CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Sixteenth Meeting of the CITES Animals Committee
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Implementation of Resolution Conf. 8.9 (Rev.)

ACIPENSERIFORMES

1. This document has been prepared by TRAFFIC International in cooperation with IUCN and UNEP-WCMC, under contract to the CITES Secretariat.

2. The Annex consists of a review of 10 species of Acipenseriformes pursuant to Decision 11.95 directing the Animals Committee to include the Acipenseriformes in its Review of Significant Trade. The document deals with the following species of Acipenseriformes:

3. The relevant parts of the Annex have been sent to all range States of the species concerned, but comments from the range States have either not yet been received or not yet been incorporated in the document.

Acipenser baerii Brandt, 1869

Siberian Sturgeon
Esturgeon sibérien

Order: ACIPENSERIFORMES **Family: ACIPENSERIDAE**

SUMMARY

Siberian Sturgeon *Acipenser baerii* may live for up to sixty years and generally reach sexual maturity between 18 and 28 years of age, except in the Lena River where fish mature sexually around 9-12 years of age. The maximum weight recorded is 210 kg, but *A. baerii* usually weigh approximately 65 kg. Little information is available on the current population status for this species in China and Kazakhstan. However, the limited data available for the Russian Federation show that the spawning area has declined by up to 40% in some areas due to dam construction and increased abnormal oogenesis has been observed, probably due to chemical and nuclear water pollution. The population in China is low and economically insignificant.

Catch volumes in the Russian Federation have generally declined, probably as a result of the above listed anthropogenic disturbances as well as over-fishing. However, the Russian Federation is the only country where significant levels of catches have been reported. The annual catch of *A. baerii* in the Ob'-Irtysh River basin decreased from 1,410 tonnes (t) in the 1930s to 11 t in 1997. Annual catches in the two other major Siberian rivers in the late 1990s were 16 t per year in the Yenisey River and 13-20 t per year in the Lena River. The Lena population of *A. baerii* is most commonly bred in captivity, because it completes its life cycle in freshwater and sexually matures relatively early. Virtually all international trade in *A. baerii* (caviar, fertilised eggs and live fish) for 1998 detailed in CITES annual reports was from captive-bred sources from France (280 kg of caviar and 160,000 live juveniles) and the Russian Federation (probably fertilised eggs). The export quota set for caviar by the Russian Federation declined from 19,000kg for 1998 to 400 kg for 2000. Additionally, for 2000 the Russian Federation has set export quotas of 3,000 kg of meat and fertilised eggs of *A. baerii* as well as of three different hybrids.

The species is recommended under Decision 11.106 for inclusion in category 2.

DISTRIBUTION AND POPULATION

The UNEP-WCMC database of CITES-listed species lists the distribution of *Acipenser baerii* as: China, Kazakhstan? and the Russian Federation (Anon., 2000a).

A. baerii is classified as Vulnerable by IUCN (1996):
VU A2d Russia
A. b. baerii EN A2d Russia [Ob and Taz rivers]
A. b. baikalensis EN A1ace Russia [Lake Baikal]
A. b. stenorrhynchus VU A2d Russia [Yenisei, Lena and east Siberain rivers]

China: There is little information about the distribution of *A. baerii* in China, but it is reported to occur within the Irtysh River system of Xinjiang (Lake Zaysan, Kara, Irtysh and Ertix rivers, tributaries of the Irtysh River) (Qing Jianhua, pers. comm., cited in: CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000). Ruban notes that *A. baerii* inhabits the part of the Irtysh River (Tchernyi Irtysh) flowing through China to the Kren River (Ruban, 1997; 1999).

Kazakhstan: *A. baerii* inhabits part of the Irtysh River including Shulbinskoe, Ust-Kmenogorskoe and Bukhtarminskoe reservoirs (Ruban, 1999).

Russian Federation: *A. baerii* inhabits virtually all large rivers in Siberia (Sokolov and Vasil'ev, 1989). Its range extends south from the Lena River basin and Ob' Bay to the Cherniyi, Irtysh and Selenga rivers. Longitudinally, it is found from the Ob' to the Kolmya rivers. The populations inhabiting the Ob'-Irtysh basin

and Lake Baikal are included in the Russian Federation Red Book, with stocks having declined throughout the country (Dr. G. Ruban, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Three subspecies are recognised. *A. baerii baerii* is restricted to the Ob' River and its tributaries. This subspecies migrates to Ob' Bay during the winter due to seasonal oxygen deficiency in the Ob' River; numbers are reported to be very low (Ruban, 1996; 1997).

A. baerii stenorrhynchus occurs in the basins of the East Siberian Rivers (Alazeya, Anabar, Indigirka, Khatanga, Lena, Lolyma, Olenek, Pyasina, Yana and Yenisei. (Ruban, 1997; Ruban and Akimova, 1991; 1993; Ruban and Panaiotidi, 1994). Two forms of this subspecies are recognised. The migrating form, which swims considerable distances upstream from estuaries and deltas to spawn, is more numerous than the non-migratory form. The constant reduction in fisheries catch statistics reflects declining populations (Dr G. Ruban, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

A. baerii baikalensis is a unique lake form from Lake Baikal, which migrates to the Selenga River to spawn. The majority of the population occurs in the northern part of the lake near to the Selenga River delta and the Barguzinskii and Chivyrkuuskii bays, and is rarely encountered in the south. From the northern areas it migrates into the large tributaries of the lake, up to 1,000 km upstream in the Selenga River, and also enters the tributaries of the Chkoi, Delger-Muren, Orhon and Tula rivers. In the mid-1990s, the subspecies was reported to be extremely rare (Ruban, 1997).

However, recent studies suggest that *A. baerii* may be monotypic and forms continuous populations in large river systems (Ruban, 1999).

Introduced populations:

France: In December 1999 several thousand juvenile and several hundred gravid females (more than 7 kg specimens) of *A. baerii* escaped into the Gironde River (Bordeaux region) during two storms. The survival of the escaped fish and their effect on the wild population of *A. sturio*, are unknown. However, the introduction of new pathological germs, food competition in case of acclimatisation of the exotic specimens, and hybridisation with *A. sturio* must be taken into consideration (Cemagref, *in litt*., press release, 26 January 2000).

Germany: In the Baltic Sea river estuaries east of Rostock (Germany) and further upstream, hybrid sturgeon, including hybrids with *A. baerii*, have been caught. These probably originate from upstream aquaculture farms, or were released by private aquaria due to their large size (Jörn Gessner, Institute of Freshwater Ecology and Inland Fisheries, pers. comm. to TRAFFIC Europe, 15 March 2000).

Italy: The species has been introduced in captive breeding facilities and hybridised with Adriatic Sturgeon *A. naccarii* in Italy in the 1990s (Azienda Agricola and Agroittica Lombarda, Italian sturgeon farmers, *in litt*. to TRAFFIC Europe-Italy, 1999). *A. baerii* are occasionally found in the wild; fish sporadically escape from rearing plants or angling ponds, or are released when they become too large for private aquaria (Dr P. Bronzi *in litt*. to IUCN/SSC WildlifeTrade Programme, September 2000). There is no documentation on the potential damage of the introduction of exotic Acipenseriformes and their hybrids on native species. If specimens of *A. baerii* escape to the open waters of the Po River and become an "invasive species", this may threaten the Adriatic Sturgeon *A. naccarii*, a species that is on the brink of extinction.

Russian Federation: *A. baerii* has been introduced to Lakes Ladoga, Pskov-Chud, Seliger and others in the Baltic watershed and to the Gor'kov and Volgograd impoundment along the Volga and in manmade lakes downstream from Moscow (Berdichevskii *et al.*, 1983, cited in Sokolov and Vasil'ev, 1989). However, long-term studies have rarely found introduced *A. baerii* in these water bodies (V. S. Malyutin, pers. comm., cited in Dr G. Ruban, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

HABITAT AND ECOLOGY

A. baerii can reach a maximum length of 2 m and weight of 210 kg. However, it usually does not exceed 65 kg in weight with a maximum age of approximately 60 years (Sokolov and Vasil'ev, 1989). Only the

Lena River population reaches sexual maturity at 9-10 years for males and 10-12 years for females; all other populations reach sexual maturity at 18-24 years for males and 24-28 years for females. The minimum recorded size for spawning is 0.6-0.9 m in length and 0.7 kg in weight (Hochleithner and Gessner, 1999). The spawning season is from May to June. *A. baerii* feeds predominantly on benthic organisms including chironomid larvae and river amphipods, isopods and polychaetes (Sokolov and Vasil'ev, 1989).

The results of *A. baerii* captive breeding suggest that young females (two years after reaching sexual maturity, minimum age ten years), born and bred in captivity, may bear 10% of their weight in caviar, while for 18-year old females the yield is 18-20% (T. Rouault, Cemagref, pers. comm. to TRAFFIC Europe, 27 September 2000). Therefore the average rate most commonly used is 12-13% per female and 6-7% for the whole catch, assuming that 50% of the catch are males (1:1 sex ratio of the population).

THREATS TO SURVIVAL AND DOMESTIC USE

China: The size of the population is relatively small and economically insignificant (CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000).

Russian Federation: Much of the habitat of *A. baerii* has been lost due to the damming of many Siberian rivers since the 1950s. The migratory forms have been particularly affected because they can no longer access their spawning sites. There is little documentation as to the extent of habitat loss.
Forty percent of the spawning habitat of the migrating form of *A. baerii stenorrhynchus* has been lost in the Ob'-Irtysh River due to construction of the Novosibirsk, Ust'-Kamengorsk and Shul'binsk hydroelectric power stations (Ruban, 1996). The Yenisey River and Lena River populations have been similarly affected, losing 500-600 km and 300 km of habitat respectively. The development of oil extraction facilities and the use of pesticide in agriculture in the Yenisey River have polluted Siberian rivers (Ruban, 1997). Pollution has drastic effects on fish physiology and has consequently reduced the already low fecundity of all sturgeon species by causing degenerative oocytes (Akimova and Ruban, 1995). In the 1980s, oil and petroleum products in the Ob' River exceeded permissible levels by a factor of ten (Green, 1993). Many Siberian rivers are contaminated by radioactive substances and eastern Siberian rivers are polluted by the gold mining industry (Akimova and Ruban, 1995).

Law enforcement appears to be lacking and numerous experts as well as high position officers claim that the wild population is highly threatened by increasing illegal fishing and trade in caviar in a large part of the range (Anon., 2000b).

In the 1930s, the annual recorded catch of *A. baerii* in the Ob'-Irtysh rivers basin reached 1,410 t. By 1997, this figure had dropped to 11 t (Ruban, 1999). The ratio between illegal and legal catch in the Ob' River in 1994 was estimated at 300 t to 11 t (Ruban, 1996).

Russian catch of *A. baerii* in three large Siberian rivers (tonnes)

	1985	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Ob'	73	74	48	63	48	57	26	15.9	17	11.5	n/a	6.7	11
Yenisey	23.4	28.1	30.4	20.7	17	40.6	36.9	31.1	42.4	44.1	n/a	33.6	n/a
Lena	8.8	11.2	8.7	15.2	8.2	9.5	14.9	4.9	5.4	17.2	12.9	21.6	9
Total	***105.2***	***113.3***	***87.1***	***98.9***	***73.2***	***107.1***	***77.8***	***51.9***	***64.8***	***72.8***		***61.9***	

Source: Ruban, 1999

Current catch in the Yenisey River does not exceed 16 t per year, and the Lena River annual catches are approximately 13-20 t. In other Siberian rivers (Anabar, Indigirka, Khatanga, Kolyma, Olenek and Yana) stocks have always been relatively small. There are no recent catch data available for Yakutian (Republic Sakha-Yakutiya of the Russian Federation) rivers (Anabar, Indigirka, Khatanga, Kolyma, Lena, Olenek and Yana) (Anon., 2000b).

INTERNATIONAL TRADE

The listing of *A. baerii* in CITES Appendix II entered into effect on 1 April 1998. Complete data for this species were therefore limited to nine months of trade (April-December 1998).

Gross exports and the comparative tabulation of trade in *A. baerii* in 1998 are given in the Appendix.
CITES Annual Reports for 1998 suggest that the international trade in wild specimens of *A. baerii* was extremely limited in 1998: 283 kg "eggs", 360,950 live fish (including 160,000 of captive-bred sources from France and 200,000 of unknown origin that were seized by the US Customs) and 433 kg of meat of captive-bred source from Uruguay. The export of 283 kg "eggs", comprised 280 kg caviar of captive-bred source from France and 3 kg of eggs (probably fertilised eggs destined for captive breeding facilities, but could be caviar; see *Note* at the end of the section) from the Russian Federation to Greece. Together with *A. transmontanus* White Sturgeon, *A. baerii* is one of the most common sturgeon species bred in captivity for meat. Captive breeding of *A. baerii* for caviar is limited to France, with the majority of caviar being consumed within the European Union (EU). Internal EU trade does not require CITES permits and is therefore not recorded in CITES Annual Reports.

"Live" specimens and fertilised "eggs" were probably destined to supply aquaculture farms and the growing demand for private aquaria. Germany and Hungary are also involved in the international trade of live first generation and captive-bred specimens respectively. "Meat" is the major production of sturgeon farms (see "Captive Breeding").

Exports of *A. baerii* from Russia in 1999 (kilogrammes)

	Quantity	Description	Importer	No of permits
A. baerii	27.50	Live eggs	HU, PL, DE, US, AM, IT, SY	10 Export
	300.00	Live fish	KR	2 Export
Hybrids:				
A. baerii x A. gueldenstaedtii	3.50	Live eggs	PL, DE	2 Export
A. gueldenstaedtii x A. baerii	37.50	Live eggs	CN, SY	3 Export

Source: CITES Management Authority, *in litt*. to TRAFFIC Europe, 18 September 2000

Export quotas set for *A. baerii* and its hybrids (kilogrammes)

	1998	1999		2000	
	Caviar	Caviar	Caviar	Meat	Fertilised Eggs
Russian Federation	19,000	2,000	400	3,000	30
Hybrids:					
A. baerii* x *A. gueldenstaedtii					10
A. gueldenstaedtii* x *A. baerii					70
A. baerii* x *A. ruthenus					15
Total	19,000	2,000	400	3,000	125

Source: CITES Notification No. 1998/35-36-61, 1999/21-47-53-68 and 2000/053-056-061

Illegal trade: A large shipment (200,000 live fish) of *A. baerii* of unknown origin was confiscated by the US Customs. Poaching and smuggling are closely related and have been intensively reported in the media of range States and importing countries (Evtouchenko, 1997; Mc Donald, 2000; Snyder, 2000). However, a great deal of illegally caught sturgeon is destined for the domestic market, particularly meat (Anon., 1998).

Note: The use of the term "eggs" and the unit "kg" or "g" to describe shipments of both caviar and fertilised eggs complicates the analysis of trade data. Similar difficulties arise from the unit used for export quotas of fertilised eggs, which is kilogramme ("kg") instead of "number of specimens". Kilogrammes do not directly correspond to the number of specimens, and hence do not allow the effective evaluation of quotas.

CONSERVATION MEASURES

China: Insufficient studies have been undertaken to determine necessary conservation measures for wild populations of *A. baerii* (CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000).

Russian Federation: The Lake Baikal population was listed in the Red Data Book in 1983 (Ruban, 1997) and the Ob' River population in 1998. In the late 1990s, commercial catch in the Yenisey River was prohibited due to rapidly declining populations and their extremely low fecundity (Anon., 2000b), caused by inaccessible spawning grounds and impact of pollution (Ruban, 1997). Catch for scientific and monitoring purposes, as well as subsistence use is limited to 8 t for *A. baerii* (Anon., 2000b).

Available data suggest that amendments of previous regulations and/or adoption of new legislation are in effect in Russian Federation. However, enforcement measures appear to be lacking and numerous experts as well as high–ranking officials have reported the increasing pressure of illegal fishing practices and criminal activities around caviar trade in a large part of the range (Anon., 2000b).

Russian scientists hold a few specimens of *A. baerii baikalensis* in a hatchery near Moscow for research and conservation (gene bank) purposes (Birstein, 1993). Approximately 300,000 larvae are reintroduced annually to Lake Baikal (V.S. Malyutin, pers. comm. to G. Ruban, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

CAPTIVE BREEDING

A. baerii is one of the most frequently captive-bred species of sturgeon. *A. baerii stenorrhynchus* have been successfully bred in several European countries (Sokolov and Vasil'ev, 1989; Willot *et al*., 1991).

Caviar is not the main product of sturgeon farms. The economic viability of a sturgeon farm depends on the existence of a meat market, particularly until females have reached sexual maturity, during the first 8 to 10 years. Once the stock of caviar producers is constituted, one tonne of caviar per year is correlated to the production of 20 t of sturgeon meat (C. Raymakers, TRAFFIC Europe, *in litt*. to Pr R. Billard, National Natural History Museum, Paris, May 1999).

Western and Central Europe: M. Hochleithner (*in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000) specifically names the following countries: Austria, Belgium, France, Germany, Hungary, Italy and Spain. In 1997, Bronzi *et al*. (1999) estimated the total annual captive-bred production of Siberian Sturgeon to be approximately 200 t in France, 120 t in Italy (pure species and hybrids), and 10 t in Germany.

Bulgaria: Only one Bulgarian hatchery exists. Established in 1997 in Boliartzi village (Plovdiv region), the hatchery has a total capacity of 60,000 juveniles. All juveniles released in the Bulgarian part of the Danube River from 1998 to 2000 were produced here. In 1998, a total of 200 hybrid fingerlings of *A. gueldenstaedtii* x *A. baerii*, with an average weight of 200 g, were released in the Ovcharitza dam reservoir. Since 1999, attempts have been made to breed sturgeon in artificial water basins near Sofia (CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000).

China: In recent years, more than 200,000 fertilised eggs of *A. baerii* have been imported by China from Germany and the Russian Federation for aquaculture. Although not recorded in the CITES Annual Reports, small quantities of fingerlings and live juvenile *A. baerii* of captive bred sources were exported from China in 1998 (CITES Management Authority of China, *in litt*. to TRAFFIC Europe, 28 August 2000).

France: The production of *A. baerii* caviar from aquaculture exceeded three tonnes in 1999 and is expected to reach five tonnes in 2000 (A. Jones, Manager of a *A. baerii* farm in France, pers. comm. to TRAFFIC Europe, 22 September 2000). Based on estimates made (C. Raymakers, TRAFFIC Europe, *in litt*. to Pr R. Billard, National Natural History Museum, Paris, May 1999), this implies a minimum annual production of 100 t of meat of farmed Siberian Sturgeon.

Italy: *A. baerii* has been bred for human consumption (meat) and sport angling in private closed basins since 1997. These specimens originated from larvae imported from France, Hungary and, since 1998, Italy (Dr P. Bronzi *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000).

Japan: *A. baerii* has been introduced into aquaculture in Japan (Katsumi and Genjiroi, 1977) but there are no production figures available.

Uruguay: According to CITES data, the US imported *A. baerii* meat of captive-bred source from Uruguay.

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APPENDIX

Gross exports* and export quotas for *Acipenser baerii* 1998

TAXON	TERM	UNIT	Exporter	1998	Export quota 1998 (kgs)
Acipenser baerii	Bodies		FR	24	
Acipenser baerii	Eggs	kg	FR	280	
Acipenser baerii	Eggs	kg	RU	3	19,000
Acipenser baerii	Live		DE	400	
Acipenser baerii	Live		FR	160,000	
Acipenser baerii	Live		GB	550	
Acipenser baerii	Live		XX	200,000	
Acipenser baerii	Meat	kg	FR	83	
Acipenser baerii	Meat	kg	UY	350	
Acipenser baerii	Other		CH	50	

Comparative tabulation of trade in *Acipenser baerii* 1998

				Imports reported					Exports reported				
Year	**Imp.**	**Exp.**	**Origin**	**Quantity**	**Unit**	**Term**	**P**	**S**	**Quantity**	**Unit**	**Term**	**P**	**S**
Eggs													
1998	GA	FR							100	kg	eggs	T	C
1998	MA	FR							50	kg	eggs	T	C
1998	US	FR		61	Kg	eggs	T	C	130	kg	eggs	T	C
1998	GR	RU							3	kg	eggs	T	C
			Total:	**61**	**Kg**				**283**	**kg**			
Live fish													
1998	CZ	DE		200		live	T	F					
1998	PL	DE		200		live		F	200		live	T	F
1998	CN	FR							150,000		live	T	C
1998	HK	FR							5,000		live	T	C
1998	MA	FR							5,000		live	T	C
1998	XX	GB	HU						550		live	T	C
1998	US	XX		200,000		live	T	I					
			Total:	**200,400**					**160,750**				
Other specimens													
1998	CH	FR		24		bodies	T	C					
1998	CH	FR							83	kg	meat	T	O
1998	US	UY		350	kg	meat	T	C					
1998	DE	CH	XX						50		other		O

Definition: "**Gross exports** are the sum of all reported exports and re-exports in a particular commodity or species in a particular year or series of years; Gross trade is thus a simple measure of the total number of items recorded in international trade. However, gross trade may be an overestimate of the total number of actual specimens in trade as re-exports are not deducted from the total." (Anon, 1996).

This is particularly applicable to caviar of which shipments are often exported, re-packaged and re-exported. For instance, in the mid-1990s, Germany re-exported as much as 45% of its annual caviar imports (De Meulenaer and Raymakers, 1996).

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 catch of *A. fulvescens* in the last quarter of the 19th century exceeded 2,000 tonnes (t) annually. Today, almost the entire catch originates from Canada where in 1997 landings of the commercial catch 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.

The species is recommended under Decision 11.106 for inclusion in category 2 (ii).

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). In addition, sturgeon cultures to rehabilitate populations in the Nelson, Winnipeg and Saskatchewan rivers have begun (CITES Management Authority of Canada *in litt*. to CITES Secretariat, November 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. (CITES Management Authority of Canada, *in litt.* to TRAFFIC Europe, August 2000). All commercial fishers in Ontario are required to fill out daily catch report, however, in the north many First Nations do not complete these daily catch records (CITES Management Authority of Canada *in litt*. to CITES Secretariat, November 2000). 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 States 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.

Acipenser gueldenstaedtii Brandt, 1833

Russian Sturgeon
Ossetra

Order: ACIPENSERIFORMES **Family: ACIPENSERIDAE**

SUMMARY

The Russian Sturgeon *Acipenser gueldenstaedtii* may live to 48 years weighing around 100 kg. The species matures sexually between 8-16 years and most female spawners in the wild are aged 13-23 years. Spawning occurs every 2-3 years. *A. gueldenstaedtii* has a wide distribution, occurring in the Caspian Sea, Black Sea and the Sea of Azov, and originally in many of the tributaries of these seas. However the construction of dams on virtually all these rivers has significantly reduced the spawning area. The Ural River is one of the few major spawning rivers that has not been dammed. In addition to loss of habitat, *A. gueldenstaedtii* has been subject to overfishing and egg-production has been disrupted due to environmental pollution. In the early 1990s, around 30% of the population in the Caspian Sea and almost all the stock in the Sea of Azov originated from re-stocking programmes. However, the restocking of the Volga River by Russian hatcheries decreased from 1991-1995 levels by almost one third during 1996-1998. In contrast, the number of fingerlings released by Azerbaijan, Bulgaria and Iran has generally increased since 1995. Only Iran monitors the success of their restocking programme. The species is widely bred in captivity to produce meat and fry for both domestic and international trade. There is no record of caviar production in captive breeding facilities.

When commercial sturgeon catch in the Caspian peaked in 1997, *A. gueldenstaedtii* comprised almost 80% of the total catch and still provides a major portion of the global caviar production. Since then, recorded annual catches of the species have decreased in all range States. In the Caspian Sea they decreased from 21,550 tonnes (t) in 1977 to less than 1,000 t in 1999, and in the Danube River annual catches decreased from 24 t in the 1950s to the early 1980s, to less than 11 t in 1999. Caspian Sea annual catch quotas are set by the Intergovernmental Commission for Caspian Biological Resources, composed of representatives of all Caspian range States. The catch quotas of Azerbaijan, Kazakhstan and the Ukraine have all recently been decreased. Domestic markets of sturgeon products are unknown in the Russian Federation, and Iran estimated its domestic consumption to be 5% of the country's total caviar production and 65% of its sturgeon meat production. In 1998, range State exports of *A. gueldenstaedtii* caviar of wild origin totalled 95.3 t, with the Russian Federation (46 t) and Iran (40 t) being the main exporters. This may represent a minimum catch (males and females) of 1,361-1,588 t, using a standard rate of 6-7% in weight of caviar of the total catch. Iran apparently exceeded its caviar export quota of 10 t (but caviar exports of *A. gueldenstaedtii* and *A. persicus* may have been combined in the Iranian CITES Annual Report for 1998). The total caviar export quota for 2000 has decreased from the 1999 quota from 119.5 t to 95.9 t, but increased significantly for meat, from 53.5 t to 204 t.

The species is recommended under Decision 11.106 for inclusion in category 1 (i).

SPECIES IDENTIFICATION

Vlasenko *et al.* (1989) contend that *A. gueldenstaedtii* is not distinguishable from *A. persicus* Persian Sturgeon, where their ranges overlap in the southern and southeastern Caspian. Indeed, the two species are combined in the catch statistics of Azerbaijan, and are combined for Iran's 2000 caviar export quota. However, Dr M. Pourkazemi (*in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000) notes that *A. gueldenstaedtii* can be distinguished from *A. persicus* in the Iranian coasts on the basis of 22 morphological differences (Nazari Chari, 1993, cited in Dr M. Pourkazemi *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000). These two species can also be differentiated on the basis of immuno-biochemical characteristics.

Taxonomic confusion also exists concerning the species to which the subspecies *colchicus* belongs; *A. gueldenstaedtii colchicus* (e.g. Dr N. Patriche, *in litt.* to IUCN/SSC Wildlife Trade Programme, 2 November 2000), or *A. persicus colchicus* (e.g. Zarkua and Tsuladze, 1999).

DISTRIBUTION AND POPULATION

The CITES database lists the current distribution of *A. gueldenstaedtii* as: Azerbaijan, Bulgaria, Georgia, Iran (Islamic Republic of), Kazakhstan, Romania, Russian Federation, Turkey, Turkmenistan, Ukraine (Anon., 2000a).

A. gueldenstaedtii is classified as Endangered by IUCN (1996):
EN A2d Azerbaijan, Bulgaria, Hungary, Iran, Kazakhstan, Moldova, Romania, Russia, Turkey?, Turkmenistan, Ukraine, Yugoslavia
Caspian Sea stock: EN A2d Azerbaijan, Iran, Kazakhstan, Russia, Turkmenistan
Sea of Azov stock: EN A1acde + 2d Russia [Mediterranean and Black Sea]
Black Sea stock: EN A1acde Hungary, Romania, Ukraine, Yugoslavia [Mediterranean and Black Sea].

Two forms of the species exist. The anadromous form of this sturgeon inhabits the Caspian Sea, the Black Sea and the Sea of Azov (Vlasenko *et al.*, 1989). Sturgeon inhabiting the Caspian Sea migrate mainly to the Volga and Ural rivers for spawning. Spawning populations in rivers other than the Volga are now minimal (Khodorevskaya *et al.*, 1997; Levin, 1997; Vlasenko, 1990; Vlasenko *et al.*, 1989). In the Caspian Basin, *A. gueldenstaedtii* is estimated to have lost approximately 70% of its spawning grounds (Barranikova *et al.,* 1995). The Caspian and Black Sea populations contain both a spring and a winter spawning race (Vlasenko *et al.*, 1989). A non-migratory form also exists in the Danube and Volga River basins, and formerly in the Ural River (Hensel and Holèik, 1997; Holèik, 1995; Manea, 1966; Vlasenko *et al.,* 1989), although Birstein (1993) believes the non-migratory form to be extinct.

Azerbaijan: *A. gueldenstaedtii* occurs in the Kura River, up to Vavarin resevoir, the Lenkoranka River (Azerbaijan, Georgia) and the Astara River (Azerbaijan, Iran) (Vlasenko *et al*., 1989). In waters of the mid-western Caspian Sea, along the Azeri shore, *A. gueldenstaedtii* swims in coastal areas in spring and summer and migrates towards deep waters of the open sea as the temperature drops (CITES Management Authority of Azerbaijan, *in litt.* to TRAFFIC Europe, 18 September 2000).

Bulgaria: A portion of the Black Sea population migrates into the Danube River to spawn. The breeding seasons are in spring (early-April when the first catch of the year are recorded) and in autumn (end-September) (CITES Management Authority of Bulgaria, *in litt.* to TRAFFIC Europe, 15 September 2000). *A. gueldenstaedtii* also occurs along the Black Sea coast. However, it is considered "rare" (Pr N. Bacalbasa-Dobrovici, *in litt.* to IUCN/SSC, September 2000) due to overfishing and reduced reproductive capacity (Karapetkova *et al.*, 1995).

Georgia: The southeast coast of the Black Sea is an important feeding and wintering area for sturgeon (*Huso huso*, *A. stellatus*, *A. nudiventris*, *A. persicus colchicus* and *A. sturio*) that migrate upstream to a number of rivers for spawning. The main rivers involved are the Supsa, Inguri, Chorokhi and particularly the Rioni. *A. persicus colchicus* is still the most abundant sturgeon species in Georgian waters (Zarkua and Tsuladze, 1999). *A. gueldenstaedtii* has also been recorded from the Lenkoranka River (Azerbaijan, Georgia) (Vlasenko *et al*., 1989).

Hungary: The species is believed by some to be extinct in Hungary (Pintér, 1991). However, it may still occur in the Tisza River (Tiszafüred) where the last catch was recorded in 1980 (CITES Management Authority of Hungary, *in litt.* to TRAFFIC Europe, 13 September 2000).

Iran: Dr M. Pourkazemi (*in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000) notes that the Sefidrud River and Gorganrud River on the Iranian coasts of the Caspian Sea are used for spawning (Laluyee, 1996; Ramin, 1998, cited in Dr M. Pourkazemi, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000). However, Dr J. Holèik (*in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000) contends that access to the spawning grounds in the Sefidrud has been prevented by the Mangil Dam construction, water extraction and pollution. According to Dr M. Pourkazemi (*in litt.* to IUCN/SSC Wildlife Trade Programme, 25 September 2000), among the Mangil Dam and other dams constructed on the Sefidrud River, there is a remaining distance of 45 km from the dam closest to the estuary, and sturgeon are still observed entering the river to spawn.

Kazakhstan: The species enters the Ural River for spawning, one of the few spawning rivers that is not dammed (Vlasenko *et al.,* 1989).

Moldova: The Moldovan range on the Danube River is 811 m and sturgeon also occur in the Prut River, a tributary of the Danube River (junction at km 137th) (Anon., 2000c).

Romania: *A. gueldenstaedtii* is recorded from the Danube River and the coast of the Black Sea. The population density and catches of *A. gueldenstaedtii* dropped dramatically after the damming of the Danube by Djerdap I and II power stations (Bacalbasa-Dobrovici, 1997). The species was formerly caught in the lower reaches of the Prut, Jiu and Mures rivers (Hensel and Holèik, 1997).

Russian Federation: In the Caspian region, the population entering the Volga River to spawn in 1996 was estimated at 120,000-150,000 individuals (Levin, 1997), a decrease from 500,000–600,000 individuals in previous years. Levin (1997) estimated the age range of the population majority to be between 8-25 years, with individuals older than 28 years being extremely rare.

In the Sea of Azov, some natural spawning grounds are no longer accessible due to the construction of dams on the Don and Kuban rivers (Anon., 2000b). In the mid-1980s, Volovik *et al.* (1993) estimated the total biomass of *A. gueldenstaedtii* stock to be 44.8 t. In 1990, 55,000 sturgeon were found dead on the shores of the Sea of Azov. No population estimates have been undertaken since.

Slovakia: The winter race was present in the Danube until 1967, when it is likely that the last specimen was caught (Holèik, 1995). Three or four individuals of the resident form are caught annually in the Danube River (Dr J. Holèik, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000). The species' future is threatened and the species is critically endangered (Holèik, 1989).

Turkey: The Coruh River is used for spawning. Unidentified sturgeon species have been reported in small numbers in the Sakarya and Mert rivers (Edwards and Doroshov, 1989). In the late 1980s, local fishermen estimated that only five to six gravid female sturgeon could be taken from the Yesilirmak to supply a hatchery and up to 20 from the Kizilirmak (Edwards and Doroshov, 1989).

Ukraine: From the Sea of Azov, *A. gueldenstaedtii* migrates to the Don River, where it spawns in its lower segment, downstream of the Tsimlyansk Hydropower Station. According to Pavlov (1980), *A. gueldenstaedtii* is also occasionally known from the Dniester, Dnieper and Bug rivers.

Former Yugoslavia: The population density has dramatically decreased in the Danube since the construction of the Djerdap I and II power stations. There are not enough adults to maintain fry production in the Kladow hatchery (Pr N. Bacalbasa-Dobrovici, *in litt.* to IUCN/SSC, September 2000). It has been classified as Endangered by Simonovic and Nikolic (1996).

Introduced populations: In the Baltic Sea river estuaries, east of Rostock (Germany), and further upstream, *A. gueldenstaedtii* and hybrid sturgeon specimens have been caught. They probably originate from upstream aquaculture farms and/or private aquaria (specimens that have grown too large to be kept in the aquarium) (Jörn Gessner, Scientist at the Institute of Freshwater Ecology and Inland Fisheries, pers. comm. to TRAFFIC Europe, 15 March 2000).

HABITAT AND ECOLOGY

A. gueldenstaedtii reach 2.2-2.4 m in length and 65-115 kg in weight. In the past, specimens were known to reach an age of 48 years; life expectancy has now been reduced to 38 years due to overfishing (Vlasenko *et al.*, 1989). The species matures sexually between 8-16 years and most female spawners in the wild are aged 13-23 years. The average size of females at first spawning is 1.2 m and 9 kg and spawning occurs every 2-3 years (Hochleithner and Gessner, 1999). The diet alters according to food availability but mainly consists of benthic molluscs, larvae and in some areas, small fish. Migration to riverine spawning grounds occurs during two periods: from early spring to late autumn, peaking in summer; and during the winter, when fish hibernate in the rivers and reproduce the following year. Juveniles migrate downstream to feeding grounds. In the Caspian Sea the main feeding area is in the

north, but a winter migration to the central and southern areas of the Caspian has been observed (Barannikova *et al.*, 1995).

Based on catches and caviar production in the late1970s, the rate in weight of caviar/total catch was estimated at 7% for the three main commercial species of the northern Caspian Sea, *H. huso*, *A. gueldenstaedtii* and *A. stellatus* (Doroshov and Binkowski, 1985, cited in Williot and Bourguignon, 1991).

Studies indicate that sexual maturity of *A. gueldenstaedtii* in Iranian waters differ to that given by Levin (1997); an average age of 15 years in females (min. 9 and max. 19 years) and an average age of 14 years in males (min. 8 and max. 17 years) (International Sturgeon Research Institute, 1998, cited in Dr M. Pourkazemi, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Kazakhstan: Until 1993, the mouth of the Ural River was dredged annually to allow vessels to travel upstream to Atyrau (former Gur'yev) harbour. Since 1993, this annual management of the river channel has not been carried out and is an obstacle to sturgeon migration (Anon., 2000c).

THREATS TO SURVIVAL AND DOMESTIC USE

In the Caspian Sea, construction of hydroelectric power stations and dams on most of the rivers that enter the sea has reduced available spawning habitat by up to 70% of that available in the 1950s. Winter migration has been more severely impacted by this construction than the summer migration because the distance travelled upstream in winter is generally greater (Barannikova *et al.*, 1995). The only river with an unregulated flow is the Ural. Poor environmental conditions during 1986 to 1990 have caused degeneration of the female reproductive system in fish caught in the lower Volga River in 1990 (Shagaeva *et al.*, 1993).

In the Black Sea and Sea of Azov Basins, water flow has been altered by construction and irrigation in virtually all rivers entering these seas. Pollution and eutrophication of coastal waters has caused a mass death of fish. Food sources have been depleted by an introduced ctenophore *Mnemiopsis leydyi.* However, it has recently been reported that a second invasive ctenophore *Beroe ovata* in the Black Sea may prey on the first and hence restore the ecological balance (Schrope, 2000).

High levels of pollution have posed a serious threat to sturgeons in both the Caspian and Black Sea basins. Studies have shown that high levels of toxins, from oil and other industrial waste, have altered hormonal balance, disturbed metabolism and increased the number of hermaphroditic fish. However, since the break up of the Soviet Union, heavy industry and resulting discharges have decreased allowing water quality to improve (Levin, 1997).

Caviar from *A. gueldenstaesdtii* is commercially known as "Ossetra," as is caviar from several other species such as Ship Sturgeon *A. nudiventris* and Amur Sturgeon *A. schrenckii*, and is the second most highly sought-after caviar, after that from Beluga *H. huso*. The commercial sturgeon catch in the Caspian Sea basin peaked at 27,300 t in 1977, with *A. gueldenstaedtii* being the most abundant species (79%, 21,550 t), followed by *A. stellatus* (17%, 4,650 t) (Levin, 1997), with the remaining 4% (0.11 t) being shared between *H. huso* and *A. nudiventris*. The catch of *A. gueldenstaedtii* dropped to 16,300 t in 1978 (Khodorevskaya *et al.*, 1997) and to approximately 965 t in 1997. In the middle Danube River, the average annual catch of the species from 1958 to 1981was 24.9 t (Hensel and Holèik, 1997). The recorded landings from the lower Danube River in Romania and Bulgaria did not exceed 11 t in 1999.

In the former Soviet Union and Iran, strict legislation regarding sturgeon fisheries had been in effect for decades until the emergence of three new independent States in the Caspian Sea Basin in 1992 (Azerbaijan, Kazakhstan and Turkmenistan) (De Meulenaer and Raymakers, 1996). Current information suggests that amendments of previous regulations and/or adoption of new legislation are now in effect in most new range States in the Caspian Sea as well as in Black Sea (including the Danube River) and Sea of Azov basins. In the latter, Bulgaria, Romania and Ukraine are the most important sturgeon fishing nations. However, enforcement measures appear to be lacking and numerous experts as well as government officials have reported an increasing pressure of illegal fishing practices and criminal activities surrounding the caviar trade in most of

the range (Anon., 2000b; Dobbs, 1992; Doward, 2000; Evtouchenko, 1997; King, 1998; Ward, 2000a; 2000b)

Azerbaijan: Waters of this region represent important winter feeding grounds, but lakes of deposited oil and pollutants lie on the shore lines of the Caspian and the number of these polluting the sea is expected to increase as the sea level rises (Dumont, 1995). Along the northern and southern coast of Azerbaijan, within the 200-nautical mile Exclusive Economic Zone, *A. gueldenstaedtii* is caught as by-catch in stationary nets and *kilka* (Clupeidae) fishing devices (CITES Management Authority of Azerbaijan, *in litt.* to TRAFFIC Europe, 18 September 2000). Young and adult fish are caught by coastal fisheries at the time of their migration, when the water temperatures change. Young fish make up to 17.7% of the by-catch.

Species composition of the catch and by-catch of sturgeon species in the late 1990s

	A. persicus* & *A. gueldenstaedtii	***A. stellatus***	***H. huso***	***A. nudiventris***
Catch	63.47%	30.77%		5.76%
By-catch	78.50%	16.80%	3.70%	1%

Source: CITES Management Authority of Azerbaijan, *in litt.* to TRAFFIC Europe, 18 September 2000

Annual recorded landings (catch and by-catch) of *A. gueldenstaedtii* and *A. persicus* (tonnes)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
A. gueldenstaedtii* & *A. persicus	26.00	40.20	37.00	72.60	100.30	101.20	51.30	79.20	48.60	55.00
Total	*74.00*	*88.20*	*111.00*	*240.10*	*201.20*	*162.50*	*120.30*	*128.60*	*82.40*	*108.90*

Source: CITES Management Authority of Azerbaijan, *in litt.* to TRAFFIC Europe, 18 September 2000

In the late 1990s, for the first time in the history of *kilka* fishery, the by-catch of *A. gueldenstaedtii* has dropped to almost zero. For instance 364 specimens were caught in 1992, while incidental catches were reduced to few anecdotal specimens in more recent years.

Bulgaria: Wild populations of sturgeon have been threatened by the decrease in number of spawning grounds on the Danube River as a result of human development, particularly hydroelectric facilities. The long lasting unregulated fisheries have disrupted the age composition of the populations due to selective catch of sexually mature fish and to by-catch of juveniles as they migrate to the sea. Water pollution has also influenced the metabolism of the fish (CITES Management Authority of Bulgaria, *in litt.* to TRAFFIC Europe, 15 September 2000).

Annual catch of *A. gueldenstaedtii* (tonnes)

	1995	**1996**	**1997**	**1998**	**1999**
A. gueldenstaedtii	0.9	2.4	5.4	7.5	6.0
Total sturgeon catch	*14.7*	*32.5*	*49.8*	*55.9*	*50.5*
n° of licenses issued	0	0	122	155	169

Source: CITES Management Authority of Bulgaria, *in litt.* to TRAFFIC Europe, 15 September 2000

Domestic consumption of caviar in Bulgaria is limited to 7-10% of the total caviar production of Bulgaria. Bulgaria's entire sturgeon meat production is consumed within the country.

Georgia: During the fishing seasons, particularly coastal anchovy fisheries, numerous sturgeon juveniles are caught as by-catch. The estimated catch of all species of sturgeon declined from 77,000 individuals in 1977, to 57,000 in 1980 and 27,000 in 1986. During the 1990s, illegal fishing in Georgia expanded rapidly due to poor control (Zarkua and Tsuladze, 1999).

Hungary: Threats to *A. gueldenstaedtii* are not documented due to the general lack of records. The species is protected, and domestic utilisation is prohibited (CITES Management Authority of Hungary, *in litt.* to TRAFFIC Europe, 13 September 2000).

Iran: Spawning grounds of the Sefidrud River have been lost due to the construction of the Mangil Dam in L1961 (Dr J.Holèik, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000). For the past 5

years, the Iranian domestic market of caviar and sturgeon meat is estimated at 5% and 65% of the country's production respectively (CITES Management Authority of Iran, *in litt*. to TRAFFIC Europe, 24 September 2000).

Annual catch of *A. gueldenstaedtii* and *A. persicus* (tonnes)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000 ***
A. persicus	538.3	601.1	559.6	415.0	408.9	386.5	488.3	448.2	547.3	439.9	153.6
A. gueldenstaedtii	384.7	422.7	363.1	212.7	142.1	114.3	130.9	86.3	75.3	56.7	11.2
Total	*2,296.3*	*2,315.1*	*2,058.0*	*1,462.1*	*1,380.9*	*1,216.3*	*1,310.0*	*1,043.5*	*1,127.9*	*923.3*	*182.4*

* Catch in spring 2000 only.
Source: CITES Management Authority of Iran, *in litt*. to TRAFFIC Europe, 24 September 2000

Production of *A. gueldenstaedtii* and *A. persicus* in 1992 and 1999 (tonnes)

	1992				**1999**			
	Meat	**% ***	**Caviar**	**% ***	**Meat**	**% ***	**Caviar**	**% ***
A. persicus	451.9	*28.2*	62.6	*23.9*	355.5	*48.7*	50.8	*51.2*
A. gueldenstaedtii	279.7	*17.4*	38.6	*14.7*	43.6	*6.1*	5.8	*6.0*
Total	**1,604.2**		**262.3**		**730.2**		**99.3**	

* Percentages relate to the share of *A. gueldenstaedtii* products of the total Iranian sturgeon fisheries.
Source: Dr M. Pourkazemi, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000

The above tables indicate that the total tonnage of meat and caviar of *A. gueldenstaedtii* produced in Iran comprised 87% of the country's annual catch in weight in 1992 and 1999. This rate was 92% for *A. persicus*.

Note on *A. persicus*: The best results of the restocking programme of five sturgeon species were obtained for *A. persicus*. This species is considered to be endemic to the southern Caspian Sea Basin and rarely migrates to the central and northern parts of the sea. The results of the monitoring of catch and stocks of *A. persicus* suggest that the wild population does not follow the same trends as the other commercially caught sturgeon. The status of the population appears to be improving while the stocks of *A. gueldenstaedtii*, *A. stellatus*, *A. nudiventris* and *H. huso* seem to be decreasing. In the near future, the status of the stock of *A. persicus* is expected to be larger than that of other species. In the past, *A. persicus* comprised 20% of the annual Iranian sturgeon catch, while at present, it comprises more than 55-60%. Whilst the status of *A. persicus* appears to be improving in Iranian waters and comprises over 50% of the Iranian catch, the status of *A. gueldenstaedtii* continues to decline (CITES Management Authority of Iran, *in litt*. to TRAFFIC Europe, 24 September 2000).

Kazakhstan: Oil fields may affect spawning and feeding grounds in the northern area of the Caspian (Sagers, 1994). The central area is threatened by radioactive contamination from a nuclear reactor (Dumont, 1995).

Annual catch of *A. gueldenstaedtii* (tonnes)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000 ***
A. gueldenstaedtii	123.0	154.0	136.0	115.0	47.0	31.6	42.1	39.5	135.0	60.0	34.6
Total	*1,963.0*	*1,767.0*	*1,437.3*	*1,109.0*	*556.0*	*573.0*	*367.8*	*389.5*	*490.0*	*279.0*	*230.5*

* Spring catch
Source: CITES Management Authority of Kazakhstan, *in litt.* to TRAFFIC Europe, 21 September 2000

Romania: Threats include: overfishing, poaching, pollution and damming of the Danube by Djerdap I and Djerdap II (Bacalbasa-Dobrovici, 1997).

Annual catch of *A. gueldenstaedtii* (kilogrammes)

	1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Catch	748	639	398	2,528	2,820	3,273	4,382	1,732	4,314

Source: Dr N. Patriche, *in litt.* to IUCN/SSC Wildlife Trade Programme, 5 September 2000

These data include catches in the Danube River and Delta as well as in the Black Sea. From 1991 to 1999, approximately 17% of the total Romanian sturgeon catch comprised *A. gueldenstaedtii*.

Russian Federation: Caspian region: The Volgograd Dam has reduced spawning grounds in the main spawning river, the Volga, to 430 ha from 3,600 ha. Similarly, available spawning grounds in the Terek and Sulak rivers have been reduced to 132 ha and 202 ha respectively. The flow of the Ural River remains unregulated and provides a natural spawning area of 1,400 ha.

Black Sea and Sea of Azov region: Flow regulation of the Kuban River has led to the loss of approximately 140,000 ha of breeding ground, and the Tsymlyansk Reservoir construction on the Don River in 1952 has removed approximately 68,000 ha of spawning ground (Volovik *et al.*, 1993). Worsening environmental conditions in this area caused the death of 55,000 fish in 1990.

Annual catch of *A. gueldenstaedtii* in the Caspian Sea (tonnes)

	1992	**1993**	**1994**	**1995**	**1996**	**1997**
Catch	4,446	2,259	1,490	1,113	510	759

Source: Caspian Fisheries Research Institute (KaspNIRKh), cited in Anon., 2000b

From 1992 to 1997, approximately 50% of the total sturgeon catch of the Russian Federation in the Caspian Sea comprised *A. gueldenstaedtii* (Anon., 2000b).

The level of domestic consumption of sturgeon products in the Russian Federation is unknown, but is said to be the main outlet of illegal sturgeon fisheries (Mr Roman V. Ivakhnenko, State Fisheries Committee, pers. comm. to TRAFFIC Europe-Russia, September 2000). Based on the number of sets of illegal fishing equipment recorded by enforcement agencies of the Caspian Sea and the Sea of Azov, the illegal sturgeon catch was evaluated at 6 to 10 times the legal catch (Anon., 2000b). In 1997, the estimated volume of the Moscow sturgeon meat market was three times the annual catch quotas for all sturgeon species (Anon., 1998).

Slovakia: No catches have been reported since the construction of the Gabcíkovo River dam system in 1992 (Dr J. Holèik, *in litt.* to IUCN/SSC Wildlife Trade Programme, 2000). The species future is threatened and the species is critically endangered (Holèik, 1989).

Turkey: From 1969 to 1979, Turkish annual sturgeon landings ranged from 310 t to 10 t, with an annual average of 112 t (Edwards and Doroshov, 1989). In 1989 in Samsun, a Turkish landing site on the Black Sea, one caviar processor claimed that his business had dropped from 8 t per year of caviar between the 1940s and the 1970s, to 200 kg per year by the end of the 1980s. In 1989, sturgeon were caught as by-catch by trawlers that operated legally along the Turkish coast at a distance greater than three nautical miles from the shore, but also illegally within the three nautical mile limit. This represented the main fishing pressure on sturgeon. In April 1989, A. stellatus, A. gueldenstaedtii, H. huso and A. sturio were observed in Samsun. The investigators were told that A. nudiventris was also landed in Samsun (Edwards and Doroshov, 1989).

Turkmenistan: Sturgeon fisheries and processing are a state monopoly in Turkmenistan (Anon., 2000c).

Ukraine: No information provided.

Yugoslavia: The Danube River spawning grounds are no longer accessible due to the construction of the Djerdap dams. The catch of *A. gueldenstaedtii* on the Yugoslav part of the Danube River dropped drastically before (588 km) and after (17.8 km of fishing ground from the dam to the border; see "Conservation Measures") the construction of the the Djerdap II dam in 1984. The following catches of *A. gueldenstaedtii* were reported: total annual catch of 14,636 kg in 1983 and 1,636 kg in 1985, with an annual average catch of 10,354 kg for the period 1978-1983 and 1,789 kg for the period 1985-1990 (Jankoviè, 1993 and 1996).

INTERNATIONAL TRADE

The listing of *A. gueldenstaedtii* in CITES Appendix II entered into effect on 1 April 1998. Data for this species were therefore limited to nine months of trade (April-December 1998).

Gross exports and the comparative tabulation of trade in *A. gueldenstaedtii* are given in the Appendix. According to 1998 CITES data, gross exports of *A. gueldenstaedtii* caviar from range States totalled 95,392 kg, the second largest volume of all sturgeon species after *A. stellatus*. Five Parties exported *A. gueldenstaedtii* caviar: the Russian Federation (46 t), Iran (40 t), Kazakhstan (7.5 t), Azerbaijan (0.867 t) and Romania (0.233 t). The largest importers of *A. gueldenstaedtii* caviar were Switzerland (19 t), the USA (17 t), France (16 t) and Germany (15 t).

Exports of other specimens of *A. gueldenstaedtii* reported by CITES Parties for 1998 are: 329,417 live fish, mostly of captive bred or "F" (First Generation) sources from Hungary and Poland, and 686 kg of meat almost entirely from Iran. The trade in live *A. gueldenstaedtii* is by far the highest of all sturgeon species. The main exporters are Central European countries, where freshwater fish hatcheries and farms have been successful since the 1960s.

Re-exports of *A. gueldenstaedtii* from Hungary in 1999 (number of fingerlings)

	Germany	Belgium	UK	France	Italy	Netherlands	Austria
Live fingerlings	60,500	25,000	25,000	15,000	5,000	7,000	4,500

Source: CITES Management Authority of Hungary, *in litt.* to TRAFFIC Europe, 13 September 2000

Exports of *A. gueldenstaedtii* from Russia in 1999 (kilogrammes)

	Quantity (kg)	Description	Importer	No of permits
A. gueldenstaedtii	37.30	Live eggs	GR, DE, SY, AM, HU	12 Export
	28,017.68	Caviar	US, DE, DK, NL, FR, GB, BE	63 Ex. + 9 Re-ex.
	8,696.50	Meat	US	4 Export
Hybrids:				
A. baerii x A. gueld.	3.50	Live eggs	PL, DE	2 Export
A. gueld. X A. baerii	37.50	Live eggs	CN, SY	3 Export

Source: CITES Management Authority of the Russian Federation, *in litt.* to TRAFFIC Europe, 18 September 2000

Export quotas for *A. gueldenstaedtii* (kilogrammes)

		1998	1999		2000		
		Caviar	Caviar	Meat	Caviar	Meat	Fert. eggs
Azerbaijan			5,900	50,000	4,350	43,500	
Iran	***A. gueldenstaedtii***	10,000	14,000		52,000 including *A. persicus* see above		
	(A. persicus)	(45,000)	(53,000)				
Kazakhstan			5,500		4,200	49,000	
Romania			1,250	3,500	1,800	20,000	
Rus. Fed.		69,000	40,000		**Caspian** 25,090	75,000	60
					Azov 8,500	17,000	
A. gueldenstaedtii* x *A. ruthenus							90
A. gueldenstaedtii* x *A. baerii							15
A. baerii* x *A. gueldenstaedtii							10
Turkmenistan					500		
Annual total		***124,000***	***119,650***	***53,500***	***95,940***	***204,500***	***175***

Source: CITES Notification Nos. 1998/35-36-61, 1999/21-47-53-68 and 2000/053-056-061

Note that Iran has established a total combined export quota of 52,000 kg for caviar of *A. gueldenstaedtii* and *A. persicus* for 2000. This is likely to be a result of the difficulty in differentiating between these two species (see Species Identification).

In 1999, new specimens appeared in the Annual Reports, such as 35 kg of swim bladders exported by Iran. Sturgeon swim bladders are exported for processing into isinglass and best quality fish glue. The glue has a wide range of uses, including antique furniture and painting restoration, and once diluted, to clarify beer, wine and champagne.

Note: The use of the term "eggs" and the unit "kg", "g" or no unit (see # in Appendix and table on export quotas, above) to describe shipments of both caviar and fertilised eggs complicates the analysis of trade data. Similar difficulties arise from the unit used for export quotas of fertilised eggs, which is kilogrammes ("kg") instead of "number of specimens". Kilogrammes do not directly correspond to the number of specimens, and hence does not allow the effective evaluation of quotas. This confusion is also a source of mis-interpretation of data and is an obstacle to the proper monitoring of international trade, e.g. underestimation of live specimens in trade.

Illegal trade: In 1998, USA Customs confiscated *A. gueldenstaedtii* caviar of unknown origin upon import. A total of 1,215 kg was confiscated, comprising of 693 kg re-exported by Turkey and 522 kg re-exported by the United Arab Emirates. Discrepancies between trade statistics of countries importing and exporting caviar can indicate illegal activities. Such discrepancies were found in 1995 and 1996 for instance for Turkey (customs declared caviar exports 21 t and 80 t respectively) and European Union Member States (6 t and 20 t respectively) (Raymakers, 1999). Additionally, Turkish 1996 caviar exports totalled 121 t (Raymakers, 1999), while the country's sturgeon fisheries has been limited to only few incidental catches since the late 1980s (Edwards and Doroshov, 1989).

Poaching and smuggling are closely related and have been intensively reported in the media of both range States and importing countries (Evtouchenko, 1997; McDonald, 2000; Snyder, 2000). However, much of the illegally caught sturgeon is destined to the domestic market, particularly meat (Anon., 1998).

Several Member States of the European Union are also detailed in CITES data as re-exporters of *A. gueldenstaedtii* caviar of unknown origin. According to CITES Annual Reports, these shipments were not confiscated upon import.

CONSERVATION MEASURES

A. gueldenstaedtii is not fully protected in any of its range States. However, a license is required for fishing in most of the countries and in Iran private sturgeon fisheries are prohibited. There is no specific monitoring programme for this species in any range State. Fish lifts and artificial spawning grounds have been introduced to certain regions of the Caspian.

Regarding juveniles restocking efforts, despite the large-scale aquaculture programmes of the Russian Federation and Iran, *A. gueldenstaedtii* stocks have continued to decline (Dr M. Pourkazemi, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000).

Azerbaijan: The Intergovernmental Commission for Caspian Biological Resources, composed of representatives of all range States, has set annual catch quotas (CITES Management Authority of Azerbaijan, *in litt.* to TRAFFIC Europe, 18 September 2000).

Annual catch quotas for Azerbaijan (tonnes)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
A. guelden.	70	225	225	?	?	?	?	?	?	?	54.8
Total	*200*	*308*	*510*	*480*	*360*	*182*	*160.5*	*160.5*	*160.5*	*108.67*	*108.35*

Source: CITES Management Authority of Azerbaijan, *in litt.* to TRAFFIC Europe, 18 September 2000

Three hatcheries were built in the lower Kura River by the authorities of the former Soviet Union in the 1960s. A feasibility study of the World Bank reports that the total capacity of the hatcheries was originally 12 million, but that this capacity had dropped significantly over the years (T. Turner, World Bank consultant, *in litt*. to TRAFFIC Europe, 6 October 2000). World Bank funds have been allocated for the construction of a new sturgeon hatchery and farm that will have the capacity of 15 million fry per annum and should be operational in the next few years. Concerns have been raised over the availability of adult sturgeon to constitute the broodstock of the farm.

Estimated combined number of fry released by three hatcheries (million fingerlings)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A. gueld.	13.370	5.330	2.130	1.230	0.750	0.940	3.030	3.770	4.490	10.186	8.869
Total	*17.523*	*9.082*	*2.980*	*1.838*	*1.142*	*1.242*	*4.070*	*6.065*	*6.220*	*20.290*	*16.965*

Source: CITES Management Authority of Azerbaijan, *in litt.* to TRAFFIC Europe, 18 September 2000

In Azerbaijan, the State institution responsible for sturgeon fishery and processing matters is the "State Concern Azerbalyg". Commercial sturgeon fisheries are prohibited in the open sea. No fishing license for sturgeon was required until 2000. The only fishing gear permitted for sturgeon catch in the Kura River is "sweep nets" of 35-55 mm mesh size. The minimum size limit set for *A. gueldenstaedtii* catch is 105 cm (Anon., 2000c).

Bulgaria: Measures at national level as described hereunder are needed, but they must be linked to co-ordinated actions of all countries in the Black Sea region. In Bulgaria, sturgeon fisheries are prohibited for 30 days, from 20 April to 20 May each year, which corresponds with the peak of the breeding season. The authorities may approve a 15-day extension of the closed season pending the natural conditions of the year. Explosives, poison, bottom trawling and dragging, as well as stunning substances and devices are prohibited fishing methods. The minimum size limit for *A. gueldenstaedtii* is 80 cm. Export quotas are set on the basis of catch data, trends and the biological characteristics of the species (CITES Management Authority of Bulgaria, *in litt.* to TRAFFIC Europe, 15 September 2000). A system was established for distribution of export quotas among export companies that are obliged to restock the Danube River with sturgeon fry before they are authorised to export sturgeon specimens. For example, for a particular year, for each kilogramme of caviar exported, the company must release 30 juvenile sturgeon (Anon., 2000c). The restocking programme is controlled by relevant government agencies.

Number of fingerlings released through the restocking programme (number of fingerlings)

	1998	***sizes***	1999	***sizes***	2000	***sizes***
A. gueldenstaedtii	1,000	*200 g each*	27,400	*20 to 120 g each*	20,400	*25 g to 1.8 kg each*

Source: CITES Management Authority of Bulgaria, *in litt.* to TRAFFIC Europe, 15 September 2000

Due to budgetary constraints, Bulgaria has not monitored the wild sturgeon population in recent years, nor the success of its restocking programme (e.g. through tagging of released fingerlings). However, plans have been prepared for these activities. A special prohibition was adopted on the use of "unbaited hooks" for sturgeon catch (Anon., 2000c).

Hungary: *A. gueldenstaedtii* is protected in Hungary. According to *Decree No. 1/1982 (III.15.) OKTH* on the *Protected and Strictly Protected Species of Flora and Fauna, Value of their Specimens, Determination of the Range of Protected and Strictly Protected Caves and Exemptions from Restrictions and Prohibitions Set for Certain Protected Animal Species*, last amended by the *15/1996 (VII.26.) Decree of the Minister for Environment*. The *Nature Conservation Act No. 53 of 1996, Article 43* orders that for all protected species, prior authorisation from the National Park Directorate is required for the: capture; killing; possession; captive breeding; introduction of specimens from exotic population; artificial exchange of genetic matter between populations; exchange; sale and purchase of *A. gueldenstaedtii* (CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 13 September 2000).

Iran: At all sturgeon catch stations, biometric measurements are carried out for each species. The age, length, sex and weight of fish landed are recorded. The population structure is estimated on the basis of age groups. As a result of these studies carried out for the past 10 years, the number of catch stations were decreased by 50%, changes were adopted on sturgeon catch methods, and lower export quotas were set for the past five years. Export quotas are established on the basis of results of research programmes and annual monitoring of stocks. These activities include the following parameters and activities: Maximum Sustainable Yield and total catch, rehabilitation of stocks, management and sustainable exploitation through restricting illegal catch and overfishing. The monitoring of fishing efforts and regulation of the time (date) of catch are also carried out on the basis of research results (CITES Management Authority ofIran, *in litt*. to TRAFFIC Europe, 24 September 2000).

Annual release of *A. gueldenstaedtii* and *A. persicus* fry (million fingerlings)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
A. persicus	4.06	5.92	2.93	3.57	4.66	8.05	11.02	18.75	22.59	17.30
A. gueldenstaedtii		0.04			0.30	0.52	0.67	0.92	0.42	0.96
Total	*4.56*	*6.60*	*3.45*	*4.17*	*5.91*	*9.13*	*12.35*	*21.63*	*24.56*	*19.10*

Source: CITES Management Authority of Iran, *in litt*. to TRAFFIC Europe, 24 September 2000

A labelling system is in place, where each tin of caviar holds a sign or mark that indicates at least the date and place of catch, the name of the catch station, name of processor and the species.

Iranian fishing regulations specify a minimum catch size limit of 1 m. *A. gueldenstaedtii* is artificially bred and reared. More than 10 million fingerlings of this species have been released into the rivers leading to the sea in recent years. Additional conservation measures have been taken for all sturgeon in the southern shores of the Caspian Sea, for instance banning the use of gillnets has been very effective in the conservation of this species. The autumn spawning population of this species is used for breeding operations in Iran (Dr M. Pourkazemi, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Kazakhstan: Commercial sturgeon catch is only allowed in the tributaries of the Caspian Sea, however scientific catch is permitted in the open sea with an annual quota of 20 t (Anon., 2000c).

Sturgeon fisheries are regulated by law. There are two fishing seasons, one during spring spawning and the other during the winter migration. The exact dates of the fishing seasons vary with the climate and are therefore set annually by authorised scientific organisations. As in most former Soviet Republics, "sweep nets" (bottom nets that are hauled several times a day) with a minimum mesh size and which are marked with the name and address of the owner are the only legal fishing gear for sturgeon. Each fisherman can only set one net at a time. A fishing license is required. Sturgeon fishing grounds (called "tonia") are limited: there are 12 on the Ural River and 8 on the Kigach River. The minimum size limit for *A. gueldenstaedtii* is 105 cm. The ratio of males and females caught is not regulated nor monitored. The purchase price at the landing site is based on a fixed legal rate of caviar weight extracted per female; *A. gueldenstaedtii* is set at 18.6% of the total body weight. The annual commercial catch quotas are allocated to Kazakhstan by the Intergovernmental Commission for Caspian Biological Resources which meets annually in Astrakhan (CITES Management Authority of Kazakhstan, *in litt.* to TRAFFIC Europe, 21 September 2000).

Annual commercial catch quotas allocated to Kazakhstan (tonnes)

	1996	1997	1998	1999	2000
A. gueldenstaedtii			135	80	52
Total	***375***	***480***	***460***	***405***	***371***

Source: CITES Management Authority of Kazakhstan, *in litt.* to TRAFFIC Europe, 21 September 2000

Two hatcheries exist in Kazakhstan; Uralo-Atyrau and Atyurau. These have been operational since 1998.

Annual release of *A. gueldenstaedtii* fry (number of fingerlings)

	1998	1999	2000
A. gueldenstaedtii	647,200	1,492,800	1,266,300
Total	*1,706,193*	*5,318,471*	*5,507,160*

Source: CITES Management Authority of Kazakhstan, *in litt.* to TRAFFIC Europe, 21 September 2000

Moldova: *A. gueldenstaedtii* catch is prohibited since the species was listed in the Red Data Book in 1995 (Anon., 2000c).

Romania: The type of sturgeon fishing gear is strictly regulated by Romanian law. The fishing season is set every year by Ministerial Order. A fishing license is required to catch sturgeon in Romanian waters. The minimum size limit for *A. gueldenstaedtii* is 140 cm. The catch quota for *A. gueldenstaedtii* for 1998 and

1999 was set at 12.5 t/year. Catch quotas are calculated by independent scientific institutes, such as the Danube Delta Institute in Tulcea and the "Centre for Conservation, Fish Farming, Fishing and Fish Industrialisation" in Galati (Anon., 2000c).

Release of *A. gueldenstaedtii* and *A. stellatus* fry in the Danube River (number of fingerlings)

	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
A. gueldenst.			10,000				8,250
A. stellatus	1,000	4,000		10,000	11,600	10,000	6,750

Source: Centre for Conservation, Fish Farming, Fishing and Processing, Galati, cited in Anon., 2000c

Russian Federation: For Caspian Sea populations the former Soviet Republics set annual catch quotas in agreement with Iran. Sturgeon catch quotas have been established by the Intergovernmental Commission for Caspian Biological Resources for many years. The annual share of sturgeon catches of each former Soviet Union Caspian range State as adopted by the Commission since 1993 are as follows: the Russian Federation, 70%, Kazakhstan 17.6%, Azerbaijan 6.1% and Turkmenistan 6.3%. There are two fishing seasons in the Caspian Sea waters: from ice melting to June 5 and from 1 September until the time of ice formation. A license is required to catch sturgeon in Russian waters. The minimum size limit for *A. gueldenstaedtii* caught in Caspian Russian waters is 105 cm along the coast and 86 cm in the northern Caspian Sea. Currently, Russian catch quotas are declared by the Federal Government following the recommendations of the State Fisheries Committee, made in consensus with an independent council of experts (Anon., 2000b).

Release of *A. gueldenstaedtii* in the Volga River and the Sea of Azov (number of fry)

	1979-1980	**1981-1985**	**1986-1990**	**1991-1995**	**1996-1998**
Volga River	25,000,000	35,000,000	40,800,000	42,000,000	28,000,000
Sea of Azov	22,050,000	15,360,000	67,300,000	13,800,000	18,233,333

Source: Azov and Caspian Fisheries Research Institute (Az- and KaspNIRKh), cited in Anon., 2000b

From 1979 to 1998, approximately 54.2% 45.4% of all fry released by Russian hatcheries in the Volga River and the Sea of Azov respectively comprised *A. gueldenstaedtii* (Anon., 2000b).

Export quotas established by the CITES Management Authority of the Russian Federation, consist of 90% of the total caviar production, which is based on the catch quotas set for each species of sturgeon (Mr Roman V. Ivakhnenko, State Fisheries Committee, pers. comm. to TRAFFIC Europe-Russia, September 2000). The annual catch quotas or Total Allowable Catches (TACs) allocated by the State Fisheries Committee, is based on the recommendations of scientific agencies such as the Russian Federal Research Institute of Fisheries and Oceanography ("VNIRO") and the Pacific Research Institute of Fisheries and Oceanography ("TINRO"). The TAC includes the commercial catch, the scientific catch, and the catch of mature males and females destined for artificial reproduction.

Recent data on the monitoring of catch per species, including the size composition and sex ratio of fish caught, are not available. The domestic consumption of sturgeon products in the Russian Federation, mostly meat and caviar, is unknown (Mr Roman V. Ivakhnenko, State Fisheries Committee, pers. comm. to TRAFFIC Europe-Russia, September 2000).

Turkey: In 1979, with the exception of *H. huso* of more than 140 cm long, the fishery for sturgeon was prohibited in Turkish waters (Edwards and Doroshov, 1989). Circular 34/1, effective from 2000-2002, prohibits the collection of Acipenseriformes (CITES Management Authority of Turkey, *in litt*. to TRAFFIC Europe, 20 September 2000).

Turkmenistan: Within the country's coastal commercial waters, sturgeon fishery is allowed for scientific research only, with an annual catch limit of 20 t. The Turkmenistan State Committee of Fisheries issues an annual license for sturgeon commercial catches to the State enterprise, Balkanbalyk. No other company, Turkmen or foreign, has the right to engage in commercial sturgeon fisheries in Turkmen inland waters. An annual catch quota for *A. gueldenstaedtii* in Turkmenistan is set by the Intergovernmental Commission for Caspian Biological Resources. There is no sex ratio set for sturgeon landings. Information on any existing

minimum size limits per species or data on the annual catch quotas set for Turkmenistan in the 1990s are unknown. (Anon., 2000b.)

Ukraine: Sturgeon fisheries in the Danube River are permitted all year around except from 16 March to 15 April. The by-catch of sturgeon is regulated. For example, for sprat trawling a tolerance of two sturgeon may be caught per tonne of sprat. The mesh size of nets used to catch sturgeon should be a minimum of 120 mm and a maximum of 150 mm. Only fishermen who were allocated an annual quota for sturgeon by the State Committee for Fishery are allowed to catch sturgeon. The minimum size limits for *A. gueldenstaedtii* are 110 cm for those caught in the Black Sea and the Danube River, and 90 cm for those caught in the Sea of Azov (Anon., 2000b.).

Annual catch quotas for *A. gueldenstaedtii* from 1997 to 1999 (tonnes)

		1996	**1997**	**1998**	**1999**
Total		505	*424*	*210*	*225*
A. gueldenstaedtii	Sea of Azov and adjacent waters		275	135	180
	Black Sea and Danube River		24	20	12

Source: State Committee for Fishery, cited in Anon., 2000b

There is currently no sturgeon fry restocking programme in the Ukraine.

Yugoslavia: The closed fishing season set in the Danube River for *H. huso*, *A. gueldenstaedtii* and *A. stellatus*, is from 15 May to 15 June. Certain types of fishing gear are prohibited to catch sturgeon and an agreement was signed between Romania and Yugoslavia on the prohibition of gear that causes high mortality of untargeted fish. Any fishing activity, including all commercial and sport fisheries, requires a license in Yugoslav waters. The licenses are issued on a per district basis and the sturgeon fishing grounds are limited to 17.8 km downstream of the Djerdap II dam and the mouth of the Timok River. The minimum size limit for *A. gueldenstaedtii* is 80 cm and the catch quota for the species from 1996 to 2000 was set at 3,000 kg per annum. A restocking programme is being carried out by the Centre for Fish Reproduction of the "Djerdap Fishing Company" in Malla Vrbica town (Anon., 2000b).

CAPTIVE BREEDING

The reduction in the area of natural spawning grounds due to river flow regulation has caused populations to decline. Fish reared in hatcheries have therefore been introduced to maintain the natural stock. In the early 1990s approximately 30% of the Caspian stock reportedly originated from hatcheries (Barannikova, 1995), whilst almost all (80-95%) generations of *A. gueldenstaedtii* in the Sea of Azov reportedly derived from aquaculture (Volovik *et al.*, 1993). The current status of re-stocking in the Sea of Azov is unclear.

The species has been successfully bred in aquaculture facilities in Austria, Belgium, Germany, Hungary, the Netherlands, Poland and Romania. It has been hybridised with various species such as Siberian Sturgeon *A. baerii* and Sterlet *A. ruthenus*.

Azerbaijan: Three hatcheries were built in the 1960s and have contributed to the former Soviet Union sturgeon restocking programme ever since. Their combined annual production was 12 million fry, but this has dropped significantly due to rising level of the Caspian Sea and the lack of funds allocated to hatchery maintenance (T. Turner, World Bank consultant, *in litt*. to TRAFFIC Europe, 6 October 2000).

Bulgaria: A fish farm was established in 1997 in Boliartzi village (Plovdiv region). It is the only existing hatchery. All juveniles released in the Danube River in Bulgaria from 1998 to 2000 were produced there. The hatchery has a total capacity of 60,000 juveniles and the farm is currently stocked with 3.5 year old *H. huso* and *A. gueldenstaedtii* that weigh 11-14 kg. In 1998, fingerlings were released in to the Ovcharitza dam reservoir: 200 juvenile *A. gueldenstaedtii* of 200 g average weight and 200 hybrids of *A. gueldenstaedtii* and *A. baerii* of 200 g average weight. Since 1999, attempts have been made to breed sturgeon in artificial water basins near Sofia (CITES Management Authority of Bulgaria, *in litt.* to TRAFFIC Europe, 15 September 2000).

Hungary: There is no broodstock of the species in Hungary. Fertilized eggs are imported from Russia, and fingerlings are re-exported. There is no caviar production in Hungarian farms (CITES Management Authority of Hungary, *in litt.* to TRAFFIC Europe, 13 September 2000).

Iran: More than 500 *A. gueldenstaedtii* between the ages of 9-11 years are currently held in captive breeding in earthen ponds in Iran (Dr M. Pourkazemi, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000). Hatcheries have been operational for 20 years.

Italy: *A. gueldenstaedtii* larvae were imported six or seven years ago and are present in rearing plants for the production of juvenile fish and hybridisation. For 6-7 year old *A. gueldenstaedtii* females, 1 kg eggs corresponds to an average 45,000 eggs. The 1998 production of one of the aquaculture facilities was 3,000 fingerlings (from 60,000 eggs and 20,000 hatchlings) of *A. gueldenstaedtii*. This indicates a 5% hatching-survival rate (Azienda Agricola and Agroittica Lombarda, Italian sturgeon farmers, *in litt*. to TRAFFIC Europe-Italy, 1999).

Kazakhstan: Two hatcheries exist in Kazakhstan, Uralo-Atyrau and Atyurau, which have been operational since 1998 (CITES Management Authority of Kazakhstan, *in litt*. to TRAFFIC Europe, September 2000).

Poland: The presence of fish farms and hatcheries of sturgeon in Poland was confirmed by the CITES Management Authority of Poland (Dr Z. Krzeminski, Deputy Director, *in litt.* to TRAFFIC Europe, 31 August 2000). The following sturgeon species are bred in captivity: *Acipenser baerii*, *A. gueldenstaedtii*, *A. ruthenus*, *A. stellatus*, *H. huso*, *Polyodon spathula* and hybrids of some species. In most cases, hybrids are F1 generation live specimens (fertilised eggs) imported by Poland from range States, particularly from the Russian Federation. Some farms keep F2 generation specimens that were bred in Poland and are used as broodstock, partly for the production of juveniles to be sold on domestic and international markets. Various hybridisations of *A. gueldenstaedtii* have been performed and appear commercially promising.

Russia: As detailed above in Conservation Measures, aquaculture has been ongoing since the 1960s.

United Staes of America: Sturgeon are in a preliminary stage of culture in Hawaii (CITES Management Authority of the US, *in litt.* to TRAFFIC Europe, September 2000).

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 trade data there is currently a significant production of *A. gueldenstaedtii* juveniles in commercial farms (see Appendix).

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APPENDIX

Gross exports* and export quotas for *Acipenser gueldenstaedtii* 1998

TAXON	TERM	UNIT	Exporter	1998	Export Quotas 1998
Acipenser gueldenstaedtii	eggs		AE	184	
Acipenser gueldenstaedtii	eggs		CH	12	
Acipenser gueldenstaedtii	eggs		DE	118	
Acipenser gueldenstaedtii	eggs		FR	70	
Acipenser gueldenstaedtii	eggs		GB	330	
Acipenser gueldenstaedtii	eggs		IR	1,500	
Acipenser gueldenstaedtii	eggs		LT	933	
Acipenser gueldenstaedtii	eggs		RO	57	
Acipenser gueldenstaedtii	eggs		RU	89	
Acipenser gueldenstaedtii	eggs		SG	1	
Acipenser gueldenstaedtii	eggs		US	57	
Acipenser gueldenstaedtii	eggs	kg	AE	5,124	
Acipenser gueldenstaedtii	eggs	kg	AZ	867	
Acipenser gueldenstaedtii	eggs	kg	BE	203	
Acipenser gueldenstaedtii	eggs	kg	CH	8,627	
Acipenser gueldenstaedtii	eggs	kg	DE	7,205	
Acipenser gueldenstaedtii	eggs	kg	DK	1,011	
Acipenser gueldenstaedtii	eggs	kg	ES	21	
Acipenser gueldenstaedtii	eggs	kg	FI	958	
Acipenser gueldenstaedtii	eggs	kg	FR	609	
Acipenser gueldenstaedtii	eggs	kg	GB	1,079	
Acipenser gueldenstaedtii	eggs	kg	GR	42	
Acipenser gueldenstaedtii	Eggs	kg	IR	40,390	10,000 (*A. gueldenstaedtii*) 45,000 (*A. persicus*)
Acipenser gueldenstaedtii	Eggs	kg	KZ	7,543	
Acipenser gueldenstaedtii	Eggs	kg	NL	1	
Acipenser gueldenstaedtii	Eggs	kg	NZ	2	
Acipenser gueldenstaedtii	Eggs	kg	PL	6,530	
Acipenser gueldenstaedtii	Eggs	kg	RO	233	
Acipenser gueldenstaedtii	Eggs	kg	RU	46,359	69,000 (incl. AZ & KZ)
Acipenser gueldenstaedtii	Eggs	kg	SG	81	
Acipenser gueldenstaedtii	Eggs	kg	TR	4,655	
Acipenser gueldenstaedtii	Eggs	kg	US	1,667	
Acipenser gueldenstaedtii	Eggs	kg	XX	4	
Acipenser gueldenstaedtii	Live		CZ	1,500	
Acipenser gueldenstaedtii	Live		GB	335	
Acipenser gueldenstaedtii	Live		HU	169,500	
Acipenser gueldenstaedtii	Live		PL	155,000	
Acipenser gueldenstaedtii	Live		US	3,000	
Acipenser gueldenstaedtii	Live		XX	11	
Acipenser gueldenstaedtii	Live	kg	DE	21	
Acipenser gueldenstaedtii	Live	kg	RU	50	
Acipenser gueldenstaedtii	Meat	kg	IR	669	
Acipenser gueldenstaedtii	Meat	kg	RU	15	
Acipenser gueldenstaedtii	Meat	kg	US	2	
Acipenser gueldenstaedtii	Skins		CH	8	
Acipenser gueldenstaedtii	Skins		IR	8	
Acipenser gueldenstaedtii	Unspec-ified		RU	1	

* **Definition:** "Gross exports are the sum of all reported exports and re-exports in a particular commodity or species in a particular year or series of years. Gross trade is thus a simple measure of the total number of

items recorded in international trade. However, gross trade may be an overestimate of the total number of actual specimens in trade as re-exports are not deducted from the total." (Anon., 1996). This is particularly applicable to caviar of which shipments are often exported, re-packaged and re-exported. For instance, in the mid-1990s, Germany re-exported as much as 45% of its annual caviar imports (De Meulenaer and Raymakers, 1996).

Comparative Tabulation of trade in *Acipenser gueldenstaedtii* 1998

				Imports reported					Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit	Term	P	S	Quantity	Unit	Term	P	S
1998	CH	AE	IR	64	kg			O	64	kg	eggs	T	O
1998	CH	AE	RU						369	kg	eggs	T	W
1998	CH	AE	RU	63	kg	eggs	T	O					
1998	DK	AE	RU	10	kg	eggs	T	O					
1998	FR	AE	RU						644	kg	eggs	T	W
1998	FR	AE	RU	487	kg	eggs	T	O					
1998	GB	AE	RU						61	kg	eggs	T	W
1998	JP	AE	RU						65	kg	eggs	T	O
1998	US	AE		522	kg	eggs	T	I					
1998	US	AE	RU	22	kg	eggs	T	I					
1998	US	AE	RU	956	kg	eggs	T	W	255	kg	eggs	T	W
1998	US	AE	RU	714	kg	eggs	T	O	3,497	kg	eggs	T	O
1998	US	AE	RU						159	kg	eggs	P	O
1998	US	AE	RU	104		eggs	T	O					
1998	US	AE	RU	80		eggs	T	W					
1998	US	AE	RU	20	kg	eggs	T	I					
1998	US	AE	XX	159	kg	eggs	T	O					
1998	CA	BE	RU						38	kg	eggs	T	O
1998	CA	BE	TR						11	kg	eggs	T	O
1998	TR	BE	RU						360	g	eggs	T	O
1998	US	BE	RU						153	kg	eggs	T	O
1998	AN	CH	IR						11	kg	eggs		W
1998	AT	CH	IR						8	kg	eggs		O
1998	BB	CH	IR						2	kg	eggs		O
1998	BE	CH	IR						4	kg	eggs		W
1998	BE	CH	IR	4	kg	eggs	T	W					
1998	BE	CH	KZ	605	kg	eggs	T	W	605	kg	eggs		W
1998	CH	CH	IR						77	kg	eggs		O
1998	CH	CH	RU						8	kg	eggs		O
1998	CY	CH	IR						1	kg	eggs		O
1998	DE	CH	IR	2,197	kg	eggs	T	W	1,470	kg	eggs		W
1998	DE	CH	IR						23	kg	eggs		O
1998	DE	CH	KZ	2,488	kg	eggs	T	W					
1998	DE	CH	RU						2,490	kg	eggs		W
1998	DK	CH	IR	252	kg	eggs	T	O	252	kg	eggs		O
1998	ES	CH	IR						1	kg	eggs		O
1998	FR	CH	IR	520	kg	eggs	T	W	1,039	kg	eggs		W
1998	FR	CH	IR	21	kg	eggs	T	O	294	kg	eggs		O
1998	FR	CH	IR	3	kg	eggs	P	W					
1998	FR	CH	KZ	780	kg	eggs	T	W	780	kg	eggs		W
1998	GB	CH	IR						21	kg	eggs		O
1998	GB	CH	KZ	12		eggs	T	W					
1998	GB	CH	RU						259	kg	eggs		W
1998	GB	CH	RU						201	kg	eggs		O
1998	HK	CH	IR						35	kg	eggs		O
1998	HK	CH	IR						27	kg	eggs		W
1998	IT	CH	IR						4	kg	eggs		O

			Imports reported					Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit	Term	P S	Quantity	Unit	Term	P	S
1998	IT	CH	IR					8		skins		W
1998	JP	CH	IR					82	kg	eggs		O
1998	JP	CH	RU					19	kg	eggs		O
1998	KW	CH	IR					20	kg	eggs		O
1998	KW	CH	IR					11	kg	eggs		W
1998	LU	CH	IR					2	kg	eggs		O
1998	MA	CH	RU					60	kg	eggs		O
1998	NL	CH	IR					42	kg	eggs		W
1998	PA	CH	IR					2	kg	eggs		O
1998	SA	CH	IR					1	kg	eggs		W
1998	SG	CH	IR	44	kg	eggs	T O	44	kg	eggs		O
1998	SG	CH	IR	8	kg	eggs	T W	8	kg	eggs		W
1998	SG	CH	RU	1	kg	eggs	T O	1	kg	eggs		O
1998	US	CH	IR					13	kg	eggs		O
1998	US	CH	IR					3	kg	eggs		W
1998	US	CH	RU	1.5	kg	eggs	T W					
1998	US	CH	RU					2	kg	eggs		O
1998	ZA	CH	IR					3	kg	eggs		O
1998	DE	CZ	RU	1,500		live	T C	1,500		live	T	C
1998	AR	DE	KZ					2	kg	eggs	T	O
1998	AR	DE	RU					220	kg	eggs	T	O
1998	AU	DE	RU					60	kg	eggs	T	O
1998	BB	DE	RU					63	kg	eggs	T	O
1998	BR	DE	RU					160	kg	eggs	T	O
1998	CA	DE	KZ					20	kg	eggs	T	O
1998	CA	DE	KZ					16	kg	eggs	T	W
1998	CA	DE	RU					14	kg	eggs	T	O
1998	CH	DE	IR	993	kg	eggs	T W	786	kg	eggs	T	W
1998	CH	DE	IR	904	kg	eggs	T O	391	kg	eggs	T	O
1998	CH	DE	KZ					70	kg	eggs	T	W
1998	CH	DE	RU	78	kg	eggs	T W	8	kg	eggs	T	W
1998	CH	DE	RU	57	kg	eggs	T O					
1998	CL	DE	RU					60	kg	eggs	T	O
1998	CZ	DE	IR					300	g	eggs	T	O
1998	CZ	DE	IR	0	kg	eggs	T W					
1998	CZ	DE	RU					682	g	eggs	T	W
1998	CZ	DE	RU					6	kg	eggs	T	O
1998	CZ	DE	RU	5	kg	eggs	T W					
1998	ET	DE	RU					104	kg	eggs	T	O
1998	ET	DE	RU					37	kg	eggs	T	W
1998	HK	DE	AZ					51	kg	eggs	T	O
1998	HK	DE	IR					42	kg	eggs	T	O
1998	HK	DE	KZ					23	kg	eggs	T	O
1998	HK	DE	RU					66	kg	eggs	T	O
1998	JP	DE	AZ					15	kg	eggs	T	O
1998	JP	DE	KZ					25	kg	eggs	T	O
1998	JP	DE	RU					374	kg	eggs	T	O
1998	KR	DE	KG	21	kg	eggs	T W					
1998	KR	DE	KZ					3	kg	eggs	T	W
1998	KR	DE	RU					25	kg	eggs	T	O
1998	KR	DE	RU	5	kg	eggs	T W					
1998	MC	DE	RU					28	kg	eggs	T	O
1998	MT	DE	RU					336	g	eggs	T	O
1998	NO	DE	IR					5	kg	eggs	T	O

				Imports reported					Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit	Term	P	S	Quantity	Unit	Term	P	S
1998	NO	DE	RU						4	kg	eggs	T	O
1998	NZ	DE	RU						60	kg	eggs	T	O
1998	PF	DE	RU						168	kg	eggs	T	O
1998	PL	DE	RU						184	kg	eggs	T	O
1998	SA	DE	RU						63	kg	eggs	T	O
1998	SG	DE	KZ		2	kg eggs	T	O	5	kg	eggs	T	O
1998	SG	DE	RU		5	kg eggs	T	O	5	kg	eggs	T	O
1998	TR	DE	RU						10	kg	eggs	T	O
1998	TW	DE	RU						40	kg	eggs	T	O
1998	US	DE	KZ		329	kg eggs	T	W	829	kg	eggs	T	W
1998	US	DE	KZ		173	kg eggs	T	O	261	kg	eggs	T	O
1998	US	DE	KZ		87	eggs	T	O					
1998	US	DE	RU		1,588	kg eggs	T	O	2,114	kg	eggs	T	O
1998	US	DE	RU		210	kg eggs	T	W					
1998	US	DE	RU		100	kg eggs	T	U					
1998	US	DE	RU		40	kg eggs	T	I					
1998	US	DE	RU		21	eggs	T	W					
1998	US	DE	RU		10	eggs	T	O					
1998	US	DE	XX		67	kg eggs	T	W					
1998	US	DE	RU		21	kg live	T	U					
1998	ZA	DE	RU						8	kg	eggs	T	O
1998	BR	DK	IR						200	kg	eggs	T	W
1998	BR	DK	IR						46	kg	eggs	T	O
1998	BR	DK	XX						268	kg	eggs	T	W
1998	CH	DK	IR		427	kg eggs	T	W	303	kg	eggs	T	W
1998	CL	DK	RU						50	kg	eggs	T	W
1998	SA	DK	IR						11	kg	eggs	T	O
1998	US	DK	RU						10	kg	eggs	T	O
1998	US	DK	RU		10	kg eggs	T	W					
1998	US	ES	RU		21	kg eggs	T	O					
1998	RU	FI	RU						958	kg	eggs	T	W
1998	AD	FR	IR						10	kg	eggs	T	W
1998	AD	FR	IR						1	kg	eggs	T	O
1998	BR	FR	IR						2	kg	eggs	T	W
1998	CA	FR	AZ						6	kg	eggs	T	O
1998	CA	FR	KZ						10	kg	eggs	T	O
1998	CA	FR	KZ						7	kg	eggs	T	W
1998	CA	FR	RU						4	kg	eggs	T	O
1998	CH	FR	IR		249	kg eggs	T	W	83	kg	eggs	T	W
1998	CH	FR	IR		153	kg eggs	T	O	153	kg	eggs	T	O
1998	CI	FR	IR						4	kg	eggs	T	W
1998	CM	FR	KZ						2	kg	eggs	T	O
1998	HK	FR	KZ						2	kg	eggs	T	W
1998	MX	FR	KZ						1	kg	eggs	T	W
1998	SA	FR	IR						3	kg	eggs	T	O
1998	US	FR	KZ						155	kg	eggs	T	W
1998	US	FR	KZ		70	eggs	T	W					
1998	US	FR	RU		84	kg eggs	T	W					
1998	US	FR	XX		42	kg eggs	T	W					
1998	BH	GB	IR						150	kg	eggs	T	W
1998	BR	GB	IR						1	kg	eggs	T	W
1998	CH	GB	RU		201	kg eggs	T	O					
1998	EG	GB	IR						1	kg	eggs	T	W
1998	HK	GB	IR						1	kg	eggs	T	W

			Imports reported					Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit	Term	P S	Quantity	Unit	Term	P	S
1998	JP	GB	IR					60	kg	eggs	T	W
1998	JP	GB	XX					14	kg	eggs	T	W
1998	NG	GB	IR					1	kg	eggs	T	W
1998	PH	GB	RU					1	kg	eggs	T	W
1998	SG	GB	IR					1	kg	eggs	T	W
1998	US	GB	IR					1	kg	eggs	T	W
1998	XX	GB	IR					50	kg	eggs	T	W
1998	XX	GB	KZ					50	kg	eggs	T	W
1998	XX	GB	HU					335		live	T	C
1998	ZA	GB	IR					243	kg	eggs	T	W
1998	ZA	GB	IR					80		eggs	T	W
1998	ZA	GB	KZ					75	kg	eggs	T	W
1998	ZA	GB	RU					77	kg	eggs	T	W
1998	ZA	GB	XX					250		eggs	T	W
1998	ZA	GB	XX					150	kg	eggs	T	W
1998	US	GR	RU	42	kg	eggs	T O					
1998	CH	HK	IR	50	g	eggs	T W					
1998	AT	HU	RU					2000		live	T	C
1998	BE	HU	RU					32,000		live	T	C
1998	BE	HU	RU					4,000		live	T	F
1998	DE	HU	RU					17,500		live	T	F
1998	DE	HU	RU	4,185		live	T C	50,000		live	T	C
1998	FR	HU	RU					8,000		live	T	C
1998	FR	HU	RU					8,000		live	T	F
1998	GB	HU	RU					20,000		live	T	C
1998	NL	HU		5,000		live	T C					
1998	NL	HU	RU					20,000		live	T	C
1998	NL	HU	RU					8,000		live	T	F
1998	BE	IR		300	kg	eggs	T W					
1998	BE	IR		2	kg	meat	T W					
1998	CH	IR		2,885	kg	eggs	T O					
1998	CH	IR		1,570	kg	eggs	T W					
1998	CH	IR	RU	5,180	kg	eggs	T W					
1998	CH	IR		520	kg	meat	T W					
1998	CH	IR	RU	8		skins	T W					
1998	DE	IR		3,117	kg	eggs	T O					
1998	DE	IR		650	kg	eggs	T W					
1998	DK	IR		800	kg	eggs	T W					
1998	ES	IR		8,320	kg	eggs	T W					
1998	ES	IR		500		eggs	T W					
1998	FR	IR		15,418	kg	eggs	T W					
1998	FR	IR		100	kg	meat	T W					
1998	FR	IR		47	kg	meat	E W					
1998	GB	IR		2,149	kg	eggs	T W					
1998	US	IR		1,000		eggs	W					
1998	US	IR		500	g	eggs	P I					
1998	US	IR	XX	400	g	eggs	T I					
1998	US	IR	XX	200	g	eggs	W					
1998	US	LT	XX	933		eggs	T I					
1998	BN	NL	IR					1	kg	eggs	T	W
1998	US	NZ	RU	2	kg	eggs	P I					
1998	DE	PL	RU	2,400	kg	eggs	T O					
1998	DE	PL	RU					1,500	kg	eggs		W
1998	DE	PL	RU					900	kg	eggs		O

			Imports reported					Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit	Term	P S	Quantity	Unit	Term	P	S
1998	DE	PL						155,000		live		C
1998	DE	PL		75,000		live	T C					
1998	GB	PL	RU					200	kg	eggs		W
1998	US	PL	RU	244.4	kg	eggs	T I					
1998	US	PL	RU					3,930	kg	eggs		W
1998	US	PL	RU	760	kg	eggs	T W					
1998	US	PL	RU	514	kg	eggs	T O					
1998	US	PL	RU	428	kg	eggs	T I					
1998	GR	RO		4	kg	eggs	T W					
1998	US	RO		51.2	kg	eggs	T W					
1998	US	RO		178	kg	eggs	T W					
1998	US	RO		44		eggs	T W					
1998	US	RO		13		eggs	T O					
1998	AE	RU						207	kg	eggs	T	W
1998	AE	RU	KZ					89	kg	eggs	T	W
1998	AZ	RU						1,458	kg	eggs	T	W
1998	BE	RU		1,044	kg	eggs	T W	1,128	kg	eggs	T	W
1998	CH	RU		4,391	kg	eggs	T W	2,919	kg	eggs	T	W
1998	CH	RU		13,30	kg	eggs	T O					
1998	CH	RU		10	kg	eggs	T U					
1998	CH	RU	AZ					795	kg	eggs	T	W
1998	CH	RU	KZ					4,391	kg	eggs	T	W
1998	CN	RU						4	kg	eggs	T	F
1998	CZ	RU		2	kg	eggs	T C	2	kg	eggs	T	C
1998	DE	RU		2,644	kg	eggs	T W	4,819	kg	eggs	T	W
1998	DE	RU		1,265	kg	eggs	T O	6,307	kg	eggs	T	O
1998	DK	RU		373	kg	eggs	T W	373	kg	eggs	T	W
1998	FI	RU		450	kg	eggs	T W	958	kg	eggs	T	W
1998	FR	RU		1,196	kg	eggs	T W	1,204	kg	eggs	T	W
1998	FR	RU	KZ	120	kg	eggs	T W	120	kg	eggs	T	W
1998	HU	RU						8	kg	eggs	T	F
1998	HU	RU						2	kg	eggs	T	C
1998	JP	RU						1,141	kg	eggs	T	W
1998	KR	RU						50	kg	live	S	F
1998	NL	RU		691	kg	eggs	T W	2,749	kg	eggs	T	W
1998	US	RU		285	kg	eggs	T I					
1998	US	RU		62.93	kg	eggs	T W					
1998	US	RU		5,999	kg	eggs	T W	13,443	kg	eggs	T	W
1998	US	RU		660	kg	eggs	T O	4,244	kg	eggs	T	O
1998	US	RU		590	kg	eggs	T I					
1998	US	RU		89		eggs	T W					
1998	US	RU		15	kg	meat	T W					
1998	US	RU		1		unspecified	I					
1998	CH	SG	IR	13	kg	eggs	T O	13	kg	eggs	T	O
1998	US	SG	RU	68	kg	eggs	T W					
1998	US	SG	RU	1		eggs	T W					
1998	CH	TR	RU	660	kg	eggs	T O	663	kg	eggs	T	O
1998	JP	TR	XX					25	kg	eggs	T	O
1998	US	TR		672	kg	eggs	T I					
1998	US	TR	RU	920	kg	eggs	T W					
1998	US	TR	RU	838	kg	eggs	T O	1,080	kg	eggs	T	O
1998	US	TR	RU	7	kg	eggs	T I					
1998	US	TR	RU	2	g	eggs	T I					
1998	US	TR	RU	2	g	eggs	T W					

			Imports reported					Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit	Term	P S	Quantity	Unit	Term	P	S
1998	US	TR	XX					2,888	kg	eggs	T	O
1998	US	TR	XX	21	kg	eggs	T I					
1998	AR	US	RU					7	kg	eggs	T	O
1998	AR	US	RU					2	kg	eggs	T	W
1998	CA	US	RU					57	kg	eggs	T	W
1998	CA	US	RU					3	kg	eggs	T	O
1998	CA	US	RU					1		eggs	T	O
1998	CA	US	RU					1		eggs	T	W
1998	CL	US	RU					53	kg	eggs	T	O
1998	CL	US	RU					25		eggs	T	W
1998	DE	US	KZ					1,800	g	eggs	T	W
1998	DE	US	RU					1,360	g	eggs	T	O
1998	DE	US	RU	579	kg	eggs	T O	95	kg	eggs	T	O
1998	DE	US	RU					539	kg	eggs	T	W
1998	DE	US	XX	84	kg	eggs	T O					
1998	DK	US	RU					102	kg	eggs	T	O
1998	DK	US	RU					21	kg	eggs	T	W
1998	ES	US	RU	21	kg	eggs	T O					
1998	FR	US	RU					21	kg	eggs	T	O
1998	FR	US	RU					21	kg	eggs	T	W
1998	GR	US	RU					105	kg	eggs	T	W
1998	GR	US	RU					89	kg	eggs	T	O
1998	IT	US	RU					10.5	kg	eggs	T	O
1998	JP	US	RU					1	kg	eggs	T	W
1998	KR	US	CO	3,000		live	T C					
1998	MC	US	RU					61	kg	eggs	T	O
1998	MC	US	RU					57	kg	eggs	T	W
1998	MX	US	RU					4	kg	eggs	T	W
1998	MX	US	RU					2	kg	meat	T	W
1998	NL	US	RU					21	kg	eggs	T	W
1998	NO	US	RU					2	kg	eggs	T	O
1998	PT	US	RU					76	kg	eggs	T	O
1998	PT	US	RU					43	kg	eggs	T	W
1998	SE	US	RU					63	kg	eggs	T	O
1998	SG	US	RU					24.5	kg	eggs	T	W
1998	TR	US	RU					44	kg	eggs	T	O
1998	TR	US	RU					34	kg	eggs	T	W
1998	TR	US	RU					21		eggs	T	W
1998	XX	US	DE					6	g	eggs	P	O
1998	XX	US	RE					3	g	eggs	P	O
1998	XX	US	RU					166	g	eggs	P	O
1998	XX	US	RU					6		eggs	T	O
1998	XX	US	RU					3		eggs	P	O
1998	XX	US	RU					3	kg	eggs	P	O
1998	XX	US	RU					2	g	eggs	T	O
1998	ZA	US	RU					54	kg	eggs	T	O
1998	ZA	US	RU					3	kg	eggs	T	W
1998	US	XX	RU	3,500	g	eggs	P I					
1998	US	XX	RU	15	g	eggs	P O					
1998	US	XX		11		live	T I					
			Total:	**103,320.5**	**kg**	**eggs**		**82,008**	**kg**	**eggs**		
				88,696		**live**		**326,335**		**live**		

Acipenser nudiventris Lovetzky, 1828

Ship Sturgeon
Esturgeon à barbillons frangés
Esturión barba de flecos

Order: ACIPENSERIFORMES **Family: ACIPENSERIDAE**

SUMMARY

The Ship Sturgeon *Acipenser nudiventris* has always been rare in the Black Sea and the Sea of Azov and their tributaries. There were originally two isolated populations in the northern Caspian Sea, but only the Ural River population is thought to exist today. In Iran (southern Caspian Sea), the species is known to migrate in several rivers. Its former range in the Danube River included Austria and Slovakia. Most range States reported that their wild populations are currently low. Restocking programmes are carried out in Azerbaijan, Iran, and Kazakhstan, but although the species has been in captivity for 60 years, broodstock is currently difficult to obtain. The species is rarely raised in captivity and there is no recorded international trade in products from aquaculture. Of all range States, only Iran, Kazakhstan and the Russian Federation authorise commercial catch of the species. During the past decade, annual catches of *A. nudiventris* have increased in Iran (from 1.9 tonnes (t) in 1990 to 3.5 t in 2000) and in Kazakhstan (from 12 t in 1990 to 23.8 t in 2000). International trade in 1998 totalled 1,156 kg of *A. nudiventris* caviar imports comprising: 1,004 kg from Iran, 87 kg from Kazakhstan, and 65 kg from the Russian Federation, 42% of which was declared as pre-Convention stock. No export quotas were established for specimens of *A. nudiventris* for 1998. Caviar export quotas set by range States increased for Kazakhstan from 1,500 kg for 1999 to 2,200 kg for 2000. The Russian Federation *A. nudiventris* caviar exports amounted 3,000 kg in 1999, that were probably re-exports from Kazakhstan, exceeding the 1999 export quota (1,500 kg) by 100%. Turkmenistan established their first export quota at 400 kg of caviar for 2000. The latter contradicts the fact that commercial catch of the species is prohibited in Turkmenistan waters and that *A. nudiventris* has been included in the country's Red Data Book.

The species is recommended under Decision 11.106 for inclusion in category 1 (i).

DISTRIBUTION AND POPULATION

The CITES database lists the distribution of *Acipenser nudiventris* as Armenia, Azerbaijan, Bulgaria, Georgia?, Hungary (ex), Iran (Islamic Republic of), Kazakhstan, Moldova, Republic of, Romania, Russian Federation, Slovakia (ex), Turkey, Turkmenistan?, Ukraine, Uzbekistan (ex) (Anon., 2000a).

A. nudiventris is classified as Endangered by IUCN (1996):
EN A1acde + 2d Azerbaijan, Bulgaria, Hungary, Iran, Kazakhstan (ex), Moldova, Romania, Russian Federation, Ukraine, Uzbekistan (ex) [River Danube]
Black Sea stock: EN A1acde + 2d Russia, Ukraine [Mediterranean and Black Sea]
Caspian Sea stock: EN A1acde + 2d Azerbaijan, Iran, Kazakhstan
Aral Sea Stock: EX Kazakhstan, Uzbekistan [Mediterranean and Black Sea]
River Danube population: CR A1cd + 2cd Hungary, Romania.

Two morphs of the species have been identified, one anadromous and one sedentary. The anadromous morph has been recorded from the Sea of Azov and the Caspian, Black and Aral Seas and enters associated river systems to spawn. *A. nudiventris* has always been less abundant than other sturgeon species and historically contributed to approximately 1% of the total sturgeon catch from the Caspian Sea. The species has always been rare in the Black Sea and the Sea of Azov (Sokolov and Vasil'ev, 1989). There were originally two isolated migratory populations in the Caspian Sea basin which ascended the Ural and Volga rivers respectively, for spawning (Makarov *et al.*, 1991a; Sokolov and Vasil'ev, 1989), however only the Ural River population is thought to remain in the Caspian Sea Basin (Avetissov, 1992). The non-migratory morph occurs in the Danube and some Ukrainian rivers (Banarescu, 1964; Holèik, 1995; Manea, 1966; Pavlov, 1980). There are no estimates of the total population size for this species, but Avetissov (1992) believes that current stocks in all rivers, except the Ural River, are on the verge of extinction. The historic range of the species included Austria (Fitzinger and Heckel, 1863) and Slovakia (Hensel and Holèik, 1997; Holèik, 1995).

Armenia: No current distribution or status information available.

Azerbaijan: In the past, the species entered the Kura River for spawning (Makarov *et al.*, 1991b; Sokolov and Vasil'ev, 1989). This spawning population used to be the largest for this particular species, however, during 1983-1987, the migrating population was estimated to number only 66-112 individuals and by the end of the 1980s, only one to four individuals passed through the spawning sites (Makarov *et al.*, 1991b). The entire existing stock is maintained by aquaculture, but this has failed to restore the former abundance (Makarov *et al.*, 1991b). In addition, the Lenkoranka and Astara River systems are used by a small number of spawning individuals (Makarov *et al.*, 1991b; Sokolov and Vasil'ev, 1989).

Bulgaria: *A. nudiventris* occurs in the Danube River and was listed in the Red Data Book of Bulgaria in 1985 as Critically Endangered (Karapetkova *et al.*, 1995).

Former Czechoslovakia: The former range included Slovakia (Hensel and Holèik, 1997; Holèik, 1995).

Georgia: The Rioni River provided the main spawning sites in Georgia, although the species was rarely found in this area. In addition, the south east coast of the Black Sea is an important feeding and wintering area for several species of sturgeon (*Huso huso*, *Acipenser stellatus*, *A. nudiventris*, *A. persicus colchicus* and *A. sturio*) that migrate upstream in a number of rivers to spawning grounds. The main rivers involved are the Supsa, Inguri, Chorokhi and particularly the Rioni (Zarkua and Tsuladze, 1999).

Hungary: *A. nudiventris* is considered to be very rare in the Danube and Tisza rivers (CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 10 September 2000), with the last specimen in the Drava River recorded in 1989 (Pintér, 1991).

Iran: *A. nudiventris* migrates to the Sefidrud, Tajen and Babulrud Rivers on the Iranian coasts of the Caspian Sea. Sturgeon hatcheries in Iran apparently obtain breeders of *A. nudiventris* and other species from these rivers (Dr M. Pourkazemi, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000). However, Dr J. Holèik (*in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000) believes the species no longer enters the Sefidrud rivers to spawn due to construction of the Mangil Dam in 1961. According to Dr M. Pourkazemi (*in litt.* to IUCN/SSC Wildlife Trade Programme, 25 September 2000) among the Mangil Dam and other dams constructed on the Sefidrud River, there is a remaining distance of 45 km from the dam closest to the estuary, and sturgeon breeders are still observed entering the river to spawn.

Kazakhstan: Historically, *A. nudiventris* entered the Ural River to spawn (Makarov *et al.*, 1991b; Sokolov and Vasil'ev, 1989) and from 1978-1990, the number of spawning individuals was estimated at 1,500 –18,600 (Avetissov, 1992). A winter migrating race of the species occurred in the Aral Sea Basin but is believed to have been extinct since the 1970s (Zholdasova, 1997). A population introduced from the Aral Sea occurred in the Ili River, which flows into Lake Balkash (Sokolov and Vasil'ev, 1989). However, even this population is now believed to be extinct because the lake is drying out (Bond *et al.*, 1992).

Moldova: The Moldovan range on the Danube River is 811 m and sturgeon also occur in the Prut River, a tributary of the Danube River (junction at km 137th) (Anon., 2000b). There have been no records to confirm the presence of *A. nudiventris* for 15 years (Dr V. Lobchenco, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000).

Romania: Previously, only the sedentary morph occurred in the Danube and its tributaries. *A. nudiventris* is thought to never have been abundant in the Danube, and is now very rare and considered Critically Endangered in the Danube Basin (Hensel and Holèik, 1997*).*

Russian Federation: In the past, *A. nudiventris* entered the Volga to spawn (Makarov *et al.*, 1991b; Sokolov and Vasil'ev, 1989). Only the Ural River spawning population is thought to remain.

Turkey: No current distribution information available (see Threats to Survival and Domestic Use).

Turkmenistan: *A. nudiventris* is close to extinction in the Amu-Darya River and is very rare in the Caspian Sea (Dr Salinkov, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000). It is listed in Category 1 of the 1999 Red Data Book of Turkmenistan, which means it is classified as a "Vanishing species that cannot be saved without special measures" (Salnikov, 1999).

Ukraine: Bacalbasca-Dobrovici reports that *A. nudiventris* is critically endangered or extinct in the Ukraine (*in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000). It has been recorded in the Danube and Karadag regions of the Black Sea coast, very rarely near the mouth of the Dnieper River, and is not known in the main Dnieper, Dniester or Bug rivers. It has always been very rare and is not of commercial value in this area (Pavlov, 1980).

Uzbekistan: *A. nudiventris* is apparently extinct in Uzbekistan, following the drying of the Aral Sea (Birstein, 1993).

Former Yugoslavia: *A. nudiventris* is thought to be critically endangered or extinct in the Danube and the Iron Gate II reservoir (Bacalbasa-Dobrovici, 1997) and is classified as Very Rare and Endangered upstream the Djerdap I dam (Jankoviè, 1994).

HABITAT AND ECOLOGY

The maximum weight of *A. nudiventris* is around 120 kg. Male sexual maturity is reached at 6-12 years and in females at 12-18 years. Males then spawn at 1-2 year intervals and females at 2-3 year intervals (Hochleithner and Gessner, 1999). *A. nudiventris* may reach a total length of approximately 1.70-2.03 m, and its maximum recorded age is 36 years (Sokolov and Vasil'ev, 1989).

A. nudiventris was most abundant in river mouths, as its preferred habitat is shallow fresh water with muddy bottoms. It is a benthic feeder with a diet of fish, molluscs, insect larvae, crustaceans and occasionally the eggs of other sturgeon species (Dr M. Pourkazemi, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000; based on reports from Shahid Marjani hatchery). According to studies conducted in Iran, sexual maturity of this species in the southern shores of the Caspian Sea is attained at average ages of 17 years (from 13 to 22) for females and 13 years (from 11 to 15) for males (International Sturgeon Research Institute, 1998; cited in Dr M. Pourkazemi, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000).

Based on catches and caviar production in the late 1970s, the rate of caviar/catch was estimated at 7% in weight for the three main commercial species of the northern Caspian Sea, *H. huso*, *Acipenser gueldenstaedtii* and *A. stellatus* (Doroshov and Binkowski, 1985; cited in Williot and Bourguignon, 1991).

Kazakhstan: Until 1993, the mouth of the Ural River was dredged annually to allow vessels to travel upstream to Atyrau (former Gur'yev) harbour. Since 1993, this annual management of the river channel has not been carried out and is an obstacle to sturgeon migration (Anon., 2000b).

THREATS TO SURVIVAL AND DOMESTIC USE

Since the 1950s, almost all spawning rivers for this species, with the exception of the Ural River have been dammed for hydroelectric power production and almost all the spawning grounds of the Sea of Azov, the Caspian and the Black Sea region have been lost. Consequently, the species' range has been drastically reduced. In addition, pollution has been rapidly increasing since 1979, the main sources being oil, industrial waste and agricultural chemicals and almost all spawning rivers are now heavily polluted (Anon., 1997).

In the former Soviet Union and Iran, strict sturgeon fishery legislation had been in effect for decades until the emergence of the three new independent States in the Caspian Sea basin in 1992 (Azerbaijan, Kazakhstan and Turkmenistan) (De Meulenaer and Raymakers, 1996). Current information suggests that amendments of previous regulations and/or adoption of new legislation are now in effect in most new range States in the Caspian Sea, as well as in the Black Sea (including the Danube River) and the Sea of Azov basins. In the latter, Bulgaria, Romania and Ukraine are the most important sturgeon fishing nations. However, enforcement

measures appear to be lacking and numerous experts as well as government officials have reported an increasing pressure of illegal fishing practices and criminal activities surrounding the caviar trade in much of the range (Anon., 2000b; Dobbs, 1992; Doward, 2000; Evtouchenko, 1997; King, 1998; Ward, 2000a and 2000b).

Azerbaijan: The Mingechaur Dam constructed on the Kura River prevents sturgeon from accessing spawning grounds higher up the river (Birstein, 1993). *A. nudiventris*, particularly the population of the Kura River, has always been less abundant than other sturgeon species. The share of *A. nudivetnris* has never exceeded 2% of the total sturgeon catch in Azerbaijan (CITES Management Authority of Azerbaijan, *in litt*. to TRAFFIC Europe, 18 September 2000).

Bulgaria: Wild sturgeon populations have been threatened by a decrease in the number of Danube River spawning grounds as a result of human development, particularly hydroelectric facilities. The long lasting unregulated fisheries have disrupted the age composition of the populations due to the selective catch of sexually mature fish and to the incidental catch of young sturgeon in nets set to catch other species when the juveniles migrate to the sea. Water pollution has also influenced the metabolism of the Ship Sturgeon (CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000).

Georgia: During the fishing seasons, particularly in the coastal anchovy fisheries, numerous sturgeon fry were caught as by-catch and have perished. The estimated number of sturgeon (no species-specific data) declined from 77,000 individuals in 1977, to 57,000 in 1980 and to 27,000 in 1986. During the 1990s, illegal fishing in Georgia expanded rapidly as a result of poor control (Zarkua and Tsuladze, 1999).

Hungary: Threats to *A. nudiventris* are unknown because of the rarity of the species and very few recent records. However, the species is protected, with domestic use and trade being prohibited (CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 13 September 2000).

Iran: Commercial catch of *A. nudiventris* is allowed in Iranian waters.

For the past 5 years, the Iranian domestic market of caviar and sturgeon meat is estimated to be 5% and 65% of the country's total production respectively (CITES Management Authority of Iran, *in litt*. to TRAFFIC Europe, 24 September 2000).

Annual catch of *A. nudiventris* (in tonnes)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000 ***
A. nudiventris	1.9	22.4	19.0	17.5	17.3	15.7	16.6	13.5	19.4	21.0	3.5
Total	*2,296.3*	*2,315.1*	*2,058.0*	*1,462.1*	*1,380.9*	*1,216.3*	*1,310.0*	*1,043.5*	*1,127.9*	*923.3*	*182.4*

* Catch in spring 2000 only.
Source: CITES Management Authority of Iran, *in litt*. to TRAFFIC Europe, 24 September 2000.

Sturgeon meat and caviar production of *A. nudiventris* (tonnes)

	1992				**1999**			
	Meat	**% ***	**Caviar**	**% ***	**Meat**	**% ***	**Caviar**	**% ***
A. nudiventris	15.2	*0.9*	1.5	*0.6*	16.8	*2.3*	2.0	*2.0*
Total	**1,604.2**		**262.3**		**730.2**		**99.3**	

* Percentages relate to the share of *A. nudiventris* products of the total Iranian sturgeon fisheries.
Source: Dr M. Pourkazemi, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000

Kazakhstan: The Ural River is susceptible to oil pollution from two oil fields (Sagers, 1994)
Both tributaries of the Aral Sea Basin have been altered for irrigation, consequently, the Aral Sea has decreased to 60-70% of its former volume (Ellis, 1990).

Annual commercial catch of *A. nudiventris* (tonnes)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000 ***
A. nudiventris	12.0	12.0	19.3	58.0	26.0	22.0	26.0	27.1	40.0	26.0	23.8
Total	*1,963.0*	*1,767.0*	*1,437.3*	*1,109.0*	*556.0*	*573.0*	*367.8*	*389.5*	*490.0*	*279.0*	*230.5*

* Spring catch

Source: CITES Management Authority, *in litt*. to TRAFFIC Europe, 21 September 2000

Moldova: The main threats are dam construction and poaching (Vedrashko *et al.,* 1998).

Russian Federation: The level of domestic consumption of sturgeon products in the Russian Federation is unknown, but is said to be the main outlet of illegal sturgeon fisheries (Mr Roman V. Ivakhnenko, State Fisheries Committee, pers. comm. to TRAFFIC Europe-Russia, September 2000). Based on the number of sets of illegal fishing equipment as recorded by enforcement agencies of the Caspian Sea and the Sea of Azov, the illegal sturgeon catch was estimated at six to ten times the legal catch (Anon., 2000b). In 1997, the estimated volume of the Moscow sturgeon meat market was three times the annual catch quotas for sturgeon species (Anon., 1998).

Turkey: The Yesilirmak River has changed dramatically due to the construction of two dams in 1979, the lowest of which limits upstream migration. The Kizilirmak River was dammed in 1998 and suffers significant amounts of pollution. Spawning ground has been drastically reduced (Edwards and Doroshov, 1989). From 1969 to 1979, Turkish annual sturgeon landings ranged from 10-310 t, with a yearly average of 112 t (Edwards and Doroshov, 1989). In 1989 in Samsun, a Turkish landing site on the Black Sea, a caviar processor claimed that his business had dropped from 8 tonnes/year of caviar of all sturgeon species between the 1940s and the 1970s to 200 kg/year at the end of the 1980s. In 1989, sturgeon were caught as by-catch by trawlers that operated legally along the Turkish coast at a distance greater than three nautical miles from the shore, but also illegally within the three nautical mile limit. This represented the main fishing pressure on sturgeon. In April 1989, *A. stellatus*, *A. gueldenstaedtii*, *H. huso* and *A. sturio* were observed in Samsun. The investigators were told that *A. nudiventris* was also landed in Samsun (Edwards and Doroshov, 1989).

Ukraine: Catch of *A. nudiventris* in Ukrainian waters is prohibited since the species was listed in the Red Data Book of Ukraine in 1992 (Anon., 2000b).

INTERNATIONAL TRADE

The listing of *A. nudiventris* in CITES Appendix II entered into effect on 1 April 1998. Data for this species were therefore limited to nine months of trade (April-December 1998).

Gross exports and the comparative tabulation of trade in *A. nudiventris* are given in the Appendix. According to 1998 CITES Annual Reports, imports of *A. nudiventris* amounted to 1,156 kg of caviar that originated from three range States: Iran, Kazakhstan and the Russian Federation. Of this, 42% was declared of pre-Convention stock.

Exports of *A. nudiventris* from Russia in 1999 (kilograms)

	Quantity (kg)	**Description**	**Importer**	**No of permits**
A. nudiventris	3,000.00	Caviar	US, FR, CH	3 Re-export

Source: CITES Management Authority of the Russian Federation, *in litt*. to TRAFFIC Europe, 18 Sept. 2000

For *A. nudiventris,* range States have established export quotas for caviar only.

Caviar export quotas for 1998, 1999 and 2000 (kilogrammes)

	1998	1999	2000	
	Caviar	Caviar	Caviar	Meat
Kazakhstan		1,500	2,200	34,000
Turkmenistan			400	
Total		***1,500***	***2,600***	***34,000***

Source: **CITES Notification Nos. 1998/35-36-61, 1999/21-47-53-68 and 2000/053-056-061**

Illegal trade: Confiscation of *A. nudiventris* shipments were not reported in 1998, however poaching and smuggling are closely related and have been intensively reported in the media of range States and importing countries (Mc Donald, 2000; Snyder, 2000). However, a great deal of illegally caught sturgeon is destined to the domestic market, particularly meat (Anon., 1998).

CONSERVATION MEASURES

A. nudiventris is not fully protected by legislation in the Caspian region.

Bulgaria, Romania, Russian Federation: Catch is prohibited by the Convention Concerning Fishing In The Black Sea. Bacalbasa-Dobrovici believes that measures which have been put in place are too late to aid species recovery for this species (Pr N. Bacalbasa-Dobrovici, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000).

Azerbaijan: The State institution responsible for sturgeon fishery and processing matters is the "State Concern Azerbalyg". Commercial catch of the species is prohibited (Anon., 2000b). The species was listed in the Red Data Book of Azerbaijan in 1994. Three hatcheries were built in the Lower Kura River by the authorities of the former Soviet Union. The total annual capacity was 1-2 million fingerlings which were to be released into the river. World Bank funds have been allocated for the construction of a new sturgeon hatchery that will have the capacity of 15 million fry/year and should be operational in the next couple of years. Concerns have been raised on the availability of adult sturgeon to constitute the broodstock of the farm (CITES Management Authority of Azerbaijan, *in litt*. to TRAFFIC Europe, 18 September 2000).

Estimated number of fry released (million fish)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A. nudiventris	0	0.738	0	0	0	0	0	0.123	0.410	1.120	0.870
Total	*17.523*	*9.082*	*2.980*	*1.838*	*1.142*	*1.242*	*4.070*	*6.065*	*6.220*	*20.290*	*16.965*

Source: CITES Management Authority of Azerbaijan, *in litt*. to TRAFFIC Europe, 18 September 2000

The Intergovernmental Commission for Caspian Biological Resources set a zero catch quota for the species in Azeri waters (Anon., 2000b).

Bulgaria: The fishing of *A. nudiventris* has been banned since 1985, when the species was included in the country's Red Data Book (Anon., 2000b). Conservation measures at the national level are needed, but they must be linked to the co-ordinated activities of all countries in the Black Sea region (CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000).

Hungary: The species is protected according to *Decree No. 1/1982 (III.15.) OKTH* on the *Protected and Strictly Protected Species of Flora and Fauna, Value of their Specimens, Determination of the Range of Protected and Strictly Protected Caves and Exemptions from Restrictions and Prohibitions Set for Certain Protected Animal Species*, last amended by the *15/1996 (VII.26.) Decree of the Minister for Environment*. The *Nature Conservation Act No. 53 of 1996, Article 43* orders that for all protected species, prior authorisation from the National Park Directorate is required for the: capture, killing, possession, captive breeding, introduction of specimens from exotic population, artificial exchange of genetic matter between populations, exchange, sale and purchase of *A. nudiventris* (CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 13 September 2000).

Iran: Biometric measurements for all species have been carried out at all sturgeon catch stations for the past 10 years. The age, length, sex and weight of fish landed are recorded. The population structure is estimated on the basis of age groups. As a result of these studies, the number of catch stations were decreased by half, changes were adopted on sturgeon catch methods, and lower export quotas were set for the past five years.

Annual release of *A. nudiventris* fry (in million fish)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
A. nudiventris	0	0	0	0	0	0	0.10	0.23	0.68	0.30
Total	*4.56*	*6.60*	*3.45*	*4.17*	*5.91*	*9.13*	*12.35*	*21.63*	*24.56*	*19.10*

Source: CITES Management Authority of Iran, *in litt*. to TRAFFIC Europe, 24 September 2000

Catch of *A. nudiventris* has been restricted in Iranian waters and enforcement of the legislation has been strengthened. Use of gillnets to catch *Rutilus* spp. Roach has been prohibited as sturgeon are caught as bycatch. There has been a forced and drastic reduction in fishing effort for *Rutilus* spp. Fishermen are encouraged to offer incidental catches of all sturgeon species to the Iranian Fisheries authorities for use in their artificial breeding programmes. A restocking programme has produced over one million fingerlings that were released in the rivers leading to the Caspian Sea during 1998-1999. A broodstock shoal of about 3,000 breeders and a gene bank have been established. Egg removal by caesarean has also been practised (Dr. M. Pourkazemi, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000).

Kazakhstan: Commercial sturgeon catch is only allowed in the tributaries of the Caspian Sea, but scientific catch is permitted in the open sea with an annual quota of 20 t.

Sturgeon fisheries are regulated by law. There are two fishing seasons, one during spring spawning and one during migration for hibernation. The dates of the fishing seasons vary with the climate and are therefore set annually by authorised scientific-research organisations. As with most former Soviet Republics, "sweep net" (bottom nets that are hauled several times a day) with a minimum mesh size and being marked with the name and address of the owner, is the only legal fishing gear for sturgeon. Each fisherman can only set one net at a time. A fishing license is required. Sturgeon fishing grounds (called "tonia") are limited; there are twelve on the Ural River and eight on the Kigach River. The minimum catch size for *A. nudiventris* is 105 cm. The ratio of males and females caught is not regulated or monitored. The purchase price at the landing site is based on a fixed legal rate of caviar weight extracted per female. *A. nudiventris* is set at 18.6% of the total body weight. The annual commercial catch quotas allocated to Kazakhstan by the Intergovernmental Commission for Caspian Biological Resources that meets annually in Astrakhan.

Annual commercial catch quotas allocated to Kazakhstan (tonnes)

	1996	**1997**	**1998**	**1999**	**2000**
A. nudiventris			40	50	35
Total	***375***	***480***	***460***	***405***	***371***

Source: CITES Management Authority of Kazakhstan, *in litt.* to TRAFFIC Europe, 21 Sept. 2000

Two hatcheries exist in Kazahstan; Uralo-Atyrau and Atyurau. These have been operational since 1998.

Annual release of *A. nudiventris* fry (number of fingerlings)

	1998	**1999**	**2000**
A. nudiventris		729,000	277,800
Total	*1,706,193*	*5,318,471*	*5,507,160*

Source: CITES Management Authority of Kazakhstan, *in litt.* to TRAFFIC Europe, 21 Sept. 2000

Russian Federation: For Caspian Sea populations, the former Soviet Republics set annual catch quotas in agreement with Iran. Sturgeon catch quotas have been established by the Intergovernmental Commission for Caspian Biological Resources for many years. The annual share of sturgeon catches of each former USSR Caspian range State as adopted by the Commission since 1993 are as follows: the Russian Federation 70%, Kazakhstan 17.6%, Azerbaijan 6.1% and Turkmenistan 6.3%. There are two fishing

seasons in the Caspian Sea waters: from ice melting to 5 June, and from 1 September until the time of ice formation. A license is required to catch sturgeon in Russian waters. The minimum size limit for Ship Sturgeon caught in Russian waters is 105 cm. Russian catch quotas are declared by the Federal Government following the recommendations given by the State Fisheries Committee in consensus with an independent council of experts.

Export quotas established by the CITES Management Authority consist of 90% of the caviar production, which in turn depends on the catch quotas set for each species of sturgeon (Mr Roman V. Ivakhnenko, State Fisheries Committee, pers. comm. to TRAFFIC Europe-Russia, September 2000). The annual catch quotas or Total Allowable Catches (TACs) allocated by the State Fisheries Committee, are based on the recommendations of scientific agencies such as the Russian Federal Research Institute of Fisheries and Oceanography ("VNIRO") and the Pacific Research Institute of Fisheries and Oceanography ("TINRO"). The TAC includes the commercial catch, the scientific catch, and the catch of mature males and females destined to captive breeding.

There has been no release of *A. nudiventris* fry by Russian hatcheries in the Volga River. Recent data on the monitoring of catch per species, including the size composition and sex ratio of fish caught, are not available. The domestic consumption of sturgeon products in the Russian Federation, mostly meat and caviar, is unknown (Mr Roman V. Ivakhnenko, State Fisheries Committee, pers. comm. to TRAFFIC Europe-Russia, September 2000).

Moldova: All sturgeon fisheries are prohibited by the Law of the Republic of Moldova on Fund of Natural Areas Protected by State (1998) (Anon. 1999).

Turkey: In 1979, with the exception of *H. huso* Beluga of more than 140 cm long, the fishery for sturgeon was prohibited in Turkish waters (Edwards and Doroshov, 1989). Circular 34/1, effective from 2000-2002, prohibits the collection of Acipenseriformes (CITES Management Authority of Turkey, *in litt*. to TRAFFIC Europe, 20 September 2000).

Turkmenistan: *A. nudiventris* was included in the country's Red Data Book in 1999 (Anon., 2000b). Commercial catch is prohibited but there are no surveys or management plans for this species (Dr. P. Salinkov, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000).

Ukraine: Catch of *A. nudiventris* in Ukrainian waters is prohibited since the species was listed in the Red Data Book of Ukraine in 1992 (Anon., 2000b).

CAPTIVE BREEDING

In the former Soviet Union *A. nudiventris* has been bred in captivity since the 1960s in order to maintain the spawning stocks for commercial harvests of the Sea of Azov and the Caspian and Black seas. An average of 0.8 million fry were released annually into the southern Caspian Sea at the end of the 1980s. Most hatcheries of Azerbaijan, Kazakhstan and the Russian Federation, stopped being operational in the early- to mid-1990s following shortage of government funds (De Meulenaer and Raymakers, 1996).

Captive breeding is not occurring at present as there are no mature individuals available to create a broodstock. M. Hochleithner (*in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000) notes that restocking projects for the non-migratory form of the species are planned.

Georgia: Up to the early 1990s, artificial breeding of sturgeon was carried out in the Varistkhi Sturgeon Plant built in 1983 on the Rioni River with mixed results (Zarkua and Tsuladze, 1999).

Hungary: There are no breeding facilities in Hungary (CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 13 September 2000).

Kazakhstan: The two hatcheries, Uralo-Atyrau and Atyurau, have been operational since 1998, and restocking of fry has restarted (CITES Management Authority of Kazakhstan, *in litt.* to TRAFFIC Europe, 21 September 2000).

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Gross exports of *Acipenser nudiventris* 1998

TAXON	TERM	UNIT	Exporter	1998
Acipenser nudiventris	eggs		DE	44
Acipenser nudiventris	eggs	kg	AE	330
Acipenser nudiventris	eggs	kg	CH	21
Acipenser nudiventris	eggs	kg	DE	601
Acipenser nudiventris	eggs	kg	FR	154
Acipenser nudiventris	eggs	kg	IR	510

Comparative tabulation of trade in *Acipenser nudiventris* 1998

				Imports reported					Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit	Term	P	S	Quantity	Unit	Term	P	S
1998	CH	AE	IR	330	Kg	eggs	T	W					
1998	FR	CH	IR	2	Kg	eggs	T	O	2	kg	eggs		O
1998	HK	CH	IR						9	kg	eggs		O
1998	MC	CH	IR	7	Kg	eggs	T	O	7	kg	eggs		O
1998	MX	CH	IR						2	kg	eggs		O
1998	CH	DE	RU	22	Kg	eggs	T	O	22	kg	eggs	T	O
1998	JP	DE	KZ						108	kg	eggs	T	O
1998	NO	DE	RU						6	kg	eggs	T	O
1998	US	DE	KZ	44		eggs	T	O					
1998	US	DE	KZ	43	Kg	eggs	T	O	465	kg	eggs	T	O
1998	US	DE	RU	43	Kg	eggs	T	O					
1998	CH	FR	IR	154	Kg	eggs	T	W					
1998	CH	IR		500	Kg	eggs	T	O					
1998	CH	IR		11	Kg	eggs	T	W					
			Total:	**1,156**	**Kg**								

Acipenser ruthenus Linnaeus, 1758 **Sterlet**

Order: ACIPENSERIFORMES **Family: ACIPENSERIDAE**

SUMMARY

The Sterlet *Acipenser ruthenus* is a freshwater species and is the smallest species of sturgeon. It reaches sexual maturity in just 3-8 years with an average life span of 15 years. It originally inhabited the rivers of Eurasia, being widely distributed in rivers flowing into the Caspian, Black, Baltic, White, Barents and Kara Seas and the Sea of Azov. In the Russian Federation, populations are now thought to be virtually extirpated from three Siberian rivers, Ob', Irtysh and Yenisey, being currently found mainly in the Volga River. The Danube is a stronghold for the species and in recent years, catches have been reported as far upstream as Austria.

Historically, the highest catches were recorded in the Danube River basin (63.5 tonnes (t) average annual catch from 1958 to 1981), and in the Siberian rivers (average annual catch in the 1990s of 69 t), while the Caspian Sea has yielded only 1-2 t annually since 1997. Nowadays, the main commercial catches are reported from the Danube River basin range States: Bulgaria, Romania and the former Yugoslavia. Recorded catches in the Russian Federation decreased by around 50% between 1990 and 1996, and commercial catch of the species has been prohibited in the Yenisey River. Re-stocking of the species is reported in Bulgaria, Hungary and the former Yugoslavia, but none in the Russian Federation. The majority of international trade is composed of live juveniles produced in aquaculture. In 1998, Hungary exported 90,000 and the Russian Federation 2,000 juveniles raised in aquaculture. Additionally, the Russian Federation exported 4 kg of eggs (probably fertilised eggs) in 1998. No export quotas were in place for live juvenile sturgeon in 1998, 1999 and 2000. Only the Russian Federation has established export quotas for *A. ruthenus* in 2000: 300 kg of caviar, 2 t of meat and a total of 125 kg of fertilised eggs for the species and three hybrids.

The species is recommended under Decision 11.106 for inclusion in category 2 (ii).

DISTRIBUTION AND POPULATION

The CITES database gives the distribution of *Acipenser ruthenus* as: Austria, Bosnia and Herzegovina, Bulgaria, Czech Republic, Georgia, Germany, Hungary, Kazakhstan, Latvia, Lithuania, Moldova, Republic of, Romania, Russian Federation, Slovakia, Slovenia, Switzerland, Turkey, Ukraine, Yugoslavia (Anon., 2000a).

A. ruthenus is classified as Vulnerable by IUCN (1996):
VU A1c Austria, Bosnia and Herzegovina, Czech Republic, Germany, Hungary, Kazakhstan, Latvia, Lithuania, Romania, Russian Federation, Slovakia, Switzerland, Ukraine, Yugoslavia
Caspian and Black Sea drainage stock: VU A1cd Hungary, Romania, Russian Federation, Ukraine, Yugoslavia [Mediterranean and Black Sea]
Russian stock: VU A1c Russia [Irtysh, Ob and Yenisei rivers]

Austria: *A. ruthenus* has a limited distribution in the Danube and Drava rivers (Honsig-Erlenburg and Schultz, 1989; Jungwirth, 1975; Schiemer and Spindler 1989, cited in Dr J. Holèik, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000). It is recorded as Endangered (Anon., 1997).

Bulgaria: *A. ruthenus* occurs in the Danube River and previously, in the lower courses of its tributaries. However, population density and catch have decreased in recent years (Karapetkova *et al.*, 1995, cited in Dr J. Holèik, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Czech Republic: *A. ruthenus* occurs in the lower course of the Morava River (the western tributary of the Danube River), and its tributary, the Dyje River (Dr J. Holèik, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000). The status of the species has not been evaluated (Lusk and Hanel, 1996b, cited in Dr J. Holèik, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Germany: *A. ruthenus* has been extirpated (Dr J. Holèik, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Hungary: *A. ruthenus* is considered to be common (Pintér, 1991; A. Ronyai, *in litt.* to IUCN/SSC Wildlife Trade Programme, 8 August 2000). No information is available on population size, other than that it is quite common and occurs in all major rivers: Berettyó, Danube, Dráva, Kõrös, Maros, Mura, Rába, Szamos and Tisza (CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 13 September 2000).

Moldova: The Moldovan range on the Danube River is 811 m and sturgeon also occur in the Pruth River, a tributary of the Danube River (junction at km 137th) (Anon., 2000c). The species also occurs in the Dniester (or Nistru) River (Sokolov and Vasil'ev, 1989).

Romania: The range of *A. ruthenus* in the Danube River increased in the 1980s due to improved water quality, but has now diminished due to overfishing (Pr N. Bacalbasa-Dobrovici, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000). The range is fragmented (Dr N. Patriche, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Russian Federation: In the Caspian Sea region, *A. ruthenus* occur throughout the course of the Volga River including reservoirs and in many of its major tributaries. The most recently published information concentrates on the Vyatka River population, which was reported to be abundant in the 1990s (Kuznetsov *et al.*, 1995). The species is rarely encountered in the Ural River. In the Sea of Azov basin, *A. ruthenus* was recorded from the Don and Kuban Rivers, but there are no current records.
In the White and Barents Sea drainage, *A. ruthenus* inhabited the Northern Dvina River basin, though there is no current information on its status. *A. ruthenus* also once inhabited the Ob', Irtysh and Yenisey Rivers in Siberia, but is now thought to be virtually extirpated from these (Birstein, 1993). Introduced populations occur in the Pechora and Western Dvina rivers (Anon., 1997).

Slovakia: Classified as Vulnerable, *A. ruthenus* occurs in the Danube River and its main tributaries, the Morava, Váh, Hron, Ipec and Tisa rivers. The species had a limited distribution until 1970 due to pollution, but improved water quality has coincided with increased distribution and catch (Holèik, 1995).

Ukraine: Listed in the Red Data Book of Ukraine (Gringevsky, 1995), *A. ruthenus* occurs in the lower Danube and the Dniester rivers where its distribution is limited since the construction of the Dubosary dam. On rare occasions it is found in the Dnieper and Bug River systems and some of their tributaries. Population density has decreased since the construction of the dam (Pavlov, 1980).

Former Yugoslavia: No information is available for Croatia. In Serbia, *A. ruthenus* occurs in the Danube and the lower parts of the Sava and Tisa rivers (Jankoviè, 1993). In Slovenia, the species is considered Vulnerable and in decline (Povž and Sket, 1990).

Introduced populations:

Germany: In the Baltic Sea river estuaries, east of Rostock (Germany), and further upstream, specimens of non-indigenous sturgeon species and probably hybrids have been caught. They probably originate from upstream aquaculture farms and/or aquaria ("specimens that had grown too large to be kept in the private aquaria") (Jörn Gessner, Scientist at the Institute of Freshwater Ecology and Inland Fisheries, pers. comm. to TRAFFIC Europe, 15 March 2000).

Italy: *A. ruthenus* has been introduced in captive breeding facilities in Italy in 1990s (Agroittica Lombarda and Azienda Agricola, Italian sturgeon farmers, *in litt*. to TRAFFIC Europe-Italy, 1999). There is no documentation on the potential damage of the introduction of exotic Acipenseriformes on local species. If specimens of *A. ruthenus* escape into the Po River, they may threaten the Adriatic Sturgeon *Acipenser naccarii*, which is on the brink of extinction.

HABITAT AND ECOLOGY

A. ruthenus is the smallest of all sturgeon species, usually reaching a total length of 1 m and a weight of up to 6.5 kg (Anon., 1997). The maximum age is reported to be 27 years, with an average life span of 15 years. Sexual maturity is reached at 3-5 years in males and 5-8 years in females (Hochleithner and Gessner, 1999). It occurs in freshwater and prefers deep depressions in rivers with a stony, gravely or sandy bed. It is a benthic feeder with a diet of insect larvae, small molluscs and invertebrates. It does not undertake long migrations. During the spawning season, *A. ruthenus* feed on sturgeon eggs of other species.

THREATS TO SURVIVAL AND DOMESTIC USE

The damming of virtually all rivers in the range of the species began in the 1930s and led to a sharp decline in spawning habitat. Spawning success is related to the water level which in turn is controlled by hydroelectric power stations; lowered water levels in rivers can cause mass death of fingerlings (Jankoviè, 1993). Reduced flow velocity has also led to degeneration in the reproductive system (Lukin *et al.*, 1981, cited in Anon., 1997). Increasing pollution (oil products, phenols, PCBs, mercury etc.) in the Volga River System and Siberian rivers in recent years has threatened the survival of *A. ruthenus* (Romanov and Altuf'ev, 1993). Studies of sympatric species have shown degeneration of the reproductive system, liver and muscle tissue as a result of pollution. Lukin *et al.*, (1981, cited in Anon., 1997) found that specimens in large water reservoirs of the Volga River grew unusually quickly but did not mature. The newly constructed Novodnestrovskaya hydro power station has lowered the spring and summer water temperatures to 5-6°C and has caused reproductive problems for *A. ruthenus* and other sturgeon in the Middle Dniester (Sarapanovscaia, 1999).

In the Danube River, from 1958 to 1981, catches of *A. ruthenus* ranged from 117 t (in 1963) to 36 t (in 1979) and averaged 63.5 t per annum for this 24-year period. The average share of these annual catches were distributed amongst the Danube countries as follows: former Yugoslavia averaging 57.5% of the total catch from 1958 to 1981, Bulgaria 21.8%, Romania 10.5%, Hungary 3.5% and the former Czechoslovakia 0.5% (Hensel and Holèik, 1997). Little data are available on recent and current catch data of *A. ruthenus* in the Danube River basin.

Bulgaria: Wild populations of sturgeon have been threatened by the decrease in the number of spawning grounds on the Danube River as a result of human development, particularly hydroelectric facilities. The long lasting unregulated fisheries have disrupted the age composition of the populations due to selective catch of sexually mature fish, and incidental catch of young sturgeon in nets set to catch other species when the juveniles migrate to the sea. Water pollution has also influenced the metabolism of the fish (CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000).

Annual catch of *A. ruthenus* (tonnes)

	1995	**1996**	**1997**	**1998**	**1999**
A. ruthenus	0.1	0.8	0.8	1.2	1.5
Total sturgeon catch	*14.7*	*32.5*	*49.8*	*55.9*	*50.5*
n° of licenses issued	0	0	122	155	169

Source: CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000

Domestic consumption of caviar in Bulgaria is limited to 7-10% of the total Bulgarian caviar production. All sturgeon meat production is consumed in Bulgaria.

Hungary: *A. ruthenus* is the only species of sturgeon commonly found in Hungary. Estimated annual catches range from 3-20 t (Pintér 1991; A. Ronyai, *in litt*. to IUCN/SSC Wildlife Trade Programme, 8 August 2000). Hungary is not involved in caviar production. From 1997 to 1999, the following catches were recorded: 1997- 14.2 t, 1998 - 9.5 t, 1999 - 34.9 t (CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 13 September 2000).

Romania: There are many small populations of *A. ruthenus* in the Danube River, but no records of national catch levels (Dr N. Patriche, *in litt*. to IUCN/SSC Wildlife Trade Programme, 5 Sept. 2000).

Russian Federation: *A. ruthenus* catch has always been relatively small on the territory of the former Soviet Union, compared with that of major commercial sturgeon species (*Huso huso*, *A. gueldenstaedtii* and *A. stellatus*). This may be partly explained by the small size of *A. ruthenus*, but also because Sterlet caviar is not as valuable as caviar of other species. *A. ruthenus* has been primarily targeted by fishermen to supply the domestic demand (Anon., 2000b).

Catch of *A. ruthenus* (tonnes)

	1988	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Caspian Sea	?	?	?	?	1	1	1	1	2	2
Water reservoirs of Russia	40.5	57.8	30.4	31.4	29.7	12.3	13.1	24.1	16.8	?
Ob' River	?	?	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Yenisey River	39.2	28.9	63.3	57.2	56.0	64.4	61.9	58.2	42.0	25.9
Northern Dvina River	?	?	7.7	8.0	9.5	7.0	5.0	8.0	4.8	8.9
Total			*116.4*	*111.6*	*111.2*	*99.7*	*96.0*	*106.3*	*80.6*	

Source: Federal Research Institute of Fisheries and Oceanography of the Russian Federation ("VNIRO"), cited in Anon., 2000a

The level of domestic consumption of sturgeon products in the Russian Federation is unknown, but is said to be the main outlet of illegal sturgeon fisheries (Mr R.V. Ivakhnenko, State Fisheries Committee, pers. comm. to TRAFFIC Europe-Russia, September 2000). Based on the number of sets of illegal fishing equipment recorded by enforcement agencies of the Caspian Sea and the Sea of Azov, the illegal sturgeon catch for all species was evaluated at six to ten times the legal catch (Anon., 2000b). In 1997, the estimated volume of the Moscow sturgeon meat market was three times the annual catch quotas for sturgeon species (Anon., 1998).

Ukraine: Catch of *A. ruthenus* in Ukrainian waters has been prohibited since the species was listed in the Red Data Book of Ukraine in 1992 (Anon., 2000c).

INTERNATIONAL TRADE

The listing of *A. ruthenus* in CITES Appendix II entered into effect on 1 April 1998. Data for this species are therefore limited to nine months of trade (April-December 1998).

Gross exports and the comparative tabulation of trade in *A. ruthenus* are given in the Appendix. CITES Annual Reports for 1998 suggest that live juvenile fish represented the majority of international trade in *A. ruthenus*. Hungary is the main exporter, exporting more than 95% of the total 92,000 live individuals in trade declared as "F" – First Generation). The European Union (EU) is the largest importer (Germany, the Netherlands, and the United Kingdom (UK)). International trade in live juvenile *A. ruthenus* supplies the sturgeon aquaculture industry and the ornamental fish (aquarium) industry. In Italy, for instance, *A. ruthenus* is imported for ornamental purposes (Dr P. Bronzi *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000). According to 1998 Annual Reports most importing countries do not report live juvenile imports (see Appendix). Possible reasons for this omission are: reporting errors; non–implementation of the CITES requirement to record imports of "live" fish and fertilised "eggs" in CITES Annual Reports; and lack of awareness of the Wildlife Regulation (EC) 338/97 among importers in the EU and therefore lack of applications for import permits for live juvenile sturgeon.

The small size of the species makes it attractive to the apparently increasing meat market (see export quotas for 2000) and because restaurants prefer smaller sized fish.

Hungary is not involved in *A. ruthenus* caviar production and export (CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 13 September 2000).

Exports of *A. ruthenus* from Hungary in 1999

	China	USA	Germany	Slovenia	United Kingdom	Czech Republic	Bulgaria	Netherlands	Belgium
Live fingerlings		4,000	22,000	15,000	10,000	8,000	6,000	5,000	5,000
Fry	200,000								
Fert. eggs		30,000							

Source: CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 13 September 2000

Exports of *A. ruthenus* from Russia in 1999

	Quantity (kg)	Description	Importer	No of permits
A. ruthenus	16.80	Live eggs	DE, CN, US, HU, GR	7 Export
	200.00	Live fish	KR	2 Export
Huso huso x A. ruth.	62.80	Live eggs	PL, DE, JP, CN, LV, US, HU, IL, GR	16 Export
	300.00	Live fish	KR	1 Export

Source: CITES Management Authority of the Russian Federation, *in litt*. to TRAFFIC Europe, 18 September 2000

Export quotas for *A. ruthenus* and its hybrids set by Bulgaria and the Russian Federation (kilogrammes)

	1998		1999		2000		
	Caviar	Meat	Caviar	Meat	Caviar	Meat	Fertilised Eggs
Bulgaria			30				
Russian Federation					300	2,000	5
A. baerii* x *A. ruthenus							15
A. gueldenstaedtii* x *A. ruthenus							15
H. huso* x *A. ruthenus							90
Total	***0***	***0***	***30***	***0***	***300***	***2,000***	***125***

Source: CITES Notification Nos. 1998/35-36-61, 1999/21-47-53-68 and 2000/053-056-061

Note: The use of the term “eggs” and the unit “kg” or “g” (see # in Appendix and table on export quotas, above) to describe shipments of both caviar and fertilised eggs complicates the analysis of trade data. Similar difficulties arise from the unit used for export quotas of fertilised eggs, which is kilogrammes (“kg”) instead of “number of specimens”. Kilogrammes do not directly correspond to the number of specimens, and hence does not allow the effective evaluation of quotas. This confusion is also a source of mis-interpretation of data and is an obstacle to the proper monitoring of international trade, e.g. underestimation of live specimens in trade.

CONSERVATION MEASURES

There are no specific monitoring programmes for *A. ruthenus* in most range States.

Bulgaria: Conservation measures at the national level are needed, but they must be linked to the co-ordinated activities of all countries in the Black Sea region (CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000). In Bulgaria, sturgeon fisheries are prohibited for 30 days, from 20 April to 20 May which corresponds to the peak of the breeding season. The authorities may allow a 15-day extension of the closed season pending the natural conditions of that year. Explosives, poison, bottom trawling and dragging, as well as stunning substances and other destructive fishing devices are prohibited. The minimum size limit for *A. ruthenus* is 33 cm. Export quotas for all sturgeon species are set

on the basis of catch data and trends, as well as the biological characteristics of the species. A system has been established for the distribution of export quotas among export companies. These companies are obliged to restock the Danube River with sturgeon fry before they are authorised to export sturgeon specimens. For example, for a given year, for each kilogramme of caviar exported, the company must release 30 juvenile sturgeon (Anon., 2000c). The restocking programme is controlled by relevant government agencies. It is expected that the first released individuals will return to the Danube River in 2005-2007. Only 300 *A. ruthenus* fingerlings of 15 g have been released in Bulgarian waters (in the Danube River in 1998). There was no restocking for this species in 1999 or 2000 (Anon., 2000c).

Due to budgetary constraints, Bulgaria has not monitored the wild population of any sturgeon species in recent years. However, plans have been prepared for these activities (CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000).

Hungary: Mature and immature individuals of *A. ruthenus*, *A. baerii* and *A. gueldenstaedtii* are bred in captivity as broodstock. Fingerlings of *A. ruthenus* are released in Hungarian waters. The catch of the species is regulated by the Act on Fishery and Sport Fishing by length limitation and with closed season (A. Ronyai, *in litt*. to IUCN/SSC Wildlife Trade Programme, 8 August 2000). The closed fishing season operates from 1 March to 31 May. During the open season, fish less than 45 cm in length cannot be caught and the daily catch limit is three specimens per angler. *A. ruthenus* is not protected by law, but the introduction of hybrids into natural waters is prohibited by the *Nature Conservation Act* (CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 13 September 2000).

Romania: In Romania, the Centre of Research for Fish Farming, Fishing and Fish Processing in Galati is monitoring the status (population sizes/trends) of sturgeon stocks upriver of the Danube Delta (Birstein, 1996). Bacalbasa-Dobrovici (*in litt*, to IUCN/SSC Wildlife Trade Programme Trade Programme, September 2000) believes that fishing pressure should be reduced in the lower Danube. He reports that that the existing legislation pertaining to the region is neither adequate nor enforced, particularly in Romania.

A fishing license is required in Romania to capture this species (Dr N. Patriche, *in litt.* to IUCN/SSC Wildlife Trade Programme Trade Programme, 5 September 2000). Sturgeon fishing gear, for instance the type of net and mesh size, is strictly regulated by Romanian law. The fishing season is set each year by Ministerial Order. A fishing license is required to catch any species of sturgeon in Romanian waters. No minimum size limit or catch quota has been established for *A. ruthenus*. The Romanian restocking programme has not released juvenile Sterlet into the Danube River (Anon., 2000c).

Russian Federation: In the late 1990s, sturgeon commercial catch in the Yenisey River (*A. ruthenus* and *A. baerii*) was prohibited due to rapidly declining populations and the extremely low rate of natural reproduction (Anon., 2000b), caused by inaccessible spawning grounds and impact of pollution on the physiology of fish (Ruban, 1997). In 2000, catch of *A. ruthenus* for scientific and monitoring purposes, as well as for local subsistence use, is limited to 5 t in the Yenisey River. In the Ob'-Irtysh rivers basin, the Total Allowable Catch (TAC – as calculated by VNIRO and accepted by the independent Council of experts) should not exceed 10 t (Anon., 2000b).

Export quotas established by the CITES Management Authority for Acipenseriformes of the Russian Federation consist of 90% of the total caviar production in the country. This in turn depends on the catch quotas set for each species of sturgeon (Mr Roman V. Ivakhnenko, State Fisheries Committee, pers. comm. to TRAFFIC Europe-Russia, September 2000). The TAC allocated by the State Fisheries Committee is based on the recommendations of scientific agencies such as VNIRO and the Pacific Research Institute of Fisheries and Oceanography (TINRO). The TAC includes the commercial catch, scientific catch and the catch of mature males and females destined for captive breeding.

There has been no release of *A. ruthenus* fry by Russian hatcheries in the Volga River (Anon., 2000b). Recent data on the monitoring of catch per species, including the size composition and sex ratio of fish caught are not available. The domestic consumption of sturgeon products in the Russian Federation, mostly meat and caviar, is unknown (Mr Roman V. Ivakhnenko, State Fisheries Committee, pers. comm. to TRAFFIC Europe-Russia, September 2000).

Ukraine: Catch of *A. ruthenus* in Ukrainian waters is prohibited since the species was listed in the Red Data Book of Ukraine in 1992 (Anon., 2000c; Gringevsky, 1995).

Yugoslavia: It seems that *A. ruthenus* is permitted to be fished throughout the year. Certain types of fishing gear are prohibited to catch sturgeon by Yugoslavia law, and an agreement has been signed between Romania and Yugoslavia on the prohibition of gear that cause high mortality of untargeted fish. Any fishing activity in Yugoslav waters, including all commercial and sport fisheries, requires a license. The licenses are issued on a per district basis. The minimum size limit for *A. ruthenus* is set at 33 cm, but catches of the species have been prohibited from 1996 to 2000. A restocking programme is being carried out by the Centre for fish reproduction of the "Djerdap Fishing Company" in Malla Vrbica village. Data on sturgeon juvenile release have not been provided (Anon., 2000b).

CAPTIVE BREEDING

The species is produced in aquaculture in most of the warm water ponds in the Russian Federation, Ukraine, Hungary and Germany for domestic meat markets. The species has been bred in captivity since 1993 and stocking programmes are in place for the Danube and Drava rivers (M. Hochleithner, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

In the Dniester River, Moldova, limited quantities of *A. ruthenus* were bred in ponds for fishing from 1980 to 1988 (Lobchenko *et.al*., 1996).

A. ruthenus has been introduced into aquaculture in Belgium (W. Verdonck, sturgeon farmer, pers. comm. to TRAFFIC Europe, July 2000), Italy (Agroittica Lombarda and Azienda Agricola, Italian sturgeon farmers, *in litt*. TRAFFIC Europe-Italy, 1999) and France (Welcomme, 1988). The size of the broodstock is not known. In European countries, a hybrid of *H. huso* and *A. ruthenus* called 'bester' is subject to aquaculture; it is fast growing and produces fertile and early maturing offspring (Burtsev, 1997).

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 trade data there is currently a significant production of *A. ruthenus* juveniles in commercial farms (see Appendix).

Bulgaria: A fish farm was established in 1997 in Boliartzi village (Plovdiv region). It is the only existing hatchery. All juveniles released in the Danube River in Bulgaria from 1998 to 2000 were produced there. The hatchery has a total capacity of 60,000 juveniles. Since 1999, attempts have been made to breed sturgeon in artificial water basins near Sofia (CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000).

Hungary: Through captive breeding and imports of fertilised eggs (from the Russian Federation), tens of thousands of fry and fingerlings are reared annually in Hungary. Most of them are exported, but some are kept until they reach a marketable size for the domestic market (A. Ronyai, *in litt*. to IUCN/SSC Wildlife Trade Programme, 8 August 2000). There are two major exporters of live fingerlings who have broodstock of *A. ruthenus*. These stocks consist of wild collected females and captive bred specimens. Other exporters do not have breeding stocks, but obtain eggs from wild caught females and fertilize them artificially. They export fertilised eggs, yolk sac fry and fingerlings. There are no sturgeon hybrids in captive breeding facilities (CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 13 September 2000).

Poland: The presence of fish farms and hatcheries of sturgeon in Poland was confirmed by the CITES Management Authority of Poland. The list of sturgeon species bred in captivity in Poland is as follows: *Acipenser baerii*, *A. gueldenstaedtii*, *A. ruthenus*, *A. stellatus*, *Huso huso*, *Polyodon spathula* and hybrids of some species. In most cases, hybrids are F1 generation live specimens (fertilised eggs) imported into Poland from range States, particularly from the Russian Federation. Some farms keep F2 generation specimens, bred in Poland and used as broodstock, partly for the production of juveniles to be sold on the domestic market and exported (Dr Z. Krzeminski, Deputy Director, *in litt*. to TRAFFIC Europe, 31 August 2000).

United States of America: Sturgeon are in the preliminary stage of captive breeding in Hawaii (USFWS, CITES Management Authority, *in litt.* to TRAFFIC Europe, September 2000), but no detailed information has been provided on the species concerned.

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Gross exports* of *Acipenser ruthenus* 1998

TAXON	TERM	UNIT	Exporter	1998
Acipenser ruthenus	eggs #	kg	RU	4
Acipenser ruthenus	live		CZ	0
Acipenser ruthenus	live		GB	300
Acipenser ruthenus	live		HU	89,700
Acipenser ruthenus	live		RU	2,000
Acipenser ruthenus	live	kg	RU	50
Acipenser ruthenus	specimens		DE	0

Comparative tabulation of *Acipenser ruthenus* 1998

			Imports reported						Exports reported				
Year	**Imp.**	**Exp.**	**Origin**	**Quantity**	**Unit**	**Term**	**P**	**S**	**Quantity**	**Unit**	**Term**	**P**	**S**
1998	JP	GB	HU						300		live	T	F
1998	BE	HU							5,000		live	T	F
1998	BG	HU							1,200		live	T	F
1998	DE	HU							40,000		live		
1998	DE	HU							2,000		live	T	F
1998	GB	HU							11,500		live	T	F
1998	NL	HU							20,000		live	T	F
1998	SI	HU							10,000		live	T	F
1998	KR	RU							2,000		live	S	F
Sub-total 1998									**92,000**	**Live fish**			
1998	CN	RU							2	kg #	eggs	T	F
1998	GR	RU							2	kg #	eggs	T	C

* **Definition:** "Gross exports are the sum of all reported exports and re-exports in a particular commodity or species in a particular year or series of years. Gross trade is thus a simple measure of the total number of items recorded in international trade. However, gross trade may be an overestimate of the total number of actual specimens in trade as re-exports are not deducted from the total." (Anon., 1996).

This is particularly applicable to caviar of which shipments are often exported, re-packaged and re-exported. For instance, in the mid-1990s, Germany re-exported as much as 45% of its annual caviar imports (De Meulenaer and Raymakers, 1996).

Acipenser schrencki Brandt, 1869 — **Amur Sturgeon**

Order: ACIPENSERIFORMES — **Family: ACIPENSERIDAE**

SUMMARY

The Amur Sturgeon *Acipenser schrencki* is one of two species of Acipenseriformes endemic to the Amur River basin. The population of *A. schrencki* has been declining for more than a century. The two species, *Huso dauricus* Kaluga and *A. schrencki,* are rarely distinguished in harvest statistics making it difficult to assess the impact of harvest on individual species. Females of the most common morph (grey) of *A. schrencki* reach sexual maturity between 10-14 years, at which time their size ranges from 105-125 cm and 6-18.5 kg. The Amur River has not yet been affected by the construction of hydroelectric dams, however plans have been made in the past and their achievement would render numerous spawning grounds inaccessible. The water quality of the river has been increasingly degraded by pollution from oil products, mineral fertilisers from agricultural development, and by-products of gold mining operations. Although the effects of pollution on sturgeon have not been studied. The main threat appears to be over-exploitation.

Official catch statistics of *A. schrencki* in the Russian Federation and the former USSR dropped from 607 t in 1881 to 8 t in 1996. International trade in 1998 totalled 3,897 kg of caviar, with 2,366 kg being exported from China and 1,385 kg exported from the Russian Federation. The annual catch quota set for *A. schrencki* by the Russian Federation for 1999 and 2000 was 15 t. Export quotas of 1,500 kg (1999) and 2,000 kg (2000) were set for caviar, with a meat quota of 4,000 kg (2000). According to current available data it appears that the Russian Federation exceeded the 1999 caviar export quota by 1,476 kg. In China, the 1998 catch quota was 1,888 individuals with a caviar production reaching 3,235 kg. Export quotas of 2,783 kg (1998) and 2,510 kg (1999 and 2000) were set. The domestic consumption of caviar in China is estimated at 20% of the national production.

The species is recommended under Decision 11.106 for inclusion in category 1 (i).

DISTRIBUTION AND POPULATION

The CITES database lists the current distribution of *Acipenser schrencki* as: China, Japan?, Russian Federation (Anon., 2000a).

A. schrencki is classified as Endangered by IUCN (1996):
EN A2d China, Russia [Amur River].

A. schrencki is endemic to the Amur River system which is 4,092 km long if its longest tributary, the Shilka River, is included (Krykhtin and Svirskii, 1997a). The middle reach of the Amur River is bordered by both the Russian Federation and China. It is 975 km long and extends from the city of Blagoveshchensk (Heihe in China) to the mouth of the Ussuri (Wusuli) River between Khabarovsk (Russian Federation) and Fuyan (China), 966 km from the estuary (Krykhtin and Svirskii, 1997a). All populations have declined considerably since the turn of the century (Krykhtin and Svirskii, 1997b). The middle Amur population has been most affected being subject to catch from both the Russian and Chinese sides (Krykhtin and Svirskii, 1997b; Wei *et al.*, 1997).

China: The species occurs in the lower to upper reaches of Amur river basin, but is most common in the middle Amur and the lower reaches of the Songhuajiang and Wusulijiang river basins. The species is included in the China Red Data Book (Yue and Chen, 1998). Although the biomass of the wild populations is unknown, it is clear that stocks of sturgeon in the Amur River are declining dramatically due to over-fishing (Wei *et al*., 1997).

Russian Federation: *A. schrencki* occurs from the Amur River delta to the upper reaches, including the Argun and Shilka tributaries. There are two morphs, the grey being more abundant than the brown (Krykhtin and Svirskii, 1997a) which occurs in the middle and lower parts of the Amur and has restricted movements to 100 km up or down stream. The grey morph is found in the middle to upper reaches of the Amur River. It

occurs in four fragmented populations: the estuary population which does not migrate to the sea (3,000 individuals); the middle Amur (190, 000 individuals); the lower Amur (95,000 individuals); and the Zeya-Bureya lowlands population, which is thought to be on the verge of extinction (Khykhtin and Svirskii, 1997a; 1997b).

HABITAT AND ECOLOGY

A. schrencki feeds on benthic freshwater molluscs and the larvae of the Arctic Lamprey *Lampetra japonica* (Svirskii, 1971, cited in Krykhtin and Svirskii, 1997a). Spawning occurs from the end of May to early-July (Krykhtin and Svirskii, 1997a). At 12 years of age, mature *A. schrencki* females of the brown morph are 96-117 cm long and weigh 3.5-5.6 kg (Krykhtin and Svirskii, 1997a), while females of the grey morph are 125-142 cm long and weigh 8.3-16.4 kg. Most grey morphs mature at the age of 10-14 years, with a length of 105-125 cm and weighing 6-18.5 kg (Krykhtin and Svirskii, 1997a). The maximum known size of the grey morph is approximately 3 m in length and more than 190 kg at an age exceeding 60 years (Krykhtin and Svirskii, 1997a). According to Wei *et al.* (1997), surveys carried out on the Chinese side of the Amur River suggest that the youngest spawning age for *A. schrencki* males is 7-8 years, at about 103 cm in length and 4 kg in weight. The corresponding age and size for females are 9-10 years, 105 cm and 6 kg. Fecundity ranges from 114,000-1,292,000 with a mean of 385,000 eggs. The average number of eggs per gram of body weight is 44.6 (Wei *et al.*, 1997). However, the survival rates of juveniles is low (CITES Management Authority of China, *in litt*. to TRAFFIC Europe, August 2000).

THREATS TO SURVIVAL AND DOMESTIC USE

Unlike many of the large rivers in the region, the Amur has not been affected by construction of hydroelectric dams. However, it is feared that hydroelectric dams would restrict access to many spawning sites (Birstein, 1993). The river has been polluted by oil products, mineral fertilisers and by-products of gold mining operations. Agricultural pollution downstream from towns is increasing from both the Russian and Chinese sides (Krykhtin and Svirskii, 1997a; Matthieson, 1993). The effects of pollution on sturgeon have not been studied. The main threat appears to be overexploitation, particularly in the middle Amur (Heilong) River, where both Chinese and Russian fisherman are operating.

Current information suggests that amendments of previous regulations and/or adoption of new legislation are in effect in both range States. However, enforcement measures appear to be lacking and numerous experts as well as government officials have reported increasing pressure from illegal fishing practices and criminal activities such as sturgeon poaching and black markets which occur in a large part of the range (Medetsky, 2000; Winchester, 2000).

At the turn of the century the highest volumes of *A. schrencki* were caught in the middle Amur River where both brown and grey morphs of the species occur. Official catch records of *A. schrencki* in the former USSR and the Russian Federation decreased from 607 t in 1881 to 4.2 t in 1948 (Krykhtin and Svirskii, 1997a). In 1996, the catch was 8 t (Anon., 2000b). Official records from China indicate that sturgeon (both Kaluga and Amur Sturgeon) catches on the Chinese side of the Amur River peaked in 1987 (452 t), dropped to 136 t in 1997 and then increased to 149 t in 1998 and 141 t in 1999 (TRAFFIC East Asia *in litt*. to TRAFFIC Europe, September 2000).

Russian catch data for 1996 suggest that the current composition of *A. schrencki* versus *Huso dauricus* in the Amur River is 9% and 91% respectively (Anon., 2000b). However, late 19th century records suggested an equal composition (Krykhtin and Svirskii, 1997a).

In China, all caviar of wild sources is from *A. schrencki* and *Huso dauricus*. Heilongjiang Province is the only province in China where caviar is processed from wild specimens (TRAFFIC East Asia , *in litt*. to TRAFFIC Europe, September 2000). Most caviar originating from the Amur River in China is destined for export, with domestic consumption representing less than 20% of the total caviar production in the country (CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000).

Domestic consumption of *A. schrencki* caviar in China (kilogrammes)

	1993	1994	1995	1996	1997	Average
A. schrencki	386.0	407.0	403.0	480.0	582.0	*451.6*

Source: CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000

Aquaculture products (captive breeding sources) of a variety of sturgeon species are sold on the domestic market (including in Hong Kong Special Administrative Region) and the rest is exported (TRAFFIC East Asia *in litt*. to TRAFFIC Europe, September 2000).

INTERNATIONAL TRADE

The listing of *A. schrencki* in CITES Appendix II entered into effect on 1 April 1998. Available complete trade data is therefore limited to nine months of trade (April-December 1998).

Gross exports and the comparative tabulation of trade in *A. schrencki* are given in the Appendix.
According to Annual Report data for 1998, the China and the Russian Federation reported respective exports of 2,366 kg and 1,385 kg of *A. schrencki* caviar. The importing countries were Japan (2,589 kg), Germany (900 kg), USA (247 kg) and South Africa (15 kg). In 1999, Russian exports of *A. schrencki* caviar totalled 2,976 kg. These shipments were imported into Japan and the USA (CITES Management Authority of the Russian Federation, *in litt*. to TRAFFIC Europe, 18 September 2000).

Caviar export quotas established for *A. schrencki* (kilogrammes)

		1998	pre-Convention	1999	2000
Caviar	**RU**	1,700		1,500	2,000
	CN	2,783	1,000	2,510	2,510
	Total	4,481		4,010	4,510
Meat	**RU**	0		0	4,000

Source: *CITES Notification Nos. 1998/35-36-61, 1999/21-47-53-68 and 2000/053-056-061*

Only trade in caviar is detailed in 1998 CITES data. However, the Russian Federation has established an export quota of 4,000 kg of meat for 2000.

Confiscation of *A. schrencki* shipments was not reported in 1998, however smuggling of caviar on the Sino-Russian border seems to occur frequently during the migration season (Medetsky, 2000).

CONSERVATION MEASURES

The species is not fully protected in the Russian Federation or China.

China: The listing of *A. schrencki* in the State Category of Protected Wildlife is expected to be adopted in the near future (CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000). In the early 1950s, the Heilongjiang Province authorities adopted protection and management regulations, such as gear restrictions, harvest size, closed seasons and areas, and the requirement of a fishing licence. These were renewed in 1982 through "*The Heilongjiang Ordinance on the Protection and Propagation of Fisheries Resources*". However, the regulations have not been fully implemented (Wei *et al.*, 1997).

Restriction on fishing size
The Ordinance of 1982 prescribed the minimum catch size limits for *A. schrencki* to be 100 cm or 4 kg (CITES Management Authority of China, in litt. to TRAFFIC Europe, 28 August 2000). Specimens under these size and weight specifications must be released (TRAFFIC East Asia, in litt. to TRAFFIC Europe, September 2000).

Other restrictions
According to the *"Protocol on Fisheries Resources Conservation, Regulation and Multiplication in Border Areas of Heilong (Amur) River and Wusuli (Ussuri) River of The People's Republic of China and the Russian Federation"* adopted on 27 May 1994, fishing on the Heilong River is prohibited from mid-June to mid-

July. The protocol also established areas where fisheries are prohibited: the mainstream of the Heilong River from Dagangzi, Luobei County, to Saniangkou where the Heilong and Songhua rivers converge. These areas were designated as no-fishing zones by the Government of China. The fishing grounds stretch over 1,270 km, from Fuyan (downstream) to Heihe (or Aihui) (Blagoveshchensk on the Russian side) (upstream). These measures protect *A. schrencki*'s natural breeding sites and hence the survival of juvenile sturgeon.

The catch of *A. schrencki* on the Chinese side of the Heilong (Amur) River requires prior acquisition of a fishing licence. In 1991, 2,248 sturgeon fishing licences were issued, and in 2000 the number had been reduced to 1,850 (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000).

Restocking of juveniles
From 1988 to 1998, a total of 3,780,000 larvae and fingerlings of *A. schrencki* bred artificially in hatcheries in China were released in the Heilong (Amur) and Wusuli rivers (CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000). Since 1998, the restocking activities of the main hatchery, Qindeli State Farm (Heilongjiang Province), have been jeopardised by financial constraints and an increase in the price of eggs (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000).

In 2000, the Heilongjiang Province Fisheries Bureau authorised seven stations to undertake research on the captive breeding of *A. schrencki* and *H. dauricus* (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000).

Determination and allocation of quotas by local government
Based on the average annual production for 1986-1988, the average size of fish landed, decreasing caviar production and the hydrological resource and migration conditions, Chinese scientists calculated Amur River sturgeon (*A. schrencki* and *H. dauricus*) annual catch quotas for the period 1989-1997. This quota was revised in 1997 and the Heilongjiang Province Fisheries Bureau adopted a new total catch quota of 105.4 t for 1998. The 1998 quota is composed of 1,888 individuals for *A. schrencki* with an expected caviar production of 3,235 kg and 309 individuals for *H. dauricus* with an expected caviar production of 4,045 kg (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000).

Processing and export company management
Caviar processing companies are required to register with the Heilongjiang Provincial Fisheries Bureau. In 1998, six companies were registered as sturgeon product processors, all established in Heilongjiang Province. Six other companies were registered as caviar exporters: four in Heilongjiang Province, one in Beijing and one in Dalian Free Trade Zone (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000). According to the Ministry of Agriculture's (MOA) "*Regulation on Special License of Aquatic Wildlife Utilization, People's Republic of China*", caviar processing companies must acquire special qualification from the local Fisheries Bureau, including a "special (caviar) purchase license" and a "special (caviar) processing license". Caviar purchase and processing are controlled by the local Fisheries Bureau. The Fisheries Bureau will gradually decrease the number of licenses issued and also monitor those companies with special purchase and production licenses. According to the "*Law of Wildlife Protection of the People's Republic of China*", the MOA only issues caviar trade licenses to a limited number of import and export companies. The MOA also strictly manages those companies issued with this special license (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000).

Russian Federation: A total prohibition on sturgeon catch throughout the USSR was adopted in 1923 and withdrawn in 1930. A ban on the catch of *A. schrencki* and *Huso dauricus* was introduced in 1958. This prohibition is still in effect (Krykhtin and Svirskii, 1997a). However, a tolerance called "controlled catch" for incidental and scientific catches is permitted. These catches are the current source of caviar and sturgeon meat from the Amur River. "Controlled catch" is not well defined and difficult to enforce. Russian catch quotas of 15 t annually for 1999 and 2000 were adopted by the Federal Government following recommendations set by the State Fisheries Committee in consensus with an independent body of experts (Anon., 2000b).

CAPTIVE BREEDING

China: Aquaculture has been successful for 30 years (Dr Zhang Chun-Guang, *in litt*. to IUCN/SSC, Wildlife Trade Programme, September 2000). An aquaculture station was set up on the Chinese side of the Amur River and was in operation from 1988 to 1991. During this period it released 900,000 fry and 168,000 fingerlings into the Amur River. The restocking programme was not able to continue after this time due to lack of funds (Dr Zhang Chun-Guang, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000). However, additional hatcheries in China continued to restock the Amur and Wusuli rivers (see above) until 1998 (CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000).

Russian Federation: Sturgeon hatcheries were under construction during 1996–97 (Krykhtin and Svirskii, 1997b). A broodstock also exists in captivity in research stations (Svirskii *et al*., 1993).

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 and China have not reported the results of their research on sturgeon captive breeding nor the development of commercial farms.

However, *A. schrencki* is recognised as an important species for China's sturgeon aquaculture industry (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000). In 1992, construction began of a large commercial sturgeon aquaculture farm in Dalian at the tip of the peninsula in Bo Hai Bay, west of Beijing. The expected annual production of the farm was 2,000 t, with 800 marketable fish (average weight of 2.5 kg) and 200 t of fish fillets in 1999 and 50 t of caviar in 2001. Other sturgeon products planned in the marketing strategy of the farm are skin (to be processed into leather), bones, meat, and internal organs (as raw materials for biomedical products and tonics). This large intensive aquaculture facility was developed with the assistance of Russian experts (Anon., 2000c).

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APPENDIX

Gross exports of, and export quotas for *Acipenser schrencki* 1998

TAXON	TERM	UNIT	Exporter	1998	Export quotas 1998 (kg)
Acipenser schrencki	eggs		RU	145	
Acipenser schrencki	eggs	kg	CN	2,352	2,783 + 1,000 pre-Convention
Acipenser schrencki	eggs	kg	DE	15	
Acipenser schrencki	eggs	kg	RU	1,385	1,700

Comparative Tabulation of trade in *Acipenser schrencki* 1998

				Imports reported					Exports reported				
Year	**Imp.**	**Exp.**	**Origin**	**Quantity**	**Unit**	**Term**	**P**	**S**	**Quantity**	**Unit**	**Term**	**P**	**S**
1998	DE	CN		900	kg	eggs	T	O	900	kg	eggs	T	O
1998	JP	CN							1,349	kg	eggs	T	W
1998	JP	RU							1,240	kg	eggs	T	W
1998	US	CN		102	kg	eggs	T	W	102	kg	eggs	T	W
1998	US	RU		145		eggs	T	W					
1998	US	RU							145	kg	eggs	T	W
1998	ZA	DE	CN						15	kg	eggs	T	O
		TOTAL		**1,147**	**kg**				**3,751**	**kg**			

Acipenser stellatus Pallas, 1771

Stellate Sturgeon
Esturgeon étoilé
Esturión estrelado

Order: ACIPENSERIFORMES **Family: ACIPENSERIDAE**

SUMMARY

Stellate Sturgeon *Acipenser stellatus* has a wide distribution, occurring in the Caspian Sea, Black Sea and Sea of Azov and originally in many of the tributaries of these seas. However, the construction of dams on virtually all these rivers has significantly reduced the spawning area. The Ural River is one of the few major spawning rivers that has not been dammed. In addition to loss of habitat, the species has been subject to overfishing and egg-production has been disrupted due to environmental pollution. In the early 1990s, around 30% of the population in the Caspian Sea and almost all the stock in the Sea of Azov originated from re-stocking programmes. Re-stocking reportedly occurs in Azerbaijan, Iran, Kazakhstan, Romania, the Russian Federation and Yugoslavia but monitoring of the sturgeon restocking is performed only in Iran. In addition, hatcheries have had difficulty in obtaining broodstock.

A. stellatus has always been rare in the Danube River, with only 7.8 tonnes (t) average annual catch in the middle Danube River between 1958 and 1981. However, recorded landings in Romania and Bulgaria increased from 6.2 t in 1997 to 14.5 t in 1999. In contrast, annual catches of the species have generally decreased in other range States, except in the Danube River Basin. In the northern Caspian Sea, reported catches dropped from 4,650 t in 1977 to approximately 4,600 t in 1990 and to an estimated 1,060 t for 1997 for the whole of the Caspian (according to data collected during this review). Range States decreased the catch quotas for *A. stellatus* by around one third for Azerbaijan, Kazakhstan and Ukraine in 2000. The size of the domestic market for sturgeon products in the Russian Federation are unknown. Iran estimated its domestic consumption to be 5% of the country's caviar production and 65% of the sturgeon meat production.

The major product from wild of *A. stellatus* recorded in international trade in 1998 was caviar, with caviar of this species being commercially known as Sevruga caviar. According to CITES data, caviar from *A. stellatus* represents the largest portion of caviar from all Acipenseriformes traded internationally. *A. stellatus* exports from range States in 1998 included a total of 103 t of caviar, mainly from Iran (46 t with an export quota of 50 t) and the Russian Federation (39 t with an export quota of 85 t, including quotas for Azerbaijan and Kazakhstan). For 1999, the Russian Federation set the caviar export quota at 42 t and exported 32.4 t. Assuming a standard rate of 6-7% in weight of caviar of the total catch (males and females), the total volume of caviar exported in 1998 represents a total catch of 1,471-1,717 t of *A. stellatus* caught by range States. Iran also exported 8,794 kg of meat of wild origin (including 4,000 kg declared as "bodies"). The total combined caviar export quotas for 2000 decreased from that of 1999 (from 111.8 t to 102.9 t), but increased significantly for meat (from 42 t to 334.5 t). A total of 25,700 live fish (of captive bred source - 25,000 from Poland imported into Germany) were exported in 1998. However, commercial aquaculture of this species appears to be in its infancy.

The species is recommended under Decision 11.106 for inclusion in category 1 (i).

DISTRIBUTION AND POPULATION

The CITES database lists the current distribution of *Acipenser stellatus* as: Azerbaijan, Bulgaria, Czech Republic, Georgia, Greece**?**, Hungary, Iran (Islamic Republic of), Italy**?**, Kazakhstan, Moldova, Republic of, Romania, Russian Federation, Slovakia, Turkey, Turkmenistan, Ukraine, Yugoslavia

A. stellatus is classified as Endangered by IUCN (1996):
EN A2d Azerbaijan, Bulgaria, Georgia, Hungary, Iran, Kazakhstan, Moldova, Romania, Russian Federation, Turkmenistan, Ukraine, Yugoslavia
Caspian Sea Stock: VU A1acde + 2d Azerbaijan, Iran, Kazakhstan, Russian Federation, Turkmenistan
Sea of Azov Stock: EN A2d Russia [Mediterranean and Black Sea]

Black Sea Stock: EN A1acde+2d Hungary, Romania, Ukraine, Yugoslavia [Mediterranean and Black Sea].

A. stellatus inhabits the Caspian, Azov and Black Seas although isolated catches have also been recorded in the Adriatic Sea (Birstein, 1993a; Shubina *et al.*, 1989). It is anadromous and enters the rivers that flow into these seas to spawn. The largest population is believed to occur in the Volga-Caspian region and produces 80% of the total sturgeon catch in this region (Anon., 1997). The species has always been considered rare in the middle Danube and after the construction of the Djerdap I and II hydropower stations, it is considered extirpated from both the upper and middle Danube (Hensel and Holèik, 1997). Although there are no recent population estimates available, Volovik *et al.* (1993) estimated the total *A. stellatus* biomass in the Sea of Azov during the mid-1980s to be 12,390 t. In 1990, 55,000 sturgeon were found dead on the shore of the Sea of Azov as a result of pollution and no population estimates have been made since. Due to reduced natural reproduction, about 60-98% of each generation in the Sea of Azov consisted of farm grown fish in the early 1990s (Volovik, *et al.*, 1993), while in the Caspian Sea around 30% originated from hatcheries. A decline in the commercial catch of this species reflects a decline in the population (Anon., 1997).

Azerbaijan: There is no recent information on the distribution in the Kura River, but Khodorevskaya *et al.* (1997) note that sturgeon no longer use the Kura and Terek rivers to spawn.

Bulgaria: As part of the Black Sea population, *A. stellatus* spawn in the Danube River. The breeding seasons are in spring, early-April (when the first catch of the year is recorded) and in autumn (end-September) (CITES Management Authority of Bulgaria, *in litt.* to TRAFFIC Europe, 15 September 2000). There has been a remarkable decline in *A. stellatus* catches in recent years (Karapetkova *et al.*, 1995), which now amount to only a few hundred kilogrammes per year (Pr N. Bacalbasa-Dobrovici, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Georgia: The south east coast of the Black Sea is an important feeding and wintering area for sturgeon (*A. stellatus*, *A. nudiventris*, *A. persicus colchicus, A. sturio* and *Huso huso*) that migrate upstream in a number of rivers for spawning. The main rivers used are the Supsa, Inguri, Chorokhi and particularly the Rioni (Zarkua and Tsuladze, 1999).

Greece: In the Aegean and Adriatic Seas, only a few isolated specimens have been recorded and it is doubtful if spawning still occurs in Greece (Lelek, 1987).

Hungary: Pinter (1991, cited in CITES Management Authority of Hungary, *in litt.* to TRAFFIC Europe, 13 September 2000) reported that last specimen was caught in 1965 (Mohács, Danube). Pr N. Bacalbasa-Dobrovici (*in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000) considers the species as exceptionally rare whilst A. Rónyai (*in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000) notes that *A. stellatus* is now considered extinct in Hungary.

Iran: *A. stellatus* previously entered the Sefidrud and the Gorgan rivers on the southern coast of the Caspian Sea to spawn (Shubina *et al.*, 1989). According to Dr. J. Holèik (*in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000), the species does not occur in these rivers. However, Laluyee (1996) and Ramin (1998, both cited in Dr M. Pourkazemi, *in litt.* to IUCN/SSC Wildlife Trade Programme, September, 2000), maintain that *A. stellatus* enters the Sefidrud, Tajen and Gorganrud rivers in the southern shores of the Caspian Sea to spawn. *A. stellatus* migrates to the Sefidrud and other rivers during spring and autumn, the intensity of spawning being high particularly after heavy rainfall (Dr M. Pourkazemi, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Moldova: The Moldovan range on the Danube River is 811 m and sturgeon also occur in the Pruth River, a tributary of the Danube River (junction at km 137th) (Anon., 2000c). There are no recent records of the species occurring in the Dniester River. Pr. Bacalbasa-Dobrovici (*in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000) reports that specimens have been caught in the Pruth, while Dr V. Lobcenco (*in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000) notes that there have been no records of the species in recent years.

Romania: *A. stellatus* enters the Danube from the Black Sea to spawn downstream of Calarash. However, catches have dramatically declined after the damming of the lower Danube by the Djerdap I and Djerdap II hydropower stations (Bacalbasa-Dobrovici, 1997).

Russian Federation: The largest populations of *A. stellatus* occur in the Caspian Sea from where they ascend to the Volga, Ural and Terek-Kuma rivers to spawn. From the Sea of Azov the spawning population ascends to the lower sections of the Don and Kuban rivers (Shubina *et al*., 1989). Volovik *et al.* (1993) estimated that *A. stellatus* accounts for 12,390 t (21%) of the total sturgeon biomass of the Sea of Azov.

Approximately 60% of the historic spawning sites remain intact in the northern Caspian Sea (Khodorevskaya *et al*., 1997). Between 1985 and 1992, stocks declined sharply in the Volga and Ural rivers. In 1992, the Ural River population was only one third of the numbers observed in 1986, and Birstein (1993b) reports 90,000 spawning individuals in the Ural. The spawning population of the Volga River has been estimated by Levin (1997) to be approximately 116,000 mature individuals (a decline in recent years from 500,000 individuals). There are no population estimates available for the other rivers in which they spawn, but Vlasenko (1990) and Levin (1995) believe populations to be minimal. In the Sea of Azov, some natural spawning grounds are no longer accessible due to the construction of dams on the Don and Kuban rivers (Anon., 2000b).

Autonomous Republic of Dagestan: No information is available on the current status of populations in the Sulak and Samur rivers.

Serbia: The annual catch of 1.4-2.0 t dropped to 0.184 t in 1971 when Djerdap I Dam was built on the Danube (Hensel and Holèik, 1997).

Slovakia: The last specimen of *A. stellatus* was caught in 1926 (Holèik, 1995).

Turkey: *A. stellatus* has been observed here, possibly in the Kizil-Irmak and Yesil-Irmac rivers, but it is unclear whether they spawn. The Coruh River is a known spawning site and unidentified sturgeon species have been reported in small numbers in the Sakarya and Mert rivers. In the late 1980s, local fishermen estimated that only five to six gravid female sturgeon were caught from the Yesilirmak to supply a hatchery and up to 20 from the Kizilirmak (Edwards and Doroshov, 1989).

Ukraine: There is very little recent information on the distribution and status of *A. stellatus* in the Ukraine. According to Pavlov (1980), *A. stellatus* was formerly considered rare in the Dnieper River, where it was known mainly from the lower river. It also occurred in the Dniester and Bug rivers, but as a result of the construction of the Dubosar and Oleksandriv hydropower stations, its distribution was reduced and catches subsequently declined. The species occurs in the Don and Kuban rivers, where it has been a commercially important fish, however the catch declined significantly after the construction of the Cimlyansk hydropower station.

Former Yugoslavia: There are no records for the species in Croatian rivers (Taler, 1953). However, there was a significant drop in catch of all sturgeon species after 1970 and 1984, when the lower stretch of the Danube was respectively dammed by Djerdap I and II hydropower stations (Jankoviè, 1993; 1996; Simonovic and Nikolic, 1996). Today, the species occurs in a 17.8 km stretch of the Danube River, from the Djerdap II dam to the border, close to the Timok River mouth (Pr N. Bacalbasa-Dobrovici, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

HABITAT AND ECOLOGY

The species reaches a total length of 2.18 m, a maximum weight of 54 kg and maximum age of 35 years (Shubina *et al*., 1989). The normal size ranges between 1.0-1.2 m and 6-8 kg. The age of *A. stellatus* spawners ranges between 6-28 years, on average 11-16 years. The average weight of females is 11-12 kg and 6-7 kg for males. Females constitute 40-48% of the spawning population (Levin, 1997).

Unlike other sturgeon species, *A. stellatus* is found in the middle and upper water layers. There are two forms, one of which spawns in winter and the other in spring. The spring form migration peaks in summer

and ends in late autumn. The winter migrating form hibernates in rivers and reproduces the following year. The main feeding grounds of the Caspian are to the north, but a winter migration to the central and southern areas of the Caspian has been observed (Barannikova *et al.*, 1995).

Based on catches and caviar production in the late 1970s, the rate of caviar extracted per fish caught was estimated at 7 kg per 100 kg of the total catch (including males and females) for the three main commercial species of the northern Caspian Sea, *Huso huso*, *A. gueldenstaedtii* and *A. stellatus* (Doroshov and Binkowski, 1985, cited in Williot and Bourguignon, 1991).

Iran: Two forms of the species are found in the Caspian Sea: *A. stellatus* Pallas or north Caspian, and *A. stellatus cyrensis* Berg or south Caspian. The two forms can not be visually differentiated. The south Caspian form can be identified on the basis of later sexual maturity, slower growth and a lower fecundity (Bilialova *et al.*, 1989, cited in Dr M. Pourkazemi, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000). Molecular studies on mitochondrial DNA and alloenzymes have reported high genetic diversity in *A. stellatus* in the southern Caspian Sea region (Pourkazemi, 1995). Sexual maturity of *A. s. cyrensis* is attained at an average age of 12 years for females (range of 6-18 years) and 9 years for males (range of 6-15 years) (Int. Sturgeon Res. Inst., 1998, cited in Dr M. Pourkazemi, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Kazakhstan: Until 1993, the mouth of the Ural River was dredged annually to allow vessels to travel upstream to Atyrau (former Gur'yev) harbour. Since 1993, this annual management of the river channel has not been carried out and is an obstacle to migration (Anon., 2000c).

THREATS TO SURVIVAL AND DOMESTIC USE

Hydroelectric power stations and water reservoirs constructed on the vast majority of rivers have reduced spawning ground availability by approximately 40% in the Caspian basin (Barannikova *et al.*, 1995). In addition, pollution has far exceeded maximum permissible concentrations in the Volga River and the northern Caspian Sea (Romanov and Altuf'yev, 1993). However, since 1991 the intensity of industrial development decreased, leading to an improvement in water-quality. The rise of the sea level of the Caspian now threatens to engulf lakes of pollutants along the shore line.

Overexploitation has posed an increasing threat over the years. In the mid 1990s, open sea fishing in the Caspian and reputedly high levels of illegal catch served to reduce the number of mature sturgeons to such a level that the Volgograd hatcheries in the Russian Federation were unable to collect mature fish to stock the hatcheries.

In the former Soviet Union and Iran, strict legislation regarding sturgeon fisheries had been in effect for decades until the emergence of three new independent States in the Caspian Sea Basin in 1992 (Azerbaijan, Kazakhstan and Turkmenistan) (De Meulenaer and Raymakers, 1996). Current information suggests that amendments of previous regulations and/or adoption of new legislation are now in effect in most new range States in the Caspian Sea as well as in Black Sea (including the Danube River) and Sea of Azov basins. In the latter, Bulgaria, Romania and Ukraine are the most important sturgeon fishing nations. However, enforcement measures appear to be lacking and numerous experts as well as government officials have reported an increasing pressure of illegal fishing practices and criminal activities surrounding the caviar trade in most of the range (Anon., 2000b; Dobbs, 1992; Doward, 2000; Evtouchenko, 1997; King, 1998; Ward, 2000a; 2000b)

The total commercial sturgeon catch in the Caspian Sea Basin peaked at 27,300 t in 1977. *A. stellatus* represented 17% (4,650 t) of this total (Levin, 1997). The catch of *A. stellatus* in the northern Caspian Sea decreased from approximately 4,600 t in 1990 to 1,600 t in 1994 (Khodorevskaya *et al*., 1997). The Russian Caspian Sea catch of *A. stellatus* was 1,060 t in 1997 (Anon., 2000b). The species was always considered rare in the Danube River, with only an average annual catch of 7.8 t in the middle Danube River between 1958 and 1981 (Hensel and Holèik, 1997). However, landings recorded from the lower Danube River in Romania and Bulgaria increased from 6.2 t in 1997 to 14.5 t in 1999.

Azerbaijan: The range of the species in the Kura River, including spawning grounds, has been reduced to about 160 ha due to the construction of the Vavarin reservoir and dam. Waters of this region represent important winter feeding grounds, however, lakes of deposited oil and pollutants lie on the shore lines of the Caspian and as the sea level rises these 'lakes' will be engulfed (Dumont, 1995).

Along the northern and southern coast of Azerbaijan, within the 200-nautical mile Exclusive Economic Zone, sturgeon species are caught as by-catch in stationary nets and *kilka* (Clupeidae) fishing devices. Young and adult migrating fish are caught by coastal fisheries when the water temperatures change. Young fish make up to 17.7% of the by-catch.

Species composition of recorded sturgeon landings

	A. persicus & A. gueldenstaedtii	***A. stellatus***	***H. huso***	***A. nudiventris***
Catch	63.47%	30.77%		5.76%
By-catch	78.50%	16.80%	3.70%	1%

Source: CITES Management Authority of Azerbaijan, *in litt.* to TRAFFIC Europe, 18 September 2000

Annual recorded landings (catch and by-catch) of *A. stellatus* (tonnes)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
A. stellatus	20.00	27.00	25.00	92.00	67.60	31.80	44.80	27.10	20.70	33.50	20.76
Total	*74.00*	*88.20*	*111.00*	*240.10*	*201.20*	*162.50*	*120.30*	*128.60*	*82.40*	*108.90*	*63.22*

Source: CITES Management Authority of Azerbaijan, *in litt.* to TRAFFIC Europe, 18 September 2000

Bulgaria: Wild sturgeon populations have been threatened by a decrease in the number of spawning grounds on the Danube River as a result of human development, particularly hydroelectric facilities. The long-lasting unregulated fisheries have disrupted the age composition of the populations through the selective catch of sexually mature fish, and to by-catch of young sturgeon as they migrate to the sea. Water pollution has also influenced the metabolism of sturgeon (CITES Management Authority of Bulgaria, *in litt.* to TRAFFIC Europe, 15 September 2000). The species is affected by overfishing and pollution (Pr N. Bacalbasa-Dobrovici, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Annual catch of *A. stellatus* (tonnes)

	1995	**1996**	**1997**	**1998**	**1999**
A. stellatus	0.1	0.5	1.4	3.7	6.0
Total sturgeon catch	*14.7*	*32.5*	*49.8*	*55.9*	*50.5*
n° of licenses issued	0	0	122	155	169

Source: CITES Management Authority of Bulgaria, *in litt.* to TRAFFIC Europe, 15 September 2000

Domestic consumption of caviar in Bulgaria is limited to 7-10% of the total caviar production of Bulgaria. The entire production of sturgeon meat is consumed within Bulgaria.

Georgia: During the fishing seasons, particularly coastal anchovy fisheries, numerous sturgeon juveniles are caught as by-catch. The estimated catch of all species of sturgeon declined from 77,000 individuals in 1977, to 57,000 in 1980 and 27,000 in 1986. During the 1990s, illegal fishing in Georgia expanded rapidly due to poor control (Zarkua and Tsuladze, 1999).

Iran: For the past five years, the Iranian domestic market for caviar and sturgeon meat has been estimated at 5% and 65% of the country's total production respectively.

Annual catch of *A. stellatus* (tonnes)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000 ***
A. stellatus	1,114.0	1,019.5	917.9	679.1	672.5	562.2	507.1	360.1	346.3	288.1	-
Total	*2,296.3*	*2,315.1*	*2,058.0*	*1,462.1*	*1,380.9*	*1,216.3*	*1,310.0*	*1,043.5*	*1,127.9*	*923.3*	*182.4*

* Catch in spring 2000 only.

Source: CITES Management Authority of Iran, *in litt.* to TRAFFIC Europe, 24 September 2000

Production of sturgeon meat and caviar in Iran in 1992 and 1999 (tonnes)

	1992				1999			
	Meat	**% ***	**Caviar**	**% ***	**Meat**	**% ***	**Caviar**	**% ***
A. stellatus	**695.4**	***43.9***	**153.4**	***56.6***	**218.3**	***30.6***	**36.5**	***37.5***
Total	**1,604.2**		**262.3**		**730.2**		**99.3**	

* Percentages relate to the share of *A. stellatus* products in the total Iranian sturgeon fisheries.
Source: Dr M. Pourkazemi, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000

The above tables indicate that the total tonnage of meat and caviar of *A. stellatus* produced in Iran comprised 92% and 88% of the country's annual catch in weight in 1992 and 1999, respectively.

Kazakhstan: The Ural River provides 1,400 ha of spawning ground and is the only river with unregulated flow into the Caspian. Oil fields are developing rapidly in the northern Caspian, especially the Tengiz oil field (Sagers, 1994); pollution from this industry affects spawning and feeding grounds. Radioactive contamination from a nuclear reactor also poses a threat (Dumont, 1995).

Annual catch of *A. stellatus* in the 1990s (tonnes)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000 ***
A. stellatus	1,498.0	1,313.0	1,002.0	547.0	274.0	197.9	175.1	227.6	235.0	140.0	117.4
Total	*1,963.0*	*1,767.0*	*1,437.3*	*1,109.0*	*556.0*	*573.0*	*367.8*	*389.5*	*490.0*	*279.0*	*230.5*

* Spring catch.
Source: CITES Management Authority of Kazakhstan, *in litt.* to TRAFFIC Europe, 21 September 2000

Moldova: Catch of *A. stellatus* has been prohibited since the species was listed in the Red Data Book in 1995 (Anon., 2000c).

Romania: Pollution emitted between 1970 and 1989 has been the greatest threat to this species. The loss of spawning habitat due to dam construction has posed an important threat, but to a lesser extent than pollution. Overfishing and poaching have increased in recent years (Pr N. Bacalbasa-Dobrovici, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Annual catch of *A. stellatus* for 1991 to 1999 (kilogrammes)

1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
2,184	2,910	2,405	2,852	6,506	4,941	4,788	4,003	8,556

Source: Dr N. Patriche, *in litt.* to IUCN/SSC Wildlife Trade Programme, 5 September 2000
Note: These data include catches in the Danube River and Delta as well as in the Black Sea.

From 1991 to 1999, approximately 32% of the total Romanian sturgeon catch in the Danube River comprised *A. stellatus*. Romanian scientific surveys have concluded that the population of *A. stellatus* is quite well represented in the Danube River (Dr N. Patriche, *in litt.* to IUCN/SSC Wildlife Trade Programme, 5 September 2000).

Russian Federation: Construction of the Volgograd dam led to a 82% decrease in the range and spawning grounds formerly available in the Volga River. The remaining area can accommodate 280,000 spawning sturgeon, but during the last 30 years their numbers have been estimated to be considerably less than this (Veschecv, 1993; 1995). Dam construction has also restricted the range in the Terek and Sulak rivers, with the spawning ground having been reduced to 132 ha and 202 ha respectively (Vlasenko, 1990). In the Black Sea and Sea of Azov region, the Kuban River flow has been regulated resulting in the loss of 140,000 ha of spawning grounds. The Tsymlyansk reservoir, on the Don River in 1952, removed approximately 68,000 ha of spawning ground (Volovik *et al.*, 1993).

The Volga River hatcheries started to release juveniles in 1957. From the release of half a million juveniles in 1959, numbers increased to around 16 million in 1970. In the late 1980's, approximately 30% of *A. stellatus* caught in the Volga River were from hatcheries. The numbers released did not seem to affect the numbers of wild spawners later entering the rivers (Khodorevskaya *et al.*, 1997).

Shagaeva *et al.* (1993) found that 100% of the eggs taken from *A. stellatus* in the lower Volga (both of wild and captive bred (hatchery) sources) in 1989 had anomalous larvae because of poor environmental conditions. It is thought that these eggs may not have been viable. However, water quality has started to improve in the Volga–Caspian region since the decline of heavy industrial activities in the former USSR.

From 1992 to 1997, approximately 40% of the Russian sturgeon catches in the Caspian Sea were composed of *A. stellatus* (Anon., 2000b)

Catch of *A. stellatus* in the Caspian Sea (tonnes)

	1992	**1993**	**1994**	**1995**	**1996**	**1997**
Catch	3,610	1,349	1,467	968	675	449

Source: Caspian Fisheries Research Institute (KaspNIRKh), cited in Anon., 2000b

The level of domestic consumption of sturgeon products in the Russian Federation is unknown, but is said to be the main outlet of illegal sturgeon fisheries (Mr Roman V. Ivakhnenko, State Fisheries Committee, pers. comm. to TRAFFIC Europe-Russia, September 2000). Based on the number of sets of illegal fishing equipment recorded by enforcement agencies of the Caspian Sea and the Sea of Azov, the illegal sturgeon catch was evaluated at six to ten times the legal catch (Anon., 2000b). In 1997, the estimated volume of the Moscow sturgeon meat market was three times the annual catch quotas for sturgeon species (Anon., 1998).

Turkey: Spawning grounds have been reduced. From 1969 to 1979, the Turkish annual sturgeon landings ranged from 310 t to 10 t, with an annual average of 112 t (Edwards and Doroshov, 1989). In 1989 in Samsun, a Turkish landing site on the Black Sea, one caviar processor claimed that his production had decreased from 8 t per year of caviar between the 1940s and the 1970s, to 200 kg per year at the end of the 1980s. In 1989, sturgeon were caught as by-catch by trawlers that operated legally along the Turkish coast at a distance greater than three nautical miles, but also illegally within the three nautical mile limit. This represented the main fishing pressure on sturgeon species. In April 1989, *A. stellatus*, *A. gueldenstaedtii*, *A. sturio* and *H. huso* were observed in Samsun (Edwards and Doroshov, 1989). The investigators were told that *A. nudiventris* was also landed in Samsun.

Ukraine: Pollution and, to a lesser extent, loss of spawning grounds, have affected this species. Overfishing has been a problem in recent years.

Former Yugoslavia: Most of the Danube River spawning grounds are no longer accessible due to the construction of the Djerdap dams.

INTERNATIONAL TRADE

The listing of *A. stellatus* in CITES Appendix II entered into effect on 1 April 1998. Complete data for this species were therefore limited to nine months of trade (April-December 1998). Gross exports of trade in specimens of *A. stellatus* in 1998 are given in the Appendix.

CITES Annual Reports for 1998 suggest that caviar of *A. stellatus*, commercially known as "Sevruga", represented the largest portion of all sturgeon caviar traded internationally. Range States exported a total of 103,085 kg in 1998; Iran (45,955 kg), the Russian Federation (38,981 kg), Kazakhstan (17,467 kg), Azerbaijan (422 kg) and Romania (260 kg).

Other specimens reported in international trade in 1998 were meat (8,794 kg exported by Iran and imported by France and Italy), live fish (25,000 individuals exported by Poland and imported into Germany (CITES Management Authority of Poland, *in litt.* to TRAFFIC Europe, 31 August 2000)), and eight skins (probably destined to be processed into leather, exported by Iran to Switzerland and subsequently re-exported to Italy). The live juveniles exported by Poland in 1998 were of captive bred source (see "Captive Breeding").

In addition to caviar, a further 51,500 specimens (fertilised eggs or caviar ; see *Note* at the end of this section) were traded internationally. Of these, 26,500 were declared to be from a wild source and

originated from Hong Kong (non-range State), and 20,400 were declared of pre-Convention stock imported from the Russian Federation into Greece and subsequently re-exported to the USA.

Exports of *A. stellatus* from Russia in 1999

	Quantity (kg)	Description	Importer	No of permits
A. stellatus	2.50	Live eggs	GR DE	2 Export
	32,418.72	Caviar	US, CY, DK, DE, GB, FR, CH, NL, BE, JP	52 Export + 10 Re-export
	5,740.00	Meat	US	2 Export

Source: CITES Management Authority of the Russian Federation, *in litt*. to TRAFFIC Europe, 18 September 2000

Export quotas established by range States (kilogrammes)

	1998		1999			2000	
	Caviar	Meat	Caviar	Meat		Caviar	Meat
Azerbaijan			3,800	38,000		2,450	24,500
Iran	50,000		40,000			35,000	
Kazakhstan			24,000			22,000	199,000
Romania			2,000	4,000		2,100	23,000
Russian Fed.	85,000		42,000		**Caspian**	30,350	72,000
					Azov	11,000	16,000
Total	***135,000***		***111,800***	***42,000***		***102,900***	***334,500***

Source: CITES Notification Nos. 1998/35-36-61, 1999/21-47-53-68 and 2000/053-056-061

Illegal trade: In 1998, a total of 541 kg *A. stellatus* caviar shipments of unknown origin was confiscated by US Customs upon import. This comprised 410 kg re-exported by Turkey and 114 kg re-exported by the United Arab Emirates. Discrepancies between trade statistics of countries importing and exporting caviar can indicate illegal activities. Such discrepancies were found in 1995 and 1996 for instance for Turkey (customs declared caviar exports 21 t and 80 t respectively) and European Union Member States (6 t and 20 t respectively) (Raymakers, 1999). Additionally, Turkish 1996 caviar exports totalled 121 t (Raymakers, 1999), while the country's sturgeon fisheries has been limited to only few incidental catches since the late 1980s (Edwards and Doroshov, 1989).

Poaching and smuggling are closely related and have been intensively reported in the media of both range States and importing countries (Evtouchenko, 1997; McDonald, 2000; Snyder, 2000). Much of the illegally caught sturgeon is destined to the domestic market, particularly meat (Anon., 1998).

Note: The use of the term "eggs" and the unit "kg" or "g" to describe shipments of both caviar and fertilised eggs complicates the analysis of trade data. Similar difficulties arise from the unit used for export quotas of fertilised eggs, which is kilogrammes ("kg") instead of "number of specimens". Kilogrammes do not directly correspond to the number of specimens, and hence does not allow for the effective evaluation of quotas.

CONSERVATION MEASURES

A. stellatus is not fully protected in any range State other than Moldova. However, a license is required for fishing in most of the countries and private sturgeon fisheries are prohibited in Iran.

Regarding juvenile restocking efforts, despite the large-scale aquaculture programmes of the Russian Federation since the 1960s (20 hatcheries were fully operational in the 1980s) and Iran (hatcheries have been operational for 20 years), stocks have continued to decline (Dr M. Pourkazemi, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000).

Azerbaijan: The Intergovernmental Commission for Caspian Biological Resources, composed of representatives of all range States, has set annual catch quotas.

Annual catch quotas allocated to Azerbaijan (tonnes)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A. stellatus	120	163	163								42.7
Total	*200*	*308*	*510*	*480*	*360*	*182*	*160.5*	*160.5*	*160.5*	*108.67*	*108.35*

Source: CITES Management Authority of Azerbaijan, *in litt.* to TRAFFIC Europe, 18 September 2000

Three hatcheries were built in the lower Kura River by the authorities of the former Soviet Union in the 1960s. A World Bank feasibility study reported that the total capacity of the hatcheries was originally 12 million, but that this capacity had dropped significantly over the years (T. Turner, World Bank consultant, *in litt*. to TRAFFIC Europe, 6 October 2000). World Bank funds have been allocated for the construction of a new sturgeon hatchery and farm that will have the capacity of 15 million fry per year; this should be operational in the next few years. Concerns have been raised about the availability of adult sturgeon to constitute the broodstock of the farm.

Estimated number of sturgeon fry released in the Kura River (million fingerlings)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A. stellatus	3.747	2.870	0.400	0.608	0.392	0.302	1.040	2.100	1.320	8.822	6.869
Total	*17.523*	*9.082*	*2.980*	*1.838*	*1.142*	*1.242*	*4.070*	*6.065*	*6.220*	*20.290*	*16.965*

Source: CITES Management Authority of Azerbaijan, *in litt.* to TRAFFIC Europe, 18 September 2000

The State institution responsible for sturgeon fishery and processing matters is "State Concern Azerbalyg". Commercial sturgeon fisheries are prohibited in the open sea. No fishing license was required until 2000. The only fishing gear permitted for sturgeon catch in the Kura River is "sweep nets" of 35-55 mm mesh size. The minimum size limit set for *A. stellatus* is 90 cm in the Kura River, and 110 cm in coastal waters (Anon., 2000c).

Bulgaria: Measures at the national level as described hereunder are needed, but they must be linked to co-ordinated actions of all countries in the Black Sea region. In Bulgaria, sturgeon fisheries are prohibited for 30 days, from 20 April to 20 May each year, at the peak of the breeding season. The authorities may approve a 15-day extension of the closed season pending the natural conditions of the year. Explosives, poison, bottom trawling and dragging, as well as stunning substances and devices are prohibited fishing methods. The minimum size limit for *A. stellatus* is 75 cm in the Danube River and 100 cm along the Black Sea coast.

Export quotas are set on the basis of catch data, trends and the biological characteristics of the species. A system was established for the distribution of export quotas among export companies that are obliged to restock the Danube River with sturgeon fry before they are authorised to export sturgeon specimens, but until now, no fry of *A. stellatus* have been released. Due to budgetary constraints, Bulgaria has not monitored the wild sturgeon population in recent years, nor the success of its restocking programme (e.g. through tagging of released fingerlings). However, plans have been prepared for these activities (CITES Management Authority of Bulgaria, *in litt.* to TRAFFIC Europe, 15 September 2000). A special prohibition was adopted on the use of "unbaited hooks" for sturgeon catch (Anon., 2000c).

Georgia: Until the early 1990s, artificial breeding of sturgeon was carried out in the Varistkhi Sturgeon Plant built in 1983 on the Rioni River with mixed results (Zarkua and Tsuladze, 1999).

Hungary: The species is protected according to *Decree No. 1/1982 (III.15.) OKTH* on the *Protected and Strictly Protected Species of Flora and Fauna, Value of their Specimens, Determination of the Range of Protected and Strictly Protected Caves and Exemptions from Restrictions and Prohibitions Set for Certain Protected Animal Species*, last amended by the *15/1996 (VII.26.) Decree of the Minister for Environment*. The *Nature Conservation Act No. 53 of 1996, Article 43* orders that for all protected species, prior authorisation from the National Park Directorate is required for the capture, killing, possession, captive breeding, introduction of specimens from exotic population, artificial exchange of genetic matter between populations, exchange and sale or purchase of *A. stellatus* (CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 13 September 2000).

Iran: At all sturgeon catch stations, biometric measurements are carried out for each species. The age, length, sex and weight of fish landed are recorded. The population structure is estimated on the basis of age groups. As a result of these studies carried out for the past 10 years, the number of catch stations were decreased by 50%, changes were adopted on sturgeon catch methods, and lower export quotas were set for the past five years. Export quotas are established on the basis of results of research programmes and the annual monitoring of stocks. These activities include the following parameters and activities: Maximum Sustainable Yield and total catch, rehabilitation of stocks, management and sustainable exploitation through restriction of illegal catch and overfishing. Monitoring fishing efforts and regulating the time of catch are also carried out on the basis of research results (CITES Management Authority of Iran, *in litt*. to TRAFFIC Europe, 24 September 2000).

Annual release of *A. stellatus* fry (million fish)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
A. stellatus	0.36	0.47	0.07	0.30	0.46	0.27	0.22	0.29	0.18	0.13
Total	*4.56*	*6.60*	*3.45*	*4.17*	*5.91*	*9.13*	*12.35*	*21.63*	*24.56*	*19.10*

Source: CITES Management Authority of Iran, *in litt*. to TRAFFIC Europe, 24 September 2000

A labelling system is in place, where each tin of caviar holds a sign or mark that indicates at least the date and place of catch, the name of the catch station, name of processor and the species.

Additional conservation measures have been undertaken for all sturgeon in the southern shores of the Caspian Sea. The fishing permits of more than 6,000 fishermen engaged in fishing using gill nets have been bought, and employment for these fishermen has been created in other fishery operations regarding catch of kilka and beach seine catch. Coastal patrols have also been strengthened (Dr M. Pourkazemi, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Kazakhstan: Commercial sturgeon catch is only allowed in the tributaries of the Caspian Sea, but scientific catch is permitted in the open sea with an annual quota of 20 t. Sturgeon fisheries are regulated by law. There are two fishing seasons, one during spring spawning and the other during the time of winter migration. The exact dates of the fishing seasons vary with the climate and are therefore set annually by authorised scientific organisations. As in most former Soviet Republics, "sweep nets" (bottom nets that are hauled several times a day) with a minimum mesh size and which are marked with the name and address of the owner, are the only legal fishing gear for sturgeon. Each fisherman can only set one net at the time. A fishing license is also required. Sturgeon fishing grounds (called "tonia") are limited: there are 12 on the Ural River and 8 on the Kigach River. The minimum catch size limit for *A. stellatus* is 110 cm. The ratio of males and females caught is not regulated. The purchase price at the landing site is based on a fixed legal rate of caviar weight extracted per female; *A. stellatus* is set at 15.4% of the total body weight (Anon., 2000c). Annual commercial catch quotas are allocated to Kazakhstan by the Intergovernmental Commission for Caspian Biological Resources.

Annual commercial catch quotas allocated to Kazakhstan (tonnes)

	1996	**1997**	**1998**	**1999**	**2000**
A. stellatus			305	215	215.5
Total	***375***	***480***	***460***	***405***	***371***

Source: CITES Management Authority of Kazakhstan, *in litt.* to TRAFFIC Europe, 21 September 2000

Two hatcheries, the Uralo-Atyrau and the Atyurau, have been operational since 1998.

Annual release of *A. stellatus* fry (number of fingerlings)

	1998	**1999**	**2000**
A. stellatus	1,058,993	2,581,005	3,771,060
Total	*1,706,193*	*5,318,471*	*5,507,160*

Source: CITES Management Authority of Kazakhstan, *in litt.* to TRAFFIC Europe, 21 September 2000

Moldova: Fishery of *A. stellatus* is prohibited in Moldova since the species was included in the National Red Data Book (Anon., 2000c) and is protected by law (Anon., 1999). No monitoring of the population of *A. stellatus* has been undertaken recently (Dr V. Lobcenco, *in litt*, to IUCN/SSC Wildlife Trade Programme Trade Programme, September 2000).

Romania: Bacalbasa-Dobrovici (*in litt*, to IUCN/SSC Wildlife Trade Programme Trade Programme, September 2000) believes that the fishing pressure should be reduced in the lower Danube. He reports that that the existing legislation pertaining to the region is neither adequate nor enforced, particularly in Romania. A fishing license is required in Romania to capture this species (Dr N. Patriche, *in litt.* to IUCN/SSC Wildlife Trade Programme Trade Programme, 5 September 2000). There is a research programme for artificial spawning and culture of *A. stellatus*, and a restocking programme started in 1993. The total number of juveniles restocked in the Danube River is 44,850 fingerlings (Dr N. Patriche, *in litt.* to IUCN/SSC Wildlife Trade Programme Trade Programme, 5 September 2000).

The type of sturgeon fishing gear is strictly regulated by Romanian law. The fishing season is set every year by Ministerial Order. A fishing license is required to catch sturgeon in Romanian waters. The minimum size limit for *A. stellatus* is 100 cm. The catch quota for *A. stellatus* for 1998 and 1999 was set at 20 t per year. Catch quotas are calculated by independent scientific institutes, such as the Danube Delta Institute in Tulcea and the Centre for Conservation, Fish Farming, Fishing and Fish Processing in Galati (Anon., 2000c).

Release of sturgeon juveniles in the Danube River (number of fingerlings)

	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
A. stellatus	1,000	4,000		10,000	11,600	10,000	6,750

Source: Centre for Conservation, Fish Farming, Fishing and Fish Processing, Galati, December 2000, cited in Anon., 2000c

Russian Federation: For Caspian Sea populations, the former Soviet Republics set annual catch quotas in agreement with Iran. Sturgeon catch quotas have been established by the Intergovernmental Commission for Caspian Biological Resources since the early 1990s. The annual share of sturgeon catches of each former USSR Caspian range State as adopted by the Commission since 1993 are as follows: the Russian Federation 70%, Kazakhstan 17.6%, Azerbaijan 6.1%, and Turkmenistan 6.3%. There are two fishing seasons in the Caspian Sea waters: from ice melting to June 5 and from 1 September until the time of ice formation. A license is required to catch sturgeon in all Russian waters. The minimum size limit for *A. stellatus* caught in Russian Caspian waters is 110 cm along the coast and 90 cm in the northern Caspian Sea (Anon., 2000c). Russian catch quotas are currently declared by the Federal Government following the recommendations given by the State Fisheries Committee in consensus with an independent council of experts (Anon., 2000b).

Release of *A. stellatus* in the Volga River and the Sea of Azov by Russian hatcheries (number of fingerlings)

	1979-1980	**1981-1985**	**1986-1990**	**1991-1995**	**1996-1998**
Volga River	16,400,000	19,400,000	16,200,000	10,100,000	15,500,000
Sea of Azov	18,950,000	19,120,000	73,800,000	13,040,000	14,293,103

Source: Azov and Caspian Fisheries Research Institute (Az- and KaspNIRKh), cited in Anon., 2000b

From 1979 to 1998, approximately 24.6% and 50.4% of all fry released by Russian hatcheries in the Volga River and the Sea of Azov respectively comprised *A. stellatus* (Anon., 2000b).

Export quotas established by the CITES Management Authority of the Russian Federation consist of 90% of the caviar production, which in turn varies according to the catch quotas set for each species of sturgeon (Mr Roman V. Ivakhnenko, State Fisheries Committee, pers. comm. to TRAFFIC Europe-Russia, September 2000). The annual catch quotas or Total Allowable Catches (TAC) allocated by the State Fisheries Committee, is based on the recommendations of scientific agencies such as the Russian Federal Research Institute of Fisheries and Oceanography (VNIRO) and the Pacific Research Institute of Fisheries and Oceanography (TINRO). The TAC includes the commercial catch, the scientific catch, and the catch of mature males and females destined to form hatchery broodstock.

Recent data on the monitoring of catch per species, including the size composition and sex ratio of fish caught are not available. The volume of domestic consumption of sturgeon products in the Russian Federation, mostly meat and caviar, is unknown (Mr Roman V. Ivakhnenko, State Fisheries Committee, pers. comm. to TRAFFIC Europe-Russia, September 2000).

Turkey: In 1979, with the exception of *H. huso* of more than 140 cm long, the fishery for sturgeon was prohibited in Turkish waters (Edwards and Doroshov, 1989). Circular 34/1, effective from 2000-2002, prohibits the collection of Acipenseriformes (CITES Management Authority of Turkey, *in litt*. to TRAFFIC Europe, 20 September 2000).

Turkmenistan: In coastal commercial waters, sturgeon fishery is allowed for scientific research only, with an annual catch limit of 20 t. The Turkmenistan State Committee of Fisheries issues an annual license for sturgeon commercial catches to the State enterprise, Balkanbalyk. No other company, Turkmen or otherwise has the right to engage in commercial sturgeon fisheries in Turkmen inland waters. An annual catch quota for the species is set by the Intergovernmental Commission for Caspian Biological Resources. There is no sex ratio set for sturgeon landings (Anon., 2000c).

Ukraine: Sturgeon fishing in the Danube River is permitted throughout the year, except from 16 March to 15 April. The by-catch of sturgeon is regulated. For example, for sprat trawling, a tolerance of two sturgeon specimens of trade length (see below) may be caught per tonne of sprat. The mesh size of nets used to catch sturgeon should be a minimum of 120 mm and a maximum of 150mm. Only fishermen who have been allocated an annual sturgeon quota by the State Committee for Fishery are allowed to catch sturgeon. The minimum size limits for *A. stellatus* are 100 cm for fish caught in the Black Sea and the Danube River, and 80 cm for those caught in the Sea of Azov (Anon., 2000c).

Annual catch quotas for *A. stellatus* for 1997 to 1999 (tonnes)

		1996	**1997**	**1998**	**1999**
Total		*505*	*424*	*210*	*225*
A. stellatus	Sea of Azov and adjacent waters		125	45	30
	Black Sea and Danube River			10	3

Source: State Committee for Fishery of Ukraine, cited in Anon., 2000c

There is currently no sturgeon fry restocking programme in Ukraine.

Yugoslavia: The closed fishing season set in the Danube River for *H. huso*, *A. gueldenstaedtii* and *A. stellatus*, is from 15 May to 15 June. Certain types of fishing gear are prohibited to catch sturgeon and an agreement was signed between Romania and Yugoslavia on the prohibition of gear that cause high mortality of untargeted fish. Any fishing activity, including all commercial and sport fisheries, requires a license in Yugoslav waters. Licenses are issued on a per district basis and the sturgeon fishing grounds are limited to 17.8 km downstream of the Djerdap II dam and the mouth of the Timok River. The minimum size limit for *A. stellatus* was set at 75 cm, but catches of the species have been prohibited from 1996 to 2000. A restocking programme is being carried out by the Centre for Fish Reproduction of the "Djerdap Fishing Company" in Malla Vrbica village (Anon., 2000c).

CAPTIVE BREEDING

The reduction in area of natural spawning grounds due to river flow regulation has caused population declines. Fish reared in hatcheries have therefore been introduced to maintain the stock. Approximately 30% of the Caspian stock originates from hatcheries (Barannikova, 1995). In 1993, 60-98% of each generation of *A. stellatus* in the Sea of Azov was derived from aquaculture (Volovik *et al.*, 1993). *A. stellatus* has also been introduced into aquaculture in Belgium and France (Welcomme, 1988).

Overfishing has prevented hatcheries from catching enough mature fish to maintain the necessary broodstock (Artyukhin, 1997). Levin (1995) stated that although aquaculture contributes considerably to the maintenance of the stocks, it cannot compensate for the damage caused to natural reproduction.

Azerbaijan: Three hatcheries were built in the 1960s and have contributed to the former Soviet Union sturgeon restocking programme ever since. Their combined annual productive capacity was 12 million fry, but this has dropped significantly due to rising levels of the Caspian Sea, and the lack of funds allocated to hatchery maintenance (T. Turner, World Bank consultant, *in litt*. to TRAFFIC Europe, 6 October 2000).

Georgia: Until the early 1990s, artificial breeding of sturgeon species was carried out at the Varistkhi Sturgeon Plant. Built in 1983 and located on the Rioni River, the results obtained were not always 'satisfactory' (Zarkua and Tsuladze, 1999).

Hungary: There are no captive breeding facilities for *A. stellatus* (CITES Management Authority of Hungary, *in litt.* to TRAFFIC Europe, 13 September 2000).

Iran: Captive breeding activities have been carried out for *A. stellatus* in the southern shores of the Caspian Sea. The breeding, rearing and release of more than 10 million fingerlings into the sea has been undertaken in recent years. The artificial rearing and production of broodstock consisting of 2,000 breeders in earthen ponds has also been undertaken and *A. stellatus* has also been introduced into permanent inland water bodies (Dr M. Pourkazemi, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000).

Kazakhstan: Two hatcheries exist in Kazakhstan, Uralo-Atyrau and Atyurau, which have been operational since 1998 (CITES Management Authority of Kazakhstan, *in litt*. to TRAFFIC Europe, September 2000).

Poland: The presence of fish farms and hatcheries of sturgeon in Poland was confirmed by the CITES Management Authority of Poland (*in litt.* to TRAFFIC Europe, 31 August 2000). The following sturgeon species are bred in captivity: *A. baerii*, *A. gueldenstaedtii*, *A. ruthenus*, *A. stellatus*, *H. huso*, *Polyodon spathula* and hybrids of some of these species. In most cases, hybrids are F1 generation live specimens (fertilised eggs) imported in to Poland from range States, particularly the Russian Federation. Some farms keep F2 generation specimens, which are bred in Poland and used as broodstock, partly for the production of juveniles for both the domestic and international market.

Romania: An aquaculture programme exists and has been releasing 10,000 fish of 1-3 g per year (Bacalbasa-Dobrovici, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000). The programme is thought to be efficient, but quantitative data are lacking (Suciu *et al*., 1998). Approximately 30,000 juveniles are retained each year for aquaculture and research purposes (Dr N. Patriche, *in litt.* to IUCN/SSC Wildlife Trade Programme Trade Programme, 5 September 2000). In Romania, hatcheries and captive breeding of *A. stellatus* in earth ponds, with the aim of developing commercial farms, are still at an experimental stage (Dr N. Patriche, pers. comm. to TRAFFIC Europe, September 1999).

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 aquaculture companies, there is currently no significant production of meat of *A. stellatus* in commercial farms.

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Gross exports* and export quotas for *Acipenser stellatus* 1998

TAXON	TERM	UNIT	Exporter	1998	Export quotas 1998
Acipenser stellatus	**bodies #1**	**Kg**	**IR**	**4,000**	
Acipenser stellatus	Eggs		AE	237	
Acipenser stellatus	Eggs		AU	4	
Acipenser stellatus	Eggs		CH	12	
Acipenser stellatus	Eggs		DE	26,538	
Acipenser stellatus	Eggs		DK	128	
Acipenser stellatus	eggs #2		GR	20,400	
Acipenser stellatus	Eggs		NL	713	
Acipenser stellatus	Eggs		SG	1	
Acipenser stellatus	Eggs		US	297	
Acipenser stellatus	Eggs	Kg	AE	12,168	
Acipenser stellatus	Eggs	Kg	AU	214	
Acipenser stellatus	Eggs	Kg	AZ	422	
Acipenser stellatus	Eggs	Kg	BE	221	
Acipenser stellatus	Eggs	Kg	CA	21	
Acipenser stellatus	Eggs	Kg	CH	19,059	
Acipenser stellatus	Eggs	Kg	DE	15,638	
Acipenser stellatus	Eggs	Kg	DK	4,694	
Acipenser stellatus	eggs	Kg	FI	50	
Acipenser stellatus	eggs	Kg	FR	1,398	
Acipenser stellatus	eggs	Kg	GB	1,015	
Acipenser stellatus	eggs	Kg	GR	68	
Acipenser stellatus	eggs	Kg	HK	41	
Acipenser stellatus	eggs	Kg	IR	45,955	50,000
Acipenser stellatus	eggs	Kg	KZ	17,467	
Acipenser stellatus	eggs	Kg	NL	6	
Acipenser stellatus	eggs	Kg	PE	17	
Acipenser stellatus	eggs	Kg	PL	4,820	
Acipenser stellatus	eggs	Kg	RO	260	
Acipenser stellatus	eggs	Kg	RU	38,981	85,000 (incl. quotas for AZ and KZ)
Acipenser stellatus	eggs	Kg	SA	79	
Acipenser stellatus	eggs	Kg	SG	121	
Acipenser stellatus	eggs	Kg	TR	10,994	
Acipenser stellatus	eggs	Kg	US	9,656	
Acipenser stellatus	live		AE	706	
Acipenser stellatus	live		PL	25,000	
Acipenser stellatus	meat	Kg	DE	50	
Acipenser stellatus	meat	Kg	IR	4,735	
Acipenser stellatus	meat	Kg	US	9	
Acipenser stellatus	skins		CH	8	
Acipenser stellatus	skins		IR	8	

* **Definition:** "Gross exports are the sum of all reported exports and re-exports in a particular commodity or species in a particular year or series of years;... Gross trade is thus a simple measure of the total number of items recorded in international trade. However, gross trade may be an overestimate of the total number of actual specimens in trade as re-exports are not deducted from the total." (Anon., 1996). This is particularly applicable to caviar of which shipments are often exported, re-packaged and re-exported. For instance, in the mid-1990s, Germany re-exported as much as 45% of its annual caviar imports (De Meulenaer and Raymakers, 1996).

#1 The term "bodies" should be interpreted as "meat" (Dr P. Bronzi, *in litt*. to IUCN/SSC Wildlife Trade Programme, 8 September 2000).

#2 The import of 20,400 eggs into Greece (re-exported to the US) without a specified unit, almost certainly refers to “fertilised eggs” and not to caviar. The term “eggs” being used for both caviar and fertilised eggs and the absence of a unit (e.g. specimens, grammes, etc.) renders data analyses problematic. For example, in this case, if the quantity is interpreted in kilogrammes (20,400 kg) it would lead to an overestimate of 20.4 t of caviar in trade.

Comparative Tabulation of trade in *Acipenser stellatus* 1998

			Imports reported						Exports reported				
Year	**Imp.**	**Exp.**	**Origin**	**Quantity**	**Unit**	**Term**	**P**	**S**	**Quantity**	**Unit**	**Term**	**P**	**S**
1998	AU	AE	RU						21	kg	eggs	T	O
1998	CA	AE	IR						24	kg	eggs	T	W
1998	CA	AE	IR						4	kg	eggs	T	O
1998	CH	AE	IR	331	kg	eggs	T	W	99	kg	eggs	T	W
1998	CH	AE	IR	75	kg	eggs	T	O	75	kg	eggs	T	O
1998	CH	AE	RU	507	kg	eggs	T	O	39	kg	eggs	T	O
1998	CH	AE	RU						256	kg	eggs	T	W
1998	DK	AE	IR	34	kg	eggs	T	W	68	kg	eggs	T	W
1998	DK	AE	RU	2	kg	eggs	T	O					
1998	FR	AE	IR	252	kg	eggs	T	W					
1998	FR	AE	RU	741	kg	eggs	T	O	500	kg	eggs	T	O
1998	GB	AE	RU						10	kg	eggs	T	W
1998	HK	AE	IR						209	kg	eggs	T	W
1998	HK	AE	RU						419	kg	eggs	T	W
1998	JP	AE	IR						8	kg	eggs	T	W
1998	JP	AE	RU						139	kg	eggs	T	O
1998	KR	AE	RU						32	kg	eggs	T	O
1998	NO	AE	IR						35	kg	eggs	T	W
1998	NO	AE	IR	22	kg	eggs	T	O	21	kg	eggs	T	O
1998	PR	AE	DE						43	kg	eggs	T	O
1998	SG	AE	RU	4,845	kg	eggs	T	O	807	kg	eggs	T	O
1998	SG	AE	RU						606		live	T	O
1998	TH	AE	RU						200	kg	eggs	T	O
1998	TH	AE	RU						100		live	T	O
1998	TR	AE	RU						22	kg	eggs	T	O
1998	TW	AE	IR						40	kg	eggs	T	W
1998	US	AE		114	kg	eggs	T	I					
1998	US	AE	RU	21.895	kg	eggs	T	I					
1998	US	AE	RU	899	kg	eggs	T	W	191	kg	eggs	T	W
1998	US	AE	RU	772	kg	eggs	T	O	3,931	kg	eggs	T	O
1998	US	AE	RU	237		eggs	T	W					
1998	US	AE	RU	112	kg	eggs	T	I					
1998	US	AE	XX	93	kg	eggs	T	O					
1998	CN	AU	IR						15	kg	eggs	T	O
1998	NZ	AU							3,966	g	eggs	T	W
1998	NZ	AU	IR						22	kg	eggs	T	O
1998	NZ	AU	IR						4		eggs	T	O
1998	SG	AU	IR						98	kg	eggs	T	O
1998	TH	AU	IR						75	kg	eggs	T	O
1998	CA	BE	RU						67	kg	eggs	T	O
1998	TR	BE	RU						360	g	eggs	T	O
1998	US	BE	RU						153	kg	eggs	T	O
1998	US	CA	RU	21	kg	eggs	T	O					
1998	AT	CH	AZ	2	kg	eggs	T	O					
1998	AT	CH	IR						7	kg	eggs		O
1998	AT	CH	IR	5	kg	eggs	T	O					

			Imports reported					Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit	Term	P S	Quantity	Unit	Term	P	S
1998	AT	CH	RU					2	kg	eggs		O
1998	BE	CH	IR					5	kg	eggs		O
1998	BE	CH	IR	5	kg	eggs	T W					
1998	BE	CH	KZ	3,229	kg	eggs	T W					
1998	BE	CH	RU					3,228	kg	eggs		W
1998	CH	CH	IR					54	kg	eggs		O
1998	CH	CH	RU					18	kg	eggs		O
1998	CY	CH	IR					2	kg	eggs		O
1998	CY	CH	RU					1	kg	eggs		O
1998	DE	CH	IR	1,243	kg	eggs	T W					
1998	DE	CH	IR					934	kg	eggs		W
1998	DE	CH	IR					3	kg	eggs		O
1998	DE	CH	KZ	9,844	kg	eggs	T W					
1998	DE	CH	RU					9,855	kg	eggs		W
1998	DE	CH	RU					467	kg	eggs		O
1998	DK	CH	AZ	150	kg	eggs	T O					
1998	DK	CH	IR	289	kg	eggs	T W					
1998	DK	CH	IR					288	kg	eggs		W
1998	DK	CH	IR	203	kg	eggs	T O					
1998	DK	CH	IR					203	kg	eggs		O
1998	DK	CH	RU					150	kg	eggs		O
1998	FR	CH	IR					743	kg	eggs		W
1998	FR	CH	IR					495	kg	eggs		O
1998	FR	CH	IR	493	kg	eggs	T O					
1998	FR	CH	IR	331	kg	eggs	T W					
1998	FR	CH	KZ	154	kg	eggs	T W					
1998	FR	CH	RU					153	kg	eggs		W
1998	GA	CH	IR					36	kg	eggs		O
1998	GA	CH	IR					5	kg	eggs		W
1998	GA	CH	RU					32	kg	eggs		O
1998	GB	CH	AZ	145	kg	eggs	T W					
1998	GB	CH	AZ	97	kg	eggs	T O					
1998	GB	CH	KZ	12		eggs	T W					
1998	GB	CH	RU					679	kg	eggs		O
1998	GR	CH	IR					5	kg	eggs		O
1998	HK	CH	IR					78	kg	eggs		O
1998	HK	CH	IR					4	kg	eggs		W
1998	IT	CH	RU					230	kg	eggs		O
1998	IT	CH	IR					8		skins		W
1998	JP	CH	IR					88	kg	eggs		O
1998	JP	CH	RU					944	kg	eggs		O
1998	KW	CH	IR					22	kg	eggs		O
1998	MU	CH	RU					228	kg	eggs		O
1998	MX	CH	IR					28	kg	eggs		O
1998	PA	CH	IR					6	kg	eggs		O
1998	SA	CH	IR					1	kg	eggs		W
1998	SG	CH	IR	37	kg	eggs	T O					
1998	SG	CH	IR					37	kg	eggs		O
1998	SG	CH	IR					1	kg	eggs		W
1998	SG	CH	IR	1	kg	eggs	T W					
1998	SG	CH	RU					1	kg	eggs		O
1998	SG	CH	RU	1	kg	eggs	T O					
1998	TN	CH	RU					20	kg	eggs		O
1998	US	CH		500	g	eggs	T W					

			Imports reported						Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit	Term	P	S	Quantity	Unit	Term	P	S
1998	US	CH	AZ	400	g	eggs	T	O					
1998	US	CH	AZ	100	g	eggs	T	I					
1998	US	CH	AZ	2	kg	eggs	T	O					
1998	US	CH	IR						0	kg	eggs		O
1998	US	CH	RU						4	kg	eggs		O
1998	US	CH	XX	500	g	eggs	T	O					
1998	AD	DE	KZ						7	kg	eggs	T	W
1998	AD	DE	RU						42	kg	eggs	T	W
1998	AE	DE	XX						5	kg	eggs	T	O
1998	AR	DE	KZ						2	kg	eggs	T	O
1998	AR	DE	RU						20	kg	eggs	T	O
1998	AU	DE	RU						140	kg	eggs	T	O
1998	BR	DE	KZ						90	kg	eggs	T	O
1998	BR	DE	RU						120	kg	eggs	T	O
1998	CA	DE	KZ						19	kg	eggs	T	W
1998	CA	DE	KZ						11	kg	eggs	T	O
1998	CA	DE	RU						106	kg	eggs	T	O
1998	CA	DE	RU						1	kg	eggs	T	W
1998	CH	DE	IR	550	kg	eggs	T	W	508	kg	eggs	T	W
1998	CH	DE	IR	482	kg	eggs	T	O	147	kg	eggs	T	O
1998	CH	DE	KZ						97	kg	eggs	T	W
1998	CH	DE	KZ						30	kg	eggs	T	O
1998	CH	DE	RU	464	kg	eggs	T	O	65	kg	eggs	T	O
1998	CH	DE	RU	192	kg	eggs	T	W	89	kg	eggs	T	W
1998	CL	DE	IR						87	kg	eggs	T	W
1998	CL	DE	RU						30	kg	eggs	T	O
1998	CO	DE	XX						8	kg	eggs	T	O
1998	CY	DE	KZ						22	kg	eggs	T	W
1998	CZ	DE	IR						780	g	eggs	T	O
1998	CZ	DE	IR	1	kg	eggs	T	W					
1998	CZ	DE	RU						672	g	eggs	T	O
1998	CZ	DE	RU	6	kg	eggs	T	W	1	kg	eggs	T	W
1998	CZ	DE	RU						5	kg	eggs	T	O
1998	HK	DE	IR						8	kg	eggs	T	O
1998	HK	DE	KZ						25	kg	eggs	T	O
1998	HK	DE	RU						157	kg	eggs	T	O
1998	HR	DE	KZ						6	kg	eggs	T	W
1998	HR	DE	RU						4	kg	eggs	T	O
1998	IN	DE	KZ						200	g	eggs	T	O
1998	IN	DE	XX						10	kg	eggs	T	O
1998	JO	DE	KZ						5	kg	eggs	T	O
1998	JP	DE	AZ						25	kg	eggs	T	O
1998	JP	DE	KZ						268	kg	eggs	T	O
1998	JP	DE	RU						2,990	kg	eggs	T	O
1998	JP	DE	RU						727	kg	eggs	T	W
1998	KR	DE	KZ						25	kg	eggs	T	O
1998	KR	DE	KZ						20	kg	eggs	T	W
1998	KR	DE	RU						204	g	eggs	T	O
1998	KR	DE	RU						68	kg	eggs	T	O
1998	KR	DE	RU	4	kg	eggs	T	W					
1998	KW	DE	RU						131	kg	eggs	T	O
1998	MT	DE	RU						336	g	eggs	T	O
1998	MU	DE	RU						7	kg	eggs	T	O
1998	MX	DE	XX						10	kg	eggs	T	O

			Imports reported					Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit	Term	P S	Quantity	Unit	Term	P	S
1998	MY	DE	AZ					150	kg	eggs	T	O
1998	MY	DE	IR					85	g	eggs	T	O
1998	MY	DE	RU					20	kg	eggs	T	O
1998	NO	DE	IR					21	kg	eggs	T	O
1998	NO	DE	KZ					50	kg	eggs	T	W
1998	NO	DE	KZ					24	kg	eggs	T	O
1998	NO	DE	RU					27	kg	eggs	T	O
1998	NO	DE	RU					9	kg	eggs	T	W
1998	NZ	DE	RU					60	kg	eggs	T	O
1998	PE	DE	KZ					2	kg	eggs	T	O
1998	PH	DE	KZ					100	kg	eggs	T	O
1998	PL	DE	KZ					5	kg	eggs	T	O
1998	PL	DE	RU					56	kg	eggs	T	O
1998	RU	DE	RU					8	kg	eggs	T	O
1998	SA	DE	KZ					115	kg	eggs	T	O
1998	SA	DE	RU					735	kg	eggs	T	O
1998	SG	DE	AZ	25	kg	eggs	T O	13	kg	eggs	T	O
1998	SG	DE	IR	8	kg	eggs	T O	8	kg	eggs	T	O
1998	SG	DE	KZ	168	kg	eggs	T O	169	kg	eggs	T	O
1998	SG	DE	KZ					87	kg	eggs	T	W
1998	SG	DE	RU	1,095	kg	eggs	T O	66	kg	eggs	T	O
1998	SG	DE	RU	87	kg	eggs	T W					
1998	SY	DE	KZ					7	kg	eggs	T	O
1998	TH	DE	IR					256	g	eggs	T	O
1998	TH	DE	KZ					363	kg	eggs	T	O
1998	TH	DE	KZ					256	g	eggs	T	O
1998	TR	DE	KZ					18	kg	eggs	T	O
1998	TW	DE	RU					40	kg	eggs	T	O
1998	US	DE	HK	26,008		eggs	T W					
1998	US	DE	KZ	174	kg	eggs	T O	708	kg	eggs	T	O
1998	US	DE	KZ	114	kg	eggs	T W	420	kg	eggs	T	W
1998	US	DE	NZ	300		eggs	T O					
1998	US	DE	RU	3,716	kg	eggs	T W					
1998	US	DE	RU	1,053	kg	eggs	T O	2711	kg	eggs	T	O
1998	US	DE	RU	170		eggs	T W					
1998	US	DE	RU	100	kg	eggs	P W					
1998	US	DE	RU	60		eggs	T O					
1998	US	DE	RU	50	kg	eggs	T U					
1998	US	DE	XX	246	kg	eggs	T O	59	kg	eggs	T	O
1998	US	DE	XX	17	kg	eggs	T I					
1998	US	DE	XX	8	kg	eggs	T W					
1998	US	DE	RU	50	kg	meat	T W					
1998	UY	DE	KZ					14	kg	eggs	T	O
1998	ZA	DE	RU					682	g	eggs	T	W
1998	ZA	DE	RU					41	kg	eggs	T	O
1998	ZA	DE	RU					1	kg	eggs	T	W
1998	ZA	DE	XX					17	kg	eggs	T	O
1998	BR	DK	RU					65	kg	eggs	T	W
1998	CH	DK	IR	2,658	kg	eggs	T W	1,586	kg	eggs	T	W
1998	CH	DK	IR	1,425	kg	eggs	T O	1,930	kg	eggs	T	O
1998	CH	DK	RU	302	kg	eggs	T W	262	kg	eggs	T	W
1998	CH	DK	RU	150	kg	eggs	T O	270	kg	eggs	T	O
1998	JP	DK	IR					2	kg	eggs	T	W
1998	MA	DK	RU					21	kg	eggs	T	O

			Imports reported						Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit	Term	P	S	Quantity	Unit	Term	P	S
1998	MU	DK	IR						27	kg	eggs	T	W
1998	NO	DK	IR						3	kg	eggs	T	W
1998	SA	DK	IR						3	kg	eggs	T	W
1998	TH	DK	IR						15	kg	eggs	T	O
1998	US	DK	RU	23	kg	eggs	T	W					
1998	US	DK	RU						2	kg	eggs	T	O
1998	US	DK	XX	128		eggs	T	W					
1998	RU	FI	RU						50	kg	eggs	T	W
1998	AD	FR	IR						16	kg	eggs	T	W
1998	AD	FR	IR						2	kg	eggs	T	O
1998	AN	FR	IR						2	kg	eggs	T	W
1998	AO	FR	IR						1	kg	eggs	T	W
1998	AR	FR	IR						3	kg	eggs	T	O
1998	AR	FR	KZ						4	kg	eggs	T	O
1998	BR	FR	IR						10	kg	eggs	T	O
1998	BR	FR	IR						4	kg	eggs	T	W
1998	BS	FR	IR						85	kg	eggs	T	W
1998	BS	FR	IR						2	kg	eggs	T	O
1998	CA	FR	AZ						9	kg	eggs	T	O
1998	CA	FR	IR						1	kg	eggs	T	O
1998	CA	FR	KZ						10	kg	eggs	T	O
1998	CA	FR	KZ						7	kg	eggs	T	W
1998	CA	FR	RU						10	kg	eggs	T	O
1998	CG	FR	IR						3	kg	eggs	T	W
1998	CH	FR	IR	155	kg	eggs	T	O	155	kg	eggs	T	O
1998	CH	FR	IR	143	kg	eggs	T	W	153	kg	eggs	T	W
1998	CH	FR	KZ	2	kg	eggs	T	W	2	kg	eggs	T	W
1998	CI	FR	IR						252	kg	eggs	T	W
1998	CI	FR	IR						8	kg	eggs	T	O
1998	CM	FR	IR						4	kg	eggs	T	W
1998	CM	FR	KZ						2	kg	eggs	T	O
1998	CY	FR	KZ						2	kg	eggs	T	W
1998	GA	FR	IR						7	kg	eggs	T	W
1998	GA	FR	KZ						1	kg	eggs	T	O
1998	HK	FR	IR						13	kg	eggs	T	W
1998	HK	FR	IR						11	kg	eggs	T	O
1998	HK	FR	KZ						19	kg	eggs	T	O
1998	HK	FR	KZ						5	kg	eggs	T	W
1998	HT	FR	IR						1	kg	eggs	T	W
1998	ID	FR	IR						2	kg	eggs	T	W
1998	JP	FR	IR						49	kg	eggs	T	W
1998	JP	FR	IR						1	kg	eggs	T	O
1998	JP	FR	KZ						4	kg	eggs	T	O
1998	KR	FR	IR						100	kg	eggs	T	O
1998	LB	FR	IR						22	kg	eggs	T	W
1998	LB	FR	IR						4	kg	eggs	T	O
1998	LC	FR	IR						2	kg	eggs	T	W
1998	LI	FR	KZ						1	kg	eggs	T	W
1998	MC	FR	IR						7	kg	eggs	T	W
1998	MR	FR	IR						1	kg	eggs	T	W
1998	MU	FR	IR						3	kg	eggs	T	W
1998	MX	FR	IR						36	kg	eggs	T	W
1998	MX	FR	IR						11	kg	eggs	T	O
1998	MX	FR	KZ						5	kg	eggs	T	W

			Imports reported						Exports reported				
Year	**Imp.**	**Exp.**	**Origin**	**Quantity**	**Unit**	**Term**	**P**	**S**	**Quantity**	**Unit**	**Term**	**P**	**S**
1998	MY	FR	IR						1	kg	eggs	T	W
1998	NC	FR	IR						12	kg	eggs	T	W
1998	PF	FR	IR	5	kg	eggs	T	W	3	kg	eggs	T	W
1998	PF	FR	KZ						1	kg	eggs	T	O
1998	PF	FR	RU	1	kg	eggs	T	O	1	kg	eggs	T	O
1998	SA	FR	IR						15	kg	eggs	T	W
1998	SA	FR	KZ						2	kg	eggs	T	O
1998	SG	FR	IR	8	kg	eggs	T	O	9	kg	eggs	T	O
1998	SG	FR	IR	4	kg	eggs	T	W	34	kg	eggs	T	W
1998	SG	FR	KZ						3	kg	eggs	T	O
1998	SG	FR	KZ	1	kg	eggs	T	W					
1998	SN	FR	IR						73	kg	eggs	T	W
1998	SN	FR	IR						8	kg	eggs	T	O
1998	TH	FR	IR						2	kg	eggs	T	W
1998	TN	FR	IR						5	kg	eggs	T	W
1998	TW	FR	IR						17	kg	eggs	T	W
1998	TW	FR	IR						1	kg	eggs	T	O
1998	US	FR	KZ						134	kg	eggs	T	O
1998	US	FR	KZ						20	kg	eggs	T	W
1998	US	FR	RU	154	kg	eggs	T	W					
1998	UY	FR	IR						2	kg	eggs	T	W
1998	ZA	FR	IR						1	kg	eggs	T	O
1998	ZA	FR	KZ						1	kg	eggs	T	O
1998	AR	GB	IR						2	kg	eggs	T	W
1998	BH	GB	AZ						43	kg	eggs	T	W
1998	BH	GB	AZ						11	kg	eggs	T	O
1998	CH	GB	RU	41	kg	eggs	T	O					
1998	HK	GB	IR						1	kg	eggs	T	W
1998	IS	GB	IR						2	kg	eggs	T	W
1998	JP	GB	IR						129	kg	eggs	T	W
1998	JP	GB	XX						575	kg	eggs	T	W
1998	MX	GB	IR						1	kg	eggs	T	W
1998	OM	GB	AZ						20	kg	eggs	T	W
1998	OM	GB	AZ						8	kg	eggs	T	O
1998	PH	GB	XX						59	kg	eggs	T	W
1998	QA	GB	AZ						51	kg	eggs	T	O
1998	QA	GB	AZ						4	kg	eggs	T	W
1998	SA	GB	IR						1	kg	eggs	T	W
1998	XX	GB	AZ						6	kg	eggs	T	W
1998	ZA	GB	KZ						60	kg	eggs	T	W
1998	CH	GR	IR	5	kg	eggs	T	O					
1998	US	GR	RU	20,400		eggs	T	O					
1998	US	GR	RU	63	kg	eggs	T	O					
1998	US	HK	RU	40.8	kg	eggs	T	O					
1998	AT	IR		8,250	kg	eggs	T	O					
1998	BE	IR		80	kg	eggs	T	W					
1998	CH	IR		3,205	kg	eggs	T	O					
1998	CH	IR		540	kg	eggs	T	W					
1998	CH	IR	RU	6,160	kg	eggs	T	W					
1998	CH	IR		20	kg	meat	T	W					
1998	CH	IR	RU	8		skins	T	W					
1998	DE	IR		2,446	kg	eggs	T	O					
1998	DE	IR		1167	kg	eggs	T	W					
1998	DK	IR		1,600	kg	eggs	T	W					

			Imports reported					Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit	Term	P	S	Quantity	Unit	Term	P	S
1998	ES	IR		4430	kg	eggs	T	W					
1998	ES	IR		400		eggs	T	W					
1998	FR	IR		13,651	kg	eggs	T	W					
1998	FR	IR		1,020	kg	eggs	T	O					
1998	FR	IR		4,715	kg	meat	T	W					
1998	GB	IR		1,505	kg	eggs	T	W					
1998	IT	IR		4,000	kg	bodies	T	W					
1998	US	IR		1,500		eggs		W					
1998	US	IR		1,000	g	eggs		W					
1998	ID	NL	IR						11		eggs	T	W
1998	ID	NL	RU						2		eggs	T	W
1998	JP	NL	RU						700		eggs	T	O
1998	JP	NL	RU						5	kg	eggs	T	O
1998	ZA	NL	IR						1	kg	eggs	T	W
1998	US	PE	RU	16,800	g	eggs	P	W					
1998	DE	PL	RU						3,050	kg	eggs		W
1998	DE	PL	RU	2,550	kg	eggs	T	O					
1998	DE	PL		25,000		live	T	C	25,000		live		C
1998	GB	PL	RU						340	kg	eggs		W
1998	US	PL	RU						1,430	kg	eggs		W
1998	US	PL	RU	300	kg	eggs	T	W					
1998	US	PL	RU	240	kg	eggs	T	O					
1998	US	PL	RU	40	kg	eggs	T	I					
1998	GR	RO		2	kg	eggs	T	W					
1998	US	RO		200		eggs	T	W					
1998	US	RO		58	kg	eggs	T	O					
1998	AE	RU							255	kg	eggs	T	W
1998	AE	RU	KZ						263	kg	eggs	T	W
1998	AZ	RU							106	kg	eggs	T	W
1998	BE	RU		872	kg	eggs	T	W	870	kg	eggs	T	W
1998	CH	RU		14,625	kg	eggs	T	W	865	kg	eggs	T	W
1998	CH	RU		331	kg	eggs	T	O					
1998	CH	RU	AZ						405	kg	eggs	T	W
1998	CH	RU	KZ						14,625	kg	eggs	T	W
1998	DE	RU		3,833	kg	eggs	T	W	5,024	kg	eggs	T	W
1998	DE	RU		455	kg	eggs	T	O	748	kg	eggs	T	O
1998	DK	RU		395	kg	eggs	T	W	702	kg	eggs	T	W
1998	FI	RU		50	kg	eggs	T	W	50	kg	eggs	T	W
1998	FR	RU		627	kg	eggs	T	W	674	kg	eggs	T	W
1998	FR	RU	KZ	840	kg	eggs	T	W	2,842	kg	eggs	T	W
1998	JP	RU							3,025	kg	eggs	T	W
1998	NL	RU		816	kg	eggs	T	W	2,082	kg	eggs	T	W
1998	RO	RU							4	kg	eggs	T	W
1998	US	RU		92	kg	eggs	T	I					
1998	US	RU		3,094	kg	eggs	T	W	3,630	kg	eggs	T	W
1998	US	RU		500	kg	eggs	T	O	2,520	kg	eggs	T	O
1998	US	RU		263		eggs	T	W					
1998	US	RU							25	kg	eggs	T	C
1998	DE	SA	KZ	79	kg	eggs	T	O					
1998	CH	SG	IR	15	kg	eggs	T	O	15	kg	eggs	T	O
1998	JP	SG	RU						53	kg	eggs	T	O
1998	JP	SG	RU						53	kg	eggs	T	W
1998	US	SG	RU	1		eggs	T	W					
1998	US	TK	RU	21	kg	eggs	T	W					

			Imports reported						Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit	Term	P	S	Quantity	Unit	Term	P	S
1998	CH	TR	RU	1,517	kg	eggs	T	O	1,519	kg	eggs	T	O
1998	JP	TR	XX						25	kg	eggs	T	O
1998	US	TR		390	kg	eggs	T	I					
1998	US	TR		2	g	eggs	T	I					
1998	US	TR	RU	3,401	kg	eggs	T	W					
1998	US	TR	RU	2,098	kg	eggs	T	O	6,209	kg	eggs	T	O
1998	US	TR	RU	310		eggs	T	O					
1998	US	TR	RU	2		eggs	T	I					
1998	US	TR	RU	1	g	eggs	T	W					
1998	US	TR	XX						2,909	kg	eggs	T	O
1998	US	TR	XX	18	kg	eggs	T	I					
1998	AR	US	RU						53	kg	eggs	T	W
1998	AR	US	RU						13	kg	eggs	T	O
1998	AR	US	RU						4		eggs	T	O
1998	AU	US	RU						42	kg	eggs	T	O
1998	AU	US	RU						42	kg	eggs	T	W
1998	CA	US	CA						35		eggs	T	O
1998	CA	US	RU						1,264	kg	eggs	T	W
1998	CA	US	RU						339	kg	eggs	T	O
1998	CA	US	RU						139		eggs	T	W
1998	CA	US	RU						99		eggs	T	O
1998	CL	US	RU						20	kg	eggs	T	W
1998	DE	US	KZ						3,600	g	eggs	T	W
1998	DE	US	RU						21,770	g	eggs	T	O
1998	DE	US	RU						5,321	kg	eggs	T	W
1998	DE	US	RU	1,064	kg	eggs	T	O	410	kg	eggs	T	O
1998	DE	US	RU						616	g	eggs	T	W
1998	DK	US	RU						202	kg	eggs	T	O
1998	DK	US	RU						81	kg	eggs	T	W
1998	ES	US	RU						41	kg	eggs	T	W
1998	ES	US	RU	21	kg	eggs	T	O	15	kg	eggs	T	O
1998	ES	US	XX	36	kg	eggs	T	O					
1998	FR	US	RU						128	kg	eggs	T	O
1998	FR	US	RU						91	kg	eggs	T	W
1998	GR	US	RU						230.4	kg	eggs	T	O
1998	GR	US	RU						49	kg	eggs	T	W
1998	GR	US	RU						20		eggs	T	O
1998	GR	US	SV						41	kg	eggs	T	W
1998	IT	US	RU						10.5	kg	eggs	T	O
1998	JP	US	RU						1	kg	eggs	T	W
1998	LC	US	RU						1	kg	eggs	T	W
1998	MC	US	RU						38	kg	eggs	T	W
1998	MC	US	RU						21	kg	eggs	T	O
1998	MX	US	RU						4	kg	eggs	T	W
1998	MX	US	RU						9	kg	meat	T	W
1998	NL	US	RU						42	kg	eggs	T	W
1998	NL	US	RU						41	kg	eggs	T	O
1998	NO	US	RU						225	kg	eggs	T	O
1998	PT	US	RU						167.4	kg	eggs	T	W
1998	PT	US	RU						105	kg	eggs	T	O
1998	RU	US	RU						55	kg	eggs	T	O
1998	SE	US	RU						42	kg	eggs	T	O
1998	SG	US	RU	27	kg	eggs	T	W	27	kg	eggs	T	W
1998	TR	US	RU						266	kg	eggs	T	W

			Imports reported					Exports reported				
Year	**Imp.**	**Exp.**	**Origin**	**Quantity**	**Unit**	**Term**	**P**	**S**	**Quantity**	**Unit**	**Term**	**P**	**S**
1998	TR	US	RU						167	kg	eggs	T	O
1998	UY	US	RU						20	kg	eggs	T	W
1998	ZA	US	RU						14	kg	eggs	T	O
			Total:	**121,274.7 kg**		**eggs**			**109,501.3 kg**		**eggs**		

Huso dauricus Georgi, 1775

Kaluga
Great Siberian Sturgeon

Order: ACIPENSERIFORMES

Family: ACIPENSERIDAE

SUMMARY

Kaluga *Huso dauricus* is one of two species of Acipenseriformes endemic to the Amur River Basin, located in the Russian Federation and in China. It is one of the largest species of sturgeon and has a relatively low reproductive rate, reaching sexual maturity at 14-23 years and spawning every 3-5 years. The species has apparently been declining in numbers for more than a century. The main threat to the species appears to be over exploitation, but the Amur River is now being increasingly degraded by pollution from oil products, mineral fertilisers from agricultural development, and by-products of gold mining operations. Although the Amur River has not yet been affected by the construction of dams, plans for such construction exist and if achieved would render numerous spawning grounds inaccessible.

Historically, the highest sturgeon catches were recorded on the middle reach of the river, where both Chinese and Russian fisheries operate. However, as the two species *H. dauricus* and *Acipenser schrencki* Amur Sturgeon are rarely distinguished in harvest statistics, it is difficult to assess the impact of harvest on each species individually. Official catch records of *H. dauricus* in the former USSR and the Russian Federation dropped gradually from 595 t in 1881 to 61 t in 1948, and increased to 89 t in 1996. In 1998, the annual catch quota for *H. dauricus* was 309 individuals (legal minimum size limits of 200 cm and 65 kg) with a potential caviar production of 4,045 kg. Kaluga caviar reported in international trade in 1998 totalled 7,239 kg (4,481 kg from China and 2,758 kg from the Russian Federation). The Russian Federation decreased the caviar export quota for 1999 (3,500 kg compared to 3,600 kg for 1998), but increased it for 2000 (6,000 kg, plus a quota of 18,000 kg of meat). According to current available data, it appears that the caviar export quota was exceeded in the Russian Federation by 133 kg for 1999. China has set lower caviar export quotas of 3,430 kg per year for both 1999 and 2000. The domestic consumption of caviar in the Russian Federation is unknown and in China it is estimated to be 20% of the total national production. Captive breeding of this species has not yet been successful and *H. dauricus* restocking programmes and commercial captive breeding facilities therefore do not exist.

DISTRIBUTION AND POPULATION

The CITES database lists the distribution of *Huso dauricus* as: China, Russian Federation, former USSR (Anon., 2000a).

H. dauricus is classified as Endangered by IUCN (1996):
EN A1acde + 2d China, Russia [Amur River].

The Amur River is 4,092 km long if its longest tributary, the Shilka River, is included (Krykhtin and Svirskii, 1997a). The middle reach of the Amur River, where it is bordered by both the Russian Federation and China, is 975 km long. It extends from the city of Blagoveshchensk (Heihe in China) to the mouth of the Ussuri (Wusuli) River between Khabarovsk (Russian Federation) and Fuyan (China), 966 km from the estuary (Krykhtin and Svirskii, 1997a).

H. dauricus is endemic to the Amur River basin, its tributaries and lakes. Young enter the Okhotsk Sea during the summer. The species distribution is fragmented with a population living in the estuary and coastal zones that is distinguishable from populations in the lower Amur, middle Amur and Zeya-Bureya River systems (Krykhtin and Svirskii, 1997b; Svirskii, 1971).

All populations have decreased considerably due to increased fishing since the 19th century when the highest catches were recorded, and the middle Amur population was the largest (Krykhtin and Svirskii, 1997b). At present, the estuary population is the most abundant and had increased by 35% since fishing restrictions were introduced in 1976. However by 1993, this population was estimated to have been reduced by 30-35%, due to illegal fishing (Krykhtin and Svirskii, 1997b).

During the latter part of the 1980s, Krykhtin and Svirskii (1997b) estimated population sizes using mark and recapture methods. The results show that the estuary population is the most abundant with approximately 70,000 individuals aged one year or more. Approximately 14% of this population was thought to be potentially sexually mature individuals, but by the early 1990s this percentage had decreased by about one third due to illegal catches (Krykhtin and Svirskii, 1997a). The lower Amur population was estimated to consist of approximately 40,000 individuals aged two years or older and the mid Amur population to consist of 30,000 such individuals. The Zeya-Bureya population was very small (Krykhtin and Svirskii, 1997a).

Current populations consist predominantly of young fish, with mature fish accounting for only 2-3% of the population (Krykhtin and Svirskii, 1997b). As a result of the species' late maturation and generally low reproductive rate, the population decline is expected to continue, especially in the middle Amur.

China: Two populations of the species occur in China, the largest one in the middle Amur River and the other in the brackish estuary waters of the Sea of Japan (Krykhtin and Svirskii, 1997b). Spawning sites are located at the mouth of the Ahaoxing, Pingyanghe, Quingdeli, Xiabaca, Xueshuiwen and Yadanhe rivers) (Wei *et al*., 1997).

Russian Federation: Four populations of the species occur in the Russian Federation, the two largest ones inhabiting the lower and middle reaches of the Amur River, and the two smallest ones occurring in the Burya and Zeya rivers, and the coastal brackish waters of the Sea of Japan and Sea of Okhotsk. The Zeya-Bureya population is thought to be on the verge of extinction having only single specimens recorded in the upper region of the mid Amur and lower regions of the Zeya, Shilka and Argun Rivers (Krykhtin and Svirskii, 1997b).

HABITAT AND ECOLOGY

H. dauricus is one of the largest freshwater fishes; its total size can exceed 5.6 m in length, 1 t in weight and it can live for over 80 years (Anon., 1997). Juveniles up to one year of age feed on invertebrates; from three to four years of age they switch to feed on adult fish and cannibalism is frequent (Krykhtin and Svirskii, 1997b). According to a survey of the *H. dauricus* spawning population conducted in China, at 220 cm few specimens had reached sexual maturity (13.8% for males and 31.6% for females). In a sample of fish taken in 1978-1979, the spawning population ranged from 12-54 years of age, and age correlated positively with length and weight. Fecundity ranged from 383,400-3,280,000, and the number of eggs per gram of body weight averaged 41.4 (Wei *et al*., 1997). Krykhtin and Svirskii (1997b) reported that males of the estuary population reach sexual maturity at 14-21 years of age and females at 17-23 years. Males spawn every three to four years and females every four to five years. Many individuals of the middle Amur population reach sexual maturity much earlier than the estuary population.

The estuary population comprises 75-80% of the freshwater form and the remainder are the saltwater form. The latter winters in the freshwater zone, and migrates to the brackish water of the delta to the northern part of the Tatar Strait and the south-western part of the Sakhalin Gulf for feeding in June and July. It returns to the freshwater zone in autumn when the salinity increases. For spawning, most of the population migrates in winter to grounds up to 500 km from the river mouth, whilst others enter the mid-Amur River.

The lower Amur population feeds in the lower river; mature fish migrate and use the same spawning grounds and time frame as the estuary population. The middle Amur population inhabits an area that begins at about 950 km upstream of the river mouth (Krykhtin and Svirskii, 1997a). Spawning migration to the lower regions of the middle Amur take place in May and June.

In May and June, adults of the Zeya-Bureya population migrate to the upper Amur to spawn.

THREATS TO SURVIVAL AND DOMESTIC USE

In contrast to most large rivers, the Amur River has not been dammed. However, the revival of certain dam construction plans would threaten to block access to a great number of spawning sites (Birstein, 1993). Investigations on ovaries by Svirskii (1984, cited in Krykhtin and Svirskii, 1997a) showed that a

parasite *Polypodium hydroforme* decreased the fecundity of *H. dauricus* by approximately 19%. In addition, water pollution (heavy metals, oil products, phenol, mineral fertilisers and gold mining by-products) in the Amur has increased in recent years from both the Russian and Chinese banks (Matthieson, 1993; Krykhtin and Svirskii, 1997b). However, studies of the effects of pollution on sturgeon have not been undertaken.

Information provided suggests that amendments to previous regulations and/or adoption of new legislation are in effect in both range States, China and the Russian Federation. However, enforcement measures appear to be lacking and numerous experts as well as government officials have reported increasing pressure from illegal fishing practices and criminal activities around sturgeon poaching and black markets that have been reported in a large part of the range (Medetsky, 2000; Winchester, 2000).

Official catch records of *H. dauricus* in the Russian Federation and the former USSR dropped from 595 tonnes in 1881 to 61 t in 1948 (Krykhtin and Svirskii, 1997b), and was 89 t in 1996 (Anon., 2000b). Russian catch data for 1996 suggest that the current proportion of *A. schrencki* versus *H. dauricus* in the Amur River catch is 9% and 91% respectively (Anon., 2000b). However, late 19th century records suggested a 50% composition for each species (Krykhtin and Svirskii, 1997a).

Between 1993 and 1997, meat of *H. dauricus* was observed for sale both in markets and in shops in Khabarovsk, Komsomolsk-on-Amur, Nikolayevsk-on-Amur and Vladivostok (Anon., 2000b; TRAFFIC Europe-Germany, *in litt*. to TRAFFIC Europe, January 1997). Official records in China indicate that the combined annual catches of *A. schrencki* and *H. dauricus* fluctuated inconsistently since the 1950s

Combined annual catch of *A. schrencki* and *H. dauricus* (tonnes)

1959	**1969**	**1979**	**1987**	**1989**	**1997**	**1998**	**1999**
47	15	130	452	286	136	149	141

Source: TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000

In China, all caviar of a wild source is from *A. schrencki* and *H. dauricus* (CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000). Heilongjiang Province is the only province in China where caviar is processed from wild specimens (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000). Most caviar produced in China is destined for the export market; domestic consumption represents less than 20% of the total caviar production in the country (CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000).

Domestic consumption of *H. dauricus* caviar in China (kilogrammes)

	1993	**1994**	**1995**	**1996**	**1997**	***Average***
H. dauricus	498.0	492.0	878.0	416.0	452.0	*547.2*

Source: CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000

INTERNATIONAL TRADE

The listing of *H. dauricus* in CITES Appendix II entered into effect on 1 April 1998. Available complete trade data are therefore limited to nine months of trade (1 April to 31 December 1998).

Gross exports and the comparative tabulation of trade in *H. dauricus* for 1998 are given in the Appendix. CITES Annual Reports for 1998 show that China and the Russian Federation exported, respectively, 4,481 kg and 2,758 kg of caviar. The importing countries were Japan (4,995 kg), Germany (1,300 kg), USA (907 kg) and the United Arab Emirates (36 kg). In 1999, Russia exported a total of 3,632.8 kg of *H. dauricus* caviar, entirely destined for the USA (CITES Management Authority of the Russian Federation, *in litt*. to TRAFFIC Europe, 18 September 2000).

Caviar export quotas established by the Russian Federation and China for *H. dauricus* (kilogrammes)

		1998	pre-Convention	1999	2000
Caviar	**Russian Federation**	3,600		3,500	6,000
	China	3,487	1,500	3,430	3,430
	Total	7,087		6,930	9,430
Meat	**Russian Federation**	0		0	18,000

Source: *CITES Notification Nos. 1998/35-36-61, 1999/21-47-53-68 and 2000/053-056-061*

Only trade in 'caviar' has so far been detailed in CITES data. However, the Russian Federation has established an export quota of 18,000 kg of meat for *H. dauricus* for 2000.

There were no confiscations of *H. dauricus* reported in 1998, however smuggling of caviar on the Sino-Russian border seems to occur frequently during the migration season (Medetsky, 2000).

CONSERVATION MEASURES

The species is not fully protected in the Russian Federation or China.

China: The listing of *A. schrencki* and *H. dauricus* in the State Category of Protected Wildlife is expected to be adopted in the near future (CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000). The Heilongjiang Province authorities issued protection and management regulations, such as gear restrictions, harvest size, closed seasons and areas, and the requirement of a fishing license in the early 1950s. These were renewed in 1982 through "*The Heilongjiang Ordinance on the Protection and Propagation of Fisheries Resources*". However, the regulations have not been fully implemented (Wei *et al*., 1997).

Restriction on fishing size
The Ordinance of 1982 prescribed the minimum size limits for *A. schrencki* at 100 cm or 4 kg, and for *H. dauricus* at 200 cm or 65 kg (CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000). Sturgeon under these size and weight specifications must be released back in to the river (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000).

Other restrictions
According to the "Protocol on Fisheries Resources Conservation, Regulation and Multiplication in Border Areas of Heilong (Amur) River and Wusuli River (Ussuri) of The People's Republic of China and the Russian Federation*" adopted on 27 May 1994, fishing activities on the Heilong River are prohibited from mid-June to mid-July. The protocol also established areas where fisheries are prohibited; the mainstream of the Heilong River from Dagangzi, Luobei County, to Saniangkou where the Heilong and Songhua Rivers converge, were designated as no-fishing zones by the Government of China. The area where fishing is prohibited stretches over 1,270 km, from Fuyan (downstream) to Heihe (or Aihui; Blagoveshchensk on the Russian side) (upstream). These measures protect natural breeding sites, survival of juvenile fish and propagation of* A. schrencki *and* H. dauricus*.*

The catch of any specimen of *H. dauricus* and *A. schrencki* on the Chinese side of the Heilong (Amur) River requires prior acquisition of a fishing license. In 1991, 2,248 sturgeon fishing licenses were issued, and in 2000, the number was reduced to 1,850 (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000).

Restocking of juveniles
Breeding of *H. dauricus* in captivity has not yet been successful in China (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000).

Determination and allocation of quotas by local governments
Based on the average annual production from 1986 to 1988, the average size of fish landed, the decreasing rate of caviar production and the hydrological resource and migration conditions, Chinese scientists calculated Amur River sturgeon (*A. schrencki* and *H. dauricus*) annual catch quotas for the period 1989-1997. This quota was revised in 1997 and the Heilongjiang Province Fisheries Bureau

adopted a new total catch quota of 105.4 t for 1998. The latter is composed of: 1,888 individuals for *A. schrencki* with an expected caviar production of 3,235 kg; and 309 individuals for *H. dauricus* with an expected caviar production of 4,045 kg (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, Sept. 2000).

Processing and export company management
Caviar processing companies are required to register with the Heilongjiang Provincial Fisheries Bureau. In 1998, six companies were registered as sturgeon products processors, all established in Heilongjiang Province. Six other companies were registered as caviar exporters: four established in Heilongjiang Province, one in Beijing and one in Dalian Free Trade Zone (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000). According to the Ministry of Agriculture's "*Regulation on Special License of Aquatic Wildlife Utilization, the People's Republic of China*", caviar processing companies must acquire special qualification from the local Fisheries Bureau, including a "special (caviar) purchase license" and a "special (caviar) processing license". Caviar purchase and processing are controlled by the local Fisheries Bureau. In principle, the Fisheries Bureau will gradually decrease the number of licenses and also monitor those companies with special purchase and production licenses. According to the *"Law of Wildlife Protection of the People's Republic of China*", the Ministry of Agriculture only issues caviar trade licenses to a limited number of import and export companies. The Ministry of Agriculture strictly controls companies that receive a special license.

Russian Federation: A prohibition on sturgeon catch throughout the USSR was adopted in 1923 and then withdrawn in 1930. A ban on the catch of *A. schrencki* and *H. dauricus* was introduced in 1958. This prohibition is still in effect (Krykhtin and Svirskii, 1997a), however a tolerance called "controlled catch" for incidental and scientific catches is allowed. These catches are the current source of caviar and sturgeon meat from the Amur River. The "controlled catch" is apparently not well defined and difficult to control (Anon., 2000b).

Russian catch quotas for 1999 and 2000 were adopted by the Federal Government following the recommendations set by the State Fisheries Committee in consensus with an independent body of experts, at 15 t per year for *A. schrencki* and 65 t per year for *H. dauricus* (Anon., 2000b).

CAPTIVE BREEDING

Both the Russian Federation and China are constructing sturgeon hatcheries on the Amur River, but aquaculture of *H. dauricus* specifically is not reported (Krykhtin and Svirskii, 1997a). In China, experimental captive breeding is carried out in governmental and private facilities. In 2000, the Heilongjiang Province Fisheries Bureau authorised eight stations to undertake research on the captive breeding of *A. schrencii* and *H. dauricus* (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000).

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 and China has not reported the results of their research on sturgeon captive breeding and the development of commercial farms.

Sturgeon hatcheries and farms are developing rapidly world-wide. These have led to the successful production of juveniles for the rehabilitation of wild populations, as well as significant production of sturgeon meat and caviar. In China, sturgeon aquaculture started in 1957 and has developed quickly since the 1980s; most species bred in captivity in China are sturgeon species occurring in the Russian Federation and *A. schrencki* is recognised as an important species for the sturgeon aquaculture industry (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000). The captive breeding of *H. dauricus* has not yet been successful (CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000), but research stations are carrying out experimental breeding of the species in Heilongjiang Province (TRAFFIC East Asia, *in litt*. to TRAFFIC Europe, September 2000).

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Gross exports of, and export quotas for *Huso dauricus* 1998

TAXON	TERM	UNIT	Exporter	1998	Quotas 1998 (kg)
Huso dauricus	eggs	kg	CN	4,481	3,487 + 1,500 pre-Convention
Huso dauricus	eggs	kg	DE	0	
Huso dauricus	eggs	kg	RU	2,758	3,600

Comparative Tabulation of trade in *Huso dauricus* 1998

				Imports reported					Exports reported				
Year	**Imp.**	**Exp.**	**Origin**	**Quantity**	**Unit**	**Term**	**P**	**S**	**Quantity**	**Unit**	**Term**	**P**	**S**
1998	AE	CN							36	kg	eggs	T	W
1998	DE	CN		1,100	kg	Eggs	T	O	1,100	kg	eggs	T	O
1998	DE	CN							200	kg	eggs	T	W
1998	JP	CN							2,629	kg	eggs	T	W
1998	US	CN		516	kg	eggs	T	W	516	kg	eggs	T	W
1998	JP	RU							2,366	kg	eggs	T	W
1998	US	RU		392	kg	eggs	T	W	391	kg	eggs	T	W
TOTAL				***2,008 kg***					***7,238 kg***				

Huso huso Gray, 1827

Beluga
Giant Sturgeon

Order: ACIPENSERIFORMES

Family: ACIPENSERIDAE

SUMMARY

Beluga *Huso huso* has a wide distribution. It occurs in the Caspian Sea, Black Sea and the Sea of Azov and many of the tributaries of these seas including the Volga and Danube rivers. It is the largest species of Acipenseriformes reaching a length of six metres and a weight of more than one tonne. The Volga River is the major spawning river for the species. However the construction of dams on virtually all these rivers has significantly reduced the spawning area. Currently, 96% of *H. huso* in the Volga River consist of hatchery-reared fish. Captive breeding does not compensate for the loss of natural reproduction and *H. huso* continues to decline. In addition to loss of habitat, the species has been subject to overfishing and egg-production has been disrupted due to environmental pollution.

Historically, *H. huso* were harvested more intensively than Russian Sturgeon *Acipenser gueldenstaedtii* or Stellate Sturgeon *A. stellatus* (Khodorevskaya *et al*., 1997). The catch of *H. huso* in the northern Caspian Sea dropped from approximately 2,800 tonnes (t) in 1970 to less than 300 t in 1994. Available data suggest that the Caspian Sea catch of *H. huso* in 1997 was 339 t. The species was always abundant in the Danube River, with an average of 23 t caught annually in the middle Danube River from 1972 to 1976. This catch decreased to 7.5 tonnes per year from 1985 to 1989 after the construction of Djerdap dams I and II. More recently, recorded landings from the Lower Danube River in Romania and Bulgaria decreased from 62.1 t in 1997 to 42.7 t in 1999. The importance of domestic markets of caviar and sturgeon meat is unknown in the Russian Federation. In Iran, for the past five years, the domestic consumption has been estimated at 5% and 65% of the country's respective production of caviar and meat. In 1998, exports of *H. huso* totalled 21,267 kg of caviar (8,035 kg from the Russian Federation, 7,033 kg from Kazakhstan and 4,013 kg from Iran) and 15,755 kg of meat and 22 skins from Iran, destined for Italy and Switzerland, respectively. Assuming that 6-7 kg of caviar is obtained per 100 kg of sturgeon caught (both male and female), total caviar exports for 1998, i.e. 21.3 t, represents a catch of 304-354 t. Caviar export quotas for 1998 were set at 5 t by Iran, 2.5 t by Bulgaria and 5 t by the Russian Federation. For 1999, the Russian Federation's caviar export quota was set at 3 t; export quotas were exceeded in 1998 and 1999 by 3 t and 2.7 t respectively. The combined export quotas set by range States have increased from 16.6 t to 17.2 t of caviar, and from 15.5 t to 111 t of meat for 1999 and 2000, respectively.

The species is recommended under Decision 11.106 for inclusion in category 1 (i).

DISTRIBUTION AND POPULATION

The CITES database lists the distribution of *H. huso* as: Azerbaijan, Bulgaria, Croatia, Czech Republic? (ex), Georgia, Hungary, Iran (Islamic Republic of), Italy (ex), Kazakhstan, Moldova, Republic of, Romania, Russian Federation, Slovenia, Turkey, Turkmenistan, Ukraine, Yugoslavia (Anon., 2000a).

H. huso is classified as Endangered by IUCN (1996):

EN A2d Azerbaijan, Bulgaria, Hungary, Iran, Italy, Kazakhstan, Moldova, Romania, Russian Federation, Turkmenistan, Ukraine, Yugoslavia

Sea of Azov stock: CR A1acde + 2d Russia [Mediterranean and Black Sea]

Black Sea stock: EN A1acde + 2d Hungary, Romania, Russian Federation, Ukraine, Yugoslavia [Mediterranean and Black Sea]

Caspian Sea stock: EN A1acde + 2d in Azerbaijan, Iran, Kazakhstan, Russian Federation, Turkmenistan

Adriatic Sea stock: EX Italy [Mediterranean and Black Sea].

H. huso is historically widespread, inhabiting the Caspian and Black seas and the Sea of Azov. The most recent record of the species in the Sea of Azov is from the mid 1980s (Volovik *et al.*, 1993), when *H. huso* was believed to make up 3% of the total sturgeon biomass. It is now believed extinct in the Adriatic where historically, solitary individuals occurred. The last report of the species in the Po River Basin is from 1972 (Rossi *et al.*, 1991).

A seasonal migration occurs in the Caspian; in the summer the main feeding grounds are in the north and in the winter in the south (Barannikova *et al.*, 1995). There are no estimates of the total population size. The main spawning population enters the Volga; the other spawning populations of the Caspian are thought to be minimal (Khodorevskaya and Novikova, 1995; Levin, 1997; Vlasenko, 1990).

Azerbaijan: Historically the species spawned in the Kura River, but more recent information suggests that *H. huso* no longer use the Kura River (Khodorevskaya *et al*., 1997; Levin, 1997). The coastal waters of Azerbaijan are important feeding grounds for *H. huso*, which feeds primarily on fish such as sprat and *kilka* (Clupeidae) (CITES Management Authority of Azerbaijan, *in litt*. to TRAFFIC Europe, 18 September 2000).

Bulgaria: Part of the Black Sea population, *H. huso* in the Danube River breed in spring (early April - when the first catch of the year are recorded) and in autumn (end-September) (CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000).

Czech Republic: *H. huso* is extinct, with the last specimen being caught in the Morava River at Lanžhot at the beginning of 20th century (Holcík, 1995).

Georgia: The southeast coast of the Black Sea is an important feeding and wintering area for sturgeon (*H. huso*, *Acipenser stellatus*, *A. nudiventris*, *A. persicus colchicus* and *A. sturio*) that migrate upstream in a number of rivers for spawning. The main rivers used are the Supsa, Inguri, Chorokhi, and particularly the Rioni (Zarkua and Tsuladze, 1999).

Hungary: Historically, Hungary formed the main spawning ground for this species in the Danube, but catches began to decline from the 16th century onwards. Very few were taken during the early 20th century. The last specimen caught in 1987 was an exceptional rarity and the species is regarded as extinct in Hungary (Pintér, 1991).

Iran: Razavi (1988) notes that *H. huso* enters the Sefidrud, Tajen and Gorganrud rivers in the southern shores of the Caspian Sea for spawning. This species is considered one of the most valuable sturgeon species of Iran. It migrates during February to April, but sometimes is also seen in these rivers during the autumn months. However, Dr J. Holcík (*in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000) maintains that the Mangil Dam on the Sefidrud River prevents sturgeon from entering this river where all spawning grounds have been destroyed due to heavy pollution and water extraction (pumping). Hensel and Holcík (1997) suggest that *H. huso* no longer use the Sulak River for spawning. According to Dr M. Pourkazemi (*in litt.* to IUCN/SSC Wildlife Trade Programme, 25 September 2000), among the Mangil Dam and other dams constructed on the Sefidrud River, there is a remaining distance of 45 km from the dam closest to the estuary, and fish are still observed entering the river to spawn.

Kazakhstan: *H. huso* spawns naturally in the Ural River and since 1979, the numbers entering the Ural have exceeded those entering the Volga (Khodorevskaya *et al*., 1997).

Moldova: The Moldovan range on the Danube River is 811 m. Sturgeon also occur in the Prut River, a tributary of the Danube River (junction at km 137th)(Anon., 2000c). In the early 1990s, *H. huso* had not been recorded for two decades (Chepurnova, 1991).

Romania: The Danube River has the only current *H. huso* spawning population in the Black Sea Basin. However, the population has been extirpated in the upper part of the river and is critically endangered in the central region because of overfishing, pollution and damming (Bacalbasa-Dobrovici, 1997; Hensel and Holcík, 1997; Suciu *et al.*, 1998).

Russian Federation: The largest population is believed to occur in the Volga River (Vlasenko, 1990). Levin (1997) estimated that the spawning population entering the Volga in recent years is approximately 8,000-9,000 individuals, up to 25% of which are female. The decline in commercial catches from this region (northern Caspian Sea) from 2,650 t in the 1970s to 460 t in 1993, reflect a decline in the population. Recent information suggests that *H. huso* no longer use the Terek River (Khodorevskaya *et al*., 1997). In the Sea of Azov, some natural spawning grounds are no longer accessible due to the construction of dams on

the Don and Kuban rivers (Anon., 2000b). The biomass of Beluga in the Sea of Azov, was estimated to be around 1,770 t in the mid-1980s, before a mass die-off of various sturgeon species (Volovik *et al.,* 1993).

Slovakia: The last *H. huso* recorded in the Slovakian-Hungarian portion of the Danube was in 1925 (Hensel and Holcík, 1997).

Slovenia: There are no records of *H. huso* occurring in Slovenia (Povž and Sket, 1990).

Turkey: The Coruh River is used for spawning by *H. huso*, and unidentified sturgeon species have been reported in small numbers in the Sakarya and Mert Rivers (Edwards and Doroshov, 1989). In the late 1980s, local fishermen estimated that only five to six gravid female sturgeon could be taken from the Yesilirmak to supply a hatchery and up to 20 from the Kizilirmak (Edwards and Doroshov, 1989).

Turkmenistan: No information provided.

Ukraine: *H. huso* is known from the east and west coasts of the Crimea. It is also known from the north-western part of the Black Sea, from where it enters the Danube, Dniester, Dnieper, and occasionally the Bug rivers. Its distribution was limited in the last century by pollution and the damming of these rivers (Pavlov, 1980). The biomass of *H. huso* in the Sea of Azov was estimated to be around 1,770 t in the mid 1980s, before a mass die off of sturgeon (Volovik *et al.,* 1993).

Former Yugoslavia: Extinct in Croatia, *H. huso* was formerly recorded in the Sava River at Zagreb and also in its tributary, the Kupa River (Glowacki, 1896; Munda, 1926; Taler 1954). It is Endangered in Serbia. Access to spawning grounds has been prevented by the Djerdap I and Djerdap II dams, and catch has dramatically decreased (Jankoviæ, 1993; 1996; Simonoviæ and Nikoliæ, 1996). There have been no records from Slovenia since at least 1990 (Povž and Sket, 1990).

Introduced populations: In the Baltic Sea river estuaries east of Rostock (Germany), and further upstream, hybrid sturgeon specimens have been caught. They probably originated from upstream aquaculture farms and/or aquaria (i.e. specimens that had grown too large to be kept in aquaria) (Jörn Gessner, Scientist at the Institute of Freshwater Ecology and Inland Fisheries, pers. comm. to TRAFFIC Europe, 15 March 2000).

HABITAT AND ECOLOGY

H. huso is the largest of all sturgeon species. It can reach a total length of six metres and more than one tonne in weight (Berg, 1948). Khodorevskaya and Novikova (1995) reported that the mean length of immature males is 2.25 m and females 2.6 m. The maximum reported age is 118 years (Babushkin *et al*., 1964, cited in Pirogovskii *et al*., 1989). Sexual maturity is reached at 10-16 years for males and 14-20 years for females; the average size at first spawning is 2 m and 50 kg (Hochleithner and Gessner, 1999).

H. huso is piscivorous and begins to prey upon other fish in an early life stage. The species is anadromous and enters rivers flowing into the Black, Caspian and Sea of Azov to spawn. There are two forms; one of which spawns in winter and one in spring. The spring form migration peaks in summer and ends in late autumn. Fish migrating in winter are the largest of the two forms. They hibernate and reproduce the following year whereas the spring form migrates and reproduces during the same year. Unlike *A. gueldenstaedtii* and *A. stellatus*, *H. huso* do not congregate and remain dispersed in winter and summer (Levin, 1997).

Based on catches and caviar production in the late-1970s, the rate of caviar extracted per fish caught was estimated at 7 kg per 100 kg of the total catch (including males and females) for the three main commercial species of the northern Caspian Sea, *H. huso*, *A. gueldenstaedtii* and *A. stellatus* (Doroshov and Binkowski, 1985, cited in Williot and Bourguignon, 1991).

Iran: On the Iranian coast of the Caspian Sea, *H. huso* is primarily found in the eastern regions and in the Turkmen and Gomeeshan ports (Ghazel, 1993, cited in Dr M. Pourkazemi, *in litt*. to IUCN/SSC, Wildlife Trade Programme, September 2000). Sexual maturity in the southern shores of the Caspian Sea is attained

at an average age of 21 years in females (min. 10 years and max. 44 years) and at an average age of 14 years in males (min. 10 and max. 23 years) (International Sturgeon Research Institute, 1998; cited in Dr M. Pourkazemi, *in litt*. to IUCN/SSC, Wildlife Trade Programme, September 2000).

Kazakhstan: Until 1993, the mouth of the Ural River was dredged annually to allow vessels to travel upstream to Atyrau (former Gur'yev) harbour. Since 1993, this annual management of the river channel has not been carried out and is an obstacle to sturgeon migration (Anon., 2000c).

THREATS TO SURVIVAL AND DOMESTIC USE

Since the 1950s, all northern and western Caspian Sea tributaries, with the exception of the Ural River, have been dammed for hydroelectric power production, hence virtually all spawning grounds of the Caspian, Black and Sea of Azov regions have been lost. Approximately 90% of spawning grounds in the Caspian Sea have been lost and 91% of each generation now originates from hatcheries (Barannikova *et al*., 1995). In the Sea of Azov, 100% of each generation is thought to consist of farm grown fish (Volovik *et al.*, 1993). There are also high levels of pollution in most rivers within its range. *H. huso* are particularly threatened by overfishing since Beluga caviar is highly prized and the species is relatively slow to reach maturity. In the mid 1990s, a period of open sea fishing which caught young and immature sturgeon as by-catch is likely to have destroyed a major component of future sturgeon stocks (Anon., 1997).

The commercial sturgeon catch in the Caspian Sea Basin peaked at 27,300 t in 1977, with *A. gueldenstaedtii* being the most abundant species (79%, 21,550 t), followed by *A. stellatus* (17%, 4,650 t). The remaining 4% (1,100 kg) was shared between various sturgeon species including *H. huso* (Levin, 1997). The catch of *H. huso* in the northern Caspian Sea dropped from approximately 2,800 t in 1970 to less than 300 t in 1994 (Khodorevskaya *et al*., 1997). The Caspian Sea catch of *H. huso* was 339 t in 1997. The species was formerly abundant in the Danube River, with an average annual catch of 23 t in the middle Danube River from 1972 to 1976. This decreased to and average of 7.5 t/year from 1985 to 1989 after the construction of Djerdap dams I and II (Hensel and Holcík, 1997). More recently, recorded catch from the Lower Danube River in Romania and Bulgaria decreased from 62.1 t in 1997 to 42.7 t in 1999.

In the former Soviet Union and Iran, strict sturgeon fishery legislation had been in effect for decades until the emergence of the three new independent States in the Caspian Sea Basin in 1992 (Azerbaijan, Kazakhstan and Turkmenistan) (De Meulenaer and Raymakers, 1996). Current information suggests that amendments of previous regulations and/or adoption of new legislation are now in effect in most new range States in the Caspian Sea, as well as in the Black Sea (including the Danube River) and the Sea of Azov basins. In the latter, Bulgaria, Romania and Ukraine are the most important sturgeon fishing nations. However, enforcement measures appear to be lacking and numerous experts as well as government officials have reported an increasing pressure of illegal fishing practices and criminal activities surrounding the caviar trade in much of the range (Anon., 2000b; Dobbs, 1992; Doward, 2000; Evtouchenko, 1997; King, 1998; Ward, 2000a; 2000b).

Azerbaijan: The Vavarin reservoir on the Kura River prevents sturgeon from accessing spawning grounds. Lakes of deposited oil occur in industrial regions; the number of these is expected to increase with the rising sea level (Dumont, 1995). The waters of this country are particularly important winter feeding grounds. Along the northern and southern coast of Azerbaijan, within the 200-nautical mile Exclusive Economic Zone, *H. huso* is caught as by-catch in stationary nets and *kilka* (Clupeidae) fishing devices. Young and adult fish are caught by coastal fisheries during migration. Juvenile fish comprise up to 17.7% of the by-catch (CITES Management Authority of Azerbaijan, *in litt*. to TRAFFIC Europe, 18 September 2000).

Species composition of the total catch in the 1990s

	A. persicus* & *A. gueldenstaedtii	**A. stellatus**	***Huso huso***	***A. nudiventris***
Catch	63.47%	30.77%		5.76%
By-catch	78.50%	16.80%	3.70%	1%

Source: CITES Management Authority of Azerbaijan, *in litt*. to TRAFFIC Europe, 18 September 2000

Adult *H. huso* are caught in spring and autumn. This fishery is carried out in low salinity waters.

Annual recorded landings of *H. huso* (tonnes)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
H. huso	27.00	21.00	49.00	74.60	33.30	29.50	24.10	22.30	13.10	20.00
Total	*74.00*	*88.20*	*111.00*	*240.10*	*201.20*	*162.50*	*120.30*	*128.60*	*82.40*	*108.90*

Source: CITES Management Authority of Azerbaijan, *in litt*. to TRAFFIC Europe, 18 September 2000

Bulgaria: Wild sturgeon populations are threatened by a decrease in the number of spawning grounds on the Danube River as a result of human development, particularly hydroelectric facilities. The long lasting unregulated fisheries have disrupted the age composition of the populations due to selective catch of sexually mature fish, and to incidental catch of young migrating sturgeon. Water pollution has also influenced the metabolism of fish (CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000).

The largest part of the Bulgarian sturgeon catch is composed of *H. huso*. This share has decreased progressively from 92% in 1995 to 73% in 1999.

Annual sturgeon catch in Bulgaria (tonnes)

	1995	1996	1997	1998	1999
H. huso	13.6	28.8	42.2	43.5	37.0
Total sturgeon catch	*14.7*	*32.5*	*49.8*	*55.9*	*50.5*
n° of licenses issued	0	0	122	155	169

Source: CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000

Domestic consumption of caviar in Bulgaria is limited to 7-10% of the total caviar production of Bulgaria. The entire sturgeon meat production is consumed within Bulgaria.

Georgia: During the fishing seasons, particularly coastal anchovy fisheries, numerous sturgeon juveniles are caught as by-catch. The estimated number of sturgeon caught (no species specific data available) declined from 77,000 individuals in 1977, to 57,000 in 1980 and to 27,000 in 1986. During the 1990s, illegal fishing in Georgia expanded rapidly as a result of poor control (Zarkua and Tsuladze, 1999).

Iran: For the past 5 years, the Iranian domestic market of caviar and sturgeon meat is estimated at 5% and 65% of the country's total production, respectively (CITES Management Authority of Iran, *in litt*. to TRAFFIC Europe, 24 September 2000).

Annual catch of *H. huso* (tonnes)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000 *
H. huso	257.4	249.4	198.4	137.8	140.1	137.6	167.1	135.4	139.6	117.6	14.1
Total	*2,296.3*	*2,315.1*	*2,058.0*	*1,462.1*	*1,380.9*	*1,216.3*	*1,310.0*	*1,043.5*	*1,127.9*	*923.3*	*182.4*

* Catch in spring 2000 only.
Source: CITES Management Authority of Iran, *in litt*. to TRAFFIC Europe, 24 September 2000

The annual production of *H. huso* meat and caviar in Iran has decreased significantly (Dr M. Pourkazemi, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000).
Sturgeon meat and caviar production for *H. huso* in 1992 and 1999 (tonnes)

	1992				1999			
	Meat	% *	Caviar	% *	Meat	% *	Caviar	% *
H. huso	162.0	*10.1*	6.2	*2.4*	96.0	*13.1*	4.2	*4.2*
Total	**1,604.2**		**262.3**		**730.2**		**99.3**	

* Percentages relate to the share of *H. huso* products of the total Iranian sturgeon fisheries.
Source: Dr M. Pourkazemi, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000

The above tables indicate that the total tonnage of meat and caviar of *H. huso* produced in Iran comprised 85% of the country's annual catch in weight in 1992 and 1999.

Kazakhstan: Oil fields are developing rapidly in the northern Caspian Sea, especially the Tengiz oil field in Kazakhstan (Sagers, 1994). Pollution from this industry affects spawning and feeding grounds. Radioactive contamination from a nuclear reactor also poses a threat (Dumont, 1995).

Annual catch of *H. huso* (tonnes)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000 ***
H. huso	330.0	288.0	280.0	389.0	209.0	321.5	124.6	95.3	80.0	53.0	54.7
Total	*1,963.0*	*1,767.0*	*1,437.3*	*1,109.0*	*556.0*	*573.0*	*367.8*	*389.5*	*490.0*	*279.0*	*230.5*

* Spring catch.
Source: CITES Management Authority of Kazakhstan, *in litt.* to TRAFFIC Europe, 21 September 2000

Moldova: Poaching is the main threat (Vedrashko *et al*., 1998).

Romania: The Danube River population is threatened by the Djerdap I and II dams which prevent access to spawning grounds. This population is also under threat by other anthropogenic factors which have caused dramatic environmental changes in the Black Sea and the Danube River (Bacalbasa-Dobrovici, 1997).

Annual catch of *H. huso*, including the Danube River, Danube Delta and the Black Sea (kilogrammes)

1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
2,017	1,138	810	6,787	7,051	10,724	19,903	7,736	5,701

Source: Dr N. Patriche, *in litt*. to IUCN/SSC Wildlife Trade Programme, 5 September 2000

Scientific surveys concluded that the population of *H. huso* is quite well represented in Danube River. From 1991 to 1999, about 51% of the total Romanian sturgeon catch in the Danube River were composed of *H. huso*.

Russian Federation: The construction of the Volgograd Dam decreased the range area and spawning ground to only 12% of the former area available in the Volga River. Similarly, available spawning grounds in the Terek and Sulak rivers have been reduced to 132 ha and 202 ha respectively. Flow regulation of the Kuban River has caused the loss of approximately 140,000 ha of breeding ground and the Tsymlyansk Reservoir construction on the Don River in 1952 has removed approximately 68,000 ha of spawning ground (Volovik *et al.*, 1993).

The current spawning population consists mainly of fish that hatched after the alteration of the Volga River flow. Fish growth here appears to be retarded and the weight has almost halved in the 20 years from the early 1970s to the early 1990s (Khodoresvskaya *et al*., 1993). Pollution has caused anomalies and may have rendered 100% of *A. stellatus* larvae in the Volga River non-viable (Shagaeva *et al.*, 1993). This effect may also be applicable to *H. huso.*

Catch of *H. huso* in the Caspian Sea (tonnes)

	1992	**1993**	**1994**	**1995**	**1996**	**1997**
Catch	746	247	157	94	109	86

Source: Caspian Fisheries Research Institute (KaspNIRKh), cited in Anon., 2000b

From 1992 to 1997, about 50% of the Russian catches of sturgeon in the Caspian Sea was composed of *H. huso* (Anon., 2000b).

The domestic consumption of sturgeon products in the Russian Federation is unknown, but is said to be the main form of consumption of illegal sturgeon fisheries (Mr Roman V. Ivakhnenko, State Fisheries Committee, pers. comm. to TRAFFIC Europe-Russia, September 2000). Based on the number of sets of illegal fishing

equipment recorded by enforcement agencies of the Caspian Sea and the Sea of Azov, the illegal sturgeon catch was evaluated to be six to ten times the legal catch (Anon., 2000b). In 1997, the estimated volume of the Moscow sturgeon meat market was three times the annual catch quotas for sturgeon species (Anon., 1998).

Turkey: The Yesilirmak River changed dramatically due to the construction of two dams in 1979, the lowest of which limits upstream migration. The Kizilirmak was dammed in 1998 and is heavily polluted. Habitat loss was predicted due to canalisation, and the spawning ground area has been drastically reduced. From 1969 to 1979, the Turkish annual sturgeon landings ranged from 310 t to 10 t, with an annual average of 112 t (Edwards and Doroshov, 1989). In Samsun, a Turkish landing site on the Black Sea, a caviar processor claimed in 1989 that his business had decreased from 8 t/year of caviar between the 1940s and the 1970s to 0.2 t/year at the end of the 1980s. In 1989, sturgeon were caught as by-catch by illegally operating trawlers along the Turkish coast at a distance greater than 3 nautical miles from the shore, but also illegally within the 3 nautical mile limit. This represented the main fishing pressure on sturgeon. In April 1989, *A. stellatus*, *A. gueldenstaedtii*, *A. sturio* and *H. huso* were observed in Samsun. The investigators were told that *A. nudiventris* was also landed in Samsun (Edwards and Doroshov, 1989).

Ukraine: The population is threatened by pollution in the Dniester River. Catch of *H. huso* in Ukrainian waters is prohibited since the species was listed in the Red Data Book of Ukraine in 1992 (Anon., 2000c).

Yugoslavia: The Danube River spawning grounds are no longer accessible due to the construction of the Djerdap dams. The catch of *H. huso* in the region of Djerdap, on both the Yugoslav and Romanian sides of the Danube River, dropped from 8,596 kg in 1989 to 3,994 kg in 1994 (Jankoviæ, 1999). Sturgeon fishing is now limited to 17.8 km of fishing ground from the Djerdap II dam to the border, close to the Timok River mouth (Anon., 2000c) (see "Conservation Measures").

INTERNATIONAL TRADE

The listing of *Huso huso* in CITES Appendix II entered into effect on 1 April 1998. Complete data for this species are therefore limited to nine months of trade (April-December 1998).

Gross exports of *H. huso* are given in the Appendix. According to 1998 CITES data, gross exports of *H. huso* caviar (Beluga) from range States totalled 21.3 t. The main exporters were Russia (8 t), Kazakhstan (7 t), Bulgaria (1.7 t) and Iran (1.3 t). The main importers of Beluga caviar in 1998 were: Switzerland (9 t), USA (8.5 t), France (4 t) and Germany (3.5 t).

In 1998, Iran also exported a variety of other Beluga products: 15.8 t of meat and 22 skins (probably processed into leather). Most of the meat was imported into European countries (Italy, Switzerland and France in decreasing order of importance). In 1999, Iran's exports included meat of wild origin for a total of 49.6 t. However, not all Annual Reports for 1999 have been submitted and hence this figure may under-reflect the actual volume of its trade in meat. Other *H. huso* products exported from Iran in 1999 included 30 kg of swim bladders imported by Germany to be processed into isinglass (fish glue used to clarify beer, wine and champagne, and for use in antique restoration). Iran did not report exports of any sturgeon specimens in its 1999 Annual Report.

Exports of *H. huso* from Russia in 1999

	Quantity (kg)	Description	Importer	No of permits
H. huso	5,738.27	Caviar	US, DK, BE, FR, DE, CH	11 Ex. + 7Re-ex.
	617.00	Meat	US	2 Export
Hybrids:				
H. huso x A. ruthenus	62.80	Live eggs	PL, DE, JP, CN, LV, US, HU, IL, GR	16 Export
	300.00	Live fish	KR	1 Export

Source: CITES Management Authority of the Russian Federation, *in litt*. to TRAFFIC Europe, 18 September 2000

Exports of *H. huso* caviar from Bulgaria in 1998 and 1999 (kilogrammes)

	1998	1999	Jan.-Sept. 2000
Caviar of *H. huso*	1,392	2,213	901

Source: CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000

Export quotas for *H. huso* and its hybrids (kilogrammes)

	1998		1999		2000		
	Caviar	**Meat**	**Caviar**	**Meat**	**Caviar**	**Meat**	**Fert. Eggs**
Azerbaijan			434	13,000	700	7,000	
Bulgaria	2,500		2,400		2,500		
Iran	5,000		3,000		3,000		
Kazakhstan			6,000		3,600	56,000	
Romania			1,750	2,500	3,200	35,000	
Russian Federation	5,000		3,000		3,500	13,000	10
H. huso* x *A. ruthenus							90
Turkmenistan					700		
Annual total	***12,500***	***0***	***16,584***	***15,500***	***17,200***	***111,000***	***100***

Source: CITES Notification Nos. 1998/35-36-61, 1999/21-47-53-68 and 2000/053-056-061

Illegal trade: In 1998, confiscated caviar shipments of unknown origin totalling 87 kg have been reported by USA upon import. This was composed of 18 kg re-exported by Turkey and 69 kg re-exported by the United Arab Emirates. Discrepancies between trade statistics of countries importing and exporting caviar can indicate illegal activities. Such discrepancies were found in 1995 and 1996 for instance for Turkey (customs declared caviar exports 21 t and 80 t respectively) and European Union Member States (6 t and 20 t respectively) (Raymakers, 1999). Additionally, Turkish 1996 caviar exports totalled 121 t (Raymakers, 1999), while the country's sturgeon fisheries has been limited to only few incidental catches since the late 1980s (Edwards and Doroshov, 1989).

Poaching and smuggling are closely related and have been intensively reported in the media of both range States and importing countries (Evtouchenko, 1997; McDonald, 2000; Snyder, 2000). However, much of the illegally caught sturgeon is destined to the domestic market, particularly meat (Anon., 1998).

CONSERVATION MEASURES

H. huso is not fully protected in any range State, with the exception of Moldova. However, a license is required for fishing in most of the range States and in Iran private sturgeon fisheries are prohibited. In 1996, an agreement between countries bordering the Caspian Sea prohibited fishing in the open sea. Fish lifts and artificial spawning grounds have been introduced in some Caspian regions.

Azerbaijan: The Intergovernmental Commission for Caspian Biological Resources, composed of representatives of all range States, sets annual catch quotas (CITES Management Authority of Azerbaijan, *in litt*. to TRAFFIC Europe, 18 September 2000).

Catch quotas for *H. huso* allocated to Azerbaijan (tonnes)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
H. huso	10	122	122								10.85
Total	*200*	*308*	*510*	*480*	*360*	*182*	*160.5*	*160.5*	*160.5*	*108.67*	*108.35*

Source: CITES Management Authority of Azerbaijan, *in litt*. to TRAFFIC Europe, 18 September 2000

The restocking programme initiated in the 1960s by the former Soviet Union has been particularly important for *H. huso*. Three hatcheries were built in the lower Kura River. Two million *H. huso* fry were released annually in the Kura River from 1967 to 1980. A feasibility study of the World Bank reports that the total capacity of the hatcheries was originally 12 million, but that this capacity had dropped significantly over the years (T. Turner, *in litt*. to TRAFFIC Europe, 6 October 2000). World Bank funds have been allocated for the construction of a new sturgeon hatchery and farm that will have the capacity to produce 15 million fry per annum. This should be operational in the next couple of years, late 2002.

However, the major concern for *H. huso* is the availability of adult fish to constitute the broodstock of the farm.

Number of sturgeon fry released into the lower Kura River (million fingerlings)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
H. huso	0.406	0.144	0.450	0	0	0	0	0.072	0	0.162	0.357
Total	*17.523*	*9.082*	*2.980*	*1.838*	*1.142*	*1.242*	*4.070*	*6.065*	*6.220*	*20.290*	*16.965*

Source: CITES Management Authority of Azerbaijan, *in litt*. to TRAFFIC Europe, 18 September 2000

In Azerbaijan, the State institution responsible for sturgeon fishery and processing matters is the "State Concern Azerbalyg". Commercial sturgeon fisheries are prohibited in the open sea. No fishing licenses were required before 2000. The only fishing gear permitted for sturgeon catch in the Kura River is "sweep nets" of 35-55 mm mesh size. The minimum size limit set for *H. huso* catch is 165 cm in the Kura River, and 180 cm in coastal waters (Anon., 2000c).

Bulgaria: Measures at national level as described hereunder are needed, but they must be linked to co-ordinated actions of all countries in the Black Sea region. In Bulgaria, sturgeon fisheries are prohibited for 30 days, from 20 April to 20 May each year, at the peak of the breeding season. The authorities may approve a 15-day extension of the closed season pending the natural conditions of the year. Explosives, poison, bottom trawling and dragging, as well as stunning substances and devices are prohibited fishing methods. The minimum size limit for *H. huso* is 140 cm. Export quotas are set on the basis of catch data, trends and the biological characteristics of the species. A restocking programme exists and is controlled by the relevant government agencies. A system has been established for the distribution of export quotas among export companies that are obliged to restock the Danube River with sturgeon fry before they are authorised to export sturgeon specimens (CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000). For example, for a given year, for each kilogramme of caviar exported, the company must release 30 juvenile sturgeon (Anon., 2000c).

Number of *H. huso* released through the restocking programme (number of fish)

	1998	***Size***	**1999**	***Size***	**2000**	***Size***
H. huso	200	*20 g each*	2,700	*60 g each*	750	*550 g each*

Source: CITES Management Authority of Bulgaria, *in litt.* to TRAFFIC Europe, 15 September 2000

Due to budgetary constraints, Bulgaria has not recently monitored the wild sturgeon population, nor the success of its restocking programme (e.g. through tagging of released fingerlings). However, plans have been prepared for these activities. A special prohibition was adopted on the use of "unbaited hooks" for sturgeon catch (Anon., 2000c).

Hungary: The species is protected under *Decree No. 1/1982 (III.15.) OKTH* on the *Protected and Strictly Protected Species of Flora and Fauna, Value of their Specimens, Determination of the Range of Protected and Strictly Protected Caves and Exemptions from Restrictions and Prohibitions Set for Certain Protected Animal Species*, last amended by the *15/1996 (VII.26.) Decree of the Minister for Environment*. The *Nature Conservation Act No. 53 of 1996, Article 43* orders that for all protected species, prior authorisation from the National Park Directorate is required for the: capture, killing, possession, captive breeding, introduction of specimens from exotic population, artificial exchange of genetic matter between populations, exchange, sale and purchase of *H. huso* (CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 13 September 2000).

Iran: Biometric measurements are carried out for each species at all sturgeon catch stations. The age, length, sex and weight of fish landed are recorded. The population structure is estimated on the basis of age groups. As a result of these studies carried out for the past 10 years, the number of catch stations were decreased by 50%, changes were adopted on sturgeon catch methods and lower export quotas were set for the past five years. Export quotas are established on the basis of results of research programmes and annual monitoring of stocks. These activities include the following parameters and activities: Maximum Sustainable Yield and total catch, rehabilitation of stocks, management and sustainable exploitation through restricting illegal catch and overfishing. Monitoring fishing efforts and regulating the time of catch are also carried out

on the basis of research results (CITES Management Authority of Iran, *in litt*. to TRAFFIC Europe, 24 September 2000).

Annual release of sturgeon fry in the 1990s (million fingerlings)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
H. huso	0.14	0.17	0.45	0.30	0.49	0.29	0.34	1.44	0.69	0.41
Total	*4.56*	*6.60*	*3.45*	*4.17*	*5.91*	*9.13*	*12.35*	*21.63*	*24.56*	*19.10*

Source: CITES Management Authority of Iran, *in litt*. to TRAFFIC Europe, 24 September 2000

A labelling system is in place, where each tin of caviar holds a sign or mark that indicates at least the date and place of catch, the name of the catch station, name of processor and the species.

Considering the biological and commercial importance of this species, catch of *H. huso* has been banned in some of the provinces for more than five years. Additional conservation measures have been taken for all sturgeon species in the southern shores of the Caspian Sea; banning the use of gillnets in the Caspian Sea has been effective in conserving the stocks of *H. huso* (Dr M. Pourkazemi, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000).

Kazakhstan: Commercial sturgeon catch is only allowed in the tributaries of the Caspian Sea. However, scientific catch is permitted in the open sea with an annual quota of 20 t (Anon., 2000c).

Sturgeon fisheries are regulated by law. There are two fishing seasons, one during spring spawning and the other during winter migration. The exact dates of the fishing seasons vary with the climate and are therefore set annually by the authorised scientific research organisations. As in most former Soviet Republics, the only legal fishing gear for sturgeon are "sweep nets" (bottom nets that are hauled several times a day) with a minimum mesh size and each being marked with the name and address of the owner. Each fisherman can only set one net at the time. A fishing license is required. Sturgeon fishing grounds ("tonia") are limited: there are twelve on the Ural River and eight on the Kigach River. The minimum size limit for *H. huso* is 180 cm. The ratio of males and females caught is not regulated. The purchase price at the landing site is based on a fixed legal rate of caviar weight extracted per female; *H. huso* is set at 19.4% of the total body weight.

Annual commercial catch quotas are allocated to Kazakhstan by the Intergovernmental Commission for Caspian Biological Resources which meets annually in Astrakhan.

Annual catch quotas for Kazakhstan (tonnes)

	1996	**1997**	**1998**	**1999**	**2000**
H. huso			80	60	58.5
Total	*375*	*480*	*460*	*405*	*371*

Source: CITES Management Authority of Kazakhstan, *in litt.* to TRAFFIC Europe, 21 Sept. 2000

Two hatcheries, Uralo-Atyrau and Atyurau, have been operational since 1998.

Annual release of *H. huso* fry (number of fingerlings)

	1998	**1999**	**2000**
H. huso		515,666	192,000
Total	*1,706,193*	*5,318,471*	*5,507,160*

Source: CITES Management Authority, *in litt.* to TRAFFIC Europe, 21 September 2000

Moldova: *H. huso* fishery is prohibited by law (Anon., 1999).

Romania: The type of sturgeon fishing gear is strictly regulated by Romanian law. The fishing season is set each year by Ministerial Order. A fishing license is required to catch sturgeon in Romanian waters. The minimum size limit for *H. huso* is 170 cm. Catch quotas are calculated by independent scientific institutes, such as the Danube Delta Institute in Tulcea and the "Centre for Conservation, Fish Farming, Fishing and Fish Industrialisation" in Galati. The 1998 and 1999 catch quotas for *H. huso* were set at 17.5 t/year. The Romanian restocking programme has not released juvenile Beluga in the Danube River (Anon., 2000c).

Russian Federation: For Caspian Sea populations, the former Soviet Republics set annual catch quotas in agreement with Iran. Sturgeon catch quotas have been established by the Intergovernmental Commission for Caspian Biological Resources for many years. Since 1993, the annual share of sturgeon catches of each former USSR Caspian range State are as follows: the Russian Federation 70%, Kazakhstan 17.6%, Azerbaijan 6.1% and Turkmenistan 6.3%. There are two fishing seasons in the Caspian Sea waters: from ice melting to 5 June, and from 1 September until the time of ice formation. A license is required to catch sturgeon in Russian waters. The minimum size limit for *H. huso* caught in Caspian Russian waters is 180 cm along the coast, and 165 cm in the northern Caspian Sea. Russian catch quotas are declared by the Federal Government following recommendations given by the State Fisheries Committee in consensus with an independent council of experts (Anon., 2000b).

Release of *H. huso* in the Volga River and the Sea of Azov by Russian hatcheries (number of fish)

	1979-1980	**1981-1985**	**1986-1990**	**1991-1995**	**1996-1998**
Volga River	15,000,000	18,300,000	13,000,000	8,500,000	12,000,000
Sea of Azov	2,000,000	222,800	377,000	27,200	404,218

Source: Azov and Caspian Fisheries Research Institute (Az- and KaspNIRKh), cited in Anon., 2000b

From 1979 to 1998, *H. huso* comprised approximately 21.2% and 4.2% of all fry released by Russian hatcheries into the Volga River and the Sea of Azov respectively (Anon., 2000b).

Turkey: In 1979, with the exception of *H. huso* of more than 140 cm long, the fishery for sturgeon was prohibited in Turkish waters (Edwards and Doroshov, 1989). Circular 34/1, effective from 2000-2002, prohibits the collection of Acipenseriformes (CITES Management Authority of Turkey, *in litt*. to TRAFFIC Europe, 20 September 2000).

Turkmenistan: In the country's coastal waters, sturgeon fishery is allowed for scientific research only, with an annual catch limit of 20 t. The Turkmenistan State Committee of Fisheries issues an annual license for sturgeon commercial catches to the State enterprise, Balkanbalyk. No other company, Turkmen or otherwise is permitted to commercially fish sturgeon in Turkmen inland waters. An annual catch quota for the species in Turkmenistan is set by the Intergovernmental Commission for Caspian Biological Resources. There is no sex ratio set for sturgeon landings. Information on the minimum size limit per species and data on the annual catch quotas set for Turkmenistan were not provided (Anon., 2000c).

Ukraine: Catch of *H. huso* in Ukrainian waters is prohibited since the species was listed in the Red Data Book of Ukraine in 1992 (Anon., 2000c).

Yugoslavia: The closed fishing season set for *H. huso*, *A. gueldenstaedtii* and *A. stellatus* is from 15 May to 15 June. An agreement was signed between Romania and Yugoslavia on the prohibition of fishing gear causing high mortality of untargeted fish. Any fishing activity, including all commercial and sport fisheries, requires a license in Yugoslav waters. The licenses are issued on a per district basis and the sturgeon fishing grounds are limited to 17.8 km downstream of the Djerdap II dam and the mouth of the Timok River. The minimum size limit for *H. huso* is 140 cm and the annual catch quota for the species from 1996 to 2000 was set at 4,500 kg per year. A restocking programme is being carried out by the Centre for fish reproduction of the "Djerdap Fishing Company" in Malla Vrbica village. Data on the release of juvenile sturgeon have not been provided (Anon., 2000c)

CAPTIVE BREEDING

The reduction in the area of natural spawning grounds due to river flow regulation has caused population declines. Fish reared in hatcheries have therefore been produced to maintain the stock. In the former Soviet Union *H. huso* has been bred in captivity since the 1960s in order to maintain the spawning stocks for commercial harvests of the Sea of Azov, the Caspian and Black seas. An average of 0.8 million fry were released annually into the southern Caspian Sea at the end of the 1980s. Most hatcheries of Azerbaijan, Kazakhstan and the Russian Federation, ceased operation in the early to mid-1990s following shortage of government funds (De Meulenaer and Raymakers, 1996).

Azerbaijan: Three hatcheries were built in the 1960s and have contributed to the former Soviet Union sturgeon restocking programme ever since. Their combined annual productive capacity was 12 million fry, but this has dropped significantly due to rising levels of the Caspian Sea and the lack of funds allocated to hatchery maintenance (T. Turner, World Bank consultant, *in litt*. to TRAFFIC Europe, 6 October 2000).

Bulgaria: A fish farm was established in 1997 in Boliartzi village (Plovdiv region). It is the only existing hatchery. All juveniles released in the Danube River in Bulgaria from 1998 to 2000 were produced there. The hatchery has a total capacity of 60,000 juveniles and the farm is currently stocked with 3.5 year old *H. huso* and *A. gueldenstaedtii* that weigh 11-14 kg each. Since 1999, attempts have been made to breed sturgeon in artificial water basins near Sofia (CITES Management Authority of Bulgaria, *in litt*. to TRAFFIC Europe, 15 September 2000).

Georgia: Until the early 1990s, artificial breeding of sturgeon species was carried out at the Varistkhi Sturgeon Plant. Built in 1983 and located on the Rioni River, the results were not always considered satisfactory (Zarkua and Tsuladze, 1999).

Hungary: There are no captive breeding facilities for *H. huso* (CITES Management Authority of Hungary, *in litt*. to TRAFFIC Europe, 13 September 2000).

Iran: Five hatcheries are in operation in Iran (De Meulenaer and Raymakers, 1996). In the mid-1990s, more than five million *H. huso* fingerlings weighing 3-5 g were released into the Caspian Sea by Iran. In 2000, more than 1.5 million *H. huso* weighing 30-50 g were released into the Caspian Sea (Dr M. Pourkazemi, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000). In Iran, this species has been reared in captivity for more than ten years. Apart from the governmental sector, the non-governmental sector has also invested in the captive breeding of this species. At present, more than 30,000 *H. huso* individuals between one and ten years of age have been introduced into rearing ponds. Iran intends to culture 1,000 t of *H. huso* for meat and caviar production (Dr M. Pourkazemi, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000).

Kazakhstan: There are two hatcheries in Kazakhstan, the Uralo-Atyrau and the Atyurau. These have been operational since 1998 (CITES Management Authority of Kazakhstan, *in litt*. to TRAFFIC Europe, September 2000).

Russian Federation: In the mid-1990s, it was estimated that approximately 91% of the Caspian Sea stock of *H. huso* originated from hatcheries (Barannikova, 1995), whilst in 1993, 100% of each generation of *H. huso* in the Sea of Azov derived from captive-bred released fry (Volovik *et al.*, 1993). However, high levels of poaching have reduced natural populations to such low levels that most hatcheries have not been able to catch enough mature fish to produce fry for the restocking programme (Artyukhin, 1997). A hatchery on the Kuban River (Russian Federation) was still operating in 1997 (Chebanov and Savelyeva, 1999). In European countries, a hybrid of *H. huso* and *A. ruthenus* called 'bester' is subject to aquaculture. It is fast growing and produces fertile and early maturing offspring (Burtsev, 1997).

United States of America: Sturgeon species are in preliminary stage of captive breeding in Hawaii (CITES Management Authority of USA, *in litt.* to TRAFFIC Europe, September 2000).

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APPENDIX
Gross exports of, and export quotas for *Huso huso* 1998

TAXON	TERM	UNIT	Exporter	1998	Export Quotas 1998
Huso huso	bodies		PG	8	
Huso huso	bodies #	kg	IR	12,750	
Huso huso	eggs		AE	267	
Huso huso	eggs		DE	88	
Huso huso	eggs		FR	350	
Huso huso	eggs		NL	16	
Huso huso	eggs		RO	90	
Huso huso	eggs		SG	1	
Huso huso	eggs		TR	69	
Huso huso	eggs		US	2	
Huso huso	eggs	kg	AE	3,001	
Huso huso	eggs	kg	AZ	114	
Huso huso	eggs	kg	BE	28	
Huso huso	eggs	kg	BG	1,717	2,500
Huso huso	eggs	kg	CH	6,467	
Huso huso	eggs	kg	CZ	8	
Huso huso	eggs	kg	DE	1,281	
Huso huso	eggs	kg	DK	226	
Huso huso	eggs	kg	ES	0	
Huso huso	eggs	kg	FI	183	
Huso huso	eggs	kg	FR	789	
Huso huso	eggs	kg	GB	18	
Huso huso	eggs	kg	HK	32	
Huso huso	eggs	kg	IR	4,013	5,000
Huso huso	eggs	kg	KZ	7,033	
Huso huso	eggs	kg	NL	1,418	
Huso huso	eggs	kg	PL	4,365	
Huso huso	eggs	kg	RO	303	
Huso huso	eggs	kg	RU	8,035	5,000 (including AZ & KZ)
Huso huso	eggs	kg	SG	8	
Huso huso	eggs	kg	TR	1,075	
Huso huso	eggs	kg	UA	52	
Huso huso	eggs	kg	US	150	
Huso huso	meat	kg	IR	3,005	
Huso huso	meat	kg	US	18	
Huso huso	skins		CH	22	
Huso huso	skins		IR	22	
Huso huso	specimens		DE	0	

The term “bodies” should be interpreted as “meat” (Dr P. Bronzi, *in litt*. to IUCN/SSC Wildlife Trade Programme, 8 September 2000).

* **Definition:** “Gross exports are the sum of all reported exports and re-exports in a particular commodity or species in a particular year or series of years;... Gross trade is thus a simple measure of the total number of items recorded in international trade. However, gross trade may be an overestimate of the total number of actual specimens in trade as re-exports are not deducted from the total.” (Anon., 1996).

This is particularly applicable to caviar of which shipments are often exported, re-packaged and re-exported. For instance, in the mid-1990s, Germany re-exported as much as 45% of its annual caviar imports (De Meulenaer and Raymakers, 1996).

Comparative Tabulation of trade in *Huso huso* 1998

				Imports reported						Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit		Term	P	S	Quantity	Unit	Term	P	S
1998	AU	AE	RU							5	kg	eggs	T	O
1998	CA	AE	IR							4	kg	eggs	T	W
1998	CH	AE	IR	26	kg	eggs		T	W	8	kg	eggs	T	W
1998	CH	AE	IR	10	kg	eggs		T	O	10	kg	eggs	T	O
1998	CH	AE	RU							58	kg	eggs	T	W
1998	CH	AE	RU	16	kg	eggs		T	O					
1998	DK	AE	IR	4	kg	eggs		T	W	6	kg	eggs	T	W
1998	FR	AE	IR	18	kg	eggs		T	W					
1998	FR	AE	RU	20	kg	eggs		T	O					
1998	GB	AE	RU							25	kg	eggs	P	W
1998	GB	AE	RU							4	kg	eggs	T	W
1998	HK	AE	IR							54	kg	eggs	T	W
1998	HK	AE	IR							10	kg	eggs	T	O
1998	HK	AE	RU							15	kg	eggs	T	W
1998	JP	AE	RU							223	kg	eggs	T	O
1998	KR	AE	RU							4	kg	eggs	T	O
1998	NO	AE	IR	600	kg	eggs		T	O	600	kg	eggs	T	O
1998	NO	AE	RU							122	kg	eggs	T	O
1998	TW	AE	IR							10	kg	eggs	T	W
1998	US	AE		69	kg	eggs		T	I					
1998	US	AE	RU	19,625	g	eggs		T	I					
1998	US	AE	RU	651	kg	eggs		T	O	1,630	kg	eggs	T	O
1998	US	AE	RU	361	kg	eggs		T	W	155	kg	eggs	T	W
1998	US	AE	RU	190		eggs		T	O					
1998	US	AE	RU	77		eggs		T	W					
1998	US	AE	RU	30	kg	eggs		T	I					
1998	US	AE	XX	127	kg	eggs		T	O					
1998	UZ	AE	RU							20	kg	eggs	T	O
1998	CA	BE	RU							18	kg	eggs	T	O
1998	CA	BE	TR							9	kg	eggs	T	O
1998	TR	BE	RU							360	g	eggs	T	O
1998	CH	BG		1,056	kg	eggs		T	W					
1998	CH	BG		211	kg	eggs		T	O					
1998	FR	BG		450	kg	eggs		T	W					
1998	AT	CH	AZ	1	kg	eggs		T	O					
1998	AT	CH	IR							61	kg	eggs		O
1998	AT	CH	IR	5	kg	eggs		T	O					
1998	AT	CH	RU							5	kg	eggs		O
1998	AT	CH	RU	4	kg	eggs		T	O					
1998	BE	CH	KZ	87	kg	eggs		T	W	87	kg	eggs		W
1998	CH	CH	IR							28	kg	eggs		O
1998	CH	CH	RU							300	kg	eggs		O
1998	CY	CH	IR							1	kg	eggs		O
1998	DE	CH	AZ	212	kg	eggs		T	O					
1998	DE	CH	IR	61	kg	eggs		T	W					
1998	DE	CH	IR							60	kg	eggs		W
1998	DE	CH	IR							2	kg	eggs		O
1998	DE	CH	KZ	2,927	kg	eggs		T	W					
1998	DE	CH	RU							2,926	kg	eggs		W
1998	DE	CH	RU							158	kg	eggs		O
1998	DK	CH	RU							50	kg	eggs		O
1998	FR	CH	IR	291	kg	eggs		T	O					
1998	FR	CH	IR	103	kg	eggs		T	W					

				Imports reported						Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit		Term	P	S	Quantity	Unit	Term	P	S
1998	FR	CH	IR							102	kg	eggs		W
1998	FR	CH	IR							1	kg	eggs		O
1998	FR	CH	KZ	1,253	kg	eggs		T	W					
1998	FR	CH	RU							1,251	kg	eggs		W
1998	GB	CH	AZ	47	kg	eggs		T	W					
1998	GB	CH	KZ	19	kg	eggs		T	W					
1998	GB	CH	RU							412	kg	eggs		W
1998	GB	CH	RU							21	kg	eggs		O
1998	HK	CH	IR							12	kg	eggs		O
1998	HK	CH	IR							5	kg	eggs		W
1998	HK	CH	RU							38	kg	eggs		O
1998	HK	CH	RU							21	kg	eggs		W
1998	IT	CH	IR							22		skins		W
1998	JP	CH	RU							12	kg	eggs		O
1998	KW	CH	IR							10	kg	eggs		O
1998	MU	CH	IR							0	kg	eggs		O
1998	MX	CH	IR							9	kg	eggs		O
1998	PA	CH	IR							1	kg	eggs		O
1998	SG	CH	IR	13	kg	eggs		T	O					
1998	SG	CH	IR							13	kg	eggs		O
1998	SG	CH	IR							5	kg	eggs		W
1998	SG	CH	IR	5	kg	eggs		T	W					
1998	US	CH	BG	432	kg	eggs		T	I					
1998	US	CH	BG							240	kg	eggs		W
1998	US	CH	BG							192	kg	eggs		O
1998	US	CH	RU							4	kg	eggs		O
1998	US	CH	YU	94	kg	eggs		T	I					
1998	ZA	CH	IR							2	kg	eggs		O
1998	CA	CZ	AZ							8	kg	eggs	T	W
1998	AD	DE	RU							6	kg	eggs	T	W
1998	CA	DE	RU							336	g	eggs	T	O
1998	CA	DE	RU							9	kg	eggs	T	O
1998	CH	DE	AZ							106	kg	eggs	T	O
1998	CH	DE	IR	29	kg	eggs		T	O					
1998	CH	DE	IR	27	kg	eggs		T	W	27	kg	eggs	T	W
1998	CH	DE	KZ							27	kg	eggs	T	W
1998	CH	DE	RU	177	kg	eggs		T	O					
1998	CH	DE	RU	29	kg	eggs		T	W	3	kg	eggs	T	W
1998	CZ	DE	IR							300	g	eggs	T	O
1998	CZ	DE	RU							5	kg	eggs	T	O
1998	CZ	DE	RU	5	kg	eggs		T	W					
1998	HK	DE	IR							2	kg	eggs	T	O
1998	HK	DE	KZ							12	kg	eggs	T	O
1998	HK	DE	RU							11	kg	eggs	T	O
1998	HR	DE	IR							600	g	eggs	T	O
1998	HR	DE	RU							2	kg	eggs	T	O
1998	JP	DE	KZ							13	kg	eggs	T	W
1998	JP	DE	KZ							4	kg	eggs	T	O
1998	JP	DE	RU							34	kg	eggs	T	O
1998	KR	DE	KZ							7	kg	eggs	T	W
1998	KR	DE	KZ							3	kg	eggs	T	O
1998	KR	DE	RU							15	kg	eggs	T	O
1998	KR	DE	RU	1	kg	eggs		T	W					
1998	MT	DE	RU							336	g	eggs	T	O

				Imports reported						Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit		Term	P	S	Quantity	Unit	Term	P	S
1998	NO	DE	KZ							2	kg	eggs	T	W
1998	NO	DE	RU							6	kg	eggs	T	O
1998	SG	DE	KZ	10	kg	eggs		T	O	10	kg	eggs	T	O
1998	US	DE	KZ	218	kg	eggs		T	W	602	kg	eggs	T	W
1998	US	DE	KZ	214	kg	eggs		T	O	110	kg	eggs	T	O
1998	US	DE	RU	133	kg	eggs		T	O	137	kg	eggs	T	O
1998	US	DE	RU	89	kg	eggs		T	W	3	kg	eggs	T	W
1998	US	DE	RU	88		eggs		T	O					
1998	US	DE	RU	4	kg	eggs		T	F					
1998	ZA	DE	RU							23	kg	eggs	T	O
1998	BR	DK	RU							21	kg	eggs	T	O
1998	BR	DK	RU							10	kg	eggs	T	W
1998	CH	DK	RU	50	kg	eggs		T	O					
1998	SA	DK	IR							12	kg	eggs	T	W
1998	SA	DK	RU							30	kg	eggs	T	O
1998	TW	DK	IR							104	kg	eggs	T	W
1998	RU	FI	RU							183	kg	eggs	T	W
1998	AN	FR	IR							2	kg	eggs	T	W
1998	BR	FR	IR							1	kg	eggs	T	O
1998	BS	FR	IR							6	kg	eggs	T	W
1998	BS	FR	KZ							1	kg	eggs	T	O
1998	CA	FR	BG							19	kg	eggs	T	O
1998	CA	FR	IR							3	kg	eggs	T	O
1998	CA	FR	KZ							4	kg	eggs	T	O
1998	CA	FR	KZ							2	kg	eggs	T	W
1998	CH	FR	IR	21	kg	eggs		T	W	21	kg	eggs	T	W
1998	CI	FR	BG							4	kg	eggs	T	O
1998	CI	FR	IR							3	kg	eggs	T	W
1998	HK	FR	IR							9	kg	eggs	T	W
1998	HK	FR	IR							5	kg	eggs	T	O
1998	HK	FR	KZ							11	kg	eggs	T	O
1998	HK	FR	KZ							8	kg	eggs	T	W
1998	KR	FR	IR	0	kg	eggs		T	W	1	kg	eggs	T	W
1998	LB	FR	KZ							2	kg	eggs	T	W
1998	MX	FR	IR							13	kg	eggs	T	W
1998	MX	FR	IR							6	kg	eggs	T	O
1998	MX	FR	KZ							3	kg	eggs	T	O
1998	MX	FR	KZ							1	kg	eggs	T	W
1998	NC	FR	KZ							2	kg	eggs	T	W
1998	OM	FR	IR							28	kg	eggs	T	W
1998	OM	FR	KZ							42	kg	eggs	T	W
1998	OM	FR	KZ							13	kg	eggs	T	O
1998	PF	FR	KZ							1	kg	eggs	T	W
1998	PF	FR	KZ							1	kg	eggs	T	O
1998	PH	FR	IR							1	kg	eggs	T	W
1998	SA	FR	IR							3	kg	eggs	T	O
1998	SA	FR	KZ							8	kg	eggs	T	W
1998	SG	FR	IR	1	kg	eggs		T	W	2	kg	eggs	T	W
1998	SG	FR	KZ	2	kg	eggs		T	O	2	kg	eggs	T	O
1998	TH	FR	IR							1	kg	eggs	T	W
1998	TW	FR	IR							3	kg	eggs	T	W
1998	US	FR	KZ							554	kg	eggs	T	W
1998	US	FR	KZ	100		eggs		T	W					
1998	US	FR	RU	250		eggs			W					

				Imports reported						Exports reported				
Year	Imp.	Exp.	Origin	Quantity	Unit		Term	P	S	Quantity	Unit	Term	P	S
1998	US	FR	RU	239	kg	eggs		T	W					
1998	ZA	FR	IR							1	kg	eggs	T	W
1998	ZA	FR	KZ							1	kg	eggs	T	O
1998	CH	GB	RU	7	kg	eggs		T	O					
1998	EG	GB	IR							1	kg	eggs	T	W
1998	HK	GB	IR							2	kg	eggs	T	W
1998	IS	GB	IR							2	kg	eggs	T	W
1998	JO	GB	IR							1	kg	eggs	T	W
1998	JP	GB	IR							2	kg	eggs	T	W
1998	QA	GB	IR							1	kg	eggs	T	W
1998	SA	GB	IR							1	kg	eggs	T	W
1998	CH	HK	IR	1	kg	eggs		T	O					
1998	CH	HK	RU	31	kg	eggs		T	O					
1998	BE	IR		20	kg	eggs		T	W					
1998	BE	IR		5	kg	meat		T	W					
1998	CH	IR		180	kg	eggs		T	W					
1998	CH	IR	RU	319	kg	eggs		T	O					
1998	CH	IR	RU	310	kg	eggs		T	W					
1998	CH	IR		1,361	kg	meat		T	O					
1998	CH	IR		1,020	kg	meat		T	W					
1998	CH	IR		22		skins		T	W					
1998	DE	IR		127	kg	eggs		T	O					
1998	DE	IR		77	kg	eggs		T	W					
1998	ES	IR		710	kg	eggs		T	W					
1998	FR	IR		1,600	kg	eggs		T	W					
1998	FR	IR		160	kg	eggs		T	O					
1998	FR	IR		585	kg	meat		T	W					
1998	FR	IR		34	kg	meat		E	W					
1998	GB	IR		310	kg	eggs		T	W					
1998	IT	IR		12,750	kg	bodies		T	W					
1998	LU	IR		200	kg	eggs		T	W					
1998	BN	NL	IR							1	kg	eggs	T	O
1998	CH	NL	XX	1417	kg	eggs		T	O					
1998	ID	NL	IR							16		eggs	T	W
1998	ES	PG		8		bodies		T	R					
1998	GB	PL	RU							100	kg	eggs		W
1998	US	PL	RU	174.01	kg	eggs		T	O					
1998	US	PL	RU	77.5	kg	eggs		T	I					
1998	US	PL	RU							4,265	kg	eggs		W
1998	US	PL	RU	1,197	kg	eggs		T	O					
1998	US	PL	RU	800	kg	eggs		T	W					
1998	GR	RO		15	kg	eggs		T	W					
1998	US	RO		51,200	g	eggs		T	W					
1998	US	RO		237	kg	eggs		T	W					
1998	US	RO		90		eggs		T	O					
1998	AE	RU	KZ							648	kg	eggs	T	W
1998	AU	RU								2	kg	eggs	P	W
1998	AZ	RU								37	kg	eggs	T	W
1998	BE	RU		45	kg	eggs		T	W	45	kg	eggs	T	W
1998	CH	RU		4,812	kg	eggs		T	W	37	kg	eggs	T	W
1998	CH	RU		520	kg	eggs		T	O					
1998	CH	RU	KZ							4,812	kg	eggs	T	W
1998	DE	RU		137	kg	eggs		T	W	462	kg	eggs	T	W
1998	DE	RU		109	kg	eggs		T	O	211	kg	eggs	T	O

			Imports reported						Exports reported				
Year	**Imp.**	**Exp.**	**Origin**	**Quantity**	**Unit**		**Term**	**P**	**S**	**Quantity**	**Unit**	**Term**	**P**	**S**
1998	FI	RU		183	kg	eggs		T	W	183	kg	eggs	T	W
1998	FR	RU	KZ	40	kg	eggs		T	W	40	kg	eggs	T	W
1998	US	RU		106	kg	eggs		T	I					
1998	US	RU		753	kg	eggs		T	O					
1998	US	RU		94	kg	eggs		T	W	1,074	kg	eggs	T	W
1998	CH	SG	IR	8	kg	eggs		T	O	8	kg	eggs	T	O
1998	US	SG	RU	1		eggs		T	W					
1998	CH	TR	RU	96	kg	eggs		T	O	98	kg	eggs	T	O
1998	US	TR								34	kg	eggs	T	O
1998	US	TR	RU	416	kg	eggs		T	W					
1998	US	TR	RU	75	kg	eggs		T	O	621	kg	eggs	T	O
1998	US	TR	RU	69		eggs		T	O					
1998	US	TR	RU	2	g	eggs		T	I					
1998	US	TR	RU	2	g	eggs		T	W					
1998	US	TR	RU	1	kg	eggs		T	I					
1998	US	TR	XX							322	kg	eggs	T	O
1998	US	TR	XX	18	kg	eggs		T	I					
1998	US	UA	RU	52	kg	eggs		T	O					
1998	AR	US	RU							77	kg	eggs	T	O
1998	AR	US	RU							2		eggs	T	O
1998	AR	US	RU							1	kg	eggs	T	W
1998	BM	US	RU							1	kg	eggs	T	W
1998	CA	US	RU							35	kg	eggs	T	W
1998	DE	US	RU	300	g	eggs		T	O	2500	g	eggs	T	W
1998	GR	US	RU							300	g	eggs	T	O
1998	JP	US	RU							1	kg	eggs	T	W
1998	LC	US	RU							1	kg	eggs	T	W
1998	MX	US	RU							7	kg	eggs	T	W
1998	MX	US	RU							18	kg	meat	T	W
1998	PT	US	RU							1	kg	eggs	T	W
1998	SG	US	RU	3	kg	eggs		T	W	3	kg	eggs	T	W
1998	TR	US	RU							18	kg	eggs	T	W
1998	ZA	US	RU							2	kg	eggs	T	W
1998	CH	XX		120	kg	other		T	W					
Total:				**25,889.51**	**kg**	**eggs**				**24,511**	**kg**	**eggs**		

Polyodon spathula Walbaum, 1792

American Paddlefish
Poisson spatule

Order: ACIPENSERIFORMES

Family: POLYODONTIDAE

SUMMARY

American Paddlefish *Polyodon spathula* is endemic to the continent and is the only paddlefish species present in the wild in North America. This species is widely distributed in the large river drainages of the eastern United States of America (USA). During the last century it has been extirpated from four states on the periphery of its range and even within states considered as strongholds for the species, portions of the historical range have diminished. The species reaches sexual maturity between 5-12 years of age and may live up to 40-50 years attaining a weight of up to 80 kg. Southern populations apparently grow more quickly than those in colder northern waters. Following a review of the status of the species in 1983, a number of significant changes in the management of the species were adopted, due to recognition of the threats posed by continued habitat degradation, pollution and the demand for paddlefish caviar.

Commercial catch of *P. spathula* is permitted in six states only: Arkansas, Illinois, Kentucky, Mississippi, Missouri and Tennessee. In the absence of past and present catch data from Mississippi, it is difficult to determine the trends in annual catches of *P. spathula*. A similar problem exists for Arkansas where reporting of paddlefish commercial catch is not compulsory. In 1992, the estimated commercial paddlefish fishery, excluding Mississippi, totalled approximately 242 t. The largest volumes were recorded in Arkansas (65%; 136,000-181,000 kg – 158,500 kg mean) and Tennessee (25%; 60,328 kg), with the remaining 10% shared by Illinois (21,145 kg), Kentucky (3,906 kg) and Missouri (2,188 kg).

The international trade in specimens of *P. spathula* since the species was listed in Appendix II in 1992 has consisted principally of captive-bred live fish and fertilised eggs. Exports from the USA increased during 1993 to 1997, with 9,644 to 265,300 live fish and 60,000-187,000 fertilised eggs respectively, and then decreased in 1998 to 70,000 live fish and 53,440 fertilised eggs. Results of artificial breeding for the release of *P. spathula* fry in the wild are available, but there seems to be no development of commercial farming for production of meat and caviar of *P. spathula* at present.

In 1992, the USA proposed the species for listing in CITES Appendix II in accordance with Article II, paragraph 2(a). Since Resolution Conf. 10.12 *Conservation of Sturgeon* entered into effect in 1998, recommending that range States "consider the feasibility of establishing annual export quotas for sturgeon specimens", the USA did not establish export quotas for *P. spathula*.

This species is recommended under Decision 11.106 for inclusion in category 2 (ii).

DISTRIBUTION AND POPULATION

The CITES database lists the distribution of *Polyodon spathula* as: Canada (ex), United States (Anon., 2000).

P. spathula is classified as Vulnerable by IUCN (1996):
VU C2b USA [Mississippi River].

P. spathula was previously abundant throughout the Mississippi River Basin and some adjacent estuaries of the Gulf of Mexico, and has been observed in the Great Lakes including Canadian waters. *P. spathula* is also found throughout the Missouri River basins and many of their tributaries (Graham, 1997). There has been no recent verification of the occurrence of *P. spathula* in Canada. The species is found in 22 states in the USA. However, whilst several paddlefish populations appear to be stable or increasing, the species is in decline in much of its current range due to continued habitat modification and degradation, increased water contamination and overfishing (Graham, 1997). Information presented in Graham (1997), was compiled in 1994.

In 1994, the population was reported to be stable in Arkansas, Indiana, Iowa, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Montana, Oklahoma, and South Dakota (Graham, 1997). Graham (1997) also reported that wild populations are considered to be increasing in Texas, West Virginia and Wisconsin, whilst they have been declining in Illinois and North Dakota. The species has been extirpated from Maryland, New York, North Carolina and Pennsylvania (Gengerke, 1986, cited in Todd, 1998).

Alabama: P. spathula is the only species of Acipenseriformes confirmed to exist in this state (US Fish and Wildlife Service (USFWS), CITES Management Authority of USA, *in litt.* to TRAFFIC Europe, September 2000).

Kansas: P. spathula is present in the Arkansas, Kansas, Marais des Cygnes, Missouri, Neosho and Verdigris rivers. In all these rivers, restocking efforts have been undertaken and the population is considered to be stable and probably increasing (Graham, 1997).

Nebraska: The population is considered stable to declining (Graham, 1997) (see South Dakota, Missouri River common boundary: below Gavins Point Dam, near Yankton in South Dakota (USFWS, *in litt.* to TRAFFIC Europe, September 2000)).

Ohio: According to Graham (1997), the status of the *P. spathula* population is unknown (Graham, 1997). However, state authorities consider the species to be limited in distribution and relatively rare (USFWS, *in litt.* to TRAFFIC Europe, September 2000).

South Dakota: Graham (1997) considers the population to be stable. Currently, the paddlefish population below Gavins Point Dam contains too few mature individuals to be attractive to the caviar trade and the remaining paddlefish populations (in the Missouri River above Gavins Point Dam) are not abundant enough to attract interest (USFWS, *in litt.* to TRAFFIC Europe, September 2000).

Virginia: The status of the population is unknown (Graham, 1997).

HABITAT AND ECOLOGY

This species prefers large rivers and lakes. Paddlefish normally inhabit deep water, but during the summer can be found near the surface and at variable depths. *P. spathula* grows to 0.4-0.7 kg in the first year and the largest specimens caught measured 2.3 m and weighed 80 kg. Sexual maturity occurs at 5-9 years for males and 8-12 years for females with 1-1.2 m total body length (Hochleithner and Gessner, 1999). Southern stocks generally grow more quickly than their northern counterparts and rarely exceed 15 years of age, however, northern stocks have been recorded as old as 40-50 years (Scarnecchia and Graham, 1999). Spawning occurs in early spring but adults are unlikely to spawn every year (Hochleithner and Gessner, 1999). Eggs hatch in 12-14 days.

The paddlefish's large mouth strains small crustaceans, algae, ephemerid larvae and mayflies. They are also occasional bottom feeders. During their first year, they are generally particle feeders, after which they begin to filter-feed. It has been suggested that their paddle-like bill senses plankton concentration levels (Hochleithner and Gessner, 1999).

THREATS TO SURVIVAL AND DOMESTIC USE

A major threat to paddlefish is the damming of large rivers. This has eliminated much of their spawning habitat by controlling spring flooding and keeping water within riverbanks. Intentional and unintentional snagging by anglers also results in mortality. Whilst the paddlefish is heavily parasitized by lampreys *Ichthyomyzon* spp., the impact of this is unknown.

An assessment of the impact of fisheries on wild populations of *P. spathula* has not been possible due to the lack of data. Many states, particularly Arkansas and Mississippi, do not require commercial fishermen to report their catches. According to surveys and voluntary reporting, in 1992, 65% of the catch recorded in five of the six states that still allow commercial fishing of *P. spathula* came from Arkansas (Graham, 1997). In Mississippi, no surveys were conducted and no catches were voluntarily reported.

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

Of all states in the USA where *P. spathula* occurs (Graham, 1997),
- some allow commercial fishery: Arkansas, Illinois, Kentucky, Mississippi, Missouri and Tennessee;
- some prohibit the commercial fishery, but allow sport fishing: Indiana, Iowa, Kansas, Montana, Nebraska, North Dakota, Oklahoma and South Dakota; and
- others do not have large enough populations for a viable commercial fishery and therefore prohibit both commercial and sport fishing: Alabama, Louisiana, Maryland, Minnesota, New York, North Carolina, Ohio, Pennsylvania, Texas, Virginia, West Virginia and Wisconsin.

Reported catch of *P. spathula* in commercial fishing states (kilogrammes)

	1989	1990	1992	1996	1997
Arkansas	?	?	158,500	?	?
Illinois	73,473	?	21,150	?	22,289
Kentucky	?	?	3,910	?	?
Missouri	25,850	?	2,500	4,411	?
Tennessee	?	220,610	60,330	29,411	?
Total	?	?	**242,000**	?	?

Source: Graham, 1997

The 1992 official reported catches suggest that the largest volumes were caught in Arkansas (65%) and Tennessee (25%) (Graham, 1997).

The average combined annual catch of *P. spathula* for the late-1990s in Illinois, Kentucky, Missouri and Tennessee was estimated at 111.8 t. Compared to data collected by Graham (1997), a sharp drop was recorded in Tennessee (24.9 t in 1999) while other states reported increased catches, such as 62.1 t in Kentucky in 1999 and 2.5 t in Missouri in 1998.

States allowing commercial fishing

Arkansas: Commercial harvest of *P. spathula* in 1992 was estimated at 136-181 t (Graham, 1997). From 1990 to 1999, the Arkansas Game and Fish Commission collected USD150,000-300,000 annually in revenues for the sale of commercial and paddlefish sport fishing licenses, permits and tags. There is no compulsory reporting system for reporting commercial catch data to the authorities in Arkansas. Based on voluntary reporting of commercial fisheries, 69 kg of paddlefish roe (caviar) were harvested in 1998 (total catch of paddlefish estimated at 410 kg), while 230 kg average annual harvest of caviar (worth USD16,256) was reported for 1987 and 1988.

Illinois: The reported commercial catch of *P. spathula* was 73,473 kg in 1989 and 22,289 kg in 1997 (with 33 kg of roe –caviar) (Todd, 1998).

Kentucky: P. spathula are caught for commercial purposes in Kentucky.

Catch statistics for *P. spathula* (kilogrammes)

	1999	Jan.-June 2000
Meat	59,766	84,254
Caviar	2,375	5,645
Total	***62,141***	***89,899***

Source: CITES Management Authority of the USA, *in litt.* to TRAFFIC Europe, September 2000

Mississippi: No catch data were reported. Historically, Mississippi has not collected data on *P. spathula* catch. There is no compulsory reporting system to collect either commercial or sport fishing data. No scientific publication has reported past or present paddlefish catches in this State, but Graham (1997) notes that high commercial harvest may have occurred in the mid-1980s. Law enforcement intelligence

suggests that *P. spathula* are being illegally caught by commercial fishermen for their roe (caviar). Poaching is an ongoing problem, consisting not of isolated infrequent occurrences, but rather being organised and secretive operations (D. Ruche, Mississippi Department of Wildlife, Fisheries and Parks, *in litt*. to the USFWS, 16 August 2000).

Missouri: The 1989 estimated catch of *P. spathula* was 25,850 kg.

Annual catch of *P. spathula* in the Mississippi River (section in the State of Missouri) (kilogrammes)

1992	1993	1994	1995	1996	1997	1998
2,344	3,758	2,033	2,911	4,411	1,054	2,504

Source: Todd, 1998

Tennessee: Commercial harvest of *P. spathula* is allowed. The sport fishery harvest is not significant in volume. In 1975, the commercial paddlefish catch reached 197,768 kg.

Commercial catch of *P. spathula* (kilogrammes)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Catch	220,651	47,627	60,444	53,885	59,218	57,100	29,417	40,503	24,234	24,899
Roe (caviar)			84.8	724.4	565.6	683.1	63.5	283.9	855.5	1,404.3

Source: CITES Management Authority of the USA, *in litt.* to TRAFFIC Europe, September 2000

Paddlefish roe is an important source of income for commercial fishermen. The flesh (meat) is of less importance and is sold both within and outside Tennessee. Poaching has been reported to the authorities, but the state authorities claimed that it is difficult to evaluate during the fishing seasons because enforcement officers are too busy administering the permits and tags.

States allowing sport fishing only

Indiana: The state's estimated annual harvest was 10,000 kg for 1996 (Hesse and Carreiro, 1997, cited in Todd, 1998).

Iowa: Only sport harvest (snagging) of paddlefish and sturgeon is allowed. Two fish are permitted daily, with a possession limit of four. Sport fishing (snagging) has been prohibited in the Big Sioux and Missouri rivers since 1993. Data on sport fishing were not provided by the state authorities. Some illegal harvest of paddlefish is suspected by the authorities, but has not been confirmed.

Kansas: P. spathula sport snagging fisheries are limited to specific locations. They are significant local events attracting anglers from other neighbouring towns that contribute to the economy of relatively small Kansas towns. There are no official reports of poaching, but it is suspected that illegal activities occur.

Number of *P. spathula* harvested by anglers at sport fishery locations (number of fish caught)

	1992	1993	1994	1995	1996	1997	1998	1999	2000
Marais des Cygnes	4	87	19	12	11	75	58	457	5
Neosho River	71	541	325	769	479	394	800	2,010	98
Total	***75***	***628***	***344***	***781***	***490***	***469***	***858***	***2,467***	***103***

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

Montana: In the late 1980s-early 1990s, an estimated 1,360-4,536 kg of *P. spathula* roe has been collected each spring during the sport snagging (Graham, 1997). From 1990 to 1994, a total of 2,270 kg of *P. spathula* roe was collected annually from a total of 7,000 fish caught at the Intake Diversion Dam east of Glendive (Wilkinson, 1997). Several fishing grounds are on the Montana-North Dakota border. The annual average number of *P. spathula* harvested in Montana from 1995 to 1999 was 1,207 (ranging from 717 in 1998 to 1,706 in 1999). With an average body weight of 19 kg (Scarnecchia *et al*., 1996), the annual catch would represent 23 t.

Nebraska: There is no commercial fishery of *P. spathula*. Sport fisheries of the species are regulated. Annual catch quotas of 275 fish for bow and arrow and 1,400 fish for snag fishing are allocated. Quotas

are enforced by distributing no more than two tags per fisher. Poaching occurs on the Missouri River. Investigations following on from a 'sting operation' are on-going.
(see South Dakota for combined harvest estimates for *P. spathula* snagging fishery only).

North Dakota: During 1993 and 1994, 2,268 kg and 1,726 kg of *P. spathula* roe were respectively collected (Graham, 1997). The annual average number of *P. spathula* harvested in North Dakota from 1995 to 1999 was 1,356 (ranging from 800 in 1997 to 1,970 in 1998). With an average body weight of 19 kg (Scarnecchia *et al.*, 1996), the annual catch would represent 25.8 t. The average annual volume of caviar produced from 1993-2000 by a company collecting the sport fishery catch was 2,705 kg/year, ranging from 4,127 kg in 1998 to 1,537 kg in 1997.

Oklahoma: No catch data were reported by the state authorities.

South Dakota: Only harvest of *P. spathula* by sport anglers during a limited season and on a limited ground (common boundary with Nebraska) is allowed.

Number of *P. spathula* caught by sport fishers along the common South Dakota and Nebraska boundary during the snagging season (number of fish)

	1992	**1993**	**1994**	**1995***	**1996***	**1997**	**1998**	**1999**
No of fish	1,000	1,529	1,568	2,200	1,828	948	1,125	1,334

* quota exceeded due to delay in closing the season caused by the administrative procedure required.
Source: USFWS, CITES Management Authority of USA, *in litt.* to TRAFFIC Europe, September 2000

The harvest was managed with an annual 1,600 fish quota system from 1992-1996, and by a tag/permit system from 1997-1999. There are no data for 2000 because the snagging season starts on 1 October. An estimated additional 100-150 paddlefish are harvested annually during the July archery season.

States prohibiting commercial and sport fisheries

Alabama: The species is protected by law but no poaching activity is known or suspected.

Louisiana: There has been no legal commercial harvest of *P. spathula* in Louisiana since 1986. There have been complaints to the state authorities about illegal catch and possession. Recently, a request for a permit to transport and export 5,000 lbs (2,268 kg) of paddlefish roe per month was submitted to the state authorities.

Ohio: No catch data were reported by the state authorities. No poaching has been recorded by the authorities.

Texas: No information provided.

Virginia: Only historic anecdotal reports of fishing.

West Virginia: No information provided.

Wisconsin: P. spathula harvest has been prohibited since 1992. No poaching has been recorded, except for a recent case of more than 60 paddlefish incidentally caught in a large seine net and intentionally killed by the commercial fisher.

Introduced populations:

China: Significant imports (see "International Trade" and "Captive Breeding") of live *P. spathula* were introduced in captive breeding facilities in China. There is no documentation on the potential damage of the introduction of exotic Acipenseriformes on local species. If specimens of *P. spathula* escape in to the Yangtze River, this may threaten the Chinese paddlefish *Psephurus gladius*, which is on the brink of extinction. Experts have agreed that the potential threats that must be taken into consideration are: the

introduction of new pathological germs in wild populations, food competition in case of acclimatisation of the exotic specimens and hybridisation with the local species (Cemagref, *in litt*., press release, 26 January 2000).

INTERNATIONAL TRADE

P. spathula is one of four Acipenseriformes species listed in the CITES Appendices before 1997. The listing was proposed by the USA at the 8th meeting of the Conference of the Parties in 1992.

Gross exports and comparative tabulation of trade in *P. spathula* from 1992 to 1998 are given in the Appendix. Annual Reports from 1992 to 1998 suggest that most specimens of *P. spathula* traded internationally are fertilised eggs and live fish. Trade volumes increased progressively from 1993 (30,000 fertilised eggs and 9,644 live fish) to 1997 (187,000 and 238,700 respectively), before decreasing in 1998 to 70,000 fertilised eggs (as confirmed by China, the only importer in 1998 (CITES Management Authority of China, *in litt*. to TRAFFIC Europe, 28 August 2000)) and 23,440 live fish. China is the main destination for both fertilised eggs (54%, 60,600 eggs/year in average from 1994-1998) and live specimens (31%, 42,000 fingerlings/year in average from 1994-1997). Other major importers (in decreasing order of importance) are: Romania, Hungary, France, Germany, Taiwan (Province of China) and Japan. These specimens are supplying the demand of captive breeding facilities, in Moldova for instance (see "Captive Breeding").

A market for meat seems to exist since small volumes of meat were exported from the USA to Canada in 1995 and 1996 (46 kg and 381 kg respectively).

Only one export quota was established since 1998. It was set by the Russian Federation at 5 kg of fertilised eggs for 2000. Three live specimens (possibly adults) were imported into the Russian Federation from the USA in 1998.

CONSERVATION MEASURES

Both commercial and sport fishing are prohibited in Alabama, Louisiana, Maryland, Minnesota, New York, North Carolina, Ohio, Pennsylvania, Texas, Virginia, West Virginia and Wisconsin (Graham, 1997).
Unless otherwise stated, information for this section was provided by the USFWS (CITES Management Authority of USA, *in litt.* to TRAFFIC Europe, September 2000).

States allowing commercial fishing

Arkansas: For commercial fisheries, seasonal restrictions apply in some areas. A 76 cm eye-to-fork-of-tail minimum length limit from fall until spring is set as additional protection for females (Graham, 1997). For sport fishing, a daily catch limit of two paddlefish is set.

Illinois: No information provided.

Kentucky: The catch is regulated under the commercial fishing and snagging legislation which controls the type of gear, the fishing requirements (e.g. number and size of fish) and the waters open to fishing.

Mississippi: Sport and commercial fisheries are permitted. However, during the period 1 November to 30 April, it is illegal to fish for, take or possess paddlefish or its parts, including roe (caviar). A list of areas closed to the use of commercial fishing gear exists.

Missouri: P. spathula is classified as game, so sport and commercial fisheries are permitted.

Tennessee: Strict regulations exist for both commercial and sport harvest of *P. spathula*. Only one area permits sport fishing, with a limit of one fish per day. Paddlefish and its parts caught by sport fishing methods may not be sold.

States allowing sport fishing only

Indiana: Sport fishery is limited to hook-and-line (Graham, 1997).

Iowa: The commercial fishery was closed in 1986 (Graham, 1997). There is no size limit for sport fisheries. Together with neighbouring states, Iowa closed *P. spathula* sport fisheries on the Missouri and Big Sioux rivers in 1992.

Kansas: State regulation for sport fishing of *P. spathula* is strict. It includes, for instance, reporting of the catch at a check station where a numbered tag is attached to each fish caught. Restocking efforts have been undertaken in all rivers. The fry are reared in a state-run hatchery, using seedlings (eggs or fry) from Missouri or Oklahoma. The policy is to restock the reservoirs of rivers with fish that were obtained from the nearest existing stock. All stock must be tagged with coded wire tags.

Number of P. spathula released through restocking by the Kansas Department of Wildlife and Parks in Kansas and Oklahoma (number of fry)

	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Number of fry	22,267	11,685	16,918	6,196	0	0	0	0	7,100

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

Montana: Sport fishing only is allowed. The main fishing area is common to Montana and North Dakota. Regulations of both states are therefore linked. A tag limitation programme has been installed and the catch is allowed only from 1 May to 15 June in a limited area of the Missouri River. The average number of tags distributed from 1995 to 1999 is 6,467/year.

Nebraska: The state shares its *P. spathula* fishery with South Dakota along the Missouri River common boundary. Quotas of 275 and 1,400 fish (individuals) have been adopted for bow and arrow and snag fishing respectively. As in South Dakota, a slot length limit of 88-114 cm and fishing seasons were established for the two types of sport fisheries (see South Dakota).

North Dakota: Only sport fishing is permitted. The main fishing area is common to Montana and North Dakota. Regulations of both states are therefore linked. A tag limitation programme has been installed and catch is allowed only from 1 May to 15 June in a limited area of the Missouri River. The average number of tags distributed from 1992 to 2000 is 5,703/year. A research programme on *P. spathula* began in 1990. This includes research on reproduction, age structure and catch rates by the use of 10,000 micro-tags. Eight years of data suggest that the catch rate is closely correlated to the population constraints. The caviar of fish caught by sport fishermen is collected by an organisation, North Star Caviar, Joint Venture, and sold on the local and international market. The provisions of the sale of paddlefish products in North Dakota have been defined through a memorandum of understanding. This was signed in June 2000, between North Star Caviar, Joint Venture and the North Dakota Game and Fish Department. The benefit of the trade in caviar must be invested in "resource-related" projects.

Oklahoma: The sport fishery of *P. spathula* is strictly regulated, including fishing seasons, daily catch limits, restricted fishing gears and the obligation to tag every fish caught. Some *P. spathula* are being released in Oklahoma rivers by the state of Kansas (seeabove). The Oklahoma restocking programme is monitored.

Number of *P. spathula* fry released through the Oklahoma restocking programme (number of fry)

Reservoir	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Kaw	18,890	25,185	16,750	2,013	?	?	?	?	?
Oologah	?	?	?	5,974	112	10,719	2,037	8,837	3,450
Texhoma	?	?	?	?	?	?	?	5,757	20,846
Total	***18,890***	***25,185***	***16,750***	***7,987***	***112***	***10,719***	***2,037***	***14,594***	***24,296***

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

South Dakota: P. spathula catch is managed jointly with Nebraska, due to the common boundary on the Missouri River. The fishing seasons are limited to 16 days in the middle of July for archery fishermen, and to 30 days in October for the snagging fishery. A catch quota also applies to the latter. From 1992 to 1996, the catch quota was reached in six days or less. As of 1997, the management of the paddlefish snagging fishery was switched to a tag/permit system and a total of 2,250 tag/permits were issued annually from 1997 to 1999 by South Dakota and Nebraska. Several other restrictions have been adopted for the snag fishery. *P. spathula* measuring 35-45 inches (88-114 cm) must be released, and snagging is allowed only from 7:00 to 19:00 daily. Archery anglers can fish from sunrise to sunset. Graham (1997) noted that all anglers are prohibited from selling or trading any paddlefish or sturgeon flesh (meat) and/or body parts. Since 1990, the state has been restocking juveniles.

States prohibiting commercial and sport fisheries

Alabama: P. spathula is protected by State Regulation 220-2-94: "It is illegal to take or attempt to take paddlefish from all public waters of Alabama by any method or to process paddlefish or any part of a paddlefish. Any paddlefish accidentally captured shall be immediately returned to the waters from where it came. This regulation does not apply to commercially packaged paddlefish products imported from out-of-state, or to paddlefish cultured at hatchery operations or grow out ponds permitted through the Commissioner, Department of Conservation and Natural Resources".

Louisiana: P. spathula has been protected since 1986. No sport or commercial fisheries are allowed. It is illegal to possess paddlefish, sturgeon and their body parts, including roe (caviar). Violations carry a maximum fine of USD2,500/fish. There is a management plan for each species of paddlefish and sturgeon occurring in the state, including population monitoring, habitat restoration and stock enhancement. Captive breeding and restocking efforts of *P. spathula* have been carried out in Louisiana for 10 years.

Minnesota: P. spathula fishing has been closed statewide, but there is no regulation, nor restocking programme.

New York: Since the population is too low to be of interest either to commercial or sport fisheries, *P. spathula* has no official status or special protection. Fingerling restocking was initiated in 1998, and if there is significant survival of these, prohibition of harvest will be adopted by the fall of 2002.

Ohio: P. spathula was listed as an Ohio Endangered Species from 1974 until 1987 when it was re-listed as Threatened. However, this does not afford any legal or regulatory status. Ohio does not have a commercial or sport catch/quota for the species. *P. spathula* cannot, however be taken within 1,000 feet downstream of four large dams in the state. Ohio is currently participating in research and outreach programs for *P. spathula*.

Pennsylvania: Commercial and sport fisheries are prohibited. The state is engaged in a long-term restoration effort for paddlefish in the major rivers of western Pennsylvania. Individuals released through the programme should have reached sexual maturity.

Texas: The state is actively restocking and there are indications that the populations is increasing (Graham, 1997).

Virginia: Classified as Threatened (Graham, 1997).

West Virginia: The state began stocking juveniles in the Ohio and Kanawha rivers in 1992 (Graham, 1997).

Wisconsin: P. spathula has been assigned the status of Threatened in 1989; possession is illegal.

CAPTIVE BREEDING

An aggressive restocking programme for *P. spathula* has been undertaken in many states in the USA (Graham, 1997). The success of experimental releases of *P. spathula* has been investigated (Beamesderfer and Farr, 1997).

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 available information, there seems to be no current significant production of caviar and/or meat of *P. spathula* in commercial farms (USFWS, CITES Management Authority of USA, *in litt.* to TRAFFIC Europe, September 2000).

China: In 1988, the Fishery Institute of Xiantao City in central Chinas' Hubei Province started to introduce a small quantity of fertilised eggs of *P. spathula* from the USA to conduct experimental grow-out in ponds. The institute did not succeed with hatching and rearing until 1991. Since 1991, China imported an annual average of 100,000 fertilised eggs from the USA. However, no individual has been raised to adult age until now (Dr Meng Xianlin, CITES Management Authority of China, *in litt.* to TRAFFIC Europe, 28 August 2000).

Moldova: *P. spathula* was introduced in the country to study multi-species captive breeding, with Stellate Sturgeon *Acipenser stellatus* in grow-out ponds (A. Vedrashco, pers. comm. to TRAFFIC Europe, 14 March 2000).

Poland: The CITES Management Authority of Poland has confirmed that six sturgeon species and their hybrids, including *Polyodon spathula,* are bred in captivity. In most cases, hybrids are F1 generation live specimens (fertilised eggs) imported into Poland from range States, particularly from the Russian Federation. Some farms keep F2 generation specimens, bred in Poland and used as broodstock, partly for the production of juveniles to be sold on the domestic market and exported (Dr Z. Krzeminski, Deputy Director, *in litt*. to TRAFFIC Europe, 31 August 2000).

Russian Federation: At least one large facility is rearing *P. spathula* (Anon., 1999).

USA: Restocking programmes have started in Louisiana, Kansas, New York, Oklahoma, Pennsylvania, South Dakota, Texas and West Virginia. There are no records of commercial captive breeding or aquaculture activities within Arizona, Delaware, Florida, Louisiana, Minnesota, New York, Ohio, Oklahoma, South Dakota, Tennessee, Utah, Wisconsin and Wyoming. Farms and hatcheries have been developed under state or commercial initiatives to produce fingerlings for restocking (Missouri), conduct short term grow-out for research (Wisconsin), refine captive propagation, techniques (Georgia) and develop intensive grow-out culture (Texas) (Andreasen, 1999).

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APPENDIX

Gross exports* of *Polyodon spathula* 1992-1998

TAXON	TERM	UNIT	Exp	1992	1993	1994	1995	1996	1997	1998
Polyodon spathula	bodies		US	0	0	0	0	0	3,500	0
Polyodon spathula	eggs		US	0	60,000	150,305	88,000	160,000	187,000	180,000
Polyodon spathula	eggs	kg	US	0	0	0	0	0	0	7
Polyodon spathula	live		GB	0	0	90	600	500	400	0
Polyodon spathula	live		HU	0	0	0	31,300	1,000	3,000	0
Polyodon spathula	live		US	30	9,644	212,240	57,104	90,004	265,300	53,440
Polyodon spathula	meat	kg	US	0	0	0	46	381	0	0
Polyodon spathula	specimens		US	0	0	0	0	0	0	9

* **Definition:** "**Gross exports** are the sum of all reported exports and re-exports in a particular commodity or species in a particular year or series of years; Gross trade is thus a simple measure of the total number of items recorded in international trade. However, gross trade may be an overestimate of the total number of actual specimens in trade as re-exports are not deducted from the total." (Anon, 1996). This is particularly applicable to caviar of which shipments are often exported, re-packaged and re-exported. For instance, in the mid-1990s, Germany re-exported as much as 45% of its annual caviar imports (De Meulenaer and Raymakers, 1996).

Comparative Tabulation of trade in *Polyodon spathula* 1992-1998

				Imports reported					Exports reported					
Year	Imp	Exp	Origin	Quantity	Unit	Term	P	S	Quantity	Unit	Term	P	S	
Eggs														
1993	DE	US		**60,000**		eggs	S	C	**30,000**		Eggs	T	C	
1994	AT	US		10,000		eggs	T	C						
1994	CN	US							63,000		Eggs	T	C	
1994	FR	US							2,000		Eggs	T	C	
1994	GB	US		305		live	T	W	305		Eggs	T	C	"live": fertilised eggs? or
1994	HU	US							15,000		Eggs	T	C	roe in kg or gr?
			Total 1994:	**10,305**					**80,305**					
1995	CN	US							40,000		Eggs	T	U	
1995	CN	US							10,000		Eggs	T	C	
1995	FR	US		10,000		eggs	T	W	10,000		Eggs	T	C	
1995	HU	US							25,000		Eggs	T	C	
			Total 1995:	**10,000**					**85,000**					
1996	CZ	US		20,000		eggs	T	F	20,000		Eggs	T	W	
1996	HU	US							100,000		Eggs	T	W	
1996	IL	US							20,000		Eggs	T	W	
			Total 1996:	**20,000**					**140,000**					
1997	CN	US							120,000		Eggs	T	O	
1997	GR	US							10,000		Eggs	T		
1997	HU	US							7,000		Eggs	T		
1997	IL	US							50,000		Eggs	T		
			Total 1997:						**187,000**					
1998	CN	US							150,000		Eggs	T		
1998	CN	US		70,000		eggs	B	C	30,000		Eggs	T		
			Total 1998:	**70,000**					**180,000**					
1998	CZ	US	RU	3	kg	eggs	T	F						
1998	SG	US		4	kg	eggs	T	W						
			Total 1998:	**7**	**kg**									

Comparative Tabulation of trade in *Polyodon spathula* 1992-1998 (continued)

Year	Imp.	Exp.	Origin	Imports reported Quantity	Unit	Term	P	S	Exports reported Quantity	Unit	Term	P	S	
Live														
1992	JP	US							**30**		Live	T	C	
1993	DE	US							1,500		Live		C	
1993	HK	US							644		Live	T	C	
1993	JP	US							3,000		Live	T	C	
1993	TW	US							4,500		Live	T	C	
			Total 1993:						**9,644**					
1994	JP	GB	US	90		live	T	C	90		Live	T	C	
1994	CN	US							20,000		Live	T	C	
1994	DE	US		60,000		eggs	T	C	60,000		Live		C	"eggs" or "live"?
1994	FR	US		80,000		live		C	20,000		Live	T	C	i.e. fertilised eggs?
1994	HU	US							40,000		Live	T	C	
1994	IT	US		5		live	S	C	5,000		Live		U	
1994	JP	US		1,060		live	T	C	3,060		Live	T	C	
1994	TW	US							3,875		Live	T	C	
			Total 1994:	**141,155**					**152,025**					
1995	JP	GB	US	600		live	T	C	600		Live	T	C	
1995	AT	HU							800		Live		C	
1995	BE	HU	US						2,000		Live		C	
1995	DE	HU							5,000		Live	T	C	
1995	FR	HU	US						1,500		Live		C	
1995	GB	HU	US	1,000		live	T	C	1,000		Live		C	
1995	GR	HU	US						21,000		Live		C	
1995	DE	US		25,000		live	T	C						
1995	DE	US		2,500		live	T		2,500		Live	T	U	
1995	FR	US							10,000		Live	T	C	
1995	GB	US		600		live	T	C	600		Live	T	C	
1995	GB	US		4		live	B	C	4		Live		W	
1995	JP	US		3,000		eggs	T	F	4,000		Live	T	C	"eggs" or "live"?
1995	MX	US							5,000		Live	T	U	i.e. fertilised eggs?
1995	RO	US							10,000		Live	T	U	
			Total 1995:	**32,704**					**64,004**					
1996	JP	GB	US						500		Live	T	C	
1996	AT	HU	US						600		Live		F	
1996	BE	HU	US						400		Live		F	
1996	CN	US							35,000		Live	T	C	
1996	DE	US		20,000		eggs	T	C	20,000		Live	T	C	"eggs" or "live"?
1996	DE	US		4		live	Z	C	4		Live		W	i.e. fertilised eggs?
1996	FR	US		10,000		live		W	960		Live	T	C	
1996	GB	US		1,500		live	T	C	1,000		Live	T	W	
1996	JP	US		2,000		live	T	F	1,500		Live	T	C	
1996	JP	US							1,500		Live	T	W	
1996	RO	US							10,000		Live	T	C	
1996	TW	US							8,500		Live	T	C	
1996	TW	US							1,000		Live		C	
1996	TW	US							1,000		Live	T	W	
			Total 1996:	**33,504**					**81,964**					

Comparative Tabulation of trade in *Polyodon spathula* 1992-1998 (continued)

Year	Imp.	Exp.	Origin	Imports reported Quantity	Unit	Term	P	S	Exports reported Quantity	Unit	Term	P	S
Live (continued)													
1997	MY	GB	US						400		Live	T	C
1997	PL	HU	US						3,000		Live	T	F
1997	AT	US		15,000		live	T	F					
1997	CN	US							113,000		Live	T	C
1997	FR	US		30,000		live		F	15,000		Live	T	C
1997	GB	US		400		live	T	C	400		Live	T	O
1997	JP	US		3,500		bodies	T	F	3,500		Live	T	O
1997	RO	US							100,000		Live	T	C
1997	TW	US							2,400		Live	T	C
1997	TW	US							1,000		Live	T	O
		Total 1997:		**48,900**					**238,700**				
1998	FR	US		45,000		live	T	F	15,000		Live	T	W
1998	JP	US							2,100		Live	T	O
1998	JP	US							340		Live	T	C
1998	RO	US							6,000		Live	T	W
		Total 1998:		**45,000**					**23,440**				
Specimens													
1998	DE	US		6		specimens	S	O	6		Specimens		O
1998	RU	US							3		Specimens		O
Meat													
1995	CA	US							46	kg	Meat	T	W
1996	CA	US							381	kg	Meat	T	W