

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 (4,000 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
<i>H. dauricus</i>	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	4,000
	China	3,487	1,500	3,430	3,430
	Total	7,087		6,930	7,430
Meat	Russian Federation	0		0	18,000

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

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. schrenckii* 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)
<i>Huso dauricus</i>	eggs	kg	CN	4,481	3,487 + 1,500 pre-Convention
<i>Huso dauricus</i>	eggs	kg	DE	0	
<i>Huso dauricus</i>	eggs	kg	RU	2,758	3,600

Comparative Tabulation of trade in *Huso dauricus* 1998

Year	Imp.	Exp.	Imports reported					Exports reported					
			Origin	Quantit	Unit	Term	P	S	Quantit	Unit	Term	P	S
			y	y									
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						