Barbel (*Barbus barbus*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, April 2011
Revised, June 2018
Web Version, 7/30/2018

Photo: Christian Baum. Licensed under Creative Commons BY-SA 3.0. Available: https://commons.wikimedia.org/wiki/File:Barbus_barbus.jpg. (June 8, 2018).

1 Native Range and Status in the United States

Native Range

Froese and Pauly (2018a) list *Barbus barbus* as native in China, Turkey, Andorra, Austria, Belarus, Belgium, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, France, Germany, Gibraltar, Hungary, Italy, Liechtenstein, Lithuania, Luxembourg, Malta, Moldova, Monaco, Montenegro, Netherlands, Poland, Romania, Russia, Serbia, Kosovo, Slovakia, Switzerland, United Kingdom, and Ukraine.

Additionally, Freyhof (2011) lists *Barbus barbus* as native in Latvia, Macedonia, Slovenia, and Spain.

From Froese and Pauly (2018a):

"Europe: North of the Pyrénées and Alps, from Adour (France) eastward to Neman (Lithuania, Russia) drainages, in rivers draining to Atlantic, North sea and southern Baltic Sea; Danube to Dniepr drainages in northern Black Sea basin; southeastern England north to Yorkshire. Found almost throughout Mediterranean drainages of France."

"Occurs in Odra and Morava river basins [Czech Republic] [Hanel 2003]."

"Common in the Neckar in 1800 [Germany] [Günther 1853]. Recorded from Rhine drainage [Germany] [Khaefi et al. 2017]."

"Found in river Lim [Montenegro] [Marić et al. 2012]."

"Common in Maas River, Limburg [Netherlands]."

"Originally confined to rivers of eastern England between Yorkshire and Thames, it is now widespread in England and parts of Wales."

"Occurs in Ulungur Lake [Xinjiang, China]."

"Occurs in the Neman and Dneiper rivers [Russia or former areas of the USSR] [Reshetnikov et al. 1997]."

Status in the United States

No records of *Barbus barbus* in the United States were found. No information on trade of *B. barbus* in the United States was found.

Means of Introductions in the United States

No records of *Barbus barbus* in the United States were found.

Remarks

From Froese and Pauly (2018a):

"Endangered in 1984 [in Germany] [Gerstmeier and Romig 1998]."

From Gettová et al. (2016):

"Using this value as an upper limit for *B. barbus* individuals, 25 *B. barbus*, 42 *B. meridionalis* and 81 hybrids were detected within the Argens River basin […]"

From Zaccara et al. (2014):

"It was also confirmed that there were hybrids present between *B. plebejus* and *B. barbus* […]"

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to Eschmeyer et al. (2018), *Barbus barbus* (Linnaeus 1758) is the current valid name for this species. *Barbus barbus* was originally described as *Cyprinus barbus* Linnaeus 1758.

From ITIS (2018):

"Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Ostariophysi
Order Cypriniformes
Superfamily Cyprinoidea
Family Cyprinidae
Genus *Barbus*
Species *Barbus barbus* (Linnaeus, 1758)"

Size, Weight, and Age Range

From Froese and Pauly (2018a):

"Max length : 120 cm TL male/unsexed; [Bianco 1998]; common length : 30.0 cm TL male/unsexed; [Muus and Dahlström 1968]; max. published weight: 12.0 kg [Bianco 1998]; max. reported age: 15 years [Kottelat and Freyhof 2007]"

From Carosi et al. (2017):

"[…] Britton et al. (2013) reported that in some rivers of the UK the older specimens of this species showed an age of 21 years."

Environment

From Froese and Pauly (2018a):

"Freshwater; benthopelagic; potamodromous [Riede 2004]; depth range 10 - ? m. […]; 10°C - 24°C [assumed to be recommended aquarium temperature] [Baensch and Riehl 1985]; […]"

Climate/Range

From Froese and Pauly (2018a):

"Temperate; […]; 57°N - 42°N, 5°W - 36°E"

Distribution Outside the United States

Native

Froese and Pauly (2018a) list *Barbus barbus* as native in China, Turkey, Andorra, Austria, Belarus, Belgium, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, France, Germany, Gibraltar, Hungary, Italy, Liechtenstein, Lithuania, Luxembourg, Malta, Moldova, Monaco,

Montenegro, Netherlands, Poland, Romania, Russia, Serbia, Kosovo, Slovakia, Switzerland, United Kingdom, and Ukraine.

Additionally, Freyhof (2011) lists *Barbus barbus* as native in Latvia, Macedonia, Slovenia, and Spain.

From Froese and Pauly (2018a):

"Europe: North of the Pyrénées and Alps, from Adour (France) eastward to Neman (Lithuania, Russia) drainages, in rivers draining to Atlantic, North sea and southern Baltic Sea; Danube to Dniepr drainages in northern Black Sea basin; southeastern England north to Yorkshire. Found almost throughout Mediterranean drainages of France."

"Occurs in Odra and Morava river basins [Czech Republic] [Hanel 2003]."

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"Originally confined to rivers of eastern England between Yorkshire and Thames, it is now widespread in England and parts of Wales."

"Occurs in Ulungur Lake [Xinjiang, China]."

"Occurs in the Neman and Dneiper rivers [Russia or former areas of the USSR] [Reshetnikov et al. 1997]."

Introduced

Froese and Pauly (2018a) list *Barbus barbus* as introduced to Morocco, and introduced outside of its native range in Italy and the United Kingdom.

From Froese and Pauly (2018a):

"Locally introduced in northern and central Italy, rivers Wear, Tees and Medway and most western drainages of England."

FAO (2018) lists *Barbus barbus* as established through natural reproduction in Morocco.

Means of Introduction Outside the United States

From Froese and Pauly (2018a):

"It has been widely distributed due to its popularity as an anglers' fish [Wheeler and Jordan 1990]."

From FAO (2018):

“Reasons of Introduction : 1) aquaculture”

Short Description

From Froese and Pauly (2018a):

“Dorsal spines (total): 3 - 4; Dorsal soft rays (total): 7-9; Anal spines: 2-3; Anal soft rays: 5 - 6; Vertebrae: 46 - 47. Diagnosed from its congeners in France, Great Britain, Black, North, Baltic and Adriatic Sea basins and Apennine Peninsula by having the following characters: lower lip thick with a median swollen pad; tip of dorsal pointed; posterior margin of dorsal concave; last simple dorsal ray spinous, serrated along entire posterior edge; flexible segmented part of last simple dorsal ray about 20-24% of its length; fine dark spots (or no spots) in individuals larger than 10 cm SL; 53-63 total scales on lateral line; 12-14 scale rows between dorsal origin and lateral line; pelvic origin about below dorsal origin; scales with free posterior part pointed; scales on back with 1-5 well developed median longitudinal epithelial crests [Kottelat and Freyhof 2007]. Caudal fin with 19-20 rays [Spillman 1961].”

Froese and Pauly (2018a) also list *Barbus barbus* as having 7 – 12 scale rows below the lateral line, 20 – 24 scales around the caudal peduncle, 9 – 14 gill rakers, 1 pectoral spine and 14 – 15 pectoral rays, and 2 pelvic spines and 7 – 8 pelvic rays.

Biology

From Froese and Pauly (2018a):

“Inhabits from premontane to lowland reaches of clear, warm, medium sized to large rivers with fast current and gravel bottom. Occasionally found in lakes. Frequently overwinters in large group, inactive or active in slow-flowing river habitats. Adults often form shoal, hiding under overhanging trees or bridges during the day. Adults are encountered most active during dusk and dawn while larvae and juveniles are active during both day and night. Larvae and juvenile stay on the bottom in very shallow shoreline habitats and leave the shores for faster-flowing waters as they grow [Kottelat and Freyhof 2007]. Lives in the deeper, faster-flowing upper reaches of rivers with stony or gravel bottom (barbel zones). Feeds chiefly on benthic invertebrates, such as small crustaceans, insect larvae, mollusks, mayfly and midge larvae [Maitland and Campbell 1992] and also on small fish and sometimes algae [Kottelat and Freyhof 2007]. Spawns usually in very shallow, fast-flowing riffles [Kottelat and Freyhof 2007]. Spawning occurs from May to July after the fish have migrated upriver [Muus and Dahlström 1968]. Eggs are poisonous [Robins et al. 1991; Maitland and Campbell 1992]. Locally threatened due to water pollution and river regulation, especially in Baltic drainages, Elbe, South Bug and Dniepr, and heavily impacted by pollution in central Europe but recovering. Population has declined sharply due to construction of large reservoirs and pollution during 20th century and has stabilized at a moderate level since then [Kottelat and Freyhof 2007].”

“Individual females spawn with several males. Males assemble at spawning grounds and follow ripe females, often with much splashing, to shallow riffles. Males may exhibit courting or

sneaking tactics in spawning site. Courting males follow females to spawning site and, during the spawning act, one male swims head to head with the female. Sneaking males, waiting in the spawning site, then join the couple and try to fertilize eggs. Up to 130 males have been reported to be involved in a single spawning act. Females deposit non-sticky eggs in 2-3 portions into excavations made in the gravel" [Kottelat and Freyhof 2007]."

Human Uses

From Froese and Pauly (2018a):

"Fisheries: minor commercial; aquaculture: likely future use; gamefish: yes; aquarium: commercial"

From Freyhof (2011):

"It is harvested for human consumption, and for sport fishing."

Diseases

No records of OIE-reportable diseases were found for *Barbus barbus*.

Froese and Pauly (2018b) list *Bathybothrium rectangulum*, *Cucullanus dogieli*, *Ergasilus lizae*, *E. tissensis*, *Gyrodactylus malmbergi*, *G. markevitshi*, *Lernaea cyprinacea*, and *Tracheliastes polycolpus* as parasites of *Barbus barbus*.

Additionally, Poelen et al. (2014) list *Dactylogyrus carpathicus*, *D. dyki*, *D. malleus*, *Myxobolus musculi*, *Gyrodactylus barbi*, *G. katharineri*, *Clinosomum complanatum*, *Rhabdochona hellichi*, *Pseudocapillaria tomentosa*, *Pomphorhynchus laevis*, *Proteocephalus torulosus*, and *Allocreadium isoporum* as parasites and pathogens of *Barbus barbus*.

Hine and Diggles (2005) state that *Barbus barbus* can be infected with *Bothriocephalus acheilognathi* and *Neoechinorhynchus rutili*.

From Bergmann et al. (2010):

"While carp pox virus not only infects different fish, […], *Barbus barbus* (L.), […]"

Additionally, Gettová et al. (2016) list *Apharyngostrigea* sp., *Clinostomum complanatum*, *Diplostomum* spp., *Echinostomatidae* gen. sp., *Digenea* fam. gen. spp., *Holostephanus* sp., *Tylodelphys* sp., *Dactylogyrus malleus*, *Gyrodactylus hemibarbi*, *G. katharineri*, *G. markewitschi*, *Paradiplozoon homoion*, *Schyzocotyle acheilognathi*, *Caryophyllaeus brachycollis*, *Contracaecum* sp., Nematoda fam. gen. sp. 2, *Acanthocephalus anguillae*, *Acanthocephala* fam. gen spp., *Pomphorhynchus tereticollis*, *Anodonta* spp., *Argulus coregoni*, *Ergasilus sieboldi*, and *Hydrozetes* sp. as parasites of *B. barbus*.

Threat to Humans

From Froese and Pauly (2018a):

"Eggs are poisonous [Robins et al. 1991; Maitland and Campbell 1992]"

3 Impacts of Introductions

From Carosi et al. (2017):

"In two sampling sites in the middle course of the Tiber River [Italy] and in one site in the downstream reaches of the Chiascio River [Italy], the non-native species [*Barbus barbus*] has totally replaced the Tiber barbel [*Barbus tyberinus*], causing its local extinction."

"Previous studies have shown that the European barbel [*Barbus barbus*] constitutes a threat to the native Tiber barbel [*Barbus tyberinus*] because of competition, hybridisation and genetic introgression between the two congeneric species (Buonerba et al. 2015). Carosi et al. (2006) found that in the Tiber River basin, the condition of the Tiber barbel analysed by means of the Fulton condition index (Fulton 1911) was lower where the European barbel was present, indicating the possibility that negative competition occurs between the two species. Additionally, Giannetto et al. (2012), through the analysis of relative weight, reported that in the Tiber River basin the presence of the European barbel was associated with a decrease in the condition of the Tiber barbel. In the present study, the results of the estimation of the relative weight for the Tiber barbel suggest a negative impact of European barbel presence on the status of the native populations, with evident effects on the upper age classes."

From Zaccara et al. (2014):

"It was also confirmed that there were hybrids present between *B. plebejus* and *B. barbus* […]"

"Indeed, the data outputs strongly suggested that there was admixture between these species, suggesting interbreeding and hybridisation, and so disrupting the genetic integrity of the endemic *B. plebejus*."

From Meraner et al. (2013):

"Propagule pressure [number of *Barbus barbus*] was the most likely driver of the distribution of native *B. plebejus* in our study area (Table 3 [in source material]), while the support for chemical and biological water quality was weak. Invasive species are thus sufficient to explain the loss of native *B. plebejus* in the Northern Adriatic region, as the likelihood of finding *B. plebejus* drastically decreases with increasing levels of propagule pressure."

4 Global Distribution

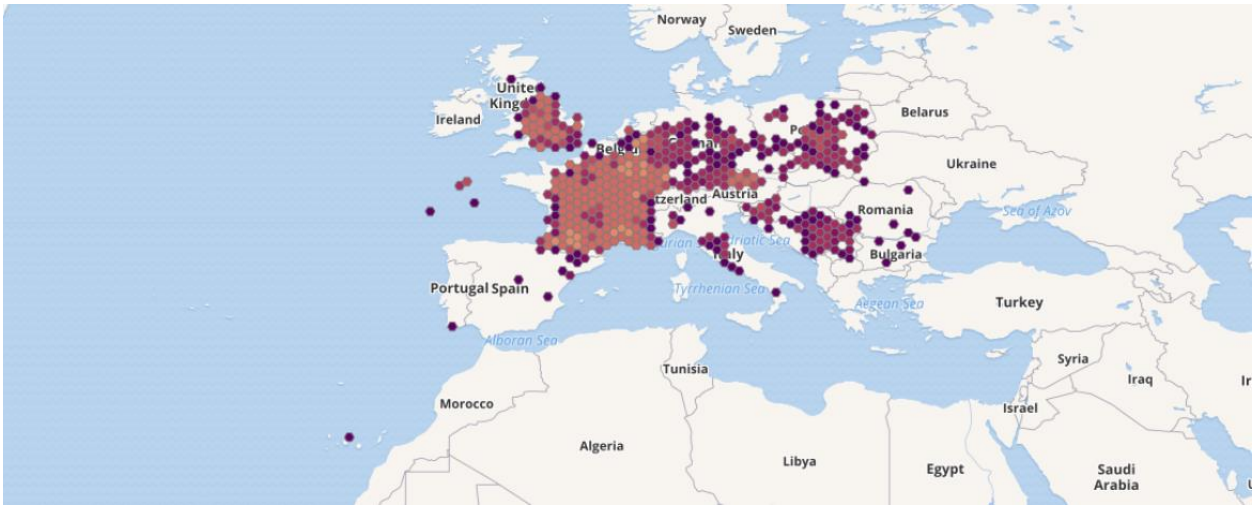

Figure 1. Known global distribution of *Barbus barbus*. Locations are in mainland Europe, England, and islands off the coast of Morocco. Map from GBIF Secretariat (2018).

The group of locations in the ocean north of Spain (Figure 1) were not used as source points for the climate match. *Barbus barbus* is a freshwater species and those locations are in the ocean with coordinate issues indicated by GBIF Secretariat (2018).

The location in Portugal (Figure 1) was used as a source point in the climate match. The location is close enough to the described range that it is plausible and the record information indicates that there was juvenile collection, which could imply reproduction at that location (GBIF Secretariat 2018).

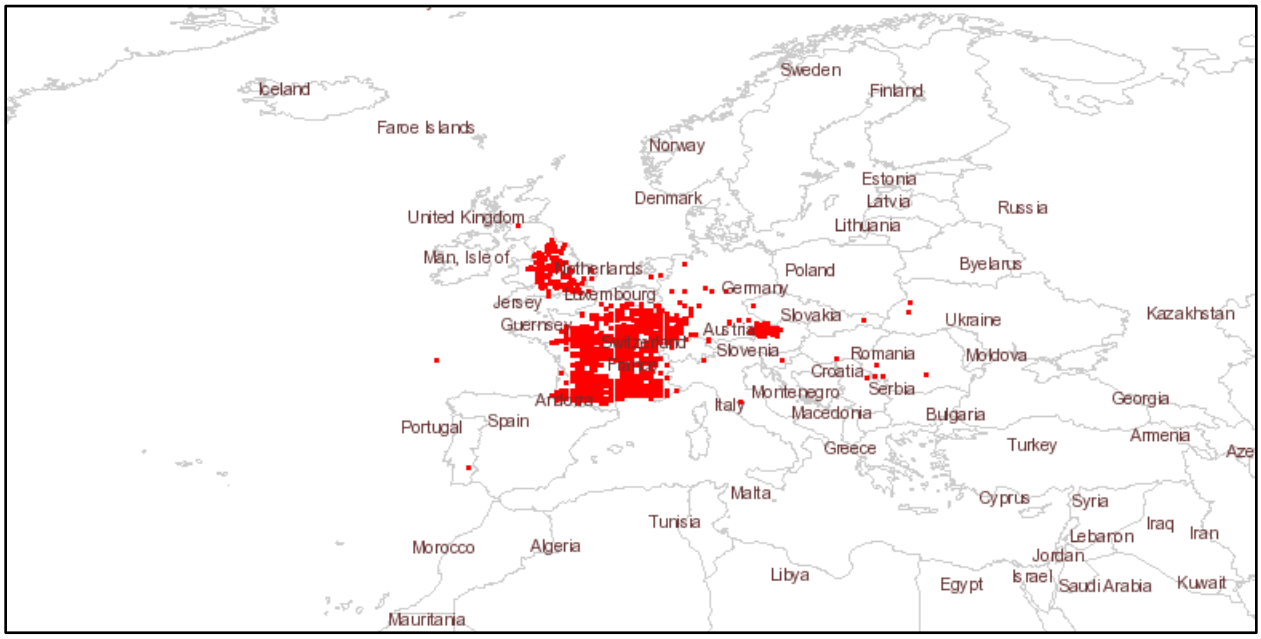

Figure 2. Additional known global distribution of *Barbus barbus*. Locations are in mainland Europe and England. Map from Froese and Pauly (2018a).

Froese and Pauly (2018) list populations in China, Turkey, and Russia (or former areas of the USSR) but there are no georeferenced locations for these populations, therefore they were not used as source points for the climate match.

5 Distribution Within the United States

No records of *Barbus barbus* in the United States were found.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Barbus barbus* was medium across much of the contiguous United States. There were areas of low match in Florida and along the Gulf Coast, in southern California and Arizona, small pockets of the northern Great Plains, upper Midwest, and northern Pacific Coast. The Great Lakes Basin, southern Pacific Coast, and small areas of the Northwest and Great Plains had high climate matches. The Climate 6 score (Sanders et al. 2014; 16 climate variables; Euclidean distance) for the contiguous United States was 0.337, high. The range for a high climate match is 0.103 and above. Thirty-five states had individually high climate scores.

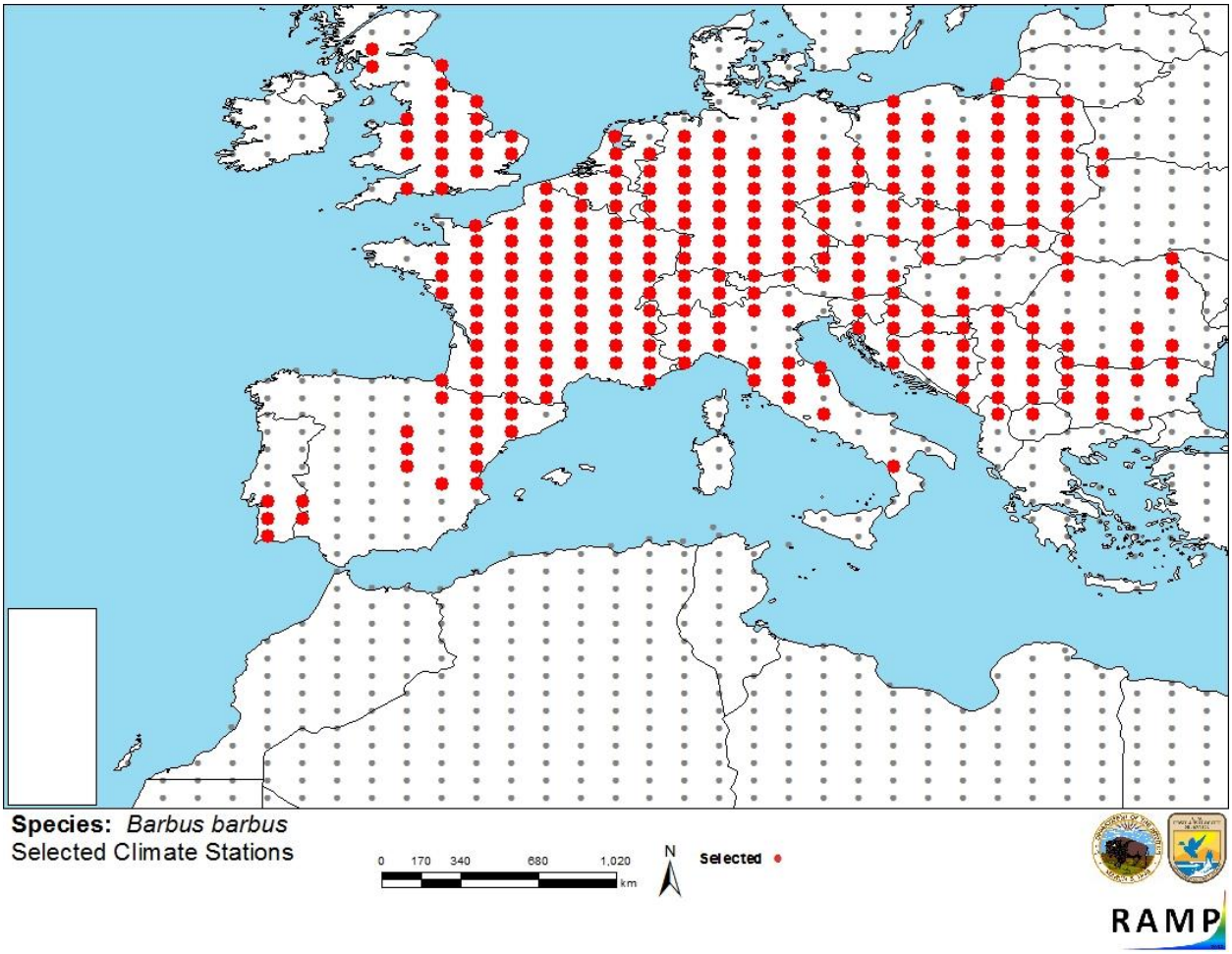

Figure 3. RAMP (Sanders et al. 2014) source map showing weather stations in Europe selected as source locations (red; United Kingdom, Portugal, Spain, France, Belgium, Netherlands, Germany, Switzerland, Italy, Austria, Croatia, Poland, Slovenia, Bosnia and Herzegovina, Albania, Serbia, Czech Republic, Macedonia, Bulgaria, Romania, Moldova, Ukraine, Hungary, Slovakia, Belarus, European Russia) and non-source locations (gray) for *Barbus barbus* climate matching. Source locations from Froese and Pauly (2018a) and GBIF Secretariat (2018).

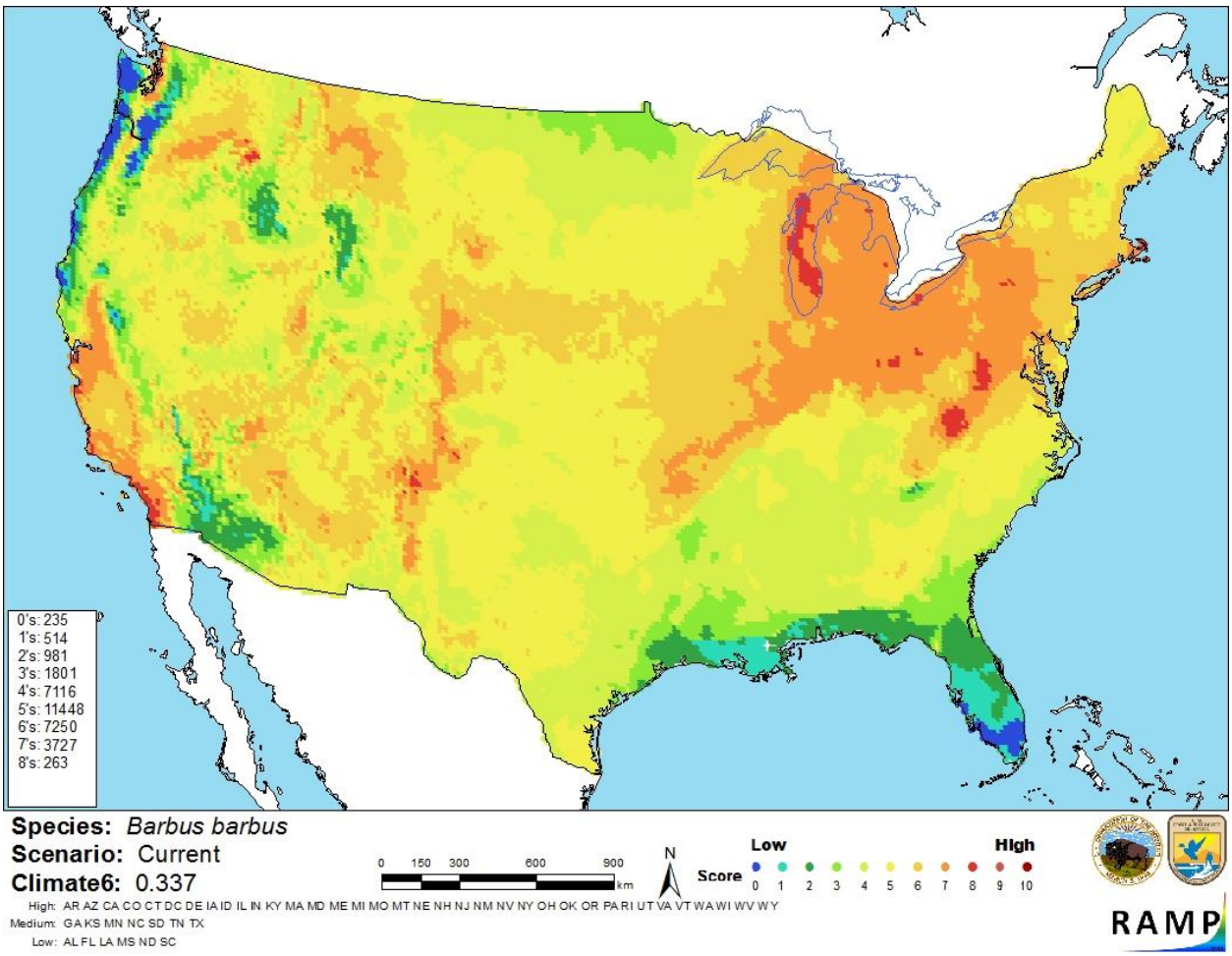

Figure 4. Map of RAMP (Sanders et al. 2014) climate matches for *Barbus barbus* in the contiguous United States based on source locations reported by Froese and Pauly (2018a) and GBIF Secretariat (2018). 0 = Lowest match, 10 = Highest match.

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≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

7 Certainty of Assessment

The certainty of assessment is high. There is enough information available for *Barbus barbus* to make an assessment. *B. barbus* is established outside its native range and multiple peer-reviewed sources demonstrate impacts on native fish species.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Barbel (*Barbus barbus*) is a freshwater fish native to Europe and China. It has been used as a commercial food source, a sport fish, and in commercial aquaria. *B. barbus* eggs are toxic. It is afflicted by many parasites and pathogens. The history of invasiveness is high. *B. barbus* has been introduced as a game fish and for aquaculture into areas of England, Italy, and Morocco outside of its native range. It is established in Morocco, and outside its native range in Italy and the United Kingdom. *B. barbus* negatively impacts native species of *Barbus* in the areas where it has been introduced. In 2012, its presence was associated with reduced weight of the native Tiber barbel (*Barbus tyberinus*), and in 2017 it was documented as the cause for local extinction of the native *B. tyberinus*. *B. barbus* hybridizes with *B. plebejus*, and increased numbers of *B. barbus* reduces the likelihood of native *B. plebejus* occupying same habitat. The climate match for the United States is high, especially around the Great Lakes. The certainty of assessment is high. The overall risk assessment category is high.

Assessment Elements

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

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10 References Quoted But Not Accessed

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