

Beluga (*Huso huso*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, June 2019
Revised, July 2019
Web Version, 11/13/2019



Image: Kruger. Work available under Public Domain (author's life plus 100 years). Available: https://commons.wikimedia.org/wiki/File:Huso_huso.jpg. (June 2019).

1 Native Range and Status in the United States

Native Range

From CABI (2019):

“*Huso huso* is distributed in the Black Sea (the Danube, Rioni, Dniepr, Dniestr and Bug rivers), the Sea of Azov (the Don and Kuban rivers), the Caspian Sea (the Volga, Ural, Kura, Gorgan and Sefid Rud rivers) and rarely in the Adriatic Sea (the Po river). *H. huso* has been extirpated from Austria, Croatia, the Czech Republic, Hungary, Serbia Montenegro, Slovakia and Slovenia (FishBase, 2004). The presence of *H. huso* in Greece is questionable (Economidis, 1991).”

CABI (2019) lists *Huso huso* as native to Azerbaijan, Georgia, Iran, Kazakhstan, Turkey, Turkmenistan, Bosnia-Herzegovina, Bulgaria, Italy, Moldova, Romania, and Ukraine.

From Froese and Pauly (2019):

“No natural spawning exists [in Iran] [Kottelat and Freyhof 2007].”

“[In Turkey:] Known from the Black Sea, Sea of Marmara, Aegean Sea and its watersheds, European Black Sea watersheds, European Mediterranean Sea watersheds and Anatolian Black

Sea watersheds [Fricke et al. 2007]. [...] Found in central coast of Black Sea (Sinop and Samsun vicinity) [Bat et al. 2005].”

“Regionally extinct [in Albania] [Bianco and Ketmaier 2016].”

“[In Russia:] Distributed in the Black Sea and the Sea of Azov, but less than in the Caspian Sea. The main spawning ground [*sic*] is the Volga. All spawning grounds are inaccessible for fish due to the presence of power station dams [Reshetnikov et al. 1997]. Reported from Don [Bogutskaya and Naseka 2002a] and Kuban River drainages [Bogutskaya and Naseka 2002b].”

“Critically endangered [in Slovenia] [Bianco and Ketmaier 2016]; previously reported as extirpated.”

Status in the United States

From CABI (2019):

“It has been introduced to Armenia, China, Poland and the USA.”

No other sources found mentioned an introduction within the United States and CABI (2019) did not provide a citation for the statement. Therefore, the author deems it unknown if this species has actually been introduced in the United States.

From USFWS (2005):

“On April 21, 2004, the U.S. Fish and Wildlife Service announced the listing of beluga sturgeon (*Huso huso*) as threatened under the Endangered Species Act (ESA). On March 4, 2005, the Service issued a special rule (Federal Register Vol. 70, No. 42 10493-10507) for beluga sturgeon that outlined requirements for the conservation of the species as provided for by section 4(d) of the ESA.”

Means of Introductions in the United States

No information on means of introduction to the United States was found.

Remarks

From CABI (2019):

“Based on morphological features, *H. huso* has been classified into two subspecies, *Huso huso ponticus* and *Huso huso maeoticus* (Salnikov and Malyatskii, 1934). Those in the Caspian Sea were subdivided into three populations: the Kura, Ural and Volga great sturgeons. The local populations (forms) exhibit slightly different characteristics of maturation, growth, fecundity. Seasonal (vernal and hiemal) races (forms) of *H. huso* can also be differentiated (Pirogovskii et al., 1989). [...] *H. huso* is one of the three major commercial sturgeons. This species is considered a most valuable fish. The roe harvested from female beluga sturgeon is processed for the most highly-prized caviar. Sturgeon aquaculture has more than 130 years of history and been developing rapidly since the early 1990s. *H. huso* and bester (a hybrid of female *H. huso* and

male *Acipenser ruthenus*) aquaculture has subsequently expanded into some regions of the world.”

From Froese and Pauly (2019):

“The largest sturgeon and largest European freshwater fish. In Guinness Book of Records as the most expensive fish [Foot 2000]. Threatened due to overfishing for meat at the sea and for caviar in estuaries. These threats will soon cause global extinction of the natural populations. Survival can only depend on stocking [Kottelat and Freyhof 2007].”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From Fricke et al. (2019):

“**Current status:** Valid as *Huso huso* (Linnaeus 1758).”

From ITIS (2019):

“Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Chondrostei
Order Acipenseriformes
Suborder Acipenseroidei
Family Acipenseridae
Subfamily Acipenserinae
Genus *Huso*
Species *Huso huso* (Linnaeus, 1758)”

Size, Weight, and Age Range

From Froese and Pauly (2019):

“Max length : 800 cm TL male/unsexed; [Kottelat and Freyhof 2007]; common length : 215 cm TL male/unsexed; [Bauchot 1987]; max. published weight: 3.2 t [Kottelat and Freyhof 2007]; max. reported age: 118 years [Beverton 1987]”

Environment

From Froese and Pauly (2019):

“Marine; freshwater; brackish; pelagic-neritic; anadromous [Riede 2004]; depth range 70 – 180 m.”

Climate/Range

From Froese and Pauly (2019):

“57°N - 35°N, 17°E - 60°E”

Distribution Outside the United States

Native

From CABI (2019):

“*Huso huso* is distributed in the Black Sea (the Danube, Rioni, Dniepr, Dniestr and Bug rivers), the Sea of Azov (the Don and Kuban rivers), the Caspian Sea (the Volga, Ural, Kura, Gorgan and Sefid Rud rivers) and rarely in the Adriatic Sea (the Po river). *H. huso* has been extirpated from Austria, Croatia, the Czech. Republic, Hungary, Serbia Montenegro, Slovakia and Slovenia (FishBase, 2004). The presence of *H. huso* in Greece is questionable (Economidis, 1991).”

CABI (2019) lists *Huso huso* as native to Azerbaijan, Georgia, Iran, Kazakhstan, Turkey, Turkmenistan, Bosnia-Herzegovina, Bulgaria, Italy, Moldova, Romania, and Ukraine.

From Froese and Pauly (2019):

“No natural spawning exists [in Iran] [Kottelat and Freyhof 2007].”

“[In Turkey:] Known from the Black Sea, Sea of Marmara, Aegean Sea and its watersheds, European Black Sea watersheds, European Mediterranean Sea watersheds and Anatolian Black Sea watersheds [Fricke et al. 2007]. [...] Found in central coast of Black Sea (Sinop and Samsun vicinity) [Bat et al. 2005].”

“Regionally extinct [in Albania] [Bianco and Ketmaier 2016].”

“[In Russia:] Distributed in the Black Sea and the Sea of Azov, but less than in the Caspian Sea. The main spawning ground [*sic*] is the Volga. All spawning grounds are inaccessible for fish due to the presence of power station dams [Reshetnikov et al. 1997]. Reported from Don [Bogutskaya and Naseka 2002a] and Kuban River drainages [Bogutskaya and Naseka 2002b].”

“Critically endangered [in Slovenia] [Bianco and Ketmaier 2016]; previously reported as extirpated.”

Introduced

From CABI (2019):

“It has been introduced to Armenia, China, Poland [...]”

From Froese and Pauly (2019):

“This has been translocated to areas within the country [Russia] for aquaculture and stocking in open waters however, it failed to establish populations in areas where it has been transplanted to [Bogutskaya and Naseka 2002c].”

“Neighbour introduction? [*sic*], non-resident [in Sweden]. Not established [NOBANIS 2013].”

“Reintroduced [to Estonia, original introduction listed as 1960] in 1972 and in the 1990s. The most widely cultivated sturgeon. It was cultivated in fish farms and released into the natural waters sometimes [but not established].”

FAO (2019) lists *Huso huso* as introduced to Poland but it is maintained by continuous restocking and is not established in the wild.

Froese and Pauly (2019) list *Huso huso* as introduced in Latvia. Additionally, CABI (2019) lists *H. huso* as introduced to Germany.

Means of Introduction Outside the United States

From Froese and Pauly (2019):

“diffused from other countries”

FAO (2019) lists aquaculture, research, and fisheries as means of introduction for *Huso huso*.

Short Description

From Froese and Pauly (2019):

“Dorsal spines (total): 0; Dorsal soft rays (total): 62-73; Anal spines: 0; Anal soft rays: 28 - 41. Snout moderate and pointed, turning slightly upward. Lower lip not continuous, interrupted at center. Barbels oval or flat, leaf-like posteriorly, reaching almost to mouth. Five rows of scutes, dorsal 11-14 (first one smallest), lateral 41-52 on each side, ventral 9-11 on each side. Back ash-grey or greenish, flanks lighter, belly white.”

Biology

From Froese and Pauly (2019):

“Pelagic at the sea, following its prey. Undertakes upriver migration to spawn. Juveniles occur in shallow riverine habitats during their first summer. Spawns in the main course of large and deep rivers with strong current and on stone or gravel bottom [Kottelat and Freyhof 2007]. Feeds

mostly on sea fishes (Black Sea whiting, anchovies, flatfishes, gobies, fry of bottom-living fishes), also crustaceans, mollusks, mysids and amphipods.”

Human Uses

From Froese and Pauly (2019):

“Fisheries are based almost entirely on the value of the caviar, but meat also is sold fresh, smoked and frozen; eaten broiled, boiled, fried and baked [Frimondt 1995]. Bester, a hybrid of female *Huso huso* and male sterlet *Acipenser ruthenus*, has been successfully cultivated for its high quality eggs [Frimondt 1995].”

“Fisheries: commercial; aquaculture: commercial”

Diseases

No records of OIE reportable diseases (OIE 2019) were found for *Huso huso*.

Bauer et al. (2002) found the protozoans, monogenea, *Bothriomonus fallax*, *Rhipidocotyle kovalae*, and *A. stellatus* in *Huso huso*.

Threat to Humans

From Froese and Pauly (2019):

“Harmless”

3 Impacts of Introductions

No information on impacts of introductions was found.

4 Global Distribution



Figure 1. Known global distribution of *Huso huso*. Observations are in Austria, Denmark, Netherlands, Poland, Serbia, Romania, Turkey, Kazakhstan, Azerbaijan, and Russia. Map from GBIF Secretariat (2019). The locations in Denmark, the Netherlands, Poland, and Austria were not used to select source points for the climate match as they do not represent currently established, wild populations. Because the climate matching analysis (section 6) is not valid for marine waters, no marine occurrences were used in the climate matching analysis.



Figure 2. Additional known global distribution of *Huso huso*. Observations are in Sweden, Poland, Italy, Bulgaria, Romania, Turkey, Azerbaijan, and Russia. Map from Froese and Pauly (2019). The locations in Sweden and Poland were not used to select source points for the climate match as they do not represent currently established, wild populations. Because the climate matching analysis (section 6) is not valid for marine waters, no marine occurrences were used in the climate matching analysis.

5 Distribution Within the United States

One source mentioned that *Huso huso* was introduced to the United States. No further details were given by that source. No other information found confirmed this report. Therefore, the author deems it unknown if this species has actually been introduced in the United States.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match for the contiguous United States was mostly medium. The upper Midwest and most of the Great Lakes area had high climate matches. There were also small patches of high match in the Great Plains and Rocky Mountains. Low climate match areas were the Southeast, parts of New England and the western Great Plains, as well as areas of the Pacific Northwest. The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.250, high (scores 0.103 and greater are classified as high). Most States had high or medium individual Climate 6 scores except for Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Kansas, Kentucky, Louisiana, Mississippi, New Jersey, North Carolina, Oklahoma, Rhode Island, South Carolina, Tennessee, and Texas, which had low individual scores.

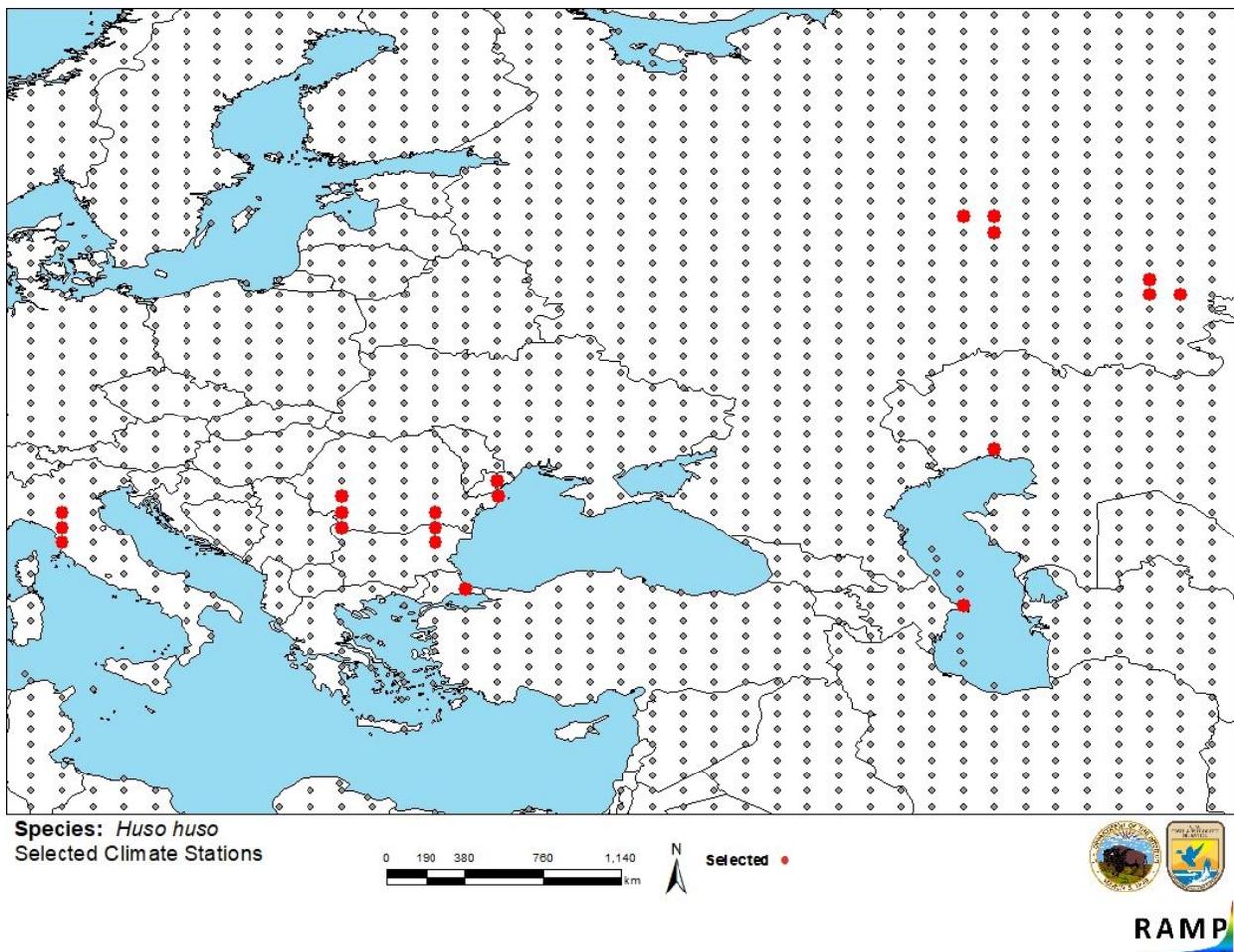


Figure 3. RAMP (Sanders et al. 2018) source map showing weather stations selected as source locations (red; Italy, Bulgaria, Romania, Ukraine, Turkey, Azerbaijan, Kazakhstan, Russia) and non-source locations (gray) for *Huso huso* climate matching. Source locations from Froese and Pauly (2019) and GBIF Secretariat (2019). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

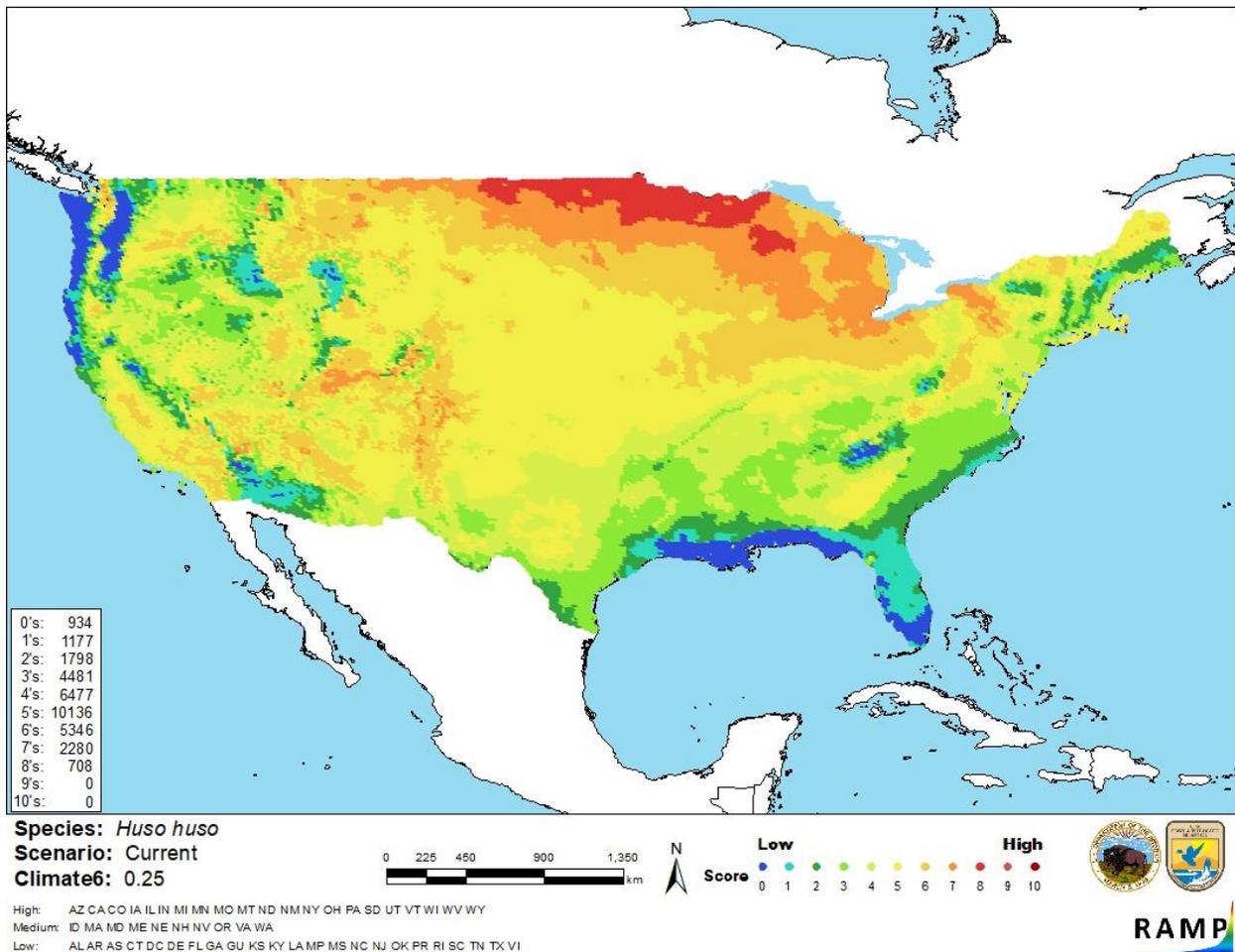


Figure 4. Map of RAMP (Sanders et al. 2018) climate matches for *Huso huso* in the contiguous United States based on source locations reported by Froese and Pauly (2019) and GBIF Secretariat (2019). 0= Lowest match, 10=Highest match.

The “High”, “Medium”, and “Low” climate match categories are based on the following table:

Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)	Climate Match Category
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

7 Certainty of Assessment

Biological and ecological information is available on this species. The native distribution of the species is fairly well documented but the information on introductions is patchy. A few records of introduction were found but there was no information on impacts of introduction. The certainty of assessment is low due to a lack of information regarding the species’ history of invasiveness. This species migrates between marine and non-marine environments. Because not

all locations in the United States are conducive to such migration, inland establishment of this species may be limited according to the existing connectivity between marine and non-marine environments.

8 Risk Assessment

Summary of Risk to the Contiguous United States

The Beluga (*Huso huso*) is a large anadromous sturgeon species highly prized for its caviar. The species is long lived and late maturing, and coupled with historically high harvest, the species is listed as threatened by the U.S. Fish and Wildlife Service and is highly imperiled within its native range. The species is native to western Asia and Eastern Europe around the Black, Azov, Adriatic, and Caspian Seas. The history of invasiveness is uncertain. Records of introduction were found but the species either failed to establish or the status is unknown. No information on impacts of introduction was found. Although the species is used in aquaculture no information on the actual volume or duration of trade was found. The climate match for the contiguous United States was high. Areas of highest match were found in the upper Midwest and around the Great Lakes. However, this species migrates between marine and non-marine environments. Because not all locations in the United States are conducive to such migration, inland establishment of this species may be limited according to the existing connectivity between marine and non-marine environments. Due to a lack of information on introductions and impacts, the certainty of assessment is low. The overall risk assessment category is uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 3): Uncertain**
- **Climate Match (Sec. 6): High**
- **Certainty of Assessment (Sec. 7): Low**
- **Remarks/Important additional information:** No additional remarks.
- **Overall Risk Assessment Category: Uncertain**

9 References

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 10.

Bauer, O. N., O. N. Pugachev, and V. N. Voronin. 2002. Study of parasites and diseases of sturgeons in Russia: a review. *Journal of Applied Ichthyology* 18:420–429.

CABI. 2019. *Huso huso* (Beluga) [original text by M. Chebanov]. *In* Invasive Species Compendium. CAB International, Wallingford, UK. Available: <http://www.cabi.org/isc/datasheet/79864>. (June 2019).

FAO (Fisheries and Agriculture Organization of the United Nations). 2019. Database on introductions of aquatic species. FAO, Rome. Available: <http://www.fao.org/fishery/introsp/search/en>. (November 2019).

- Fricke, R., W. N. Eschmeyer, and R. van der Laan, editors. 2019. Eschmeyer's catalog of fishes: genera, species, references. Available: <http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>. (July 2019).
- Froese, R., and D. Pauly, editors. 2019. *Huso huso* (Linnaeus, 1758). FishBase. Available: <https://www.fishbase.de/summary/Huso-huso.html>. (June 2019).
- GBIF Secretariat. 2019. GBIF backbone taxonomy: *Huso huso* (Linnaeus, 1758). Global Biodiversity Information Facility, Copenhagen. Available: <https://www.gbif.org/species/2402105>. (June 2019).
- ITIS (Integrated Taxonomic Information System). 2019. *Huso huso* (Linnaeus, 1758). Integrated Taxonomic Information System, Reston, Virginia. Available: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=161084#null. (June 2019).
- OIE (World Organisation for Animal Health). 2019. OIE-listed diseases, infections and infestations in force in 2019. Available: <http://www.oie.int/animal-health-in-the-world/oie-listed-diseases-2019/>. (July 2019).
- U.S. Fish and Wildlife Service. 2005. Notice to the wildlife import/export community. <https://www.fws.gov/le/publicbulletin/PB102805BelugaSturgeon.pdf>. (June 2019).
- Sanders, S., C. Castiglione, and M. Hoff. 2018. Risk assessment mapping program: RAMP, version 3.1. U.S. Fish and Wildlife Service.

10 References Quoted But Not Accessed

Note: The following references are cited within quoted text within this ERSS, but were not accessed for its preparation. They are included here to provide the reader with more information.

- Bat, L., Y. Erdem, S. Ustaoglu, Ö Yardım, and H. Hüseyin Satılmış. 2005. A study on the fishes of the Central Black Sea coast of Turkey. *Journal of Black Sea/Mediterranean Environment* 11:291–296.
- Bauchot, M.-L. 1987. Poissons osseux. Pages 891–1421 in W. Fischer, M. L. Bauchot, and M. Schneider, editors. *Fiches FAO d'identification pour les besoins de la pêche*. (rev. 1). Méditerranée et mer Noire. Zone de pêche 37, volume II. Commission des Communautés Européennes and FAO, Rome.
- Beverton, R. J. 1987. Longevity in fish: some ecological and evolutionary considerations. *Basic Life Sciences* 42:161–185.

- Bianco, P. G., and V. Ketmaier. 2016. Nature and status of freshwater and estuarine fisheries in Italy and Western Balkans. Pages 283–291 in J. F. Craig, editor. *Freshwater fisheries ecology*. John Wiley and Sons.
- Bogutskaya, N. G., and A. M. Naseka. 2002a. Regional check-lists: Don River drainage area. *In* *Freshwater fishes of Russia: a source of information on the current state of the fauna*. Zoological Institute RAS.
- Bogutskaya, N. G., and A. M. Naseka. 2002b. Regional check-lists: Kuban River drainage area. *In* *Freshwater fishes of Russia: a source of information on the current state of the fauna*. Zoological Institute RAS.
- Bogutskaya, N. G., and A. M. Naseka. 2002c. An overview of nonindigenous fishes in inland waters of Russia. *Proceedings of the Zoological Institute Russian Academy of Sciences* 296:21–30.
- Economidis, P. S. 1991. Check list of freshwater fishes of Greece (recent status of threats and protection). Hellenic Society for the Protection of Nature, Special Publication.
- FishBase. 2004. Entry for *Huso huso*. Available: www.fishbase.org. (January 2005).
- Foot, T. 2000. Guinness book of world records 2001. Guinness World Records.
- Fricke, R., M. Bilecenoglu, and H. M. Sari. 2007. Annotated checklist of fish and lamprey species (Gnathostoma and Petromyzontomorphi) of Turkey, including a Red List of threatened and declining species. *Stuttgarter Beiträge zur Naturkunde A (Biologie)* (706):1–172.
- Frimondt, C. 1995. Multilingual illustrated guide to the world's commercial coldwater fish. Fishing News Books, Osney Mead, Oxford, England.
- Kottelat, M., and J. Freyhof. 2007. Handbook of European freshwater fishes. Publications Kottelat, Cornol, Switzerland, and Freyhof, Berlin.
- NOBANIS (European Network on Invasive Alien Species). 2013. NOBANIS (Gateway to information on Invasive Alien species in North and Central Europe. NOBANIS.
- Pirogovskii, M. I., L. I. Sokolov, and V. P. Vasiliev. 1989. *Huso huso* (Linnaeus, 1758). Pages 156–200 in J. Holcik, et al. [source material did not give full list of editors], editors. *The freshwater fishes of Europe, general introduction to fishes, Acepenseriformes*. AULA Verlag, Viesbaden, Germany.
- Reshetnikov, Y. S., N. G. Bogutskaya, E. D. Vasil'eva, E. A. Dorofeeva, A. M. Naseka, O. A. Popova, K. A. Savvaitova, V. G. Sideleva, and L. I. Sokolov. 1997. An annotated check-list of the freshwater fishes of Russia. *Journal of Ichthyology* 37(9):687–736.

Riede, K. 2004. Global register of migratory species - from global to regional scales. Federal Agency for Nature Conservation, Final Report R&D-Projekt 808 05 081, Bonn.

Salnikov, N. I., and S. M. Malyatsky. 1934. On systematics of the Azov-Black Sea basin's Beluga. Reports of Fishery and Biology Research Station, Georgia (USSR) 1:31–50.