Maraena Whitefish (*Coregonus maraena*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, November 2020
Revised, November 2020
Web Version, 9/8/2021

Organism Type: Fish
Overall Risk Assessment Category: Uncertain

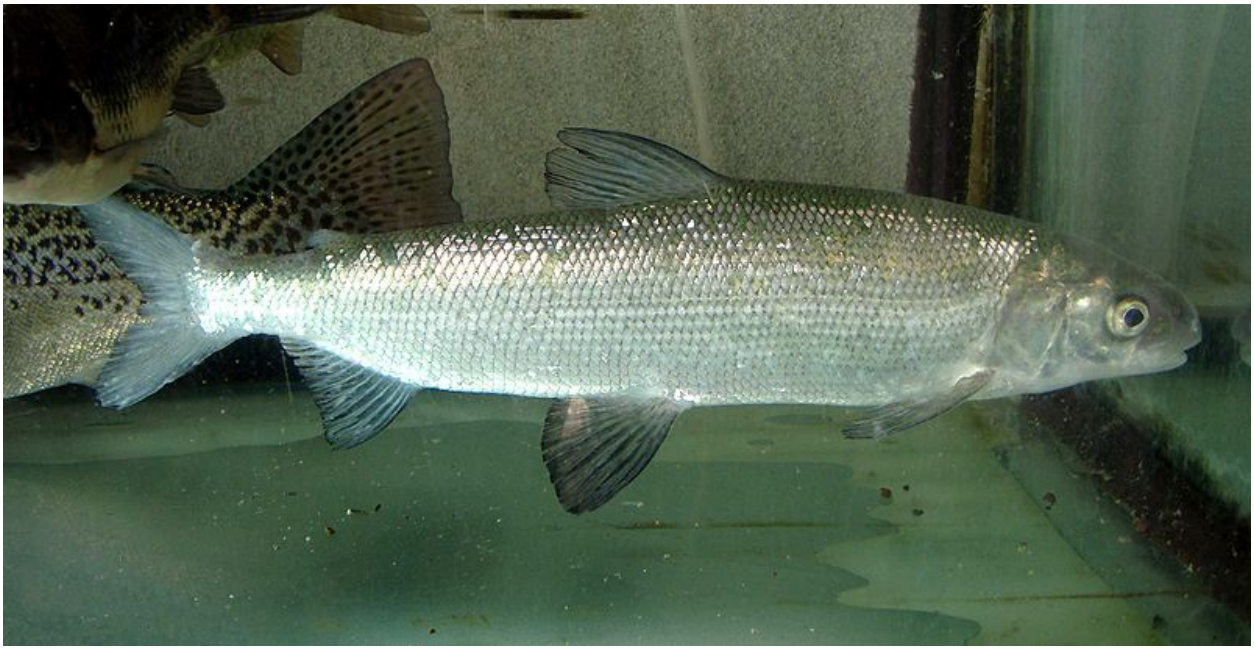

Photo: Apple2000. Licensed under Creative Commons Attribution-Share Alike 3.0 Unported license. Available: https://commons.wikimedia.org/wiki/File:Coregonus_lavaretus_maraena_1.jpg (November 2020).

1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2020):

"Europe: In the Baltic Sea: Swedish coast (including Bothnian Gulf, not in Gotland); in southern Baltic, extending from the Schlei to Gulf of Finland. Southeast North Sea Basin: Ems, Weser and Elbe drainages and small rivers of Schleswig-Holstein and Denmark. Landlocked in several lakes in Poland, Sweden, and Russia."

From Freyhof (2011):

"Landlocked populations also occur in Lake Miedwie (former Madüsee) and other lakes in Poland, Lakes Vättern, Vänern, Mälaren, Siljan (Sweden), Ladoga (Russia) and others."

Status in the United States

According to Froese and Pauly (2020) there was an introduction of *Coregonus maraena* in the United States in 1986 but the introduction failed. No further information was available regarding this introduction.

From Neilson (2019):

"According to Baird (1879), 1,000 eggs of *C. maraena* were shipped from Poland to Michigan in 1877 and hatched in captivity at the State Hatching House in Detroit. A total of 409 of the young fish were stocked in Gardner Lake (Baird 1879; Todd 1983). Baird (1879) considered the stocking an experimental introduction of a European food fish."

"Failed introduction."

All species in the family Salmonidae were officially listed as injurious wildlife species by the U.S. Fish and Wildlife Service in 1968 under 18.U.S.C.42(a)(1) because of the risk they carry certain pathogens harmful to other wildlife (USFWS 1968). The importation of any live salmonid, live eggs or gametes, or dead uneviscerated salmonid fish into the United States, any territory of the United States, the District of Columbia, the Commonwealth of Puerto Rico, or any possession of the United States, or any shipment between the continental United States, the District of Columbia, Hawaii, the Commonwealth of Puerto Rico, or any possession of the United States is prohibited unless accompanied by an approved heath certification. Dead eviscerated salmonids are not considered injurious.

From Arizona Office of the Secretary of State (2013):

"Fish listed below are considered restricted live wildlife:
[…]
34. All species of the family *Salmonidae*. Common names include: trout and salmon."

Means of Introductions in the United States

From Neilson (2019):

"*Coregonus maraena*, along with other species of *Coregonus*, was intentionally stocked as a food fish by the U.S. Fish Commission (Todd 1983)."

Remarks

This ERSS was previously published in September 2017. Revisions were completed to incorporate new information and conform to updated standards.

Coregonus maraena can survive in fresh, brackish, and marine waters. The conclusions of this ERSS are valid for only fresh and brackish water areas.

From Neilson (2019):

"There is much confusion regarding the identity of whitefish imported from Germany in the late 1800s by the U.S. Fish Commission, primarily due to the uncertain taxonomy and systematics of *Coregonus* (Kottelat and Freyhof 2007). Berg (1948) regarded *C. maraena* as a junior synonym and a subspecies of *C. lavaretus*. Ladiges and Vogt (1986) placed *C. maraena* in the *C. lavaretus* group and provided illustrations of *C. maraena* and other group members. Kottelat and Freyhof (2007) recognized 59 species of *Coregonus*, restricting *C. lavaretus* to Lake Bourget, France (origin of the common vernacular name 'lavaret')."

From Freyhof (2011):

"This species is widespread in the Baltic basin. However, there are only few natural populations left. […] Even though the population has been in decline since before World War II, it is suspected that the wild native wild population has declined by more than 30% in the past three generations (15 years) as new dams have been built, and it is surviving at very low levels.

In the European Union 27 region, this species is also Vulnerable (VU A2cd), with the same rationale as above."

According to Froese and Pauly (2020) *Coregonus lavaretus maraena* is a senior synonym of *Coregonus maraena* and was therefore used as a search term for information.

Coregonus maraena has been intentionally stocked within the United States by State fishery managers to achieve fishery management objectives. State fish and wildlife management agencies are responsible for balancing multiple fish and wildlife management objectives. The potential for a species to become invasive is now one important consideration when balancing multiple management objectives and advancing sound, science-based management of fish and wildlife and their habitat in the public interest.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to Fricke et al. (2020), *Coregonus maraena* (Bloch 1779) is the current valid name for this species. It was originally described as *Salmo maraena* (Bloch 1779). The following are also listed as synonyms of *Coregonus maraena*: *Coregonus amnipetens*, *Coregonus lloydii*, *Coregonus lavaretus mediospinatus*, *Coregonus maraena pommerana*, *Coregonus lavaretus vaetterensis*, *Coregonus holsatus vigrensis*, and *Coregonus lavaretus vygensis*.

From ITIS (2020):

Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Protacanthopterygii
Order Salmoniformes
Family Salmonidae
Subfamily Coregoninae
Genus *Coregonus*
Species *Coregonus maraena* (Bloch, 1779)

Size, Weight, and Age Range

From Froese and Pauly (2020):

"Max length : 130 cm TL male/unsexed; [Berg 1962]; max. published weight: 10.0 kg [Berg 1962]"

"Growth parameters from Russia suggest a maximum age of 20 years [Morozova 1956]."

Environment

From Froese and Pauly (2020):

"Marine; freshwater; brackish; demersal; anadromous [Narberhaus et al. 2012]."

Climate

From Froese and Pauly (2020):

"Temperate; 69°N - 49°N, 7°E - 37°E [Kottelat and Freyhof 2007]"

Distribution Outside the United States

Native

From Froese and Pauly (2020):

"Europe: In the Baltic Sea: Swedish coast (including Bothnian Gulf, not in Gotland); in southern Baltic, extending from the Schlei to Gulf of Finland. Southeast North Sea Basin: Ems, Weser and Elbe drainages and small rivers of Schleswig-Holstein and Denmark. Landlocked in several lakes in Poland, Sweden, and Russia."

From Freyhof (2011):

"Landlocked populations also occur in Lake Miedwie (former Madüsee) and other lakes in Poland, Lakes Vättern, Vänern, Mälaren, Siljan (Sweden), Ladoga (Russia) and others."

Introduced

From Froese and Pauly (2020):

"Introduced and transplanted in many drainages within its native range and outside westward to Rhine drainage [Kottelat and Freyhof 2007]. Apparent abundance in Germany, Poland and Scandinavia results from the massive stocking programs without which the populations would rapidly decline."

"[Japan] Reintroduced in 1930 from USSR and in 1977/78 from Czechoslovakia. Being reproduced in certain experimental or natural ponds [Chiba et al. 1989]. Has been recognized to be established in the country or found in the wild [Japan Ministry of Environment 2005]."

In addition, Froese and Pauly (2020) lists *Coregonas maraena* as introduced in the Netherlands but nothing is known about its status there, if it became established, or if it had any impacts.

From Lusk et al. (2010):

"They [introduced species, including *C. maraena*] are capable of living in natural aquatic habitats in the Czech Republic, yet they have not established stable populations. If natural reproduction of these species does occur in some localities the resultant populations are short-lived (*S. fontinalis*, *O. mykiss*, *C. maraena*)."

From NIES (2020):

"Released for ports fishing in Nagano Pref. Not established in Japan."

Means of Introduction Outside the United States

According to Lusk et al. (2010), the purpose of introduction into the Czech Republic was production.

From Pamminger-Lahnsteiner et al. (2009):

"Non-native *Coregonus maraena* Bloch (1779), vernacular name 'Maraene', were introduced to Austrian pond aquaculture at the beginning of the 1950s and since then are stocked annually into many Austrian lakes. These fish originate from Polish Lake Miedwie (Madü-See in German) and were established as a hatchery strain of high commercial value in Czech pond aquaculture at the end of the nineteenth century (Šusta, 1898; IUCN, 1997)."

From NIES (2020):

"[Japan] Deliberate: Imported as fishery resource. Now released for sports fishing."

Short Description

From Kottelat and Freyhof (2007):

"Distinguished from other species of *Coregonus* in area by: […] 20–36 (usually 26–33) gill rakers […] mouth inferior […] snout elongate at least in males (in landlocked populations of southern Sweden and anadromous populations of the North and Baltic Seas)."

Biology

From Froese and Pauly (2020):

"Forages along coasts. Also reported from deep, oligo-mesotrophic lakes. Feeds on benthic prey (crustaceans, molluscs, large insect larvae, small fish). Spawns in shallow water, in rapids or small rivers or over firm sediments in lowland rivers and estuaries. Northernmost stocks undertake the longest migrations between spawning and foraging grounds. In the northern part of the range, individuals may travel as much as 700 km between these areas [Kottelat and Freyhof 2007]. […] Members of the genus *Coregonus* readily hybridise with other *Coregonus* species and populations [Fricke 2007]."

"Adults ascend rivers between June and October (northern Baltic) or November (southern Baltic), when water temperature drops below 10 °C. Spawning occurs in estuarine areas with low salinities or lower reaches of rivers or rapids [Kottelat and Freyhof 2007]. *Coregonus* species spawn on gravel and sand bottoms [Muus 1999]. Spawns for the first time at 3-5 years. Some females spawn only every second year [Kottelat and Freyhof 2007]. Spawners may spend the winter in rivers or near estuaries along the coast [Freyhof and Kottelat 2008]. Eggs hatch in early spring and larvae drift downstream to estuarine bays or to the sea; juveniles migrate to the sea in summer [Kottelat and Freyhof 2007]."

From Freyhof (2011):

"In Lake Vänern, it spawns at 8–20 m depth, over firm bottom."

Human Uses

From Froese and Pauly (2020):

"Fisheries: minor commercial; aquaculture: commercial"

From Freyhof (2011):

"It is harvested for human consumption."

"In Gulf of Bothnia alone, about six million juveniles were stocked annually in 1995–1998 to support commercial fisheries."

Diseases

No records of OIE-reportable diseases (OIE 2020) were found for *Coregonus maraena*.

All species of Salmonidae are listed as injurious species in the United States due to risk of carrying certain pathogens.

From Altmann et al. (2016):

"Coregonids [including *C. maraena*] are naturally susceptible to *A.* [*Aeromonas*] *salmonicida* [Lönnström et al. 2001], and an infection is mainly expressed in form of external and internal hemorrhaging accompanied by fibrinous adhesions of the spleen and liver, and/or splenic and renal congestion [Loch and Faisal 2010]. This disease is known as furunculosis and is responsible for high economic losses annually [Toranzo et al. 2005]."

From Altmann et al. (2015):

"[…] the farmed whitefish show slow growth rates and are susceptible to the parasite *Henneguya* sp. (Kause et al. 2011)."

Threat to Humans

From Froese and Pauly (2020):

"Harmless"

3 Impacts of Introductions

From Lusk et al. (2010):

"In the Czech Republic, extensive hybridization took place between introduced *C. maraena* and *C. peled*, resulting in distinctly decreased fitness of the hybrids, associated with high mortality rate among both juveniles and adults."

From Neilson (2019):

"The impacts of this species are currently unknown, as no studies have been done to determine how it has affected ecosystems in the invaded range. The absence of data does not equate to lack of effects. It does, however, mean that research is required to evaluate effects before conclusions can be made."

All species in the family Salmonidae are listed as injurious species in the United States due to the risk of carrying certain pathogens, thus prohibiting their importation unless imported live with a health certification or are dead and eviscerated.

4 History of Invasiveness

There is one peer reviewed article that found hybridization occurring between *C. maraena and C. peled*, another introduced species, and that the hybrids had a high mortality rate. Since the impacts were on a nonnative hybrid and not on a native species or the environment that impact was not taken into consideration when evaluating the history of invasiveness. No additional impacts of introduction or detailed information on the stocking trade history of *C. maraena* was found. The history of invasiveness for *Coregonus maraena* is classified as Data Deficient.

5 Global Distribution

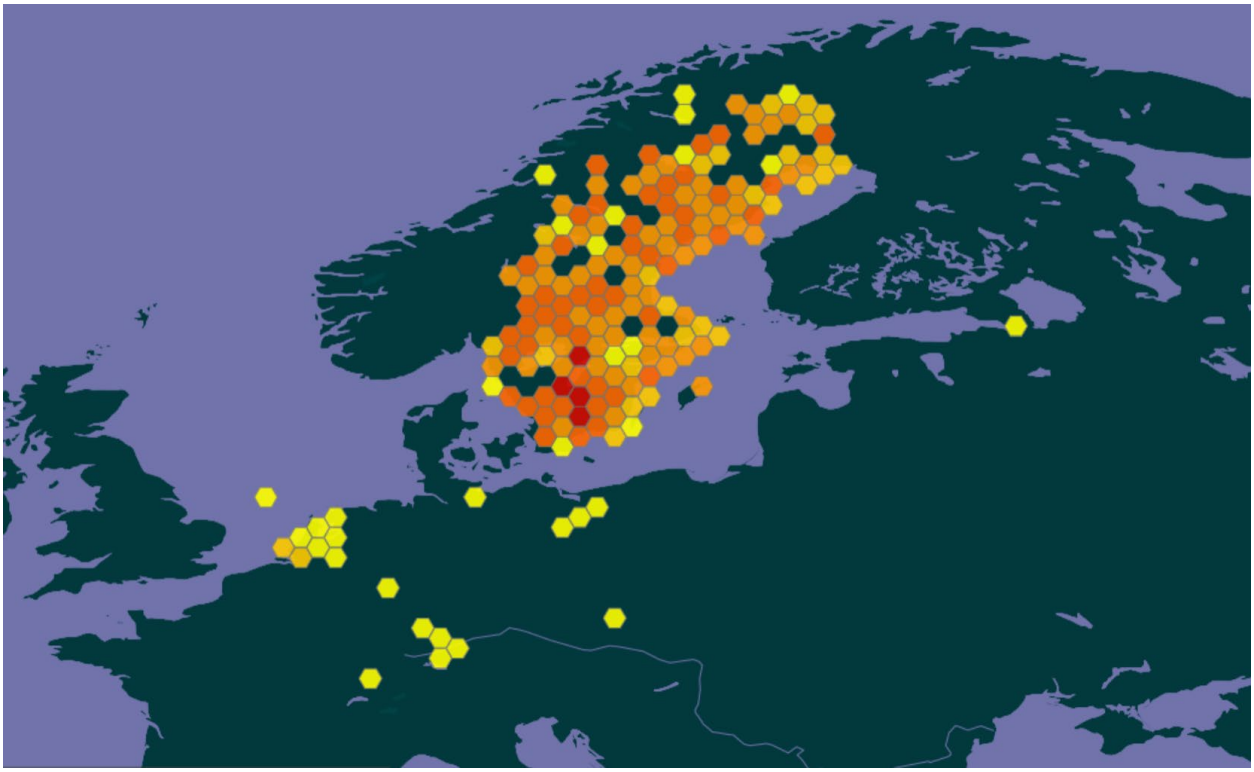

Figure 1. Known global distribution of *Coregonus maraena*. Observations are reported from Sweden, Russia, Poland, Germany, Switzerland, Czech Republic, Netherlands, Finland, and Norway. Map from GBIF Secretariat (2020). Because the climate matching analysis (section 7) is not valid for marine waters, no marine occurrences were used in the climate matching analysis.

6 Distribution Within the United States

There are no records of established populations of *Coregonus maraena* in the United States.

7 Climate Matching

Summary of Climate Matching Analysis

The majority of the contiguous United States had a medium to high climate match. High match could be found around the Great Lakes and in some of the Rocky Mountain States. Low match

was found along the West Coast States as well as the Gulf of Mexico coast and peninsular Florida. Medium match was found in the remaining areas. The overall Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.111, high (scores of 0.103 and greater are classified as high). The following States had high individual Climate 6 score: Colorado, Michigan, Montana, New Mexico, New York, Ohio, Pennsylvania, Utah, Virginia, Wisconsin, West Virginia, and Wyoming. The following States had a medium individual Climate 6 score: Arizona, Connecticut, Idaho, Illinois, Indiana, Kentucky, Massachusetts, Maryland, Minnesota, North Carolina, South Dakota, Tennessee, and Washington. All remaining States received a low individual Climate 6 score.

The climate match presented here refers only to where the species can survive in freshwater and brackish environments and not in marine environments.

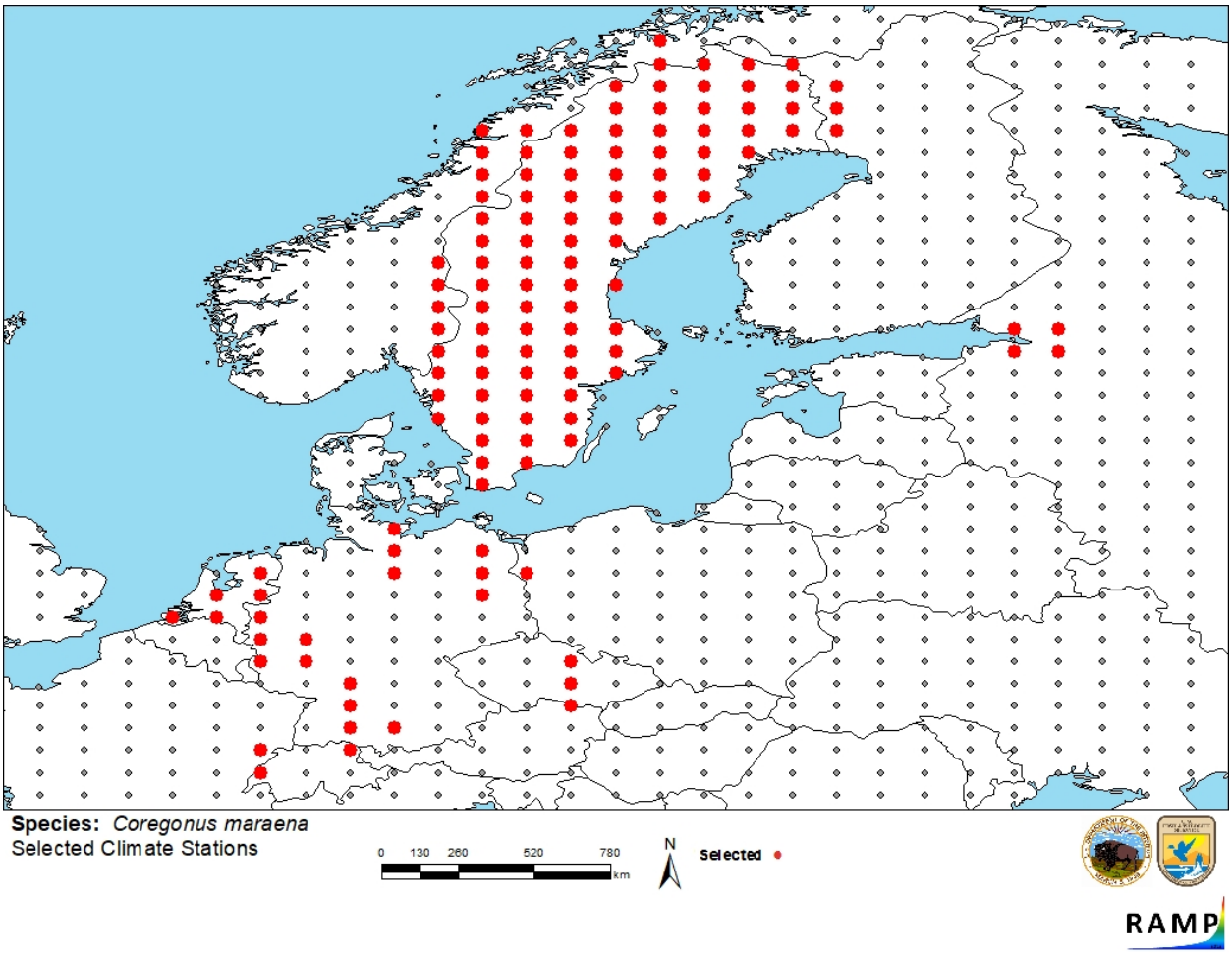

Figure 3. RAMP (Sanders et al. 2018) source map showing weather stations in Europe selected as source locations (red; Sweden, Russia, Poland, Germany, Switzerland, France, Czech Republic, Netherlands, Finland, and Norway) and non-source locations (gray) for *Coregonus maraena* climate matching. Source locations from GBIF Secretariat (2020). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

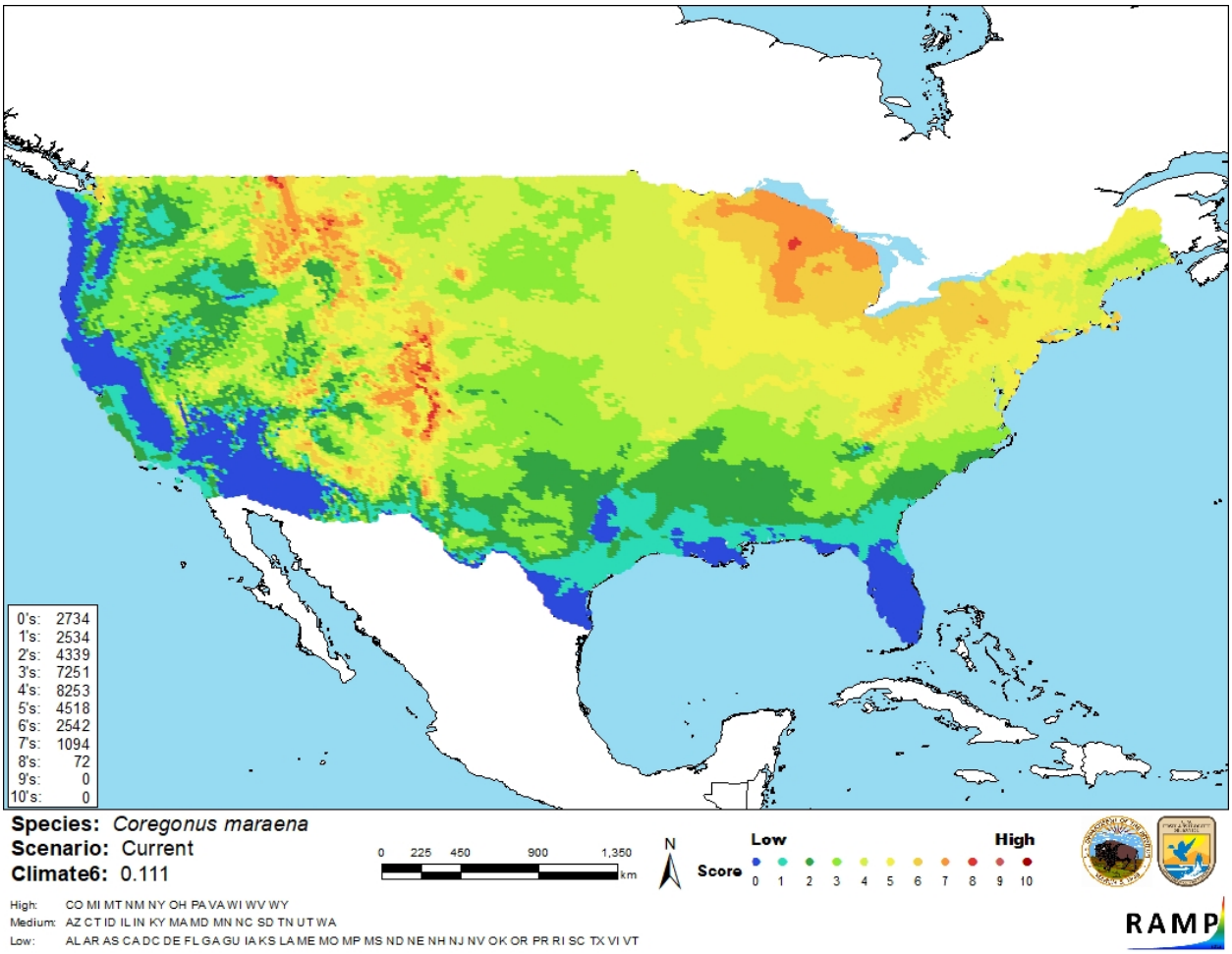

Figure 4. Map of RAMP (Sanders et al. 2018) climate matches for *Coregonus maraena* in the contiguous United States based on source locations reported by GBIF Secretariat (2020). Counts of climate match scores are tabulated on the left. 0/Blue = Lowest match, 10/Red = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: (Count of target points with climate scores 6-10)/ (Count of all target points)	Overall Climate Match Category
0.000≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

8 Certainty of Assessment

Information is available on the biology and distribution of *C. maraena*; however, scientific knowledge of impacts from introductions of the species is extremely limited. The certainty of this assessment is Low.

9 Risk Assessment

Summary of Risk to the Contiguous United States

The Maraena Whitefish, *Coregonus maraena,* is a fish species native to northern Europe with anadromous and land-locked populations. An introduction to the United States in the late nineteenth century failed to establish. All species in the family Salmonidae are listed as injurious species in the United States due to the risk of carrying certain pathogens, thus prohibiting their importation unless imported live with a health certification or are dead and eviscerated. Introductions to other countries outside its native range have sometimes resulted in established populations, although they are often supported through continued stocking. *C. maraena* has hybridized with nonnative *Coregonus peled* in the Czech Republic, with detrimental effects on juvenile and adult mortality of the hybrids. The history of invasiveness is classified as Data Deficient despite the hybridization between *C. maraena* and *C. peled* because it is an impact on another nonnative species and not on a native species, the economy, or the environment. The overall climate match for the contiguous United States was High, with high match found in throughout the Great Lakes region and the Rocky Mountains. The certainty of assessment is Low because of the lack of impacts of introductions on native species. The overall risk assessment category for *Coregonus maraena* is Uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): Data Deficient**
- **Overall Climate Match Category (Sec. 7): High**
- **Certainty of Assessment (Sec. 8): Low**
- **Remarks, Important additional information:** All species of Salmonidae are listed as injurious species in the United States due to risk of carrying certain pathogens.
- **Overall Risk Assessment Category: Uncertain**

10 Literature Cited

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 11.

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11 Literature Cited in Quoted Material

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.

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