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.

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 catch of the two species are combined in the catch statistics of Azerbaijan. 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.

DISTRIBUTION AND POPULATION

The CITES database lists the current distribution of *A. gueldenstaedtii* as: Azerbaijan, Iran, Kazakhstan, Russia, Turkmenistan (Anon., 2000a). However, information gathered during the present review suggests that the species has occurred or occurs naturally in Bulgaria, Georgia, Romania, Turkey and Ukraine.

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 Holcik, 1997; Holcik, 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, the last catches occurred in 1970 (Pintér, 1991). However, it may still occur in the Tisza River (Tiszafüred) (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. Holcik (*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 Holcik, 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 (Holcik, 1995). Three or four individuals of the resident form are caught annually in the Danube River (Dr J. Holcik, *in litt.* to IUCN/SSC Wildlife Trade Programme, September 2000). The species' future is threatened and the species is critically endangered (Holcik, 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 Holcik, 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 1961 (Dr J.Holcik, *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. gueldenst.	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. Holcik, *in litt.* to IUCN/SSC Wildlife Trade Programme, 2000). The species future is threatened and the species is critically endangered (Holcik, 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 (Jankovic, 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.

Exports of *A. gueldenstaedtii* from Hungary in 1999 (number of fingerlings)

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

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

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

	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* (kilograms)

		1998	1999			2000		
		Caviar	Caviar	Meat		Caviar	Meat	Fert. eggs
Azerbaijan			5,900	50,000		4,350	43,500	
Iran	***A. gueldenstaedtii (A. persicus)***	10,000 (45,000)	14,000 (53,000)			(52,000)		
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 No.s 1998/35-36-61, 1999/21-47-53-68 and 2000/053-056

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.

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 (Pintér, 1991). According to Decree No. 1/1982 (III.15.) 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*, 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).