Acipenser fulvescens Rafinesque, 1817 **Lake Sturgeon**
Esturgeon jaune

Order: ACIPENSERIFORMES **Family: ACIPENSERIDAE**

SUMMARY

The Lake Sturgeon *Acipenser fulvescens* is one of the few sturgeon species that spends its entire life cycle in freshwater. The species is widely distributed through the eastern United States of America (USA) and Canada occurring in the Great Lakes, Hudson Bay-James Bay and Mississippi watersheds. The age at first spawning ranges from 14-16 years with an average size of 114.3 cm for males and 24-26 years with an average size of 139.7 cm for females. Many populations have been fragmented by the construction of dams, and have been affected by increasing levels of pollution. However, populations in Canada are thought to be healthier than the majority of those in the USA. Commercial fisheries for the species were developed during the early 1900s, but in many cases after high initial yields, the fisheries closed after ten years or so when yields dropped drastically and fisheries were no longer viable.

The total annual catch of *A. fulvescens* in the last quarter of the 19th century exceeded 2,000 tonnes (t). Today, almost the entire catch originates from Canada where in 1997 landings of the commercial catches totalled only 223 t caught in New Brunswick and Quebec, valued at USD1.8 million, with 90% (200 t) caught in the St. Lawrence River. The Canadian recreational *A. fulvescens* fishery is very limited. It totalled 1,100 fish in Saskatchewan and Alberta in 1995. In the Great Lakes, the annual average recorded catch of the species in Lake Erie and Lake Ontario, combined for USA and Canada, dropped from 49 t per year in the 1880s to 0.32 t per year in the 1960s. The 1998 international trade in specimens of *A. fulvescens* amounted 18,167 kg of meat from wild sources exported by Canada to USA, 1,120 live fish exported by USA to Taiwan (Province of China) (50% from the wild and 50% from captive bred sources) and 9 specimens (probably adults) declared as pre-Convention stock and exported by USA to the Russian Federation and Germany. Although successful artificial breeding has been reported, information on the present status of development of commercial farming of *A. fulvescens* is currently lacking. No export quotas have been established by range States since the Appendix II listing entered into effect.

DISTRIBUTION AND POPULATION

The distribution of *Acipenser fulvescens* is listed in the CITES database as: Canada, USA (Anon., 2000).

A. fulvescens is classified as Vulnerable by IUCN (1996):
VU A1ad + 2d Canada, USA.

A. fulvescens is widespread in eastern Canada and USA occurring in three major watersheds: the Great Lakes, the Hudson-James Bay and the Mississippi River (Houston, 1987). The species still inhabits much of its natural distribution in Manitoba, Ontario and Quebec, but some populations are now much reduced or extirpated e.g. lakes Winnipeg, Ontario and Erie. Some populations are isolated and fragmented and differ morphologically and genetically (Ferguson and Duckworth, 1997). In contrast, their distribution within the USA is fragmented and Wisconsin is the only state where the species is considered common.

Canada: The Canadian distribution includes rivers and lakes in the five provinces of Alberta, Saskatchewan, Manitoba, Ontario and Quebec. It is found as far west as Edmonton on the North Saskatchewan River, as far east as St. Roch de Aulinaires on the St. Lawrence River, as far north as the Seal River and as far south as Lake Erie (Ferguson and Duckworth, 1997; Houston, 1987). *A. fulvescens* occurs in larger rivers and lakes from the St. Lawrence River and Great Lakes north to Hudson Bay and west to the North and South Saskatchewan rivers (CITES Management Authority of Canada, *in litt* to TRAFFIC Europe, August 2000).

United States of America: The species is mainly confined to the Great Lakes, but also occurs in the Mississippi River drainage from the upper Mississippi River and its major tributaries to the northern border of Arkansas. The species is listed as Endangered, Threatened or Extirpated by several states (Todd, 1999).

Unless otherwise stated, information hereunder has been provided by US Fish and Wildlife Service (USFWS) (CITES Management Authority of USA, *in litt.* to TRAFFIC Europe, September 2000).

Alabama: A. fulvescens is presumed to be extirpated since there are no recent records of occurrence.

Arkansas: Although occurring in Arkansas historically, *A. fulvescens* has long been extirpated from the state.

Iowa: A small population of *A. fulvescens* is found in the Mississippi River.

Kansas: A. fulvescens is currently limited to the Missouri River and possibly the lower Kansas River.

Michigan: The current population is believed to be at 1% of its former size.

Ohio: A. fulvescens is limited in distribution and relatively rare.

Vermont: A. fulvescens is only found in Lake Champlain.

Wisconsin: The population of *A. fulvescens* is large enough to allow sport fishing.

HABITAT AND ECOLOGY

A. fulvescens is one of the few sturgeon species that is generally confined to freshwater. However, there are a few records of individuals being taken in brackish waters of the St. Lawrence River and the Moose River (Scott and Crossman, 1973). The usual habitat is the highly productive shoal area of larger lakes and rivers (Houston, 1987). They require swift currents and large rough substrates for spawning and embryo incubation (Ferguson and Duckworth, 1997). Diet varies according to food availability but mainly consists of benthic invertebrates and in some areas, small fish. The approximate age and size at which *A. fulvescens* become sexually mature in Lake Winnebago (USA) are 14-16 years and 114.3 cm for males, and 24-26 years and 139.7 cm for females (Priegel and Wirth, 1971, cited in Houston, 1987). In Canadian rivers and lakes, this size ranges from 76.2-97.8 cm for males and from 83.8-116.8 cm for females (Houston, 1987).

Typical size/age relationships of *A. fulvescens*

Age	**6 months**	**5 years**	**15 years**	**50 years**
Length (cm)	10 – 15	30 – 70	63 – 100	101 – 180
Weight (kg)		0.45 – 2.26	2.27 – 11.34	18.14 – 36.29

Source: MacNeill and Busch, 1994

THREATS TO SURVIVAL AND DOMESTIC USE

Loss of habitat due to dam construction on virtually all larger river systems is the main threat to this species (Houston 1987; Ferguson and Duckworth, 1997). Dams constructed for hydroelectric generation affect water levels and prevent fish from reaching the different habitats required for specific life stages. Fragmentation into isolated populations may lead to a loss of genetic variability. Pollution of almost all river systems within the species' range by industry and agriculture development has affected *A. fulvescens* and continues to do so (Houston, 1987).

A. fulvescens was an important food source for Native Americans, especially during their spring ceremonial feasts conducted near the spawning grounds (Ferguson and Duckworth, 1997). The annual average recorded catch of *A. fulvescens* in lakes Erie and Ontario, combined for USA and Canada, dropped from 49 t per year in the 1880s to 0.32t t per year in the 1960s (MacNeill and Busch, 1994).

Canada: Sturgeon harvest in Canada consists of aboriginal, commercial and recreational fisheries (CITES Management Authority of Canada, *in litt.* to TRAFFIC Europe, August 2000). The total annual catch of *A.*

fulvescens in the last quarter of the 19th century exceeded 2,000 t (Houston, 1987). In 1995, the reported recreational *A. fulvescens* fishery totalled 1,100 fish in Saskatchewan and Alberta, mostly caught in the North and South Saskatchewan rivers (Department of Fisheries and Ocean Canada, *in litt*. to the CITES Management Authority of Canada, 9 June 2000). In the late 1990s, the remaining commercial *A. fulvescens* fisheries were in the Provinces of New Brunswick, Ontario and Quebec. In 1997, commercial catches totalled 223 t, with 200 t (90%) caught in the St. Lawrence River (Quebec). This volume was valued at USD1.8 million (Department of Fisheries and Ocean Canada, *in litt*. to TRAFFIC North America-Canada, 21 September 2000).

Unless otherwise stated, information hereunder has been provided by the CITES Management Authority of Canada (*in litt.* to TRAFFIC Europe, August 2000).

Alberta: There is no commercial sturgeon fishery but some recreational fishing.

Manitoba: In a number of rivers, stocks have been depleted through hydroelectric development and/or harvest. In 1999, only aboriginal subsistence fishing remained in most rivers.

Ontario: In 1984 there were two areas in Lake Huron that had commercial *A. fulvescens* fisheries: North Channel and the southern ends of the Main Basin. The level of annual catches in 1997 was 5.5 t in Lake Huron and 0.38 t in Lake St. Clair. The commercial fishery in Lake St. Clair was closed in 1970 due to contaminants and was reopened in 1980. There is no fishery for *A. fulvescens* in the Lake of the Woods and the Rainy River, or commercial fishery for the species in Lake Superior and the Ottawa River.

Annual commercial catch of *A. fulvescens* (kilogrammes)

	1994	**1995**	**1996**	**1997**	**1998**	**1999**
Catch	8,329	4,984	5,746	5,990	6,790	6,235

Source: Department of Fisheries and Oceans Canada, *in litt*. to TRAFFIC Europe, 27 September 2000

Quebec: Commercial fishing for *A. fulvescens* in rivers and lakes totalled 208.714 t in 1997 (Department of Fisheries and Ocean Canada, *in litt*. to the CITES Management Authority of Canada, 9 June 2000), with 96% of the catch originating from the St. Lawrence River.

Annual Commercial catch data for earlier years (tonnes)

	1986	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**
Catch	184	246	173	158	222	217	223	225	214

Source: Pierre Dumont, *in litt*. to TRAFFIC Europe, 1995

Sport fishing consists of a few hundred fish per year in the Montreal area.

Saskatchewan: The province has a commercial *A. fulvescens* catch quota of 4,500 kg/year on the lower Saskatchewan River. This quota was sustainable in the 1950s, but following the loss of habitat and over-fishing, commercial harvest declined and a self-imposed moratorium began in 1996.

United States of America: Unless otherwise stated, information hereunder has been provided by USFWS (CITES Management Authority, *in litt.* to TRAFFIC Europe, September 2000).

Iowa: A. fulvescens is on the state endangered species list.

Kansas: There is no legal commercial season for this species. However, anglers who catch *A. fulvescens* incidentally by legal methods are allowed to keep them. There are no records of illegal harvest.

Michigan: Since the mid-nineteenth century, exploitation and habitat degradation have resulted in substantial population declines. These declines have been caused by: overharvest, barriers to migration, sea lamprey (parasite) proliferation, physical alteration of habitat, changes in water flow and quality. Anglers may take *A. fulvescens* by hook-and-line methods and a tribal fishery on Keweenaw Bay and Portage Lake allows Native American anglers to catch the species (Mosher, 1999).

Minnesota: Reported annual anglers' catch of *A. fulvescens* (kilogrammes)

1996	1997	1998	1999	2000
100	643	3,900	2,260	4,170

Source: USFWS, CITES Management Authority, *in litt.* to TRAFFIC Europe, September 2000

Local consumption is based on angling harvest where the fishing season for *A. fulvescens* is open. The trade in *A. fulvescens* has decreased in recent years due to the lack of viable eggs from commercial fish farms in other States. There are records of illegal catch (see "Conservation Measures").

New York: Carcasses of *A. fulvescens* are brought in from other states under license. This trade supports an active processing (meat smoking) industry and market for sturgeon products in the New York City area. About 68,000 kg of *A. fulvescens* were imported into New York smoke-houses in 1999.

Ohio: There are no official records of poaching activities. There are no known aquaculture facilities for *A. fulvescens.*

South Dakota: Harvest of all sturgeon species, by both sport and commercial methods, is prohibited in the state. There are no records of poaching activity.

Vermont: The fishery for *A. fulvescens* was closed in 1967.

Wisconsin: The harvest is limited to two separate sport fishing seasons.

Catch of *A. fulvescens* (number of fish)

	1998	1999	2000
Spearing season	2,051	1,484	2,517
Hook and line season	314	347	

Source: USFWS, CITES Management Authority, *in litt*. to TRAFFIC Europe, September 2000

INTERNATIONAL TRADE

A. fulvescens was listed on CITES Appendix II in 1975, delisted in 1983 and relisted in1997, entering into force on 1 April 1998.

Gross exports and comparative tabulation of trade in *A. fulvescens* for 1998 are given in the Appendix.

According to 1978-1984 CITES data, exports of *A. fulvescens* were restricted to meat with an average 6,416 kg/year exported during this seven year period. For 1998, the most important international trade in wild specimens of *A. fulvescens* is still represented by meat; exports from Canada to USA totalled 18,170 kg. This volume is the largest quantity of sturgeon meat trade reported in 1998 CITES Annual Reports for all Acipenseriformes.

A total of 1,120 live specimens (probably juvenile fish) were exported from USA to Taiwan (Province of China), and nine specimens from a pre-Convention stock (probably adults to be used as broodstock in captive breeding facilities) were exported from USA to Germany and the Russian Federation.

CONSERVATION MEASURES

Tagging studies are carried out widely. Habitat reconstruction has been undertaken in some states of USA and appears to have been successful. The protection of remaining habitat is a priority in Canada (Houston, 1987).

Canada: The species is not listed as a species at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The species is protected and managed in Canada under the *Federal Fisheries Act* in each province of occurrence. Regulations differ between provinces and are revised annually. *A. fulvescens* is listed under provincial legislation as Threatened in Alberta, Manitoba, New

Brunswick, Newfoundland, Ontario, Quebec and Saskatchewan (CITES Management Authority of Canada, *in litt.* to TRAFFIC Europe, August 2000).

Alberta: A Lake Sturgeon Management Plan has been implemented on the South and North Saskatchewan River since 1997. A zero catch limit is in effect for *A. fulvescens* in the North Saskatchewan River and in the South River, a limit of one sturgeon of 130 cm in total length (through a tag system) is in effect. There is a closed season during the spawning period from 1 April to 15 June. There is no aboriginal fishery (CITES Management Authority of Canada, *in litt.* to TRAFFIC Europe, August 2000).

Manitoba: The possession limit for sturgeon was reduced to zero throughout the province in 1995. The remaining few commercial fisheries closed down during the 1990s, but "catch and release" angling is still allowed in addition to aboriginal subsistence fishing in most rivers. *A. fulvescens* population management has been initiated in a couple of rivers, with the involvement of First Nations communities (CITES Management Authority of Canada, *in litt.* to TRAFFIC Europe, August 2000).

Ontario: In 1984, catch quotas were allocated based upon annual performance by individual fishers from 1978 to 1982. Quotas have not been adjusted although they have never been achieved and may therefore have been set too high. In Lake St. Clair the total annual catch quota was set at 1,500 kg and remains unchanged since 1985. The current total catch quota for Lake Huron is 13,024 kg, although the total 1997 catch was only 5,471 kg, which has been the approximate level of the annual catch since the early 1980s. Since 1995, a Lake Sturgeon Assessment programme has been implemented, including population abundance estimation and tagging to identify movements and verify ages. A management plan for the species will be drafted after sufficient data are collected. In the meantime, quotas will not be increased, but may be decreased pending preliminary data analysis (CITES Management Authority of Canada, *in litt.* to TRAFFIC Europe, August 2000).

Catch quotas set for *A. fulvescens* in Lake Huron (kilogrammes)

1991		1992		1993		1994		1995		1996		1997	
Quota	**Catch**	**Quota**	**Catch**	**Quota**	**Catch**	**Quota**	**Catch**	**Quota**	**Catch**	**Quota**	**Catch**	**Quota**	**Catch**
11,121	5,335	11,667	4,632	11,843	4,656	13,124	4,074	13,165	3,848	13,124	4,370	13,024	5,471

Source: Department of Fisheries and Oceans Canada, *in litt*. to TRAFFIC Europe, 27 September 2000

Quebec: Starting just after the spawning season, fish may be harvested with gill nets (19-20.3 cm mesh) from 14 June to 31 October. The minimum size limit is 45 cm (the legal length is defined as: the distance from the posterior edge of the branchial slit to the posterior joint of the dorsal fin). In sport fishing, only one fish per day can be harvested or kept at any one time. Commercial catch must be tagged as soon as fish are caught and remain tagged until they are processed for human consumption. Issuing a specified number of tags to each commercial fisherman enforces catch quotas (CITES Management Authority of Canada, *in litt.* to TRAFFIC Europe, August 2000).

Saskatchewan: A self-imposed moratorium on commercial catch on the lower Saskatchewan River has been in force since 1996. Angling of the species has not been allowed in Saskatchewan since the beginning of 1999. A multi-agency study of habitat, fish migration and abundance is being carried out (CITES Management Authority of Canada, *in litt.* to TRAFFIC Europe, August 2000).

United States of America: Unless otherwise stated, information hereunder has been provided by USFWS (CITES Management Authority, *in litt.* to TRAFFIC Europe, September 2000).

Iowa: *A. fulvescens* has been on the state endangered species list for many years.

Missouri: *A total of 164,000* A. fulvescens fry and fertilised eggs were released in the Mississippi and Missouri rivers between 1983 and 2000. A few adult and pre-adults have been released occasionally.

Michigan: *A. fulvescens* was listed as a state threatened species in 1994. A rehabilitation strategy has been prepared and regulations restrict the sport fishery in season, number as well as size of fish and fishing gear (Mosher, 1999).

Minnesota: *A. fulvescens* and Shovelnose Sturgeon *Scaphirhyncus platorynchus* as well as American Paddlefish *Polyodon spathula* may not be taken, bought, sold, transported or possessed unless authorised by the commissioner. Infractions to the following regulations were recorded: no license (8 events), no license in possession (1), closed area (4), closed season (3), illegal equipment (1), undersized fish of less than 45 inches (2) and oversized fish (1). One warning was given for import/transport of sturgeon hybrid without a permit. Farming of *A. fulvescens* is being developed. A cooperative project for restocking *A. fulvescens* is being undertaken using wild broodstock and artificial breeding, or by the transfer of wild juveniles.

New York: The species is considered a threatened species. All harvest or possession is prohibited except under license or permit. Licenses are available for the import of *A. fulvescens* carcasses and the processing of their products. A recovery plan has been conducted since 1994. *A. fulvescens* fingerlings have been reared and released in a selection of target restoration waters since 1995. Survival of released sturgeon has been high and populations are recovering. Eggs for this program are collected from wild stocks in the St. Lawrence River. No captive broodstock is maintained and there are no recorded captive breeding operations in the State.

North Dakota: Although Minnesota is undertaking an *A. fulvescens* re-introduction programme within the Red River drainage, North Dakota is not an active partner of this programme.

Ohio: The species has been listed as an Ohio endangered species since 1974. Ohio is participating in research and outreach programmes for the species. The state does not have a commercial or sport catch/quota for *A. fulvescens*.

South Dakota: Harvest of any specimen by sport and commercial fishermen and selling or trading flesh and/or body parts of sturgeon (including *A. fulvescens*) by anglers is prohibited.

Vermont: The fishery was closed in 1967 and *A. fulvescens* was placed on the state endangered species list in 1987. It is illegal to take or possess *A. fulvescens* without a permit. The USFWS fish culture facility at Pittsford (Vermont) reared the St. Lawrence River strain of the species for a restoration programme on the St. Lawrence River and its tributaries in New York State. The fry were not released in Vermont.

Wisconsin: Fisheries management measures have been adopted for spear and hook-and-line fisheries. For the hook-and-line fishery, there is 127-178 cm minimum length limit depending on the location. The fishing season starts on the first Saturday in September and runs through to 15 October. The catch limit is one fish per angler per season, and anglers must apply for a free tag.
For the spear fishery, there is a 91cm minimum length catch limit. Spear fishers must purchase a USD10 sturgeon spear tag, with the season starting on the first Saturday in February until the quota is reached. The Lake Winnebago spear fishery is regulated under an annual catch quota system (in 2000, 400 adult females, 400 juvenile females and 2,150 males). Once 80% of the quota is reached, the season is closed at the end of the following day. Since the early 1980s, volunteer sturgeon patrols have observed spawning sites for 24-hour shifts each spring. Commercial breeding of *A. fulvescens* is prohibited in Wisconsin. The hatchery of the Wisconsin Department of Natural Resources propagated sturgeon for restocking purposes. Fish can only be restocked into the same basin that the eggs were collected; no inter-basin transfers are allowed.

CAPTIVE BREEDING

Canada: Aquaculture of *A. fulvescens* has been reported, but no results on the volumes of specimens produced were available from the Department of Fisheries and Oceans Canada (TRAFFIC North America-Canada, *in litt*. to TRAFFIC Europe, 21 September 2000).

United Syaes of America: No records of commercial captive breeding were recorded in Arizona, Delaware, Florida, Louisiana, New York, Ohio, Oklahoma, South Dakota, Tennessee, Utah or Wyoming. Sturgeon are in a preliminary stage of culture in Georgia, Hawaii and Virginia (USFWS, CITES Management Authority, *in litt.* to TRAFFIC Europe, September 2000).

Minnesota: Three licensed aquaculture farms have stocks of *A. fulvescens*. The fish were either obtained from artificial breeding of wild specimens or were purchased from commercial operations in Kentucky. None of the facilities have yet produced viable eggs.

Wisconsin: Commercial rearing is prohibited, but State-run hatcheries exist.

According to FAO Fishstat, the world annual production of farmed sturgeon and paddlefish (mostly for the meat market) has increased rapidly, from 160 t in 1987 to 2,576 t in 1998. Species specific data are not available in the FAO database, but according to information provided by range States, and significant production of *A. fulvescens* in commercial farms has not been reported.

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Gross exports of *Acipenser fulvescens* 1998

TAXON	TERM	UNIT	Exporter	1998
Acipenser fulvescens	live		US	1,120
Acipenser fulvescens	meat*		CA	5,950
Acipenser fulvescens	meat	kg	CA	12,220
Acipenser fulvescens	meat	kg	US	279
Acipenser fulvescens	specimens		US	9

Comparative Tabulation of trade in *Acipenser fulvescens* 1975-1983 and 1998

				Imports reported					Exports reported				
Year	**Imp.**	**Exp.**	**Origin**	**Quantity**	**Unit**	**Term**	**P**	**S**	**Quantity**	**Unit**	**Term**	**P**	**S**
Meat													
1998	US	CA		12,220	kg	meat	T	W					
1998 *	US	CA		5,950	kg*	meat	T	W					
1998	RU	US	CA						279	kg	meat	T	W
TOTAL				**18,170**	**kg**				**279**	**kg**			
Other specimens													
1998	TW	US							560		live	T	C
1998	TW	US							560		live	T	W
1998	DE	US		6	specimens		S	O	6		specimens		O
1998	RU	US							3		specimens		O
Earlier years													
1978	US	CA		270	kg	meat			(Listed from 1975 to 1983)				
1979	US	CA		1,415	kg	meat							
1980	US	CA		3,622	kg	meat							
1981	US	CA		9,705	kg	meat							
1982	US	CA		11,613	kg	meat							
1983	US	CA		15,862	kg	meat							
1984	US	CA		2,424	kg	meat			(COP 4: De-listing of the species)				
			Average:	**6,416**	**kg/year**								

* The Unit is "kg" (US CITES Management Authority, *in litt.* to TRAFFIC Europe, September 2000). The total meat of *A. fulvescens* exported from Canada in 1998 was therefore 18,170 kg.