



White Sturgeon

Habitat alteration and declining water quality threaten the survival of this species in British Columbia





Why are White Sturgeon at risk?

Over the past century, White Sturgeon populations throughout their range have been adversely affected by over-fishing, construction of hydroelectric dams, dyking and drainage projects, and human competition for food such as salmon and eulachon. Their future is also threatened by declining water quality as human populations increase and land uses intensify in the Sacramento, Columbia, and Fraser river basins, the main watersheds where White Sturgeon occur.

The first major human impact on this sensitive species, over-fishing, began before the end of the 19th century in all three watersheds. The lower Columbia River sturgeon fishery in Oregon and Washington collapsed in the late 1890s, after 2.5 million kilograms of fish were harvested in a few years. A multitude of dams were also constructed on the upper Columbia in the United States and several in British Columbia. These dams partitioned most of the remaining sturgeon in this system into several landlocked populations, many of which are not able to remain viable as stocks.

Hydro dams, particularly those like Keenleyside in British Columbia and Libby in Montana which are used for storage, may harm sturgeon in several ways. The dams block access to essential spawning or foraging sites; eliminate spring flooding of traditional spawning or rearing habitats; trap nutrients on which downstream forage fish like kokanee depend; and reduce downstream turbidity, making juvenile sturgeon more visible to predators.

The above impacts affect White Stur-

geon in both the British Columbia and United States parts of the Columbia River watershed. For example, sturgeon in the Kootenai (Kootenay) River, which flows from Idaho into Kootenay Lake in British Columbia, have failed to reproduce and have declined in numbers since flows were first regulated at the Libby Dam in 1974. Trapping of nutrients in Lake Koocanusa, behind Libby Dam, is believed to have caused a serious decline in

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White Sturgeon were also over-fished in the Fraser River from 1880 to 1915, with a peak harvest of half a million kilograms in 1897. Commercial catches after 1915, until closure of the fishery in 1994, declined dramatically to between 5000 and 20 000 kilograms per year. The population has never regained its historical abundance. Fortunately for sturgeon and other fish, no dams have been built on the mainstem Fraser River. However, sturgeon in one tributary, the Nechako River, may have been harmed by diversion of water out of the basin and regulation of the much-reduced flows that remain. Large commercial catches of salmon bound for the Fraser have undoubtedly reduced the supply of this seasonally important sturgeon food. Dyking, drainage and filling of sloughs and wetlands along the lower Fraser have caused loss of habitats

used by young sturgeon. So far, pollution levels in the Fraser don't seem to have affected the White Sturgeon, but increasing human populations, agricultural land development and industrial effluents are still long-term concerns. Sturgeon are very long-lived animals, and it may take decades to show the effects of pollutants concentrating in their tissues.

Mysterious die-offs of sturgeon occurred in the lower Fraser during the hot summers of 1993 and 1994. Thirty-four huge sturgeon were found dead along the shoreline, mostly old females. How many others died and weren't found will never be known. This seems to have been a natural die-off, but it may have been heightened by human effects on the environment.

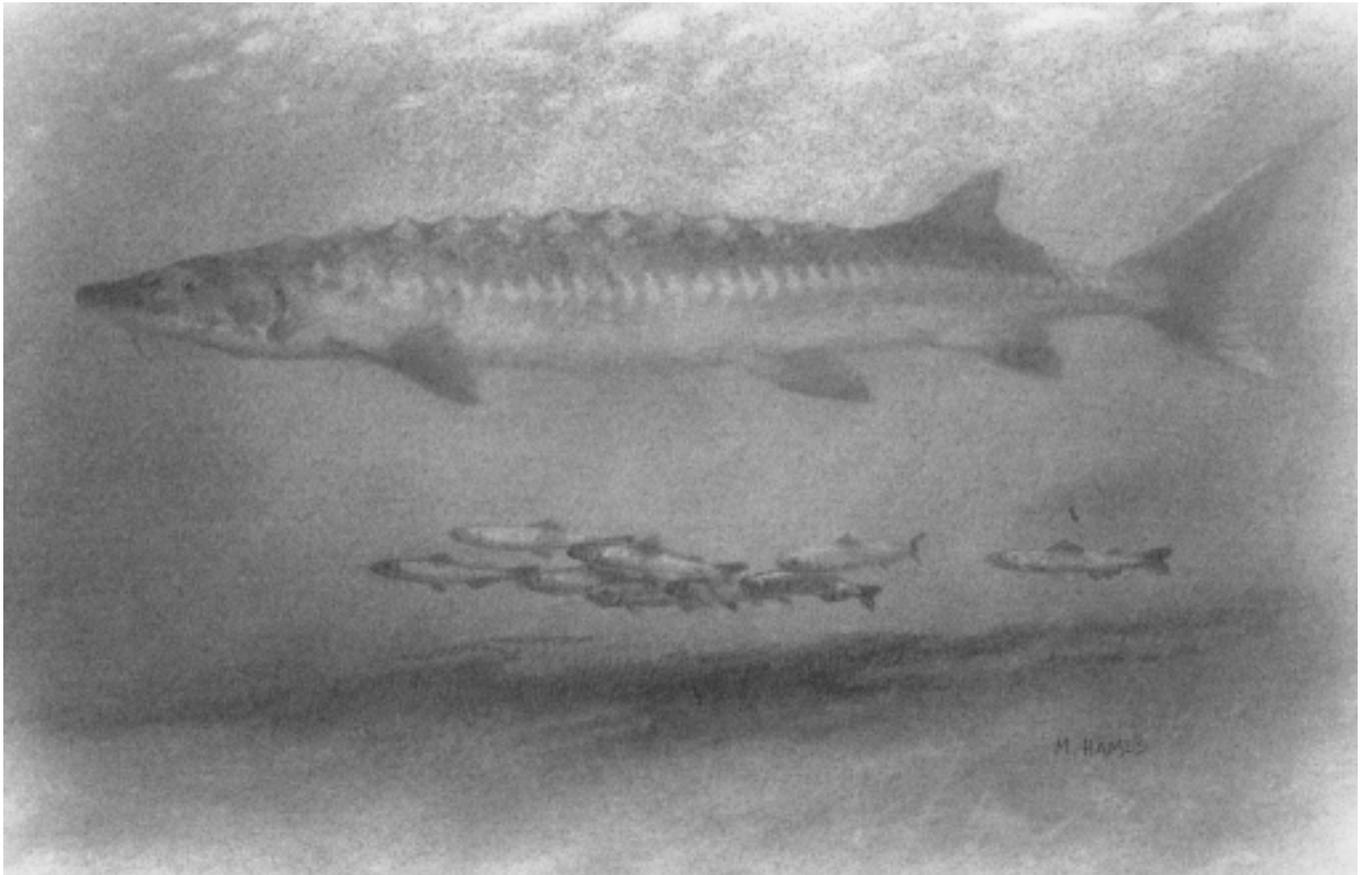
What is their status?

In Canada, White Sturgeon are primarily resident in only two watersheds, the Fraser and Columbia, where their populations are much-reduced due to historical over-fishing on both rivers and dam building in the Columbia Basin. Accurate estimates of sturgeon numbers are not available, but the number of large breeding-age individuals may

Armoured relics from the past, sturgeons have remained relatively unchanged for millions of years.

be dangerously low in many areas. As a result, the harvest of sturgeon has been illegal in British Columbia since 1994.

In the Kootenay drainage, which straddles the Canada-United States border, sturgeon have not reproduced since about 1974 and only 800 to 1000 adults remain. That population has been declared endangered under the U.S. Endangered Spe-



cies Act. In other portions of the Columbia system in Canada, the remaining landlocked populations are also small and may be affected by limited spawning success. Based on trends in the neighbouring Kootenay system, their future does not look bright. Fraser River sturgeon, though much reduced from historical levels, appear to be holding their own and might increase now that harvests have been curtailed. The Nechako River population, however, is thought to be endangered.

Because of its restricted distribution in Canada, its reduced populations, and concerns for future habitat quality, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has classified the White Sturgeon as Vulnerable. Provincially, it has been given Red List (species being considered for legal designation as Endangered or Threatened) status.

What do they look like?

Two imposing features of the White Sturgeon – the huge size reached by the oldest adults and the rows of bony shields – set this fish strikingly apart from other freshwater species in the province. Reaching 6 m in length, 635 kg in weight and over 100 years in age, this is the largest freshwater fish in Canada. Armoured relics from the past, sturgeon have remained relatively unchanged in structure for millions of years.

The torpedo-shaped White Sturgeon has no scales. Its protective bony plates, or *scutes*, are arranged in five rows – one along the back, one along the middle of each side, and one along each side of the belly. The plates of young sturgeon have very sharp points which become blunted with age. Its tail has a shark-like upper lobe which is longer

and more pointed than the lower lobe, a shape referred to as *heterocercal*.

The White Sturgeon has a broad, flattened head and tiny eyes. Its wide toothless mouth, located on the underside of the head well back from the snout, is protrusible, an adaptation for sucking up food from the lake or river bottom. Its four whiskers or *barbels*, located between the mouth and snout, aid in finding food in

the murky or darker waters where sturgeons prefer to lurk.

The back and upper sides of the “White” Sturgeon vary in colour from

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dark to medium grey often with obvious white markings. The lower sides and belly are pale grey to white.

In British Columbia waters the White Sturgeon could only be confused with its more marine relative the Green Sturgeon. The Green Sturgeon has 25 to 30 lateral shields (compared to 38 to 48 in the White Sturgeon), barbels that are nearer to the mouth than the tip of the snout (nearer the snout in White Sturgeon), and has generally greenish to olive-coloured upper body parts. Both species can be found in the mouths of large rivers such as the Fraser.

What makes them unique?

The White Sturgeon is certainly unique. Its physical appearance, particularly the plates of armour, give it a bizarre, prehistoric look. Indeed, the fossil record tells us that sturgeon have changed relatively little for millions of years. Despite this they are survivors, having successfully persisted through eons of climatic change, including ice ages. They have found a niche today as scavenger/predators in a few large, productive lakes and rivers.

Among fish, its reproductive habits are also quite unusual. Adults require 15 to 30 years to reach sexual maturity, spawn at intervals of up to 10 years and can deposit a million or more eggs at a single spawning. Sturgeon are also renowned for the delicacy of their eggs, or caviar, for human consumption.

Although present in rivers and lakes close to large cities, the White Sturgeon remains a beast of much mystery and awe due to its reclusive habits and choice of dark or muddy waters where observation and study are difficult.

How do they reproduce?

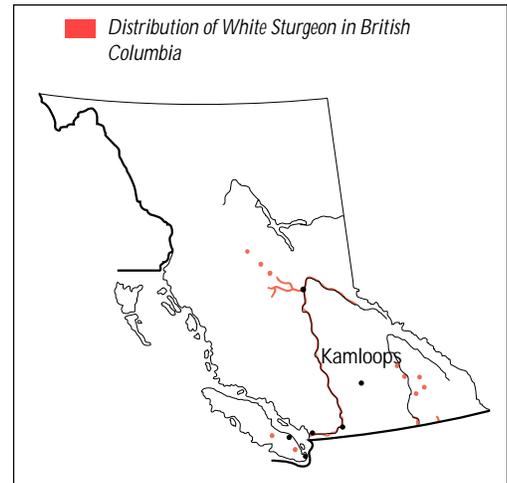
In the Fraser River, the age of sexual maturity of White Sturgeon is estimated to be 11 to 22 years for males and up to 26 or more years for females. Once mature, the females spawn

more than once, but only every 4 to 10 years. Nothing is known about the spawning interval of males. Sturgeon make up for this pattern of delayed maturity and infrequent spawning by producing prodigious numbers of eggs – from about 700 000 in medium sized females to 3 or 4 million in the largest, whose ovaries may weight over 100 kg!

Based on research in the Columbia River, White Sturgeon usually migrate upstream in spring to spawning sites that have faster currents and rockier bottoms than their normal foraging habitats. Spawning females release their small brown, sticky eggs over large areas of river bed, where they readily adhere to the rocky bottom. Strong currents ensure that the female eggs and male sperm are well mixed and that the developing eggs are bathed in well-oxygenated water. The incubation period lasts for 5 to 25 days, being longest where temperatures are lowest. The larvae, with yolk sacs attached, drift downstream with the current for many kilometres, then remain largely hidden for their first two weeks. After about 18 days, sturgeon transform into fry (young-of-the-year), complete with the elongated snout, flattened under-surface, and plates that characterize the species. During their larval and fry stages, many sturgeon are undoubtedly eaten by other, larger fish. In the Fraser, the fortunate survivors reach a length of about 50 cm by age 5, and then grow about 5 cm per year to about age 25 and at slower rates beyond that age. Sturgeon in the upper Columbia River don't grow as quickly or as large as those in the lower Fraser.

What do they eat?

The White Sturgeon lives entirely on animal matter, some of which is scavenged from the river bottom. Its mouth and sense organs which



detect food are on the underside of its flattened head, an adaptation for bottom feeding. And it is wonderfully adapted indeed for this mode of life. Sensory nerve endings on the bottom of the snout, which function much like the lateral line of other fish, allow it to detect movements of potential prey. Its four dangling barbels serve to pick up odours in the water and to identify suitable food by touch and taste. These features, rather than eyesight, are crucial for finding food in the sturgeon's usually murky environment. Food items may be located by following a water-borne odour upstream to its source, or by simply lounging in a spot where drifting materials tend to collect. Once the barbels contact acceptable food, the huge mouth is extruded and used to suck it in. Indigestible debris, often found in sturgeon stomachs, is frequently ingested with the food.

Sturgeon diet varies somewhat from system to system, depending on the food species that are present. However, invertebrates such as larval insects, crayfish, freshwater clams and snails tend to be important for young sturgeon, while fish of one kind or another predominate in the diets of older sturgeon.

In the lower Fraser River, small sturgeon eat larval chironomids (bloodworms), stoneflies, caddisflies and mayflies, as well as adult crustaceans such as crayfish and freshwater shrimp.

Large sturgeon there also consume invertebrates, particularly crayfish, but the bulk of their diet is made up of fish. In May, spawning eulachons are devoured in great quantities, while spawning salmon are important in summer and fall. Some of these fish are probably spawned-out carcasses scavenged from the bottom. Sculpins, stickleback, lamprey and small sturgeon have also been found in sturgeon stomachs.



THE BARBELS AND PROTRUSIBLE MOUTH EQUIP THE STURGEON FOR FEEDING IN MURKY WATER. *Mark White photo*

Where do they live?

More than twenty species of sturgeon are distributed across the cooler parts of Asia, Europe and North America; almost all are threatened to some degree. Of five species found in Canada, only the White and Green Sturgeon occur in British Columbia. The White Sturgeon, *Acipenser transmontanus* (“the sturgeon across the mountains”) occurs along the Pacific Coast from California to British Columbia and possibly southern Alaska. However, significant populations are confined to just three large river systems – the Sacramento, Columbia, and Fraser. In a global perspective, this is quite a restricted distribution.

In British Columbia the most widespread population occurs in the Fraser River mainstem inland to upstream of Prince George, high into the Nechako, and in the lower reaches of other large

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tributaries like the Stuart, McGregor, Bowron, Harrison and Pitt rivers. White Sturgeon also occur in the British Columbia portion of the Columbia River drainage. Within this drainage, Columbia River and Kootenay River sturgeon, originally isolated from one another by Bonnington Falls, are now, since the last Ice Age, further isolated between several dams. They have also been reported from several lakes in those drainages including Fraser, Takla, Trembleur, Stuart and Williams lakes in the Fraser system, and Kootenay, Arrow, Slocan and Duncan lakes in the Columbia watershed.

White Sturgeon have also been found in a few rivers on Vancouver Island. Sturgeon have been reported occasionally in northern British Columbia rivers, including the Skeena and Nass, although these are mostly believed to be Green rather than White Sturgeon. Any White Sturgeon populations north of the Fraser, if they exist, are very small. In British Columbia this species appears to be mostly freshwater in distribution; specimens have rarely been taken in marine waters. Nevertheless, tagging studies in the United States have shown that White Sturgeon are able to disperse

from river to river through the ocean. Since the entire Fraser Basin was ice-covered during the Pleistocene Ice Age, the White Sturgeon probably reached it via coastal waters during the past 10 000 years.

Based on historical catch records, the lower Fraser between its delta and the Fraser Canyon once had a sizeable White Sturgeon population and,

under natural conditions, was probably the most productive unit of habitat in the province. Recent studies there indicate that sturgeon spend most time in large pools in the main channels, but young individuals in particular frequently move between the main channel and adjacent sloughs over the summer months. Tagging studies on the lower Fraser have so far not shown any long distance movements within the river or any migrations to the sea.

What can we do?

Several measures have recently been taken to improve the White Sturgeon’s prospects for survival. In 1994, commercial and sport harvest of sturgeon became illegal in the province, and First Nations people voluntarily stopped their sustenance harvests. This should allow more fish to reach reproductive age, and may help to rebuild some stocks. Designation of the White Sturgeon by COSEWIC as a Vulnerable species in Canada has focused attention on its plight and stimulated some long-needed research. But this unique and valuable species deserves considerably more research effort.

A major need is for more information on the distribution, abundance,



THIS STURGEON SHOWS THE HETEROCERCAL TAIL SHAPE AND SCUTES CHARACTERISTIC OF THE SPECIES.

Marvin Rosenau photo



ADULT STURGEON SPEND MOST OF THEIR TIME IN MAIN RIVER CHANNELS. Mark White photo



THE STURGEON'S BONY SCUTES GIVE IT A PREHISTORIC APPEARANCE.

Mark White photo

population dynamics and seasonal habitat needs of White Sturgeon in British Columbia. Without that information it is very difficult to design meaningful conservation plans.

In the Fraser watershed it is crucial that water quality not be allowed to deteriorate further. The public can be of great assistance by supporting existing pollution control and clean-up programs, and by reporting any habitat degradation they observe.

Improving the lot of sturgeon in the Columbia watershed will be much

more difficult than in the Fraser, and will require increased international cooperation. Releases of reservoir water during the spring spawning season, lake fertilization to replace depleted nutrients, and conservation hatchery programs may have potential for helping sturgeon in that area.

Much more research is needed to determine if those measures will really do the job. Those studies will only be done if there is strong public support for them. It is important that the public encourage more research, support the

present ban on sturgeon harvest, and report any illegal sturgeon fishing that comes to their attention.

With the increased pressures of human settlement, White Sturgeon populations have been decimated and its habitats degraded. Today, the plight of the White Sturgeon is widely recognized and the species is getting increasing attention. Hopefully, this will ensure its continued existence as a unique and valued member of our provincial and national fauna. 

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