European Weatherfish (*Misgurnus fossilis*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, April 2020
Revised, May 2020
Web Version, 6/6/2022

Organism Type: Fish
Overall Risk Assessment Category: Uncertain

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1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2020):

"Europe and Asia: In Europe, north of the Alps, from Meuse [in France, Belgium, and the Netherlands] eastward to Neva drainages and Lake Ladoga [in Russia]; northern Black Sea basin from Danube eastward [from Germany and Austria] to Kuban [Russia], absent on the southern section; Caspian basin in Volga and Ural drainages [Russia]."

Status in the United States

No reports of any introductions or established populations of *M. fossilis* in the United States were found. This species is not known to be subject to State or Federal regulations on its trade.

This species is occasionally found in the pet trade (Rixon et al. 2005), although none were found for sale when searching aquarium store websites.

Means of Introductions in the United States

No introductions or discoveries of *Misgurnus fossilis* in the wild were reported for the United States.

Remarks

Other common names for *Misgurnus* fossilis include "weather loach" (Bianco and Ketmaier 2001; Rixon et al. 2005), as well as simply "loach" or "weatherfish" (Sukalo et al. 2018).

According to Legislation.gov (2003) *Misgurnus fossilis* is listed under the Prohibition of Keeping or Release of Live Fish (Specified Species) Order in England as amended in 2003. Under this order, a permit is required to keep live European weatherfish in England.

Gertzen et al. (2008) states that *M. fossilis* is cold-tolerant and could possibly survive if introduced to the St. Lawrence Seaway.

From Howeth et al. (2016):

"Our analysis identified four aquarium species that are native to temperate regions of Europe and/or Asia that would likely establish if introduced to the Great Lakes: European Weatherfish (*Misgurnus fossilis*) […]"

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2020):

Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Ostariophysi
Order Cypriniformes
Superfamily Cobitoidea
Family Cobitidae
Subfamily Cobitinae
Genus *Misgurnus*
Species *Misgurnus fossilis* (Linnaeus, 1758)

From Fricke et al. (2020):

"Current status: Valid as *Misgurnus fossilis* (Linnaeus 1758)."

Size, Weight, and Age Range

From Froese and Pauly (2020):

"Max length : 30.0 cm TL male/unsexed; [Muus and Dahlström 1968]; 30.7 cm TL (female); common length : 15.0 cm TL male/unsexed; [Muus and Dahlström 1968]"

Environment

From Froese and Pauly (2020):

"Freshwater; brackish; demersal; potamodromous [Riede 2004] […] 4°C - 25°C [Riehl and Baensch 1991] [assumed to be the recommended aquarium temperature];"

From Freyhof (2011):

"Backwaters and side channels of lowland streams, rivers and lakes. Mostly restricted to densely vegetated habitats with slow or no current and soft, mud bottom. Spawns in dense vegetation, often in flooded meadows."

From Rixon et al. (2005):

"This species survives at temperatures as low as 4.3 °C in Germany, and is able to undergo winter dormancy (Meyer and Hinrichs 2000)."

Climate

From Froese and Pauly (2020):

"Temperate; […] 62°N - 42°N, 15°E - 61°E"

Distribution Outside the United States

Native

From Froese and Pauly (2020):

"Europe and Asia: In Europe, north of the Alps, from Meuse [in France, Belgium, and the Netherlands] eastward to Neva drainages and Lake Ladoga [in Russia]; northern Black Sea basin from Danube [flowing eastward from Germany and Austria] eastward to Kuban [Russia], absent on the southern section; Caspian basin in Volga and Ural drainages [Russia]."

Introduced

From Froese and Pauly (2020):

"Established in the Ticino River, northwestern Italy. Naturalized in 1998."

Froese and Pauly (2020) also report *M. fossilis* as introduced and established in Spain and Croatia.

From Sanda et al. (2008):

"Rakaj (1995) mentioned the occurrence of *Misgurnus fossilis* in a reservoir close to Tirana [Albania]. This locality has not been sampled recently."

No further information is available on the establishment status of *M. fossilis* in Albania.

Britton et al. (2010) report *M. fossilis* as introduced in the 1960's in the UK. They report that the species is established, and has been recorded in more than one location, but less than ten.

From Sukalo et al. (2018):

"We gave the first record of this species in Adriatic Sea catchment area in Bosnia and Herzegovina. Individuals of weatherfish (11 specimens) were caught in small pond with mud bottom at locality Srednja Voda (43.30168°N, 18.11728°E) in the Nevesinje municipality (SE Bosnia and Herzegovina) by hand-made funnel traps for newts hunting […]"

There is disagreement in the literature about whether *M. fossilis* is native (Carrell 2002; Irz et al. 2004) or nonnative (Froese and Pauly 2020) to the Rhône River basin in France. Irz et al. (2004) also report *M. fossilis* as present and nonnative in the Adour-Garonne region of southwestern France. No additional information is available to determine establishment status.

Means of Introduction Outside the United States

From Sanda et al. (2008):

"As this locality [Tirana, Albania] is extremely remote from the natural distribution area of this species in Europe, the most probable explanation is an unintentional introduction along with economically important species such as common carp *Cyprinus carpio* Linnaeus, 1758. However, intentional introduction cannot be excluded."

Britton et al. (2010) state that the introduction of *M. fossilis* into the UK was an "accidental" release of aquarium or pond specimens.

Short Description

From Froese and Pauly (2020):

"Dorsal spines (total): 3; Dorsal soft rays (total): 5-6; Anal spines: 3; Anal soft rays: 8 - 11; Vertebrae: 49 - 50. Broad midlateral stripe from eye to caudal base and narrow stripe from opercle at least to pelvic origin. Lamina circularis absent in males [Kottelat and Freyhof 2007]. Caudal fin with 14-16 rays [Keith and Allardi 2001]."

Biology

From Freyhof (2011):

"Spawns for the first time at 2-3 years, at about 110 mm SL. Spawns in March-July. Males have a larger second pectoral ray and shallow vertical swellings of flanks above anal base, enlarged during spawning time. Male follows female into dense vegetation and forms a complete ring around her body, behind dorsal fin. Sticky eggs are released into vegetation. Larvae move to bottom and hide in mud. Larvae have large external gill filaments, reabsorbed after 10-12 days. Adults nocturnal, burrows into mud to hide during day and, especially in shallow habitats, during dry periods and strong frosts. Usually burrows 200-300 mm deep, occasionally down to 700 mm during dry periods. Able to survive in habitats with low oxygen concentrations by cutaneous and intestinal respiration. Frequently swallows air, oxygen being absorbed through the walls of the gut. Feeds on benthic invertebrates. Swims slowly above bottom and dig for invertebrates, which are localized by olfaction."

From Froese and Pauly (2020):

"Found in lower reaches of slow-flowing rivers, but can also be found in still pools [Vostradovsky 1973], on sandy bottoms of ponds, pools and ditches. Adults are nocturnal which burrow into mud during dry periods and strong frosts. Usually, burrows are 20-30 cm deep, occasionally down to 70 cm during dry periods [Kottelat and Freyhof 2007]. During the day, they stay buried in the sand. Feed on insect larvae and small mollusks. Seldom captured with hook and line [Billard 1997]. Are sensitive to pollutants which accumulate in the sediment [Keith et al. 1992]. Facultative air-breathers [Gerstmeier and Romig 1998]."

Human Uses

From Bianco and Ketmaier (2001):

"The weather loach *Misgurnus fossilis* (L.) was already well established by 1998 in several canals of the Ticino basin [Italy] and is the subject of intensive fishing for food by local fishermen."

From Froese and Pauly (2020):

"Fisheries: of no interest; bait: usually"

From Rixon et al. (2005):

"*Misgurnus fossilis* (weather loach) was present in 10% of the [aquarium and pet] stores surveyed."

Diseases

No records of OIE-reportable diseases (OIE 2020) were found for *Misgurnus fossilis*.

Popiolek and Kotusz (2008) list several monogenean parasites including *Dactylogyrus* spp. and *Gyrodactylus* spp., as well as various species of digenea, cestoda, and nematoda.

According to Poelen et al (2014) *Misgurnus fossilis* can be the host to the following parasites: *Ancryocephalus cruciatus, Tenuiproboscis misgurni, Gryporhynchus cheilancristrotus, Gyrodactylus elegans, Gyrodactylus medius, Ancyrocephalus cruciatus, Gyrodactylus misgurni, Gyrodactylus fossilis, Gyrodactylus cobitis, Paragyrodactylus, Gyrodactylus sedelnikowi, Gyrodactylus paralatus, Cystidicoloides ephemeridarum, Posthodiplostomum cuticola, Sanguinicola armata, Sanguinicola intermedia, Sanguinicola cf. inermis, Clinostomum complanatum, Allocreadium transversal, Dactylogyrus extensus, Metagonimus yokogawai, Raphidascaris acus, Tylodelphys clavata, Diplostomum spathaceum, Caryophyllaeus laticeps, Crepidostomum metoecus, Neogryporhynchus cheilancristrotus, Spiroxys contorta, Gyrodactylus, Rhabdochona denudate, Archigetes limnodrili, Acanthocephalus anguillae,* and *Pseudocapillaria tomentosa*.

Threat to Humans

From Froese and Pauly (2020):

"Harmless"

3 Impacts of Introductions

From Parrott et al. (2009):

"**Environmental Impact:** Little information available. Likely impact is the introduction of new parasites or exotic diseases."

4 History of Invasiveness

M. fossilis has been recorded in several countries outside its native range, but little information is available on its impacts after introduction. The only statements found on impacts provided no supporting evidence. This species is found in the pet trade in the United States as well as other countries, but it appears that the trade volume is quite low and availability is sporadic. In England, the possession or release of live *M. fossilis* is illegal without a permit, under an order aimed at protecting native species and their habitats. Although this species is reported as established beyond its native range (in Spain, Croatia, Italy, the United Kingdom, and possibly Bosnia and Herzegovina and southern France), without any substantial evidence of negative impacts or lack thereof, the history of invasiveness for *Misgurnus fossilis* is categorized as Data Deficient.

5 Global Distribution

Figure 1. Known global distribution of *Misgurnus fossilis*. Observations are reported across Europe, from the United Kingdom and France to western Russia and parts of Japan. Map from GBIF Secretariat (2021). The points in Japan, Italy, and western France were not included in the climate match because no other resources could be found to validate them as established populations. No occurrence data were available for established populations in Spain, the Ticino River in Italy, or the easternmost extent of the range in the Ural River drainage in Russia.

6 Distribution Within the United States

No introduced or established populations have been reported in the wild in the United States.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Misgurnus fossilis* was medium to high through a majority of the contiguous United States. Areas of high match were found mainly in the northeast and Great Lakes region with some smaller areas in the Midwest and Rocky Mountain range. Areas of medium match stretched from the east coast to parts of the West. Areas of low match were found in the West, the central Gulf Coast, and southern Florida. The overall Climate 6 score (Sanders et al. 2021; 16 climate variables; Euclidean distance) for the contiguous United States was 0.756, high. (Scores greater than 0.103, exclusive, are classified as high.) All States had a high individual climate 6 score except for California, which had a low individual climate 6 score, and Florida, which had a medium individual climate 6 score.

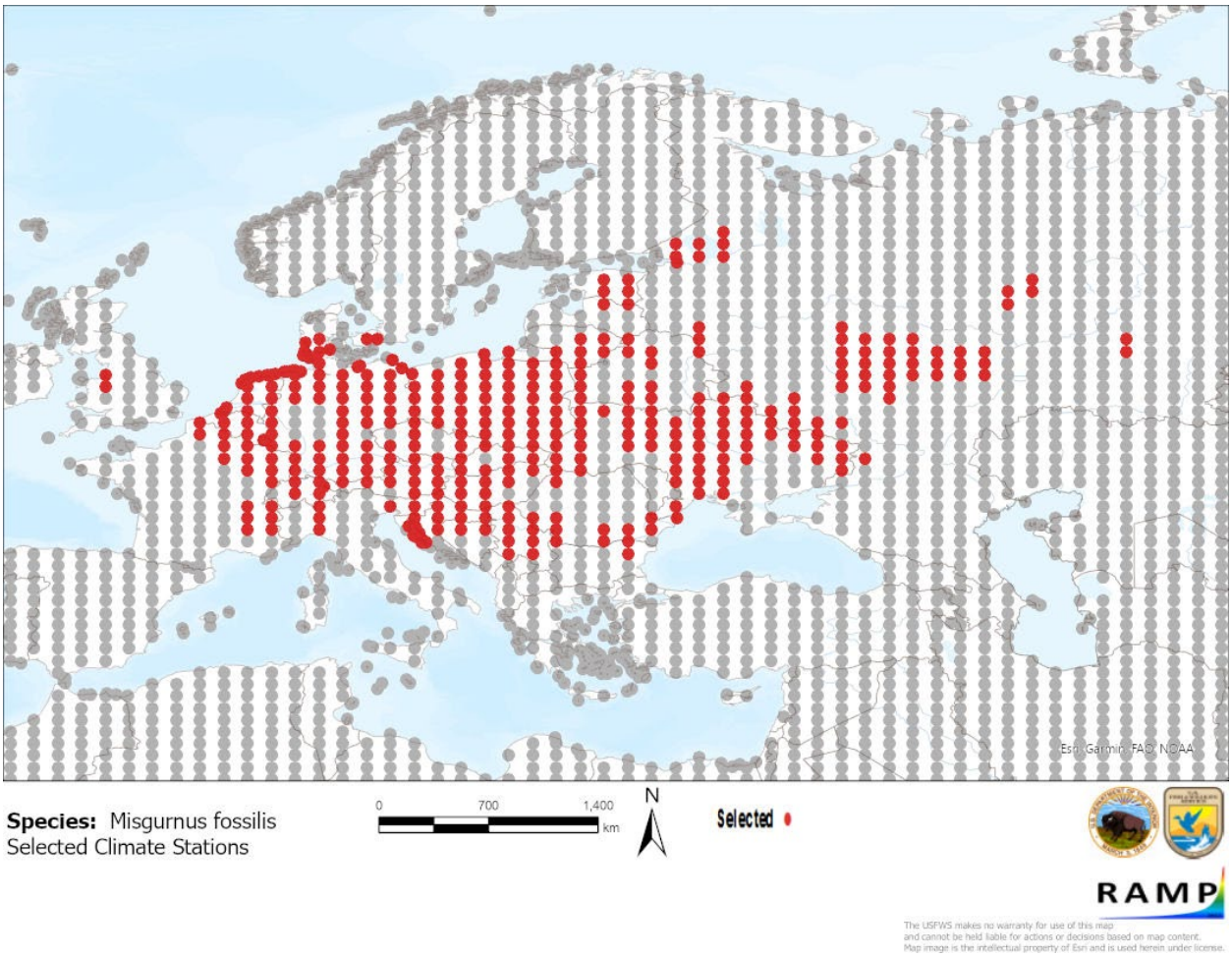

Figure 2. RAMP (Sanders et al. 2021) source map showing weather stations in Europe selected as source locations (red; France, the UK, the Netherlands, Belgium, Denmark, Luxembourg, Germany, Poland, Austria, Italy, Czech Republic, Slovakia, Hungary, Lithuania, Estonia, Belarus, Romania, Serbia, Croatia, Slovenia, Bosnia and Herzegovina, and western Russia) and non-source locations (gray) for *Misgurnus fossilis* climate matching. Source locations from GBIF Secretariat (2021). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

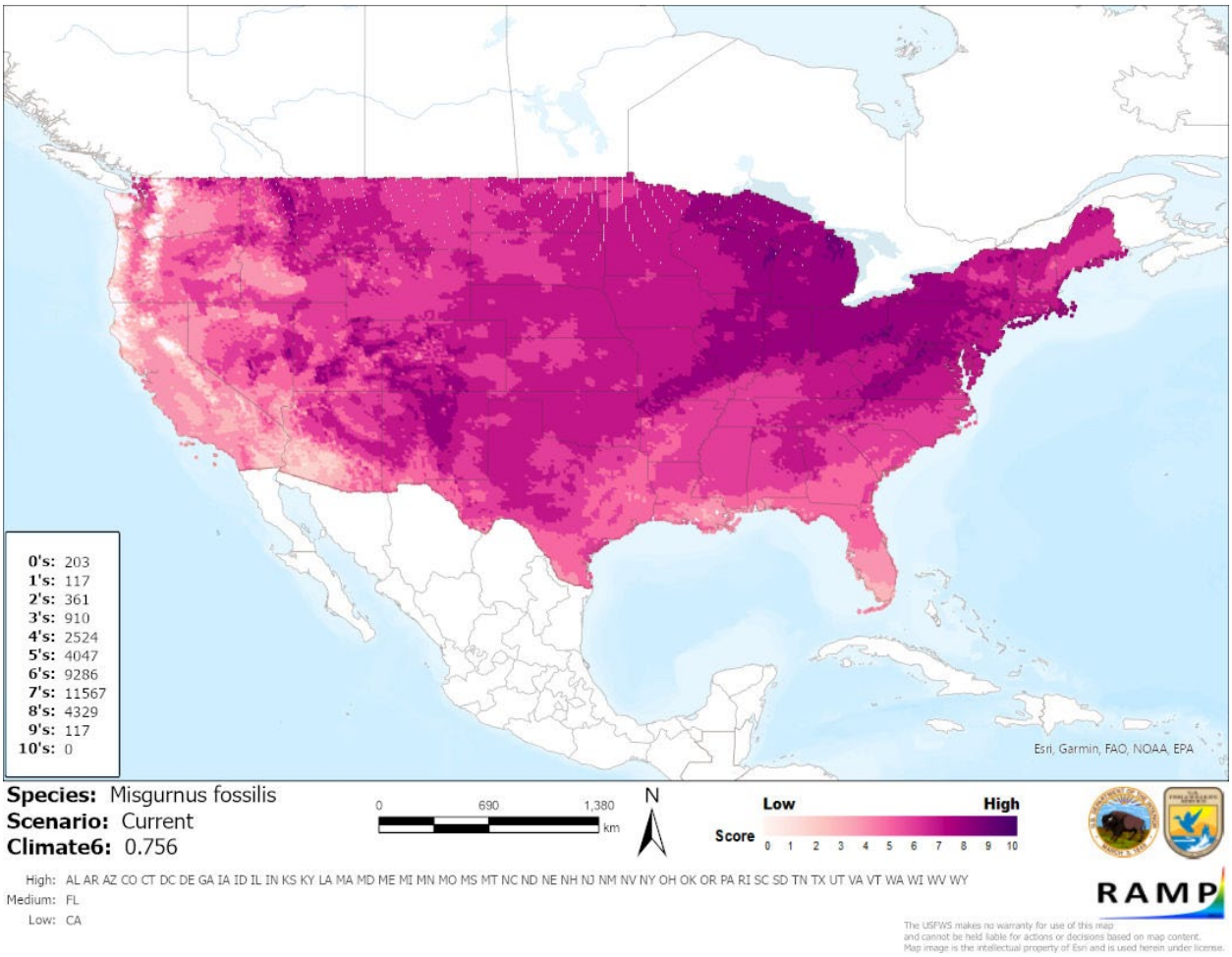

Figure 3. Map of RAMP (Sanders et al. 2021) climate matches for *Misgurnus fossilis* in the contiguous United States based on source locations reported by GBIF Secretariat (2021). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

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

The certainty of assessment for *Misgurnus fossilis* is low. There is information available on the biology of the species, and the distribution data provides a high-quality climate match assessment. The only information on impacts of introduction on native species, habitats, or

economic interests described potential impacts, rather than observed impacts. More scientific information on documented effects or lack of effects of introduced populations of *M. fossilis* is needed to improve the certainty of this assessment.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Misgurnus fossilis, the European weatherfish, is a temperate loach native to slow-moving and backwater areas of large rivers across much of Europe. Human uses of this species include consumption, use as bait, and the pet trade. Though its occurrence in the pet trade is relatively uncommon, the United Kingdom imposed a ban on keeping or releasing live European weatherfish. *M. fossilis* is currently reported as established outside its native range in the United Kingdom, Spain, Italy, Croatia, and may also be established in western France and Bosnia and Herzegovina. The history of invasiveness for *M. fossilis* is classified as data deficient due to the lack of information on realized impacts of introductions; only potential impacts were described in the literature. The overall climate match for the contiguous United States was high; all States except California had a high or medium climate match. The certainty of assessment for *M. fossilis* is low, due to the lack of information on impacts of introduced populations. The overall risk assessment 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: No additional information**
- **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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