Siberian Sturgeon (*Acipenser baerii*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, February 2011
Revised, January 2018
Web Version, 6/13/2018

Photo: Jiří Bukovský. Licensed under Creative Commons (CC BY-NC 3.0). Available: http://www.eol.org/data_objects/2005172. (January 2018).

1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2018):

"Asia [Russia]: Siberia, rivers Ob, Irtysh, Yenisei, Lena, Kolyma, Khatanga, Pyasina, Anabar, Olenyok, Yana and Lake Baikal [Ruban 2005]. Non-migratory populations exist in all river systems [Ruban 2005]."

From Ruban and Zhu (2010):

"This species is known from all Siberian rivers draining to the Kara, Laptev and East Siberian seas: basins of the Ob, Taz, Yenisei, Pyasina, Khatanga, Anabar, Olenyek, Lena, Yana, Indigirka, Alazeya (rarely) and Kolyma rivers, Lake Baikal (the Yenisei River basin) and rivers flowing to the lake – the Selenga, Barguzin and Upper Angara. It is most abundant in the Ob, Yenisei and Lena rivers."

Status in the United States

This species has not been reported as introduced or established in natural habitats in the United States.

A. baerii is found in captivity in the United States, for example:

From Hatley (2014):

"Atlantic Caviar & Sturgeon [in Lenoir, North Carolina] bought its first batch of juvenile sturgeon, or fingerlings, from a German hatchery in 2006. Today the farm houses about 16,000 fish, a mix of Russian, Siberian and Atlantic sturgeon in a 32-tank system."

FAO (2018) estimates that in 2003, the United States produced 0.5 metric tons (1100 lbs) of *A. baerii* products.

From Rubin and Zhu (2010):

"The Siberian Sturgeon was listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1998."

From CITES (2000):

"Illegal trade: A large shipment (200,000 live fish) of *A. baerii* of unknown origin was confiscated by the US Customs [in 1998]."

Means of Introductions in the United States

This species has not been reported as introduced in the United States.

Remarks

Froese and Pauly (2018) list *Acipenser stenorrhynchus*, *Acipenser stenorrhynchus baicalensis*, *Acipenser baerii baerii*, and *Acipenser baerii baicalensis* as synonyms for *Acipenser baerii*.

From Froese and Pauly (2018):

"International trade monitored [CMS 2015] […] Migratory species conserved through agreements"

From Rubin and Zhu (2010):

"The Siberian Sturgeon was listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1998. […] Based on commercial catch data, it is estimated that the Ob River basin contains more than 80% of the global population of this species (Chen 2007). In the Ob River basin, catches declined by ~99.5% from 1410 tons in 1935 to 6.7 tons in 1996. In the Yenisei River catches declined from 504 tons in 1934 to 10-12 tons in 2000s (a ~97.5% decline). In the Lena River catches declined from 190 tons in 1943 to about 10 tons in recent years (a ~94.5% decline) (Ruban 2005)."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2018):

"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 *Acipenser*
Species *Acipenser baerii* Brandt, 1869 – Siberian sturgeon"

"Taxonomic Status: Valid"

Size, Weight, and Age Range

From Froese and Pauly (2018):

"Maturity: Lm 86.9, range 65 - 167 cm; Max length : 200 cm TL male/unsexed; [Keith and Allardi 2001]; max. published weight: 210.0 kg [Kottelat and Freyhof 2007]; max. reported age: 63 years [Ruban 2005]"

Environment

From Froese and Pauly (2018):

"Freshwater; brackish; demersal; pH range: 7.0 - 7.5; dH range: ? – 20"

From FAO (2018):

"The species can live in temperatures that range widely, from only 1 °C to 25–26 °C. It is fairly resistant to low O_2 content but does not put on weight in such conditions."

Climate/Range

From Froese and Pauly (2018):

"Temperate; […]"

Distribution Outside the United States

Native

From Froese and Pauly (2018):

"Asia [Russia]: Siberia, rivers Ob, Irtysh, Yenisei, Lena, Kolyma, Khatanga, Pyasina, Anabar, Olenyok, Yana and Lake Baikal [Ruban 2005]. Non-migratory populations exist in all river systems [Ruban 2005]."

From Ruban and Zhu (2010):

"This species is known from all Siberian rivers draining to the Kara, Laptev and East Siberian seas: basins of the Ob, Taz, Yenisei, Pyasina, Khatanga, Anabar, Olenyek, Lena, Yana, Indigirka, Alazeya (rarely) and Kolyma rivers, Lake Baikal (the Yenisei River basin) and rivers flowing to the lake – the Selenga, Barguzin and Upper Angara. It is most abundant in the Ob, Yenisei and Lena rivers."

Introduced

Froese and Pauly (2018) report *A. baerii* as established in Uzbekistan, and probably established in Spain, Sweden, Lithuania, and Poland. They report *A. baerii* as introduced but not established or probably not established in Turkey, Estonia, Netherlands, United Kingdom, USSR, Latvia, Japan, France, Hungary, Poland, and Denmark. They report *A. baerii* as introduced and current establishment status is unknown in Argentina, Austria, Chile, Finland, Uruguay, Czech Republic, Greece, and China.

CITES (2000) lists France, Germany, Italy, and parts of Russia as places where populations have been introduced.

From Elvira and Almodóvar (2001):

"[*Acipenser baerii* is one of] twenty-five exotic species [that] have become established in Spanish freshwater ecosystems."

Rabitsch et al. (2016) list the status of *A. baerii* in Germany as not established and in Austria as unknown.

Means of Introduction Outside the United States

From Ludwig et al. (2009):

"The escape of farmed Siberian sturgeons is often reported, especially during flooding events (Maury-Brachet et al. 2008) which have become increasingly frequent in Europe during the last few decades. Nevertheless, until now natural reproduction outside of their native range has not been documented."

From CITES (2000):

"France: In December 1999 several thousand juvenile and several hundred gravid females (more than 7 kg specimens) of *A. baerii* escaped into the Gironde River (Bordeaux region) during two storms."

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

"Italy: The species has been introduced in captive breeding facilities and hybridised with Adriatic Sturgeon *A. naccarii* in Italy in the 1990s (Azienda Agricola and Agroittica Lombarda, Italian sturgeon farmers, in litt. to TRAFFIC Europe-Italy, 1999). *A. baerii* are occasionally found in the wild; fish sporadically escape from rearing plants or angling ponds, or are released when they become too large for private aquaria (Dr P. Bronzi in litt. to IUCN/SSC WildlifeTrade Programme, September 2000)."

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

Short Description

From Froese and Pauly (2018):

"Extended snouts; four barbels in front of the mouth [Jones et al. 1978]. The back is light grey to dark brown colored. The belly color varies from white to clear yellow. Five rows of scutes: 10-19D, 32-59L, 7-16V. Small star-like scutes between the main ones. Clearly slit inferior lip [Keith and Allardi 2001]."

Biology

From Froese and Pauly (2018):

"Found in deep and shallow parts of rivers, with moderate to swift current usually at depths of 1 to 8 m [Ruban 2005] Adults live essentially in freshwater although some fish frequently occur in estuaries. Males are sexually mature between 9 and 29 years; females between 9 and 34 years [Ruban 2005]. Spawn in main river channel over stone-gravel or gravel-sand bottom and with strong current [Kottelat and Freyhof 2007]."

From CITES (2000):

"*A. baerii* can reach a maximum length of 2 m and weight of 210 kg. However, it usually does not exceed 65 kg in weight with a maximum age of approximately 60 years (Sokolov and Vasil'ev, 1989). Only the Lena River population reaches sexual maturity at 9-10 years for males and 10-12 years for females; all other populations reach sexual maturity at 18-24 years for males and 24-28 years for females. The Doc. AC.16.7.2 – p. 5 minimum recorded size for spawning is 0.6-0.9 m in length and 0.7 kg in weight (Hochleithner and Gessner, 1999). The spawning season is from May to June. *A. baerii* feeds predominantly on benthic organisms including chironomid larvae and river amphipods, isopods and polychaetes (Sokolov and Vasil'ev, 1989)."

Human Uses

From Ruban and Zhu (2010):

"Currently used for traditional Chinese medicine in China, Japan, Korea and Singapore. In the northern parts of China, especially along the Amur River, stocks of this species are farmed, the skin is used for making boots, gloves, hats and some kinds of decoration (Zhu pers. Comm)."

From Froese and Pauly (2018):

"Fisheries: highly commercial; aquaculture: commercial; aquarium: public aquariums"

From Bronzi et al. (2011):

"In 2008, the estimated world production of farmed caviar for all species (globally) was in the order of 110–120 tonnes originating from some 80 farms in 16 countries […] The most commonly used species is the Siberian sturgeon (*Acipenser baerii*) which is presently reared in 22 countries reaching a total production of about 8800 tonnes [9700 U.S. tons] per year […]"

From CITES (2000):

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

Diseases

From Froese and Pauly (2018):

"Enteric Redmouth Disease, Bacterial diseases"

There are no known OIE reportable diseases for this species.

Threat to Humans

From Froese and Pauly (2018):

"Harmless"

3 Impacts of Introductions

From CITES (2000):

"France: […] The survival of the escaped fish and their effect on the wild population of *A. sturio*, are unknown. However, the introduction of new pathological germs, food competition in case of acclimatisation of the exotic specimens, and hybridisation with *A. sturio* must be taken into consideration (Cemagref, in litt., press release, 26 January 2000)."

"Italy: […] There is no documentation on the potential damage of the introduction of exotic Acipenseriformes and their hybrids on native species. If specimens of *A. baerii* escape to the open waters of the Po River and become an 'invasive species,' this may threaten the Adriatic Sturgeon *A. naccarii*, a species that is on the brink of extinction."

From Ludwig et al. (2009):

"[This is] the first case of natural reproduction of non-native Siberian sturgeons in Western Europe, and furthermore their hybridization with native sterlets (*A. ruthenus*), in the Upper Danube River [Austria]. This hybridization poses a serious threat for the survival of this isolated sterlet population in the upper part of the Danube."

4 Global Distribution

Figure 1. Known global distribution of *Acipenser baerii* established populations in Europe and Russia. Map from GBIF Secretariat (2017). The locations in Denmark, the Czech Republic, and Poland are not confirmed established populations (Froese and Pauly 2018), so these locations were not included in the climate matching analysis. Georeferenced occurrences are not available for much of the established range in Russia.

5 Distribution Within the United States

This species has not been reported as introduced in natural habitats in the United States.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2018; 16 climate variables; Euclidean Distance) for *Acipenser baerii* in the contiguous United States is medium overall, represented by a Climate6 proportion of 0.015. The range of proportions classified as medium match is between 0.005 and 0.103. Climate matches were high in the central Appalachian Mountains, coastal southern New England, and northwestern Washington. Most of the northeast and scattered regions of the Interior West also showed medium matches. Low matches were found in the Plains states, throughout most of the Southeast from North Carolina to Texas, and most of the West.

The climate match presented here is likely to be an underestimate of the true climate match because much of the species native range in Siberia was unrepresented in the source locations due to a lack of georeferenced occurrences.

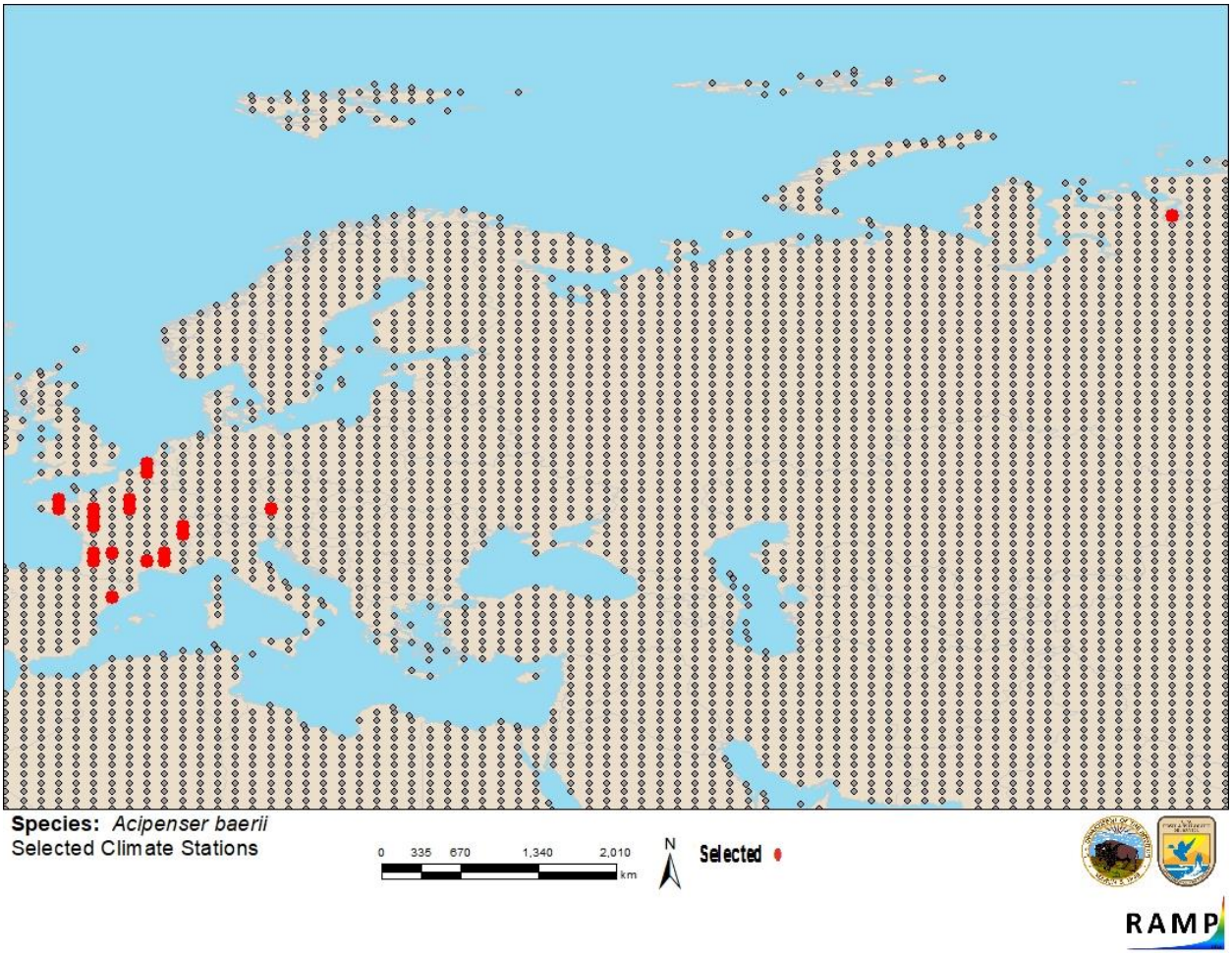

Figure 2. RAMP (Sanders et al. 2018) source map showing weather stations selected as source locations (red; France, Spain, Austria, Russia) and non-source locations (gray) for *Acipenser baerii* climate matching. Source locations from GBIF Secretariat (2017). Additional source location from Ludwig et al. (2009; Austria).

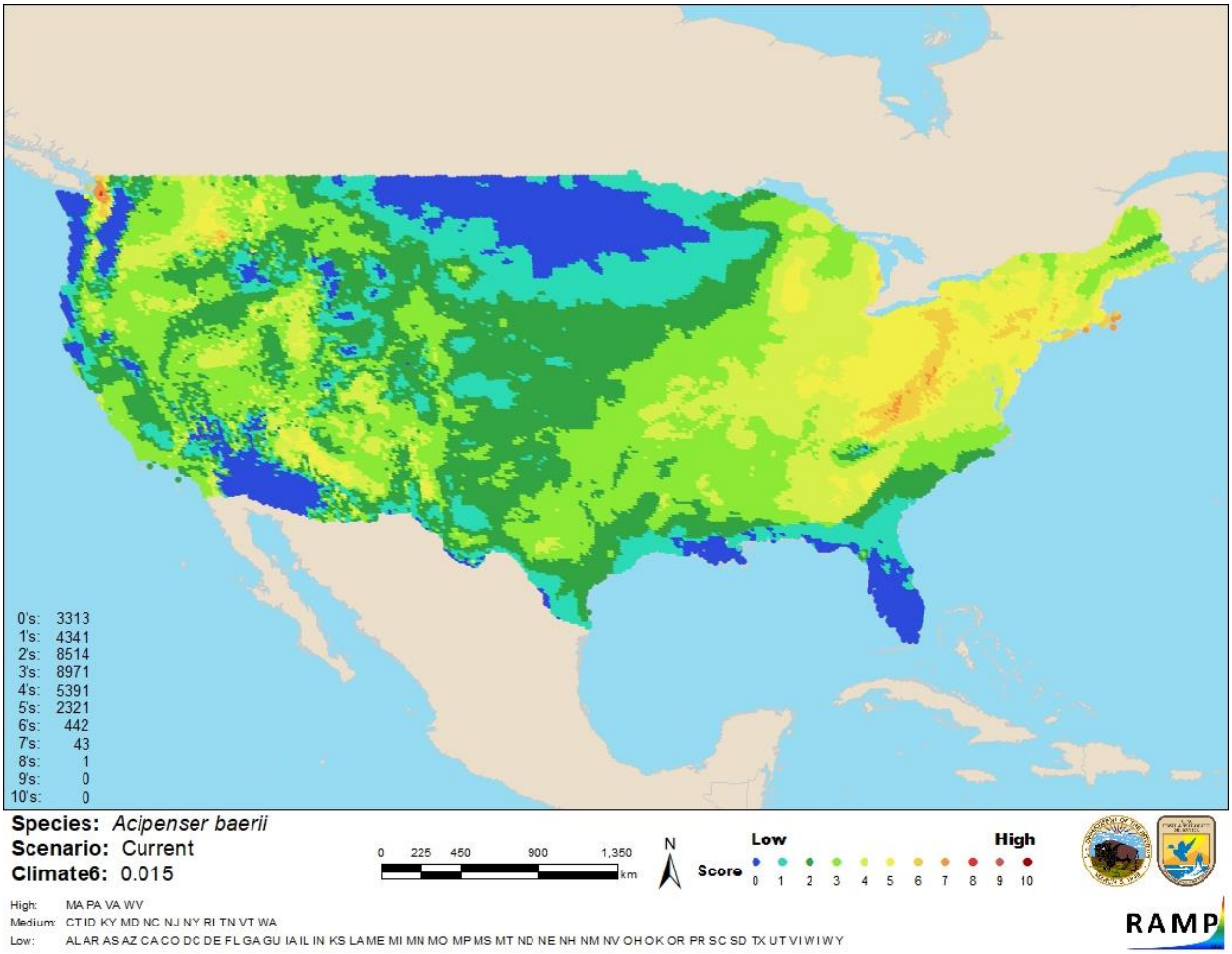

Figure 3. Map of RAMP (Sanders et al. 2018) climate matches for *Acipenser baerii* in the contiguous United States based on source locations reported by GBIF Secretariat (2017) and Ludwig et al. (2009). 0=Lowest match, 10=Highest match.

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

A considerable amount of information on the biology, ecology, and distribution of *Acipenser baerii* is available for review. Despite numerous specimens having been captured outside their native range, there are a limited number of established non-native populations. These introductions are likely due to flooding events and aquarium releases when the species become too large and escape from aquaculture facilities. *A. baerii* hybridized with the native *A. ruthenus* in the Upper Danube River, threatening survival of this isolated population. Literature sources

vary in the severity of impact described for these populations and in the level of certainty that impacts are occurring. Given these inconsistencies, certainty of this assessment is medium.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Siberian sturgeon (*Acipenser baerii*) is a species of sturgeon native to Siberian rivers draining to the Kara, Laptev and East Siberian seas. It is most abundant in the Ob, Yenisei and Lena rivers. Valued for their roe and meat, commercial fishing caused native populations to sharply decline during the 20th century. In 1998, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) listed *A. baerii* as endangered. Despite their endangered status, numerous non-native occurrences have been reported in European and Asian countries. These introductions are likely due to escape from aquaculture facilities, especially during flooding events, and aquarium releases. Establishment of *A. baerii* in the Upper Danube River poses a serious threat to an isolated population of native sterlets (*A. ruthenus*), due to hybridization. Other reports express concerns over the potential for *A. baerii* to introduce pathological germs, outcompete natives for resources, and hybridize with other compromised native sturgeons. No specimens have been taken from waterbodies within the United States. The climate match for *A. baerii* within the contiguous U.S. is medium. Given the history of negative impacts of introduction in other parts of the world and medium climate match to the contiguous U.S., the overall risk assessment category for *A. baerii* is high.

Assessment Elements

- **History of Invasiveness (Sec. 3): High**
- **Climate Match (Sec. 6): Medium**
- **Certainty of Assessment (Sec. 7): Medium**
- **Remarks/Important additional information:** Carrier of enteric redmouth disease and bacterial diseases. Hybridization with *A. ruthenus* has been documented.
- **Overall Risk Assessment Category: High**

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.

Bronzi, P., H. Rosenthal, and J. Gessner. 2011. Global sturgeon aquaculture production: an overview. Journal of Applied Ichthyology 27:169-175.

CITES. 2000. Sixteenth meeting of the Animals Committee, Shepherdstown (United States of America), 11-15 December 2000. Available: http://www.cites.org/eng/com/ac/16/16ACProceedings.pdf. (January 2018).

Elvira, B., and A. Almodóvar. 2001. Freshwater fish introductions in Spain: facts and figures at the beginning of the 21st century. Journal of Fish Biology 59:323-331.

Evtouchenko 1997 [Source did not provide full citation for this reference.]

FAO (Food and Agriculture Organization of the United Nations). 2018. *Acipenser baerii* (Brandt, 1869). Cultured Aquatic Species Information Programme. FAO, Rome.

Froese, R., and D. Pauly, editors. 2018. *Acipenser baerii* Brandt, 1869. FishBase. Available: http://www.fishbase.org/summary/Acipenser-baerii.html. (January 2018, June 2018).

GBIF Secretariat. 2017. GBIF backbone taxonomy: *Acipenser baerii* Brandt, 1869. Global Biodiversity Information Facility, Copenhagen. Available: https://www.gbif.org/species/4287131. (January 2018, June 2018).

Hatley, P. 2014. Caviar, straight from North Carolina. Modern Farmer (January 14). Available: https://modernfarmer.com/2014/01/caviar/. (June 2018).

ITIS (Integrated Taxonomic Information System). 2018. *Acipenser baerii* Brandt, 1869. Integrated Taxonomic Information System, Reston, Virginia. Available: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=161066#null. (January 2018).

Ludwig, A., S. Lippold, L. Debus, and R. Reinartz. 2009. First evidence of hybridization between endangered sterlets (*Acipenser ruthenus*) and exotic Siberian sturgeons (*Acipenser baerii*) in the Danube River. Biological Invasions 11(3):753-760.

Rabitsch, W., N. Milasowszky, S. Nehring, C. Wiesner, C. Wolter, and F. Essl. 2013. The times are changing: temporal shifts in patterns of fish invasions in central European fresh waters. Journal of Fish Biology 82(1):17-33.

Ruban, G., and B. Zhu. 2010. *Acipenser baerii*. The IUCN Red List of Threatened Species 2010: e.T244A13046607. Available: http://www.iucnredlist.org/details/244/0. (January 2018).

Sanders, S., C. Castiglione, and M. H. 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.

Anonymous. 1998. Sturgeon catch and trade in the Russian part of the Caspian Sea, unpublished report. TRAFFIC Europe-Russia, Field investigations.

Berdichevskii, L. S., V. S. Malyutin, I. I. Smolyanov, and L. I. Sokolov. 1983. Pages 259-269 *in* I. A. Barannikova, and L. S. Berditchevskii, editors. The results of aquaculture and acclimatization researches of the Siberian Sturgeon. Biologtcheskie osnovy

osetrovodstva, Nauka, Moskva. (In Russian.)

Chen, X. 2007. Biological characteristics and current situation of resource of species of Acipenseriformes. Ocean Publishing House, Beijing. (In Chinese.)

CMS (Convention on the Conservation of Migratory Species of Wild Animals). 2015. Appendices I and II of the Convention on the Conservation of Migratory Species of Wild Animals.

Hochleithner, M., and J. Gessner. 1999. The sturgeon and paddlefishes (Acipenseriformes) of the world: biology and aquaculture. AquaTech Publications, Kitzbühel, Austria.

Jones, P. W., F. D. Martin, and J. D. Hardy, Jr. 1978. Development of fishes of the Mid-Atlantic Bight. An atlas of eggs, larval and juvenile stages, volume 1. Acipenseridae through Ictaluridae. U.S. Fish and Wildlife Service Biol. Serv. Program FWS/OBS-78/12.

Keith, P., and J. Allardi, coordinators. 2001. Atlas des poissons d'eau douce de France. Muséum national d'Histoire naturelle, Paris. Patrimoines naturels 47:1-387.

Kottelat, M., and J. Freyhof. 2007. Handbook of European freshwater fishes. Publications Kottelat.

Maury-Brachet, R., E. Rochard, G. Durrieu, and A. Boudou. 2008. The 'storm of the century' (December 1999) and the accidental escape of Siberian sturgeons (*Acipenser baerii*) into the Gironde Estuary (southwest France). Environmental Science and Pollution Research 15:89.

McDonald, L. 2000. Fish that laid the golden egg faces extinction. Daily Express, UK (July 26).

Ruban, G. I. 2005. The Siberian sturgeon, *Acipenser baerii* Brandt: species structure and ecology. World Sturgeon Conservation Society, Special Publication no. 1. Demand GmbH, Norderstedt, Germany.

Snyder, D. 2000. Maryland caviar company admits smuggling. The Washington Post (July 22).

Sokolov, and V. P. Vasil'ev. 1989. *Acipenser baerii* Brandt, 1869. Pages 263-284 *in* J. Holèík, editor. The freshwater fishes of Europe, volume I/II: general introduction of fishes. Acipenseriformes. AULA-Verlag, Wiesbaden, Germany.