Kingdom	Phylum	Class	Order	Family
ANIMALIA	CHORDATA	ACTINOPTERYGII	SALMONIFORMES	SALMONIDAE

Scientific Name:	*Hucho taimen*
Species Authority:	(Pallas, 1773)
Common Name/s:	

English – Mongolian Taimen, Siberian Salmon, Siberian Taimen, Taimen

Synonym/s:	*Salmo taimen* Pallas, 1773

Assessment Information [top]

Red List Category & Criteria:	Vulnerable A2bcd ver 3.1
Year Published:	2012
Assessor/s:	Hogan, Z. & Jensen, O.
Reviewer/s:	Rand, P.S. & Weiss, S.
Contributor/s:	

Justification:

Criterion A: Population Reduction

Following the IUCN guidelines, we determined the overall abundance loss for this species by weighting factors. We include estimates reported in points 1–4 in the *Population* section (below) by region (see Tables 1–3 in the additional supporting information). All range areas are calculated as extent of occurrence (EOO). Data limitations precluded us from estimating aquatic habitat area.

Most of the historic range of the species is contained in the Russian Federation (83.8% of total). The species' historic, natural range extends into China (6.4% of total), Kazakhstan (6.1% of total) and Mongolia (3.7% of total; see Table 1 in the additional supporting information).

We estimate a total natural range reduction of 3.6% (see Table 1 in the additional supporting information). Loss in range area for specific regions

varies from 3.2% within Russia (in the Volga, Ural and Pechora Rivers), 6.9% within China (in the Amur River basin), and 19.1% within Mongolia (see Table 2 in the additional supporting information). We acknowledge that percentage loss of range calculated as area of occupancy (AOO) would likely be much higher than this, considering many populations, particularly along the southern extent of their distribution, have become significantly fragmented as a result of localized impacts from land use change and fishing pressure. However, we lack the data to generate reliable estimates of AOO for this species throughout most of its natural range.

To arrive at a population reduction estimate for this species to evaluate it against IUCN Red List Criterion A, we used our abundance loss estimates for each region (described in points 1–4 in the *Population* section below), weighted by the percent of the range in each region, as prescribed by the *Guidelines for Using the IUCN Red List Categories and Criteria* (Version 9.0; see Table 3 in the additional supporting information). We were unable to obtain an estimate of population trend within Kazakhstan, so we excluded this region from our range-wide analysis. The analysis yielded a population reduction of 37.3% (see Table 3 in the additional supporting information). It is important to acknowledge that this estimate is influenced most significantly by the abundance reduction we applied to the majority of the species' range in Russia (Volga, Ural, and the Arctic and Sea of Okhotsk river drainages; see Table 3 in the additional supporting information).

Based on criterion A2, this results in a status of VU (Vulnerable) for this species, based on A2b (index of abundance appropriate to the taxon), A2c (a decline in AOO, EOO and/or habitat quality), and A2d (actual or potential levels of exploitation).

Criterion B: Geographic Range and Continuing Decline
We estimated the total historic range (EOO) to be 12,404,332 km² (including the entire watershed area). The total range area lost is estimated to be 444,972 km². Since the species' range estimates are well outside the thresholds used for IUCN Red List Criterion B, this species does not qualify for listing under this criterion.

Criteria C and D: Current Population Size
No estimates are available for current population size, therefore the species does not qualify for listing under criterion C or D. Also, the species' range is not sufficiently restricted to qualify it for listing under VU D2.

Criterion D: Quantitative Analysis

Insufficient data are available to carry out a quantitative analysis to estimate the probability of extinction for this species. Therefore criterion E cannot be used in this case.

Follow the link below for additional supporting information for this assessment.

For further information about this species, see FW Fishes/188631_Hucho_taimen.pdf.

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Geographic Range [top]

Range Description:	The Siberian Taimen occurs in Europe and Asia, including parts of the Caspian and Arctic drainages in Eurasia (Volga, Ural, Pechora, Yenisey, Lena) and portions of the Pacific drainage in Mongolia, Russia, and China. The western border of their natural range is upstream reaches of the Volga and Pechora Rivers. The species is found in a number of tributaries of Pechora, including Ilych, Kosiu, Bolshaia Synia, and Usa. There have been no records of presence of this fish in Komi Republic for the last 20 years; the last reported catch of the species in the Komi Republic was in the Ilych River in 1978 (Taskaev 2009). Much of the range within the Volga and Ural Rivers (including the Malyi Ik River tributary) has been lost. The only place in Europe where the species is still present is the Kama River (particularly the Vishera River), where there is still a limited fishery. The Siberian Taimen is also present in Yaiva River, and there are also records in Kosva, Chusovaia and Beryozovaia Rivers (Melnikova 1998). The species was observed in 1987 in Udmurtia Republic, in the Siva River and the downstream section of the Votkono reservoir (Tepliakov 2002). It is found in Khabarovsk Krai, including Amur River and its tributaries and the Tugur and Uda Rivers along the Sea of Okhotsk coast (Zolotukhin *et al*. 2000). The species has been occasionally collected in the Langry River in northern Sakhalin Island (Safronov *et al*. 1998, Semenchenko and Zolotukhin 2011). In Mongolia, the Siberian Taimen is found in the Shiskhed, Eg, Uur, Delger Moron, Ider, Chuluud, Eroo, Selenge, Orkhon, and Tuul rivers, and Darkhad Depression (Arctic drainage), and Onon, upper Kherlen and Khalkhin rivers (Amur drainage). In China, it occurs in the Heilongjiang (Amur) River and its tributary the Eerqisi as well as the headwaters of the Irtysh River in the Altai region in Xinjiang Province. See Figure 1

	in the additional supporting information for a map of the historic and current distribution of the species. This species has been listed as endangered in country Red Lists and regional Red Books (see Figure 2 in the additional supporting information).
	Follow the link below for additional supporting information for this assessment.
	For further information about this species, see FW Fishes/188631_Hucho_taimen.pdf.
	A PDF viewer such as Adobe Reader is required.
Countries:	tive:
	na; Kazakhstan; Mongolia; Russian Federation
Range Map:	Click here to open the map viewer and explore range.

Population [top]

Population:	Four primary sources of information are used here to document declines in population abundance. Documentation of the data sources and analytical approaches in this assessment are outlined below:
	1. Russia (Amur)
	Data were obtained on catch of *H. taimen* in commercial fisheries (primarily gill net captures) in the lower reaches of the Amur River (Khabarovsk Krai, Zolotukhin *et al*. 2000). Data are reported as weight (in MT) of landed biomass of Siberian Taimen. It is important to note here that reporting of catch over this entire period has not been consistent, and much of the catch has gone unreported, particularly in recent decades. We acknowledge that the data used in this analysis are very uncertain.
	We fit the data to an exponential model and determined loss rate of the regional population to be 4.2% yr^{-1} or 90.0% loss over 51 years or three generations for the species (see Figure 3 in the additional supporting information).
	2. Russia (Volga, Ural, Pechora, Ob, Yenisey, Lena, Tugur and Uda Rivers)
	Abundance of *H. taimen* in most of this region has been declining (primarily from unregulated catch, both commercial and recreational), but there are no reliable

indices of adult abundance trends to quantify the decline in a rigorous manner.

A review of Siberian Taimen status was conducted in 57 river basins within the Russian Federation (including the Amur River, M. Skopets, unpublished data). Populations were divided into four categories: nearly extirpated, significant decline (i.e., more than 50%), moderate decline (i.e., between 30–50%), and healthy (less than 30%). Skopets found that Siberian Taimen populations have been extirpated or have undergone significant decline in 39 of 57 river basins and only a few populations could be still considered stable, primarily due to their remote, inaccessible locations. Skopets categorized Taimen populations as being at moderate risk in over half of Russian river basins and at high risk in all rivers west of the Ural mountains. Even in some very remote areas (such as mountainous rivers of the Urals) Siberian Taimen populations have declined by over 50% (M. Skopets, pers. comm).

In central Siberia (including the Baikal region) the species has undergone decline, but the rate of decline of the adult population is very uncertain (I. Knizhin, Irkutsk State University, pers. comm). The actual level of exploitation (illegal harvest) is thought to be significant throughout this region. The species is expected to continue to decline by at least 30% over the next three generations (51 years) within this region (I. Knizhin, Irkutsk State University, pers. comm). Unregulated catches is the primary threat to the species in this region.

We assumed for this assessment that that the rate of decline in adult abundance in this region was 30% over the past three generations. We acknowledge that this is a very uncertain number (this trend is suspected), but we are reasonably confident that the loss rate has been at least 30%.

3. Mongolia
In Mongolia, *H. taimen* distribution has decreased by about 60% since 1985 suggesting a population decrease of at least 50% (Ocock *et al*. 2006). For this assessment, we estimate

range loss (estimated as extent of occurrence, or EOO, between 1980 and 2008) to be 19.1% (see Tables 1 and 2 in the additional supporting information). There are continuing declines in the quality of habitat (due to mining) and in the number of mature individuals. It is suspected that the population will decrease by over 60% in the next 20 years as demand increases from China and Russia and from non-catch and release angling (Ocock *et al*. 2006). In Mongolia, fish have disappeared from rivers near town centres and downstream of mining areas. Stable populations still occur in more remote areas but these populations are vulnerable as mining, overgrazing, and fishing become more common in Mongolia. There is also illegal, international trade to China, but the scale of this trade is uncertain.

Based on available data and a Mongolian Red List assessment that was conducted in 2006 (the species was listed as Endangered in Mongolia; see Figure 2 in the additional supporting information), we estimate a loss of 50% in overall abundance over the past three generations for the species. The only quantitative estimate of Siberian Taimen abundance in Mongolia is for a river (the Eg-Uur) which is thought to be one of the least impacted populations in Mongolia (Jensen *et al*. 2009). Therefore, this abundance estimate (19 adult Taimen per km) is not thought to be representative of population status in Mongolia as a whole.

4. China
Hucho taimen occur in two regions in China. One is in the Altai mountain region in Xinjiang Province (including Kanas Lake and the Burqin River, headwaters of the Irtysh River), and the other is in the Amur River drainage in Heilongjiang Province. The species is listed as Endangered in China (see Figure 2 in the additional supporting information). In both regions the species is thought to be in decline (Guang-xiang Tong, Heilongjiang Fisheries Research Institute, pers. comm). Based on limited catch data in field surveys, the rate of decline over the past three generations (~51 years) is approximately 87% and 95% in Xinjiang and Heilongjiang Provinces, respectively (Tong, pers. comm.; see Table 3 in the additional supporting information). There is still a small breeding population of Siberian Taimen in Kanas Lake in

Xinjiang Province. The abundance trend of some more remote, inaccessible river populations in Heilongjiang Province are still considered stable, including tributaries in the north of Daxinganling Prefecture, upstream of Nen River and tributaries in the south of Daxinganling Prefecture, and the Song Acha River in the upstream of the Ussuri River. Siberian Taimen no longer make up a significant percentage of commercial catch and only a few fish are reported from the Amur River each year in Heilongjiang Province. Based on recent survey data, we estimate loss of range (estimated as extent of occurrence, or EOO) within Heilongjiang Province at 7% of the historic range (see Tables 1 and 2 in the additional supporting information). We are not aware of any loss of range in Xinjiang Province.

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Population Trend:	⬇ Decreasing

Habitat and Ecology [top]

Habitat and Ecology:	Siberian Taimen occur exclusively in freshwater, predominantly in swift flowing rivers and streams. They have been known to occur at altitudes above 1,500 m and in coastal rivers near sea level.
	Siberian Taimen are long-lived. They are relatively slow growing and late to mature. The species grows to over 2 m and can live for up to 30 years (Holcik *et al*. 1988, Matveyev *et al*. 1998). Siberian Taimen reach sexual maturity at approximately 5–7 years of age and at a size of 60–70 centimetres and 2–3 kilograms. Generation time is estimated at about 17 years for a population experiencing only natural mortality (i.e., without fishery harvest). This may be an underestimate because it doesn't account for maternal effects or increased egg size with spawner age.
	Females produce 4,000–30,000 eggs, depending on the size

	of the fish. In the Yenisei River, Russia, spawning reportedly occurs in May and June. In the Eg-Uur River Basin of northern Mongolia, spawning occurs in May (Esteve *et al*. 2009). Home range of the species can be quite extensive, up to 93 river km based on telemetry studies in Northern Mongolia (Gilroy *et al*. 2010). Siberian Taimen are apex predators in most systems where they occur, feeding on fish, rodents, aquatic birds, and even bats.
Systems:	Freshwater

Threats [top]

Major Threat(s):	In Europe the main threats to this species are pollution (industrial), and legal and illegal sport angling. A diverse set of threats exist in Kazakhstan, Mongolia, Russia and China, including pollution, sedimentation and erosion, mining, damming, road construction, illegal fishing, recreational angling, and climate change.

Conservation Actions [top]

Conservation Actions:	We recommend that the following measures need to be taken to stem further losses and allow conservation and recovery for the species: 1. The most effective means of conserving this species is establishing freshwater protected areas with a focus on species conservation and threat minimization (see Abell *et al*. 2007). Illegal fishing activities is one of the primary threats, and protected areas, with sufficient enforcement, will be an important tool for conservation in the future. 2. In regions under threat from recreational fishing practices, we recommend strict regulations and sufficient enforcement to minimize risks. There is evidence from a study of recreational fishing on the Eg-Uur River in Mongolia (Jensen *et al*. 2009) that post-release mortality rates for Siberian Taimen can be very low (4–10%). However, techniques used in this fishery favour high survival rates. These techniques include: single barbless hooks, artificial lures only (no natural bait), and keeping captured fish in the water. Some of these techniques (single barbless hooks and artificial lures only) are now part of the legal restrictions on recreational fishing for

Siberian Taimen in Mongolia. Regulations are particularly important during their most vulnerable life history stage, the spawning period. We encourage new recreational fishing regulations to be instituted and enforced in other regions experiencing recreational fishery impacts.

3. In regions under threat from catch and bycatch in commercial fishes, we recommend strict regulations and sufficient enforcement to minimize risks. The species is still caught in commercial fishing operations in the Amur River region in Russia and China. Recording of catch has not been consistent. We encourage adoption of commercial fishing practices that minimizes Siberian Taimen catch, and we recommend catch be logged and reported to help scientists better understand the impact of commercial fishing operations on this species. International trade of Siberian Taimen is thought to be increasing. More monitoring of trade between Mongolia and China is warranted.

4. Mining and sand and gravel extraction from stream beds are important conservation issues in Mongolia (especially the Yeroo River) and in Heilongjiang Province in China. Special regulations are needed to limit the impact of these land use practices on Siberian Taimen habitat.

5. We strongly encourage government agencies, universities, and conservation organizations to continue on-going research or initiate new research on life history, effect of fragmentation, sustainable harvest levels, and identification of critical habitat. A telemetry study of Siberian Taimen movements in Mongolia (Gilroy *et al*. 2010) demonstrated that adult Siberian Taimen utilize river reaches up to 93 km in length. Although there are distinct seasonal patterns in movement rates, the causes of Siberian Taimen movements and their habitat requirements remain poorly understood. For southern Siberian Taimen populations in particular (e.g., Mongolia and China), thermal refuge is likely to become an increasingly limiting habitat as climate warming continues.

6. While there have been some preliminary efforts in Mongolia and China at captive breeding for the species, we feel these activities should proceed with great caution. Inter-basin transplants could contribute to loss of locally adapted gene complexes. We encourage basic research on large-scale phylogeographic structure that could help

guide future reintroductions, as well as study on gene flow within and between populations in order to support basin level management schemes. Although there is some evidence that captive propagation can help reduce short-term extinction risk for Critically Endangered species, there is virtually no empirical evidence to indicate whether artificial propagation can promote long-term sustainability. Therefore, captive propagation efforts, to the extent that they exist, are at best stop-gap measures and are in no way a substitute for conserving the species in the wild.

7. In the process of completing this assessment, the need for international cooperation and collaboration on Siberian Taimen conservation has become very clear. Decline in abundance in this species, coupled with a growing interest among research institutes and government agencies, attest to the need to establish new initiatives to conserve this species. One positive step forward would be to add *Hucho taimen* to the Convention of Migratory Species (CMS) to raise the species' profile and provide greater international support for conservation activities.

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