced taxa, pollutants, competitors or parasites. Although paddlefish are widespread and several subpopulations could be considered relatively abundant, the Vulnerable classification is recommended to recognize that, range-wide, paddlefish still may face potential population declines due to expected increased legal and illegal harvesting for caviar production, as well as competition for food and habitat with the exotic Asian carp whose populations are increasing. The paddlefish is extinct in Canada.

IUCN Red List status: Vulnerable.



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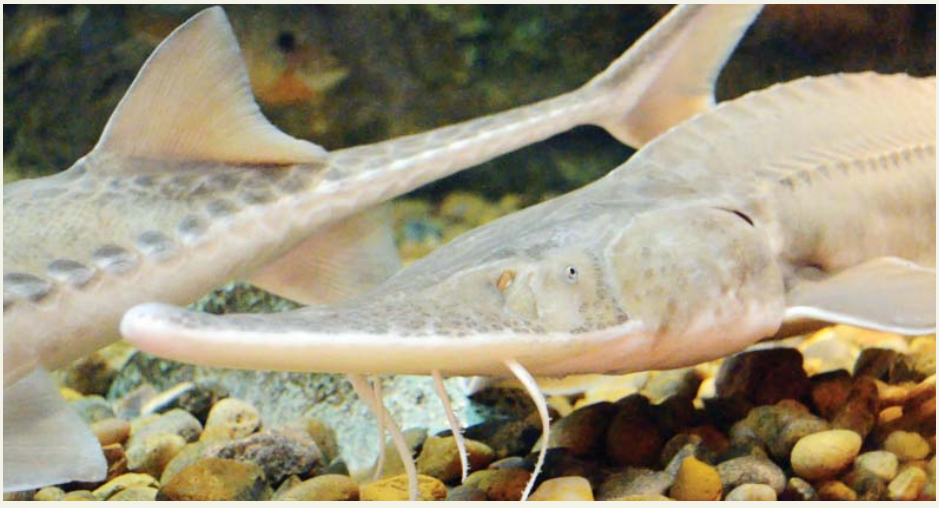
Paddlefish

The pallid sturgeon (*Scaphirhynchus albus*)

Physique and life cycle: This is a potamodromous species and can reach 1.8m in length and 45kg in weight and live to be 50 years old.

Status and threats: Pallid sturgeons are considered Endangered, as it was estimated that as few as 6,000 to 21,000 individuals may now exist in the entire range of the species. Habitat modification, including the construction of six main stem dams on the Missouri River, as well as the extensive channelization of the lower Missouri and Mississippi rivers, is the primary threat to the survival of this species. There is a very high risk of its extinction in the wild.

IUCN Red List status: Endangered.



© KATIE STEIGER-MEISTER / US FISH AND WILDLIFE SERVICE

Pallid sturgeon

The Alabama sturgeon (*Scaphirhynchus suttkusi*)

Physique and life cycle: This species is the smallest sturgeon in this region. It can reach 0.8m in length and 4kg in weight and live up to 20 years. It is potamodromous.

Status and threats: Alabama sturgeons are listed as Critically Endangered. Their historic range once included 1,600km of the Mobile river system in Alabama and Mississippi. However, it is believed that Alabama sturgeons now occupy only some 216km of the Lower Alabama River. The decline of the species is believed to be caused by overfishing, the loss and fragmentation of habitat due to navigation, and the degradation of water quality.

IUCN Red List status: Critically Endangered.

© PATRICK O'NEIL / GEOLOGICAL SURVEY OF ALABAMA

Alabama sturgeon

The shovelnose sturgeon (*Scaphirhynchus platorynchus*)

Physique and life cycle: This potamodromous species can reach a length of up to 1m, weigh up to 7kg and live up to 40 years. It occurs throughout much of the Mississippi and Missouri rivers, as well as portions of their largest tributaries.

Status: The shovelnose sturgeon is listed as Vulnerable. This classification is given because its range was reduced by approximately 30 per cent, primarily as a result of past dam construction that is realistically not reversible. In addition, within the next 10 years or three generations (whichever is longer), the population size may drop by 30 per cent or more due to actual or potential levels of exploitation.

Threats: Dams, navigation and water resource development projects have blocked spawning migrations, isolated populations, destroyed rearing and spawning habitats and altered food supply. They have also changed flow, turbidity and temperature regimes. While shovelnose sturgeon roe is used as caviar, over-harvesting has not yet caused major detriment to the species.

IUCN Red List status: Vulnerable.

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Shovelnose sturgeon

WWF'S WORK IN THE REGION

WWF-US

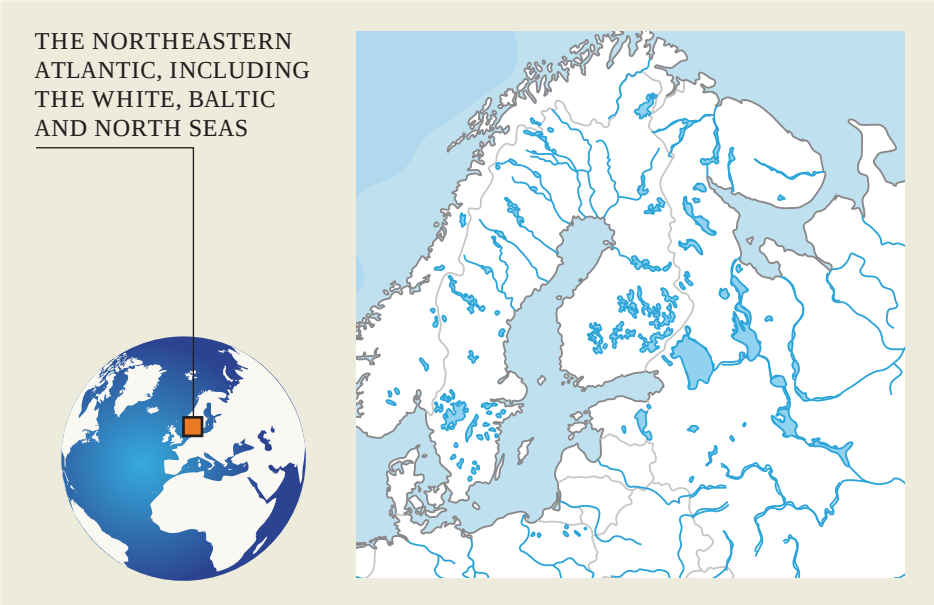
Though the United States office is not presently engaged in sturgeon protection, they worked on the issue in the 1990s. Seeing an opportunity to protect the iconic lake sturgeon, WWF along with other nonprofits and various stakeholders, including most of the region's aquatic resource agencies (The U. S. Fish & Wildlife Agency, The Tennessee Wildlife Resources Agency, the Tennessee Valley Authority, The U. S. Geological Survey, The Tennessee Aquarium Research Institute, The University of Tennessee, The Tennessee Technological University, Conservation Fisheries, Inc. and The Tennessee Clean Water Network) formally established the Tennessee Lake Sturgeon Reintroduction Working Group in 1995. That same year, a draft Recovery Plan for the lake sturgeon was developed with input from all partners. Recovery Plans must be written for all animals on the endangered species list and are guiding, not regulatory documents. Their goal is to reverse the decline of species and decrease the threats to their survival. Various NGOs were involved in spreading the message and bringing people together. Biologists raised the fish and brought them to the relocation site. With much local backing and heavy attendance at the event, the sturgeons were successfully reintroduced in the Tennessee river basin and in the Cumberland River. Though WWF-US is no longer focusing on sturgeons in these regions, awareness of the issue has been spread to the general population. This has paved the way for sturgeon work to advance through other companies and platforms. WWF's work also paved the way for the Alabama sturgeon (*Scaphirhynchus suttkusi*),which is listed on the Southeastern Fishes Council list of the Desperate Dozen – the 12 species of fish most likely to become extinct in the Southeastern United States. The report can be downloaded here: http://www.sefishescouncil.org/SFCDesDoz.php.

© JUDY A. TAKATS / WWF-US

THE NORTHEASTERN ATLANTIC

This region covers large areas of Europe and includes the White Sea, the Severnaya-Dvina River, the Baltic Sea, the Neva, Nara, Luga, Wista, and Oder rivers, the North Sea, the Elbe and Rhine rivers, the Bay of Biscay, the Gironde Estuary (including the Garrone and Dorgonne rivers), the Douro, Guadiana and Guadalquivir rivers as main sturgeon water bodies.

Sturgeon species: Today, two species are thought to occur naturally in this region: the European Atlantic sturgeon (*Acipenser sturio*) and the Atlantic sturgeon (*Acipenser o. oxyrinchus*). The natural occurrence of a third species, the sterlet (*Acipenser ruthenus*), is discussed controversially within the scientific community.



The European Atlantic sturgeon (*Acipenser sturio*)

Physique and life cycle: This species is anadromous. It can grow up to 5.6m in length and 600kg in weight and reach an age of 60 years.

Did you know? Archeological remains suggest that this species came from the North Sea and colonized the Baltic Sea about 3,000 years ago, but vanished again about 800 years ago. Climatic changes about 100 years ago (the Little Ice Age that lasted from the early 14th century through the mid- 19th century) might have had an indirect impact on it because it favoured hybridization with Acipenser oxyrinchus.

Status and threats: Once a very wide-ranging species occurring in areas from the North and Northeast Atlantic to the Mediterranean and the Black Sea, its last remaining population in the Garonne River in France keeps declining. Due mostly to habitat loss, pollution and exploitation, populations have dropped by more than a 90 per cent in the past 75 years and continue to be subject to bycatch. The European Atlantic sturgeon now remains in just one location with 27 potentially accessible spawning grounds.

The species last spawned in 1994 in the Garonne River, where dams, pollution and river regulation have degraded and destroyed its spawning sites. There are also plans to start gravel extraction. The current population size is between 20-750 wild, mature individuals. In the past three years, there has been substantial stocking, but these individuals will not reproduce until about 2016. Under normal population circumstances, the average reproductive age is suspected to be about 25 years.

There are currently efforts to reintroduce the species to the Rhine and Elbe rivers in the Netherlands and Germany, based on broodstock from the Gironde river system.

IUCN Red List status: Critically Endangered.

© GEORGIEN JUNGIUS / WWF-CANON

European Atlantic sturgeon

The sterlet (*Acipenser ruthenus*)

Did you know? According to some authors, this species is native to rivers in the Baltic and White Sea catchment, but this is the subject of a scientific debate and the IUCN lists sterlets as native to the Ponto-Caspian and Siberian regions only. (See pages 38 and 57 for more information on sterlets in those regions.)

© LUBOMIR HLASEK

Sterlet

The Atlantic sturgeon (*Acipenser o. oxyrinchus*)

Origin and range: Genetic, morphological and archaeological evidence proved this North American sturgeon species colonized the Baltic Sea and possibly other areas within this biogeographic region in the Middle Ages, thus replacing the native European Atlantic sturgeon (Acipenser sturio) before recently becoming extinct in Europe as a result of human activities. These findings had important implications for reintroduction projects in the Baltic waters. Currently, reintroduction with this species using broodstock from North American rivers and controlled propagation is taking place in the Baltic Sea and Oder river system in Germany and Poland. (For more information on the Atlantic sturgeon in the Great Lakes, Hudson Bay & St. Lawrence River region and in the Northwestern Atlantic, see pages 29 and 33.)

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Atlantic sturgeon

WWF'S WORK IN THE REGION

WWF-Netherlands

WWF-Netherlands began their sturgeon work in 2000 when they realized that reintroducing Atlantic sturgeons in the Rhine was feasible. Since then, they have worked closely with ARK Natuurontwikkeling, the Dutch Anglers Association, as well as the Scientific Institute of the French Government where Atlantic sturgeons are now being bred. The species had become extinct in the Netherlands years earlier. In 2012 and 2015, WWF-Netherlands released about 91 Atlantic sturgeons into the Rhine. Another release is planned soon. Thanks to monitoring systems, the movement and location of the sturgeons is tracked, which allows the office to gather information on sturgeon migration patterns and the dangers they face.

The office eventually plans to develop its own rearing programme. In the meantime, it will focus on local releases, researching the current threats to the species, gaining funding from the local government and increasing public support for protecting Atlantic sturgeons. The office has so far been very successful in attracting a lot of media attention and involving local celebrities.

THE PONTO-CASPIAN REGION – THE GLOBAL HOTSPOT OF STURGEON BIODIVERSITY

This biogeographical region is the global hotspot of sturgeon biodiversity. The area comprises the Mediterranean, Adriatic, Caspian, Black, Azov and Aral seas and some of the major lakes and rivers of Europe and Asia: the rivers Po, Danube, Dnestr, Dniepr, Don, Kuban, Rioni, Volga, Ural, Gorgan, Qezel Owzan, Kura, Terek, Syr Darya and Amu Darya, and Lake Balkash.

Sturgeon species: Eleven species of sturgeons occur here: the Danube or Russian Sturgeon (*Acipenser gueldenstaedtii*), the Adriatic sturgeon (*Acipenser naccarii*), the ship sturgeon (*Acipenser nudiventris*), the Persian sturgeon (*Acipenser persicus*), the sterlet (*Acipenser ruthenus*), the stellate sturgeon (*Acipenser stellatus*), the European Atlantic Sturgeon (*Acipenser sturio*), the beluga sturgeon (*Huso huso*), the Syr Darya shovelnose sturgeon (*Pseudoscaphirhynchus fedtschenkoi*), the little Amu Darya shovelnose sturgeon (*Pseudoscaphirhynchus hermanni*) and the Big Amu Darya shovelnose sturgeon (*Pseudoscaphirhynchus kaufmanni*).

THE PONTO-CASPIAN, INCLUDING THE MEDITERRANEAN, AEGEAN, BLACK, AZOV, CASPIAN & ARAL SEAS

The Danube or Russian sturgeon (*Acipenser gueldenstaedtii*)

Physique and life cycle: This species is mainly anadromous, but potamodromous populations have also been documented. It can reach 2.4m in length, weight up to 110kg and live to be 50 years.

Status and threats: It is estimated that the species' wild native population has undergone a massive population decline of over 90 per cent in the past three generations. It is now very rare throughout its range in the Black and Caspian sea basins, where almost all of the species' spawning sites have been lost due to dam construction, except in the Lower Danube where some spawning may still exist. The last natural populations still migrate up the Danube and perhaps the Rioni (they were last recorded in the Rioni in 1999), where the sturgeons are heavily overfished and poached. The Caspian populations are also under massive pressure from overfishing and loss of spawning habitats. The Ural and Volga rivers still have wild spawning individuals. But almost all migrating females are poached below the Volgograd dam on the Volga and in the estuary of the Ural River.

The decline is predicted to continue, as illegal fishing at sea and in the rivers for caviar will soon result in the extinction of the remaining natural wild population. In the immediate future, survival can only depend on conservation stocking.

IUCN Red List status: Critically Endangered.

© NATUREPL.COM-FREI-ARCO / WWF

Danube or Russian sturgeon

The Adriatic sturgeon (*Acipenser naccarii*)

Physique and life-cycle: This anadromous species can reach 2m in length and 150kg in weight and live up to 50 years.

Status and threats: The wild population is most likely extinct as the species almost totally depends on conservation stocking and there is no evidence of natural spawning (the last one probably occurred in the early 1980s in the Po River). Some wild individuals may still exist. The estimated population decline was greater than 80 per cent (possibly 100 per cent) in the past three generations (60 years) and was caused by both legal and illegal overharvesting, the loss of access to spawning grounds by dams, and pollution. The remaining potential suitable spawning grounds are restricted to very few areas in the Po River. Without continuous restocking, the survival of this species is doubtful.

IUCN Red List status: Critically Endangered (Possibly Extinct).

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Adriatic sturgeon

The ship sturgeon (*Acipenser nudiventris*)

Physique and life cycle: Both anadromous and potamodromous populations have been documented for this species in the Black, Caspian and Aral seas and their rivers. It can grow to 2.2m in length, weigh up to 120 kg and reach an age of 36 years.

Status: The ship sturgeon is believed to be on the verge of global extinction. It is suspected that it has undergone a population decline of more than 90 per cent in the past three generations, which is expected to continue. It has already disappeared from the Azov Sea and the Aral Sea after the latter's salinity levels rose sharply, and it is nearly extinct in the Black and Caspian sea basins where it is listed as Critically Endangered. Some populations may remain in the Ural, Rioni and Safid Rud rivers.

In the Danube, it is also considered possibly extinct. The largest population is in Lake Balkash, which is outside the species' natural range (it was introduced for commercial reasons from the Aral Sea in 1933-1934).

IUCN Red List status: Critically Endangered.

© CHINESE ACADEMY OF FISHERY SCIENCES

Ship sturgeon

The Persian sturgeon (*Acipenser persicus*)

Physique: The Persian sturgeon can reach a length of 2.5m, weigh up to 100kg and live to be 50 years.

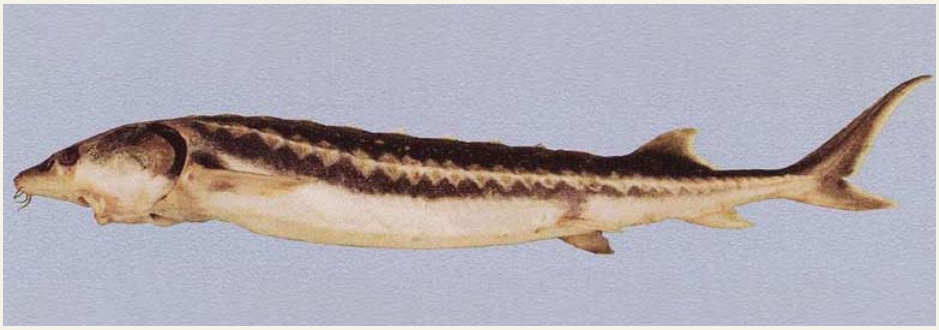
Did you know? This species was once considered a subspecies of the Danube or Russian sturgeon (A. gueldenstaedtii). Immunological, biological, reproduction studies and morphological differences have led to its acceptance as a separate species. However, no molecular markers in mitochondrial DNA were found to differentiate between these two species until now.

Status and threats: The species is listed as Critically Endangered. In its past distribution, the Persian sturgeon ascended all rivers around the Caspian Sea. It currently only ascends the lower courses of Iranian rivers, the Volga and the Ural, and individuals may enter the Terek and Kura rivers. It is difficult to distinguish between wild and stocked individuals due to long-term reintroduction of the species. However, it is suspected that the native wild population has declined by over 80 per cent in the past three generations, as all wild populations have almost disappeared. Overfishing at sea for caviar will soon cause the extinction of natural populations.

IUCN Red List status: Critically Endangered.

© HARTMUT JUNGIUS / WWF-CANON

The Caspian Sea



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Persian sturgeon

The sterlet (*Acipenser ruthenus*)

Physique and life cycle: This is a potamodromous species that can grow to 1.2m in length and 16kg in weight and live up to 27 years.

Status and range: Sterlets are listed as Vulnerable. Most of them reside in the Ural, Volga and Danube rivers where populations stabilized recently after a previous big decline. Overall, however, many sterlet populations need immediate conservation action because in recent years they have been undergoing dramatic population declines. It is impossible to identify its exact rate, but we can say that some populations, like those in the Don, Kuban and Dniestr rivers, have dropped by an estimated >80 per cent, while other stocks have seen smaller reductions. For example, the population in the upper Volga River is possibly stable, but this might be thanks to intensive stocking. Sterlets are also reintroduced in large numbers into the Danube River and in Russia, but it is unclear if they reproduce in the wild.

IUCN Red List status: Vulnerable.

© KONSTANTIN IVANOV

Sterlet

The stellate sturgeon (*Acipenser stellatus*)

Physique and life cycle: This anadromous species can reach 2.9m in length and 80kg in weight and live to be 35 years old.

Status, range and threats: The stellate is listed as Critically Endangered. Its range is the Caspian, Black and Aegean Seas, but it is now extinct from the Aegean. In the Black Sea basin, the last natural population migrates up the Danube where it is heavily overfished. Very few females remain in the rest of this basin. The Caspian populations are also under massive pressure from overfishing (including poaching) and loss of spawning sites, so the stocks are declining very quickly. Once the Ural River was called Stellate River, but today both the Ural and the Volga rivers have only rare wild spawning individuals. Below the Volgograd Dam in the Volga and in the estuary of the Ural, almost all migrating females are poached.

Overfishing will soon cause the extinction of natural stellate populations. In the immediate future, their survival can only depend on restocking, effective fisheries management and combating illegal fishing. It is estimated that the species has undergone a population decline of at least 80 per cent (possibly close to 100 per cent) in the past three generations, which is expected to continue.

IUCN Red List status: Critically Endangered.

© LUBOMIR HLASEK

Stellate sturgeon

The European Atlantic Sturgeon (*Acipenser sturio*)

Status and range: This species was present in two biogeographical regions (see page 41 on the Northeastern Atlantic) and once also known in the northern Mediterranean west of Rhodos, as well as in the western and southern Black Sea, where it is now most probably extinct. The last record from the Rioni River in Georgia was in 1991, although further surveys have failed to find the species. It is currently confined to the Gironde River in France.

IUCN Red List status: Critically Endangered.

© GEORGIEN-JUNGIUS / WWF / CANON

European Atlantic sturgeon

The beluga sturgeon (*Huso huso*)

Physique and life cycle: The beluga or great sturgeon is the largest freshwater fish in the world. It could formerly reach a length of up to 8m, weigh up to 1.4 tons and live over 100 years. It is an anadromous species.

Feeding and range: Belugas are true predators that feed on a variety of fish and other aquatic vertebrates. Their original range includes the basins of the Caspian, Black, Azov and Adriatic seas.

Status and threats: Belugas are listed as Critically Endangered and considered Extinct in the Adriatic. They disappeared from the Adriatic and Azov seas in the early 1970s due to overfishing and the loss of spawning sites after dam construction. Because the species is very long-lived, separate individuals can still be caught in some areas where their spawning sites have been cut off.

In the Black Sea basin, the last extant wild beluga population migrates up the Danube River to spawn. All other Black Sea stocks are almost extirpated due to overfishing and habitat loss. In the Caspian basin, the last wild population migrates up the River Ural. The Volga population depends on restocking, as the construction of the Volgograd dam has led to the loss of almost all of the species' spawning sites in the river.

It is estimated that belugas have seen a wild native population decline of over 90 per cent in the past three generations (a minimum of 60 years) and that overfishing for meat and caviar will soon cause the global extinction of the remaining natural wild populations. In the immediate future, their survival can only depend on restocking, the effective management of fisheries and combating illegal fishing. Range states should also protect the spawning and feeding grounds of belugas.

IUCN Red List status: Critically Endangered. (Extinct in the Adriatic.)

© JUTTA JAHRL

Beluga sturgeon

© ANTON VORAUER / WWF / CANON

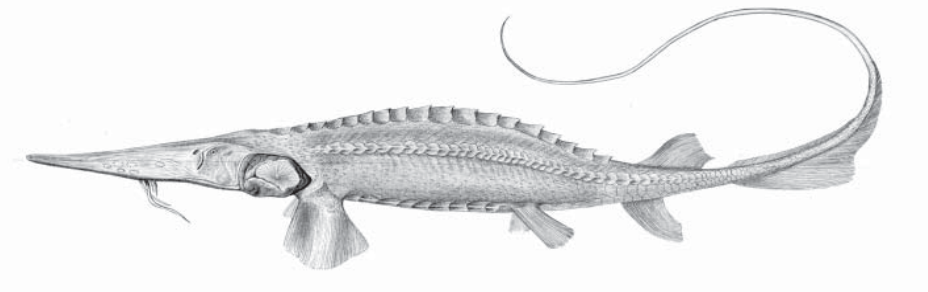
The Danube

The Syr Darya shovelnose sturgeon (*Pseudoscaphirhynchus fedtschenkoi*)

Physique and life cycle: This is a potamodromous species that can reach 0.7 m in length and 1kg in weight and live to be 10 years old.

Status and range: The Syr Darya shovelnose sturgeon is endemic to the Syr Darya River and can be found in the middle and lower reaches of its tributary, the Kara Darya River. It is listed as Critically Endangered (Possibly Extinct), as this species has not been recorded since the 1960s. A joint Russia–Kazakhstan research expedition in 2013 tried to find the fish in the tributaries and ameliorative channels of the Syr Darya, but failed.

IUCN Red List status: Critically Endangered. (Possibly Extinct.)



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Syr Darya shovelnose sturgeon

The little Amu Darya shovelnose sturgeon (*Pseudoscaphirhynchus hermanni*)

Physique and life cycle: This is a comparatively small potamodromous species that can reach 0.3m in length and 0.1kg in weight and a maximum age of seven years.

Status, range and threats: The species is listed as Critically Endangered. These sturgeons are only found in the middle reaches of the Amu Darya River. They are extinct from the Aral Sea and the Lower Amu Darya due to water abstraction. Water pollution and poaching is also a threat to the species. The location of its spawning grounds is uncertain.

Overall, there is very little information on this species, but based on the status of the big Amu Darya shovelnose sturgeon (P. kaufmanni), which shares its range and has similar biology and susceptibility, it is suspected that little Amu Darya shovelnose sturgeons have seen population declines of more than 80 per cent in the past three generations. The species is thought to occur within less than 500km of the Amu Darya River and there are unconfirmed reports of fishermen (poachers) still catching it. There is a critical need to survey the species in the Amu Darya in both Uzbekistan and Turkmenistan because more information is needed.

IUCN Red List status: Critically Endangered.

© CHERNYAK ALEXEY / WWF- RUSSIA

Little Amu Darya shovelnose sturgeon

The big Amu Darya shovelnose sturgeon (*Pseudoscaphirhynchus kaufmanni*)

This is also a potamodromous species reaching a maximum of 0.8m in length and 2kg in weight and up to 14 years in age.

Status, range and threats: The species used to be abundant in the 1970s, but is now listed as Critically Endangered. It is endemic to the middle reaches of the Amu Darya River. Presently, there are two populations: one in the Vakhsh River (a tributary of the Amu Darya) and one in the middle reaches of the Amu Darya. Big Amu Darya shovelnose sturgeons are now extinct from the Aral Sea and the Lower Amu Darya due to water abstraction. Water pollution and poaching are also a threat to the species. There are no estimates of current population sizes, but it is suspected they have seen declines of over 80 per cent in the past three generations (30 years). There has also been a drastic decline in the range of the species in the past 30 years. It is thought to occur in less than 500 km of river. There is a critical need to survey the species in both Uzbekistan and Turkmenistan, as more information is needed.

IUCN Red List status: Critically Endangered.

© CHERNYAK ALEXEY / WWF / RUSSIA

Big Amu Darya shovelnose sturgeon

WWF'S WORK IN THE REGION

WWF-Russia

The TRAFFIC-Europe programme started their sturgeon work in Russia with WWF in 1996. In 1999, their efforts to raise awareness of the rampant sturgeon poaching and illicit trafficking in Russia and the countries of the Commonwealth of Independent States (CIS) led to a ban on commercial beluga fishing in Russia in 2000. In 2005, a ban on the commercial fishing of all sturgeon species in the Caspian Sea was introduced following WWF's continued work. WWF-Russia supported the ban by a campaign in 2005-2007, which aimed to make black caviar consumption unacceptable. Many people still remember this campaign and believe all black caviar sold in Russia is illegal.

After this initial success, WWF and TRAFFIC thought their work was done. However, the ban did not have the effect they had hoped for and sturgeon populations continued to decline due to poaching.

This is why in 2013 WWF-Russia started working with retailers, consumers, restaurants and catering offices to foster responsible domestic sturgeon trade. The office also supported the development of sturgeon aquaculture. Aquaculture helped triple the amount of legal caviar production in the area in the last four years and even started to compete with poachers.

WWF-Russia also supported the establishment of the Union of Sturgeon Producers and now has a common position with it on the issues of traceability and responsible sturgeon trade. As a result, in December 2014 the government started designing a national traceability system for both the internal and external traceability of sturgeon products. The office also closely collaborates with the Sturgeon Expert Society, the Fishery Research Institutes, the Eurasian Regional Association of Zoos and Aquariums and the Ecology Journalist Union.

Currently, there are 11 sturgeon species in Russia: nine of them are critically endangered and one is endangered. To improve their status, WWF-Russia is working to reduce poaching, ensure habitat conservation and free river flow. However, given the current lack of resources, they predict one species and two sturgeon populations will be extinct within the next five years – the Sakhalin sturgeon, the stellate of the Sea of Azov and the Caspian beluga.

An update of the sturgeon populations' status in the Russian Red Book is now under way and is giving rise to heated discussions. Given the actual condition of sturgeons, many populations must be listed as Critically Endangered. However, due to the shortcomings of present legal regulations, listing them would mean losing the chance to protect and restock them. This is why WWF-Russia is now advocating for the development of national sturgeon conservation strategies and action plans for each sturgeon species, beginning with those listed in the national Red Book.

WWF-Russia is also supporting the restocking of sturgeons in the Amu Darya and Tumnin rivers and the fight against poaching along the Caspian Sea coast and continues to use any opportunity to bring attention to the status of sturgeons among institutions, fishermen, aquaculture farms and the general public.

WWF Danube-Carpathian Programme

Of the six Danube sturgeon species, one is considered extinct, one is suspected to have met this fate, and three are critically endangered. This is why in 2012, the WWF Danube-Carpathian Programme invited a group of sturgeon experts, NGO delegates, representatives of the International Commission for the Protection of the Danube River, the EU Strategy for the Danube Region and national authorities to a meeting that resulted in the establishment of the Danube Sturgeon Task Force (DSTF). The DSTF coordinates and fosters the conservation of native sturgeon species in the Danube River Basin and the adjacent Black Sea by implementing the Sturgeon Action Plan adopted under the Bern Convention and the Programme “Sturgeon 2020”.

In Bulgaria, sturgeons were fished until WWF-Bulgaria’s involvement in the issue five years ago. Today, although the government understands the need for protection, this is not yet a priority and resources are insufficient. Legislation is outdated. Against this backdrop, WWF-Bulgaria aims to create a model for sturgeon protection and ensure that the key stakeholders will embrace it long-term and lead the process themselves.

The specialized training of enforcement institutions, as well as of fishermen on alternative income WWF-Bulgaria and WWF-Romania did were steps toward this goal. Building these relationships was challenging at first because institutions in Bulgaria and fishermen in both countries were not open to collaboration. Now institutions look for our training manuals, while fishermen better understand their role in conservation and are willing to explore other sources of livelihood. The two offices are also collaborating with eight aquaculture farms to secure sustainable and traceable sturgeon aquaculture.

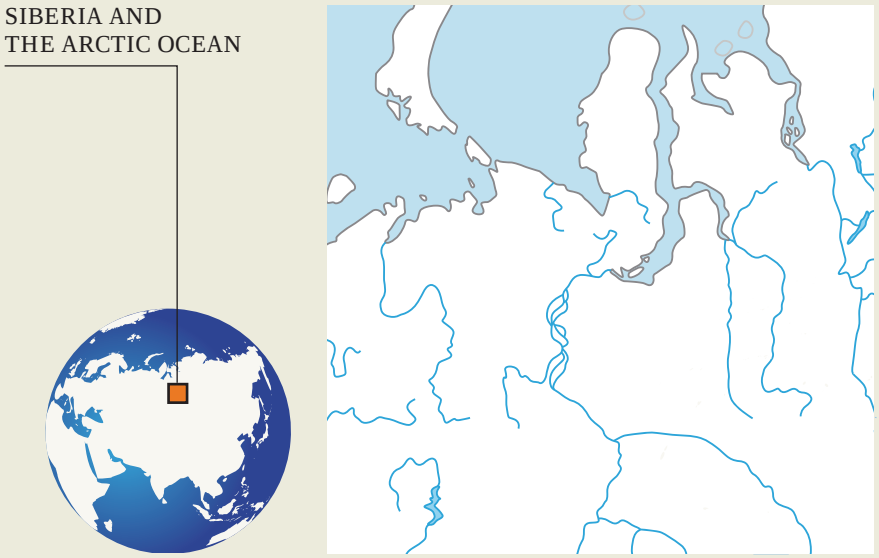
WWF-Bulgaria also successfully created and demonstrated methodologies for field research and conservation stocking with genetically pure Danube species. Some 50,000 sterlets were released in 2015, to lots of media attention. Before WWF-Bulgaria initiated field work in 2013, research on sturgeon migration paths and spawning areas had been sporadic and the scientific data on the species – scanty and scattered. Research has been carried out each year since, despite financial hardship, in cooperation with scientists and experts form the Museum of Natural History, Sofia University, the Institute of Biodiversity and Ecosystem Research, nature parks and local fishermen.

The biggest successes in the region, however, were the cancellation of a navigation project in Romania that would have proved detrimental to sturgeons, as well as the continuation of the five-year full sturgeon fishing bans in Bulgaria and Romania through 2020.

SIBERIA AND THE ARCTIC OCEAN

This region includes the Kara Sea, the Ob, Irtysh and Yenisei rivers, Lake Baikal, the Laptev Sea, The Khatanga and Lena rivers, the East Siberian Sea, and the Yana, Indigirka and Kolyma rivers as major sturgeon waterbodies.

Sturgeon species: Two sturgeon species occur naturally in these waters: the Siberian sturgeon (*Acipenser baerii*) and the sterlet (*Acipenser ruthenus*).



The Siberian sturgeon (*Acipenser baerii*)

Physique and life cycle: There are anadromous and potamodromous populations of this species, which can grow to 2m in length and 200kg in weight and live up to 60 years.

Status and threats: Siberian sturgeons are listed as Endangered. They have undergone a sharp decline in both stock and recruitment. Stock declines began in the 1930s, when demand was significantly high, and continue to this day. The total global population decline is estimated to have reached 50-80 per cent over the past 60 years.

Since the beginning of the 1990s, these declines have mainly been caused by overfishing and dam construction (for hydropower). Poaching is also a reason, as it affects the abundance mainly of the spawning stock.

In all populations, especially those in the Ob and Kolyma rivers, abnormalities have been observed in the development and functioning of females' reproductive system, including sterility, which has been caused by water pollution from mining. The abnormalities affected 80-100 per cent of the females. The natural reproduction of the Ob River population has also decreased significantly due to damming.

IUCN Red List status: Endangered.

© LUBOMIR HLASEK

Siberian sturgeon

The sterlet (*Acipenser ruthenus*)

Physique and range: Sterlets can grow up to 1.2m in length and 16kg in weight and reach an age of 27 years and is potamodromous.

Did you know? This species occurs in at least two different biogeographic regions. Whether it occurs naturally in the Northeastern Atlantic is still a matter of scientific debate. (See p. 42 and p. 48 above for more information on the species in the Northeastern Atlantic and Ponto-Caspian regions.)

Status: Sterlets are listed as Vulnerable throughout their range. Local populations still survive in most parts of its Siberian range (from the Ob River eastward to the Yenisei drainages). Globally, however, wild sterlet populations need immediate conservation action because in recent years they have undergone dramatic declines. While it is impossible to identify it exact rate, we do know that populations like those in the Ob and Irtysh rivers have seen a decline of about 50 per cent, while the stocks in the Yenisei have dropped by a little less – an estimated 40 per cent.

IUCN Red List status: Vulnerable.

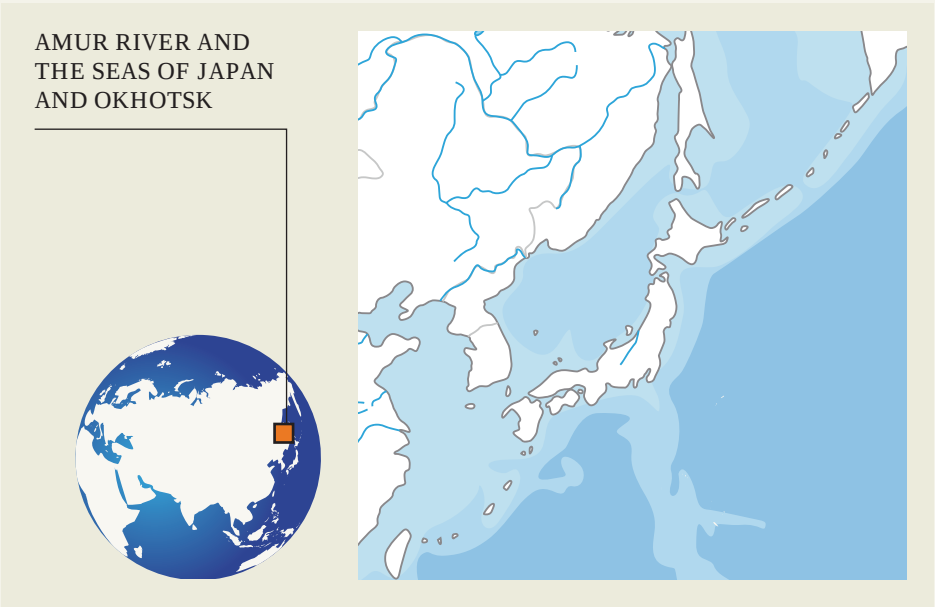
© LUBOMIR HLASEK

Sterlet

THE AMUR RIVER AND THE SEAS OF JAPAN AND OKHOTSK

This region includes water bodies in China, Japan and Russia. The main sturgeon ranges are the seas of Okhotsk and Japan, the Amur River system and the Ishikari and Tumnin rivers.

Sturgeon species: This region is home to three sturgeon species: the Amur sturgeon (*Acipenser schrenckii*), the Sakhalin sturgeon (*Acipenser mikadoi*) and the Kaluga Sturgeon (*Huso dauricus*).



The Amur sturgeon (*Acipenser schrenckii*)

Physique: Amur sturgeons can reach 3m in length and 190kg in weight and live up to 65 years.

Range and life cycle: This species is endemic to the Amur/Heilong River basin and is often described as potamodromous, or migrating only in freshwater. However, fishes in the lower reaches of the Amur River also use estuarine waters, which suggest that the species is actually freshwater amphidromous, i.e., it migrates between freshwater and the sea.

Status: The species is listed as Critically Endangered. A decline in Amur sturgeon catches has been observed since the end of the 19th century. Populations are estimated to have dropped by over 95 per cent over three **generations (about 50 years).**

IUCN Red List status: Critically Endangered.

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Amur sturgeon

The Sakhalin sturgeon (*Acipenser mikadoi*)

Physique: Sakhalin sturgeons can reach a length of 2.5m and a weight of 100kg and live up to 60 years.

Did you know? The taxonomic status of this species has only recently been clarified. It used to be considered identical to the North American green sturgeon (*A. medirostris*), but is now regarded as a separate species. It can reach a length of 2.5 m and a weight of 100 kg and live up to 60 years. It is listed as Critically Endangered.

Status and threats: Sakhalin sturgeons used to be common on Japanese fish markets in the 1950s, but now only a few specimens are found per year. They are known to ascend the small coastal rivers of the Russian Federation and Japan and are found throughout the Sea of Okhotsk and the Sea of Japan. The Tumnin River is the only known spawning river for Sakhalin sturgeons (up to 100km upstream). The species' populations are declining due to poaching during their migration, as well as habitat pollution coming from agriculture, oil production and mining. Over the past 45 years (about 3 generations), the number of wild mature individuals has dropped by more than 80 per cent.

IUCN Red List status: Critically Endangered.

© WWF / RUSSIA

Sakhalin sturgeon

The Kaluga sturgeon (*Huso dauricus*)

Physique, life cycle and range: The Kaluga sturgeon can reach a length of 5.6m, weigh up to 1.1 ton and live up to 80 years. It is a true predator, like its sister species the beluga (H. huso). It is anadromous and can be found in the seas of Okhotsk and Japan, but does not enter the open ocean. This species is also endemic to the Amur River basin.

Status: The species has undergone a sharp decline in both recruitment and stock numbers, which began in the late 19th century and continues to this day. From the late 19th century to 1992, the population dropped by more than 80 per cent. During the last 10 to 15 years, this sharp decrease has continued. The average age of Kaluga sturgeons is subsequently decreasing because adults are caught by poachers for caviar. As a result, females reproduce only once in their life.

IUCN Red List status: Critically Endangered.

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Kaluga sturgeon

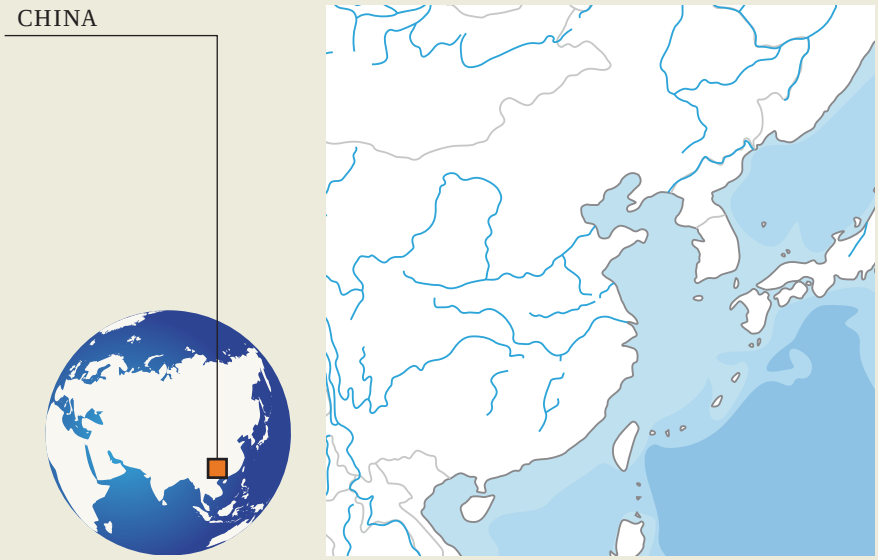
© VLADIMIR FILONOV / WWF / CANON

The Sea of Okhotsk

CHINA

This is the southernmost biogeographic sturgeon region. The main sturgeon water bodies here are the East China and South China seas, the Yangtze and Pearl rivers.

Sturgeon species: Three acipenseriform species occur here naturally: the Chinese sturgeon (*Acipenser sinensis*), the Yangtze sturgeon (*Acipenser dabryanus*) and the Chinese paddlefish (*Psephurus gladius*).



The Chinese sturgeon (*Acipenser sinensis*)

Physique and life cycle: This species is anadromous. It can reach a length of 4m, a weight of 550kg, and an age of 50 years.

Range and threats: Chinese sturgeons are restricted to the main channel of the Yangtze and Pearl rivers and the East and South China seas. Though there is still disagreement about the taxonomy of Pearl and Yangtze River populations, Chinese scholars commonly divide Chinese sturgeons into two populations: the Pearl River Chinese sturgeon, which spawns in spring and is close to extinction, and the Yangtze River Chinese sturgeon, which spawns in autumn and can still be found below the Gezhouba Dam.

This species has been overfished historically and has been extirpated from most of its former range in East Asia, except the mid-lower section of the Yangtze River below the Gezhouba Dam. In the 1970s, the total spawning population of Chinese sturgeons was estimated at 10,000 individuals, but between 2005 and 2007, it reached 203-257 individuals. This is a 97.5 per cent reduction in spawning individuals over a 37-year period.

The construction of the Gezhouba Dam in 1981 blocked the migration routes of this species, making it impossible for it to reach its spawning sites in the upper reaches of the river. Currently, there is just one remaining spawning ground (a 4-km river stretch), which is situated below the Gezhouba Dam. Furthermore, in 2003, the Three Gorges Dam was constructed 40km upstream from the Gezhouba Dam. This has changed the area's hydrological regime: it has lowered the water level of the river in autumn and winter and affected the water temperature.

IUCN Red List status: Critically Endangered.

© CEPHOTO, UWE ARANAS

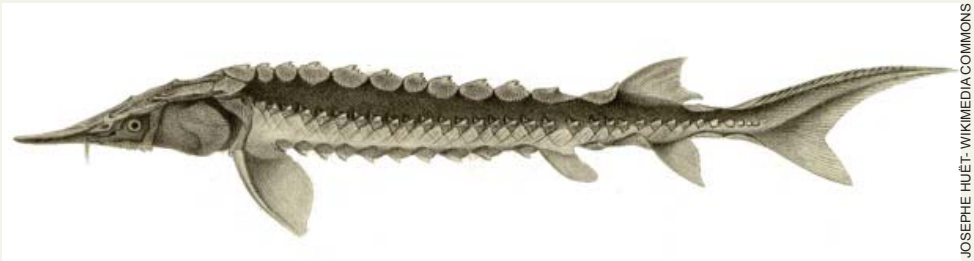
Chinese sturgeon

The Yangtze sturgeon (*Acipenser dabryanus*)

Physique: This species is often described as potamodromous, but some authors state that it might in fact be freshwater amphidromous and use the estuary of the Yangtze system for feeding. It can reach 1.5m in length, 80kg in weight, and an age of 30 years.

Status, range and threats: Yangtze sturgeons are endemic to China and restricted to the Yangtze River system. They have recently been extirpated from the lower reaches of river and are now restricted to the upper main stream in the Sichuan Province. In the late 20th century, population numbers declined drastically due to overfishing and habitat degradation. Incidental catch data between 1982 and 2008 indicate that, since 1982, only tens of specimens are being captured annually. Dam construction has caused major adverse effects to the habitat of this species and reduced its range. The wild population is considered to be very small. It is possible that it survives only due to restocking. However, there is no evidence that re-stocked animals reproduce in the wild.

IUCN Red List status: Critically Endangered (Possibly Extinct).



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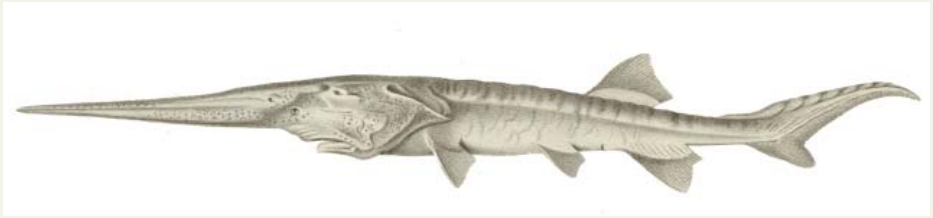
Yangtze sturgeon

The Chinese paddlefish (*Psephurus gladius*)

Physique and life cycle: This large species is endemic to the Yangtze River and can reach a length of 7m, a weight of 500kg and an age of 60 years. It is thought to be anadromous, as it spends at least a part of its life in the sea and migrates upriver to reproduce.

Status and threats: The Chinese paddlefish is listed as Critically Endangered (Possibly Extinct). The populations of Chinese paddlefish decreased due to historical overfishing and habitat degradation. In 1981, the construction of the Gezhouba Dam in the middle reaches of the Yangtze River blocked the migration route of this species and prevented adult fish from moving to the upper reaches of the river to spawn. Only two adult specimens (both females) have been recorded since 2002, despite recent surveys to re-discover the species. Juveniles were last recorded in the lower reaches of the river in 1995. It is expected that there are less than 50 mature individuals left in the wild, though more extensive surveys are needed in areas across the species' range to confirm if wild individuals remain. Controlled propagation has not been successful. The current population trend is unknown.

IUCN Red List status: Critically Endangered (Possibly Extinct).



Chinese paddlefish

© MUSÉUM D'HISTOIRE NATURELLE

Chinese paddlefish

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The East China Sea

WWF'S WORK IN THE REGION

WWF-China

WWF-China has worked on sturgeon conservation since 2006 in various ways: studying the environmental flow requirements of the Chinese sturgeon and monitoring their migration, doing conservation stocking, building the capacity for nature reserve management, and running a publicity campaign on Chinese sturgeon conservation.

Chinese sturgeon populations in the wild could become extinct within the next 20 years.

There are various reasons for this. One is the Gezhouba Dam constructed on the Yangtze River in 1981, which blocks sturgeon migration routes and makes it impossible for them to reach their spawning sites in the upper reaches of the river. This leaves sturgeons with only one spawning ground a 4-km river stretch. Furthermore, in 2003 the Three Gorges Dam was constructed 40km upstream of the Gezhouba Dam. This has changed the hydrological regime by lowering the water level in autumn and winter and affecting the water temperature.

WWF-China works in both the estuary and the central spawning site of the Yangtze River. Since the biggest threat to sturgeons is the Three Gorges Dam, the office has focused on influencing dam operators to revise their operation plan and meet the requirement of the species.

Currently, the office is also working with the Yangtze Fishery Management Bureau of the Ministry of Agriculture, Chinese sturgeon nature reserves and various scientific research institutes. It provides the funding for scientific research and communication and advocates for additional funding for sturgeon protection. The office has also managed to sign memorandums of understanding on the conservation of Yangtze aquatic life and the mitigation of the impact of dams with the Yangtze Fishery Management Bureau and the Three Gorges Company.

© MICHEL GÜNTHER / WWF-CANON

The Yangtze River

© TERRY DOMICO / WWF / CANON

The South China Sea

PART IV.
SAVING STURGEONS – WHAT NEEDS TO BE DONE

Urgent, coordinated, global actions are needed worldwide to help the species recover. Overexploitation can be addressed by leading the future transformation of markets, building institutional capacity to ensure better enforcement, and securing alternative income sources for fishermen. We must also work together to restore key habitats and do conservation stocking where needed. All these efforts must be accompanied by campaigns to raise awareness of the enormous ecological, commercial and cultural value of sturgeons and the urgent need to protect them. WWF has identifi ed four main strategies for working toward these goals.

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Sturgeon populations, water bodies and threat scenarios vary over the entire range of Acipenseriformes. This is why any practical approach to sturgeon conservation calls for an initial analysis of the respective situation, including the local threats and the past and present conservation actions.

Experience has shown that it is vital to back up any conservation activities by a strategy, as well as an action plan for its implementation. This is because the issue is complex and requires coordinating and synchronizing regional and global actions.

The 2016 WWF Global Sturgeon Strategy Proposal aims to increase the impact and efficiency of WWF conservation efforts world-wide and facilitate cooperation with other organizations because only a partnership approach can lead to success. The Proposal identifies four main strategies for successful sturgeon conservation.

GLOBAL STURGEON CATCHES

HAVE DROPPED BY OVER 99% IN THE PAST THREE DECADES, DOCUMENTING SEVERE POPULATION DECLINES.

STRATEGY 1. FIGHTING OVEREXPLOITATION THROUGH MARKET TRANSFORMATION, BETTER LAW ENFORCEMENT AND WORKING WITH FISHERIES

Overexploitation is defined as the harvesting of renewable resources to the point of diminishing their returns. Sustained overexploitation leads to the destruction of the resource. Overexploitation includes any kind of removal of individuals from a population that the population cannot compensate for by reproduction. Examples of this are unsustainably managed legal fisheries, poaching, incidental bycatches in other fisheries, but potentially also badly planned and implemented scientific and conservation projects.

Transforming markets

A key element of battling overexploitation is the transformation of markets. Introducing a mandatory, fraud-resistant traceability system for sturgeon products on domestic markets as well and advocating its enforcement would ensure that the fish source is documented. Wild sturgeons or caviar from poached sturgeons could therefore not easily be falsely labelled as stemming from aquaculture. Additionally, the introduction of ASC certification for sturgeon farms would increase the quality standards of companies.

© WWF-BULGARIA

Working with fishing communities

Local fishing communities must be included in sturgeon conservation efforts as they have to understand the need for protection measures and accept them. They must also receive support in finding other sources of livelihood.

© RUMEN DOBREV

Improving enforcement

Increasing political will to address the issue, building institutional capacity and increasing cooperation between the responsible agencies, both within countries and internationally, would lead to better enforcement of the legislation on sturgeon fishing and sturgeon products in key markets and sites. This would disrupt and decrease the amount of illegal and unsustainable fishing and illegal national and international wildlife trade and lead to sustainably managed fisheries.

STRATEGY 2. RESTORING KEY HABITATS, ENSURING MIGRATION AND PREVENTING FUTURE UNSUSTAINABLE INFRASTRUCTURE

Life cycle habitats

Life cycles are a recurring series of developmental stages an organism undergoes. The presence of functional, distinct habitats for spawning, feeding, wintering and nursery is mandatory to maintain the different life stages of Acipenseriformes. Sturgeon life cycles might spread out over the entire length of a river and include adjacent marine areas. They could also span decades of an individual sturgeon's life. Therefore, both the survival of the spawning fish and the existence and accessibility of lifecycle habitats are important for the survival of sturgeons.

Protecting and restoring key habitats and making sure species can migrate between those is often referred to as "in-situ" or "on-the-site" measures, as they take place in the natural environment.

This strategy includes three steps:

1. **Identifying and protecting key habitats.** This is an obligatory step for successful conservation because specific habitat protection measures can only be included in the sectorial strategies of relevant rivers and seas when their location is known. Poaching and accidental bycatch can be tackled in a more focused way if sturgeon spawning and wintering habitats are known. The planning and implementation of fish passage solutions with sturgeon functionality need to be coordinated with habitat protection and restoration up- and downstream of the respective migration barrier. Conservation stocking and reintroduction activities need to be based on a detailed knowledge of available habitats, since it is mandatory to synchronize them with the in-situ life cycle.

2. **Ensuring sturgeon migration across key dams.** This step calls for the identification of key blockages and feasibility assessments for sturgeon fish passages and/or dam removal.

© SUZANNE EBERT

The Iron Gates is the largest hydropower dam and reservoir system on the Danube. It confines sturgeons to 863 km of the river, cutting off important spawning sites in the Middle Danube.

3. **Preventing new, unsustainable river infrastructure.** It is necessary to advocate for the inclusion of sturgeon protection measures in the investment policies of international finance institutions and public infrastructure funding programmes. In the future, no river infrastructure in relevant rivers should be built without an adequate consideration of sturgeon needs during environmental impact procedures.

STRATEGY 3. EX-SITU CONSERVATION: SAVING STURGEONS WITH CONSERVATION STOCKING

© ZDRAVKO YONCHEV

Sturgeon conservation stocking in the Danube River, Bulgaria

This strategy should be applied in combination with the first two: fighting overexploitation, protecting and restoring habitats. As this topic is quite complex and the term “stocking” with regard to sturgeon conservation is often used in a misleading or even false context, a comprehensive description of the subject is necessary. Different terms have been used for this kind of activity, like “ex-situ operations”, “conservation breeding”, “conservation hatchery”, “conservation aquaculture”, “captive breeding” or simply “hatchery”. The latter is often misleading, as ex-situ measures do partially take place in a controlled or captive environment, yet go beyond the concept of merely producing large quantities of fertilized sturgeon eggs, letting them hatch and release the resulting offspring into a water body.

The success of controlled sturgeon propagation in hatcheries or live gene banks strongly depends on:

1. the availability of sufficient broodstock of all species and genotypes;
2. how well hatcheries can preserve the genetic identity and diversity of Acipenseriformes;
3. how well fish from hatcheries can adapt to natural habitat conditions

Ex-situ measures consist of the establishment of broodstock from endangered populations in captivity and their reproduction in close-to-nature environmental conditions to release juveniles that can survive in the wild. Thus, they work in accordance with the life cycle of populations and ensure the feasibility of measures with regard to a functioning river ecology and ecosystem health.

These measures serve three main purposes:

1. The conservation of endangered sturgeon populations or populations on the brink of extinction by establishing captive lifecycle units
2. The stabilization of populations by providing juveniles fit for survival in the wild to compensate for deficits in natural reproduction and to ensure viable year-classes of future wild spawning fish
3. The reintroduction into formerly inhabited water bodies where the risk factors leading to extinction are eliminated and the genetic purity and diversity of historical stocks are ensured as much as possible.

The in-situ life cycle of the respective populations in the wild defines the conditions of ex-situ operations. This also means that ex- and in-situ measures must be closely linked and have to be well-coordinated and synchronized.

© RUMEN DOBREV

Magnetic tag that allows tracking the migration routes and breeding areas of sturgeons.

Risks

These measures are intended to save time to ensure the successful implementation of in-situ improvements. However, the recurrent introduction of individuals from a captive environment into wild populations may alter the gene pool and have detrimental effects on the natural population. Thus, one of the most important aims of conservation stocking is to maintain and protect the genetic identity and diversity, as well as the morphological and behavioural characteristics of the respective populations in both captivity and the wild. This clearly distinguishes these operations from introductions in areas without natural sturgeon populations, the economic boosting of a sturgeon fishery by the release of juveniles, as well as from hatchery operations for the production of sturgeon products for human consumption.

Conservation stocking can only be effective if broodstock of a certain population still exists (see also “Overexploitation” above) and the life cycle habitat and respective knowledge is still there to work with (see also “Life cycles” on p. 72).

Raising the political will for conservation stocking

To save populations on the brink with conservation stocking programmes, it is of key importance to raise the political will to not only finance such programmes, including the long-term monitoring of their impact, but to also increase transboundary cooperation. International collaboration also needs to be a priority in order to ensure the possibility to share best practice methodologies.

STRATEGY 4. INTEGRATED COMMUNICATION STRATEGY: RAISING PUBLIC AWARENESS AND THE POLITICAL WILL TO PROTECT STURGEONS

We need to work together to open the hearts and minds of people in sturgeon range states and consumer countries to the need for sturgeon protection. People must be informed of the cultural value of sturgeons and be inspired to see them as a symbol of national pride, as well as an indicator of healthy rivers. We have to also reach out to decision makers in governments and the private sector so they can see the long-term economic value of sturgeons and commit to their protection, while also understanding the actions required for saving these water giants from extinction.

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Sturgy, a life-size inflatable sturgeon, grabbing people's attention at Bestfest, Romania

© WWF-BULGARIA

Sturgy in Sofia, Bulgaria

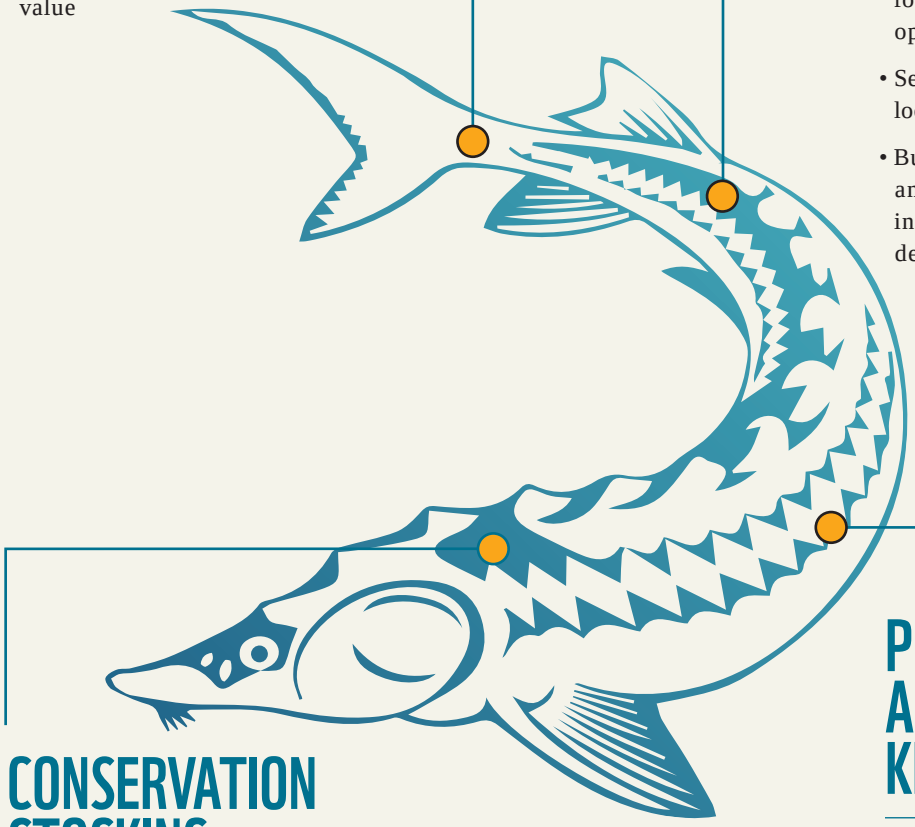
WHAT IS WWF CALLING FOR?

RAISING PUBLIC AWARENESS

- Opening the hearts and minds of people and decision makers to the need to protect sturgeons by communicating their cultural, ecological, and long-term economic value

FIGHTING OVEREXPLOITATION

- Transforming markets by introducing a traceability system also for domestic markets, in order to prevent the false labelling of poached products as farmed
- Introducing ASC certification for sturgeon farms to improve operation quality
- Securing alternative income for local fishing communities
- Building institutional capacity and increasing domestic and international cooperation to decrease illegal trade



CONSERVATION STOCKING

- Raising the political will to finance such programmes and their long-term monitoring
- Increasing transboundary cooperation on the issue in order to share best practices
- Ensuring that introduced sturgeons are genetically identical to those occurring naturally and can survive in the wild

PROTECTING AND RESTORING KEY HABITATS

- Identifying and protecting key habitats
- Ensuring migration across key blockages like dams
- Preventing new, unsustainable river infrastructure

APPENDIX: STURGEON SPECIES REFERENCE TABLE

SPECIES	MIGRATION TYPE	MAX. LENGTH	MAX. WEIGHT	MAX. AGE	IUCN GLOBAL STATUS AND ASSESSMENT YEAR
THE NORTHEASTERN PACIFIC					
White sturgeon (*Acipenser transmontanus*)	potamodromous/ anadromous	6.7m	>800kg	>80 years	Least Concern (globally) 2004
Green sturgeon (*Acipenser medirostris*)	anadromous	2.9m	160kg	75 years	Near Threatened 2006
THE GREAT LAKES, HUDSON BAY & ST. LAWRENCE RIVER					
Lake sturgeon (*Acipenser fulvescens*)	potamodromous	2.4m	140kg	95 years	Least Concern (globally) 2004
Atlantic sturgeon (*Acipenser o. oxyrinchus*)	anadromous	4.3m	370kg	60 years	Near Threatened 2006
THE NORTHWESTERN ATLANTIC					
Atlantic sturgeon (*Acipenser o. oxyrinchus*)	anadromous	4.3m	370kg	60 years	Near Threatened 2006
Shortnose sturgeon (*Acipenser brevirostrum*)	amphidromous	1.4m	45kg	67 years	Vulnerable 2004
THE MISSISSIPPI RIVER & THE GULF OF MEXICO					
Lake sturgeon (*Acipenser fulvescens*)	potamodromous	2.4	140	95	Vulnerable 2004 (Mississippi-Missouri subpopulation status)
Gulf sturgeon (*Acipenser oxyrinchus desotoi*)	anadromous	2.4	100	40	Vulnerable 2006
Paddlefish (*Polyodon spathula*)	potamodromous	2.3	90	55	Vulnerable 2004
Pallid sturgeon (*Scaphirhynchus albus*)	potamodromous	1.8	45	50	Endangered 2004
Shovelnose sturgeon (*Scaphirhynchus platorynchus*)	potamodromous	1.0	7	40	Vulnerable 2004
Alabama sturgeon (*Scaphirhynchus suttkusi*)	potamodromous	0.8	4	20	Critically Endangered 2004

SPECIES	MIGRATION TYPE	MAX. LENGTH	MAX. WEIGHT	MAX. AGE	IUCN GLOBAL STATUS AND ASSESSMENT YEAR
THE NORTHEASTERN ATLANTIC					
European Atlantic sturgeon (*Acipenser sturio*)	anadromous	5.6m	600kg	60 years	Critically Endangered 2009
Atlantic sturgeon (*Acipenser o. oxyrinchus*)	anadromous	4.3m	370kg	60 years	Under revision
THE PONTO-CASPIAN					
Danube or Russian sturgeon (*Acipenser gueldenstaedtii*)	anadromous/ potamodromous	2.4m	110kg	50 years	Critically Endangered 2009
Adriatic sturgeon (*Acipenser naccarii*)	anadromous	2m	150kg	50 years	Critically Endangered (Possibly Extinct) 2009
Ship sturgeon (*Acipenser nudiventris*)	anadromous/ potamodromous	2.2m	120 kg	36 years	Critically Endangered 2009
Persian sturgeon (*Acipenser persicus*)	anadromous	2.5m	100kg	50 years	Critically Endangered 2009
Sterlet (*Acipenser ruthenus*)	potamodromous	1.2m	16kg	27 years	Vulnerable 2009
Stellate sturgeon (*Acipenser stellatus*)	anadromous	2.9m	80kg	35 years	Critically Endangered 2009
European Atlantic sturgeon (*Acipenser sturio*)	anadromous	5.6m	600kg	60 years	Critically Endangered 2009
Beluga sturgeon (*Huso huso*)	anadromous	8m	1.4 tons	>100 years	Critically Endangered 2009
Syr Darya shovelnose sturgeon (*Pseudoscaphirhynchus fedtschenkoi*)	potamodromous	0.7 m	1 kg	10 years	Critically Endangered (Possibly extinct) 2009

SPECIES	MIGRATION TYPE	MAX. LENGTH	MAX. WEIGHT	MAX. AGE	IUCN GLOBAL STATUS AND ASSESSMENT YEAR
Little Amu Darya shovelnose sturgeon (*Pseudoscaphirhynchus hermanni*)	potamodromous	0.3m	0.1kg	7 years	Critically Endangered 2009
Big Amu Darya shovelnose sturgeon (*Pseudoscaphirhynchus kaufmanni*)	potamodromous	0.8m	2kg	14 years	Critically Endangered 2009
SIBERIA AND THE ARCTIC OCEAN					
Siberian sturgeon (*Acipenser baerii*)	anadromous/ potamodromous	2m	200kg	60 years	Endangered 2009
Sterlet (*Acipenser ruthenus*)	potamodromous	1.2m	16kg	27 years	Vulnerable 2009
THE AMUR RIVER AND THE SEAS OF JAPAN AND OKHOTSK					
Amur sturgeon (*Acipenser schrenckii*)	potamodromous	3m	190kg	65 years	Critically Endangered 2009
Sakhalin sturgeon (*Acipenser mikadoi*)	anadromous	2.5m	100kg	60 years	Critically Endangered 2009
Kaluga sturgeon (*Huso dauricus*)	anadromous	5.6m	1.1 ton	80 years	Critically Endangered 2009
CHINA					
Chinese sturgeon (*Acipenser sinensis*)	anadromous	4m	550kg	50 years	Critically Endangered 2009
Yangtze sturgeon (*Acipenser dabryanus*)	potamodromous/ amphidromous	1.5m	80kg	30 years	Critically Endangered (Possibly Extinct) 2009
Chinese paddlefish (*Psephurus gladius*)	anadromous	7m	500kg	60 years	Critically Endangered (Possibly Extinct) 2009

APPENDIX: GLOSSARY

Acipenseriformes – The 25 sturgeon and 2 paddlefish species are also referred to scientifically as Acipenseriformes or acipenseriform species.

Allee effect – Allee effects are broadly defined as a decline in individual fitness, or reproductive success, at low population size or density, which can result in critical population thresholds below which populations crash to extinction.

Amphidromouos – A species that regularly migrates between freshwater and the sea, in both directions. Amphidromous species typically reproduce in freshwater; the newly hatched larvae then migrate to the sea to feed and grow and then return again to freshwater where they continue to feed and grow and eventually reproduce.

Anadromous – Anadromous populations have a life cycle in both fresh- and saltwater, but spawn in freshwater.

Ex situ conservation – Protecting an endangered plant or animal species outside of its natural habitat. Ex-situ measures partially take place in a controlled or captive environment.

Fitness – The contribution of a genotype to the next generation, relative to the contribution of other genotypes. The number of offspring an organism manages to produce or raise successfully.

In-situ conservation – In-situ or “on-the-site” conservation takes place in the natural environment and aims to protect and restore key habitats and ensure species migration between them.

Potamodromous – Potadromous populations have an entirely freshwater life cycle.

Recruitment – The number of fish surviving to add to the population or living to a certain life history stage, such as settlement or maturity.

Sympatric – Occurring in the same geographic range.

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STURGEONS IN NUMBERS:

23 OF 27

Up to 23 of 27 sturgeon and paddlefish species are on the brink of extinction, mostly in the Ponto-Caspian Region. They are the most critically endangered group of species globally.

17 OF 27

Up to 17 of 27 sturgeon and paddlefish species are listed as Critically Endangered.

99%

Global sturgeon catches have dropped by over 99% in the last three decades.

4

Four sturgeon and paddlefish species are perhaps already extinct.

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