

# Large-scale Loach (*Paramisgurnus dabryanus*)

## Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, February 2011  
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Photo: C. Castle, USFWS.

## 1 Native Range and Status in the United States

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### Native Range

From Eschmeyer et al. (2018):

“Distribution: China and Russia; Taiwan?”

From Froese and Pauly (2018):

“Asia: China [...] Reported from Taiwan [Shen 1993].”

From Kirsch et al. (2018):

“The native distribution of Large-Scale Loach includes the Yangtze River basin in China and the inland waters of Taiwan (Kottelat 2012) [...]”

## **Status in the United States**

From Neilson (2019):

“Status: Unknown”

Nico et al. (2019) report a 1977 collection of *Misgurnus mizolepis* in Baker County, Oregon (Powder-Snake River drainage); *M. mizolepis* is currently synonymized with *P. dabryanus* (see Remarks). Nico et al. (2019) state that “further collections have yielded no other specimens” and the introduction status is classified as “failed.”

From Kirsch et al. (2018):

“On October 6, 2014, members of the U.S. Fish and Wildlife Service detected a previously unknown exotic fish in a disconnected pool immediately upstream from the Chowchilla Bifurcation Structure in the San Joaquin River, a major tributary of the San Francisco Estuary. A member of the U.S. Fish and Wildlife Service initially identified the fish as an Oriental Weatherfish *Misgurnus anguillicaudatus* using external morphological characteristics. We conducted additional fish sampling near the Chowchilla Bifurcation Structure in November 2014 and collected a total of six additional specimens in disconnected pool habitats. Unexpectedly, genetic and meristic techniques revealed that these specimens were Large-Scale Loach *Paramisgurnus dabryanus*. To our knowledge this is the first confirmed occurrence of Large-Scale Loach in the United States [...]”

“[...] we recommend further research to assess [the species’] level of establishment in the San Francisco Estuary watershed. Additional field sampling is needed throughout the San Joaquin River downstream of Friant Dam including the San Francisco Estuary, adjacent diversion canals, and managed waterfowl habitat to document the distribution and abundance of the species.”

“In the United States, cobitids [family Cobitidae] are commonly sold as aquarium fish in retail stores (Courtenay and Stauffer 1990; Rixon et al. 2005) including those within the San Francisco Estuary watershed (Chang et al. 2009) [...]”

From Seriously Fish (2019):

“It’s actually sold in the aquarium hobby on a regular basis but almost always labelled as or mixed in with *Misgurnus anguillicaudatus* and is thus poorly documented.”

## Means of Introductions in the United States

From Kirsch et al. (2018):

“We speculate that the introduction to the San Joaquin River may have been the result of one or more aquarium releases within 1 km of the Chowchilla Bifurcation Structure or farther upstream when the river was connected.”

## Remarks

Eschmeyer et al. (2018) lists *Misgurnus mizolepis* as a synonym of *Paramisgurnus dabryanus*.

From Kirsch et al. (2018):

“In two recent studies using both nuclear (RAG-1) and mitochondrial (cytochrome *b*) gene sequence data, Large-scale and Fine-scale Loach [*Misgurnus mizolepis*] resolved into a single lineage with low genetic divergence within it, supporting the hypothesis posed by several authors that the two taxa are very genetically similar (Perdices et al. 2016) or conspecific (Vasil’eva 2001; Kottelat 2012; Perdices et al. 2012). Morphological similarity of some Fine-scale Loach specimens to Oriental Weatherfish [*Misgurnus anguillicaudatus*] have led to recommendations that those taxa are conspecific (Kottelat 2012), but this is not supported by genetic data (Perdices et al. 2012, 2016; this study).”

## 2 Biology and Ecology

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### Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2018):

“Kingdom Animalia  
Subkingdom Bilateria  
Infrakingdom Deuterostomia  
Phylum Chordata  
Subphylum Vertebrata  
Infraphylum Gnathostomata  
Superclass Actinopterygii  
Class Teleostei  
Superorder Ostariophysii  
Order Cypriniformes  
Superfamily Cobitoidea  
Family Cobitidae  
Subfamily Cobitinae  
Genus *Paramisgurnus*  
Species *Paramisgurnus dabryanus* Dabry de Thiersant, 1872”

From Eschmeyer et al. (2018):

“Valid as *Paramisgurnus dabryanus* Dabry de Thiersant 1872. Cobitidae.”

## **Size, Weight, and Age Range**

From Froese and Pauly (2018):

“Max length : 15.4 cm TL male/unsexed; [Chen et al. 2016] common length : 7.3 cm SL male/unsexed; [Nichols 1943]; max. published weight: 18.80 g [Chen et al. 2016]”

## **Environment**

From Froese and Pauly (2018):

“Freshwater; demersal; dH range: 6 - 18.”

From Kirsch et al. (2018):

“The native distribution of Large-Scale Loach includes the Yangtze River basin in China and the inland waters of Taiwan (Kottelat 2012) where water temperatures can range from 10°C to 30°C (Wang and Li 2005; Zhang et al. 2012).”

## **Climate/Range**

From Froese and Pauly (2018):

“Subtropical [...]”

## **Distribution Outside the United States**

### **Native**

From Eschmeyer et al. (2018):

“Distribution: China and Russia; Taiwan?”

From Froese and Pauly (2018):

“Asia: China [...] Reported from Taiwan [Shen 1993].”

From Kirsch et al. (2018):

“The native distribution of Large-Scale Loach includes the Yangtze River basin in China and the inland waters of Taiwan (Kottelat 2012) [...]”

### **Introduced**

From Onikura et al. (2011):

“[...] this species has begun to reproduce in several regions of Honshu Island [Japan] (Kanou et al. 2007).”

From Froese and Pauly (2018):

“Regularly imported from southern China to Europe. It is possible that this species has escaped in the European waters [Kottelat and Freyhof 2007].”

## **Means of Introduction Outside the United States**

From Onikura et al. (2011):

“This species has been regularly imported [to Japan] and cultivated as a source of fishing bait and food.”

From NIES (2019):

“Accidental: Hitchhiking on imported weatherfish *Misgurnus anguillicaudatus*”

From Kirsch et al. (2018):

“It has been introduced to Europe and Japan by means of aquaculture escape and aquarium release (Kanou et al. 2007; Tang et al. 2008).”

## **Short Description**

From Froese and Pauly (2018):

“Absence of dark spot at upper caudal base. Caudal peduncle with high adipose crests. Lamina circularis spade-shaped with crenulated posterior margin [Kottelat and Freyhof 2007].”

## **Biology**

From Kirsch et al. (2018):

“They are found in lentic and lotic habitats containing muddy substrate, low gradient, slack water, and high turbidity (Gao et al. 2010; Sato et al. 2011; Huang et al. 2013). Additionally, Large-scale Loach can occur in irrigation or diversion canals, ponds, and rice fields (Kanou et al. 2007; Greshishchev et al. 2015); they are able to breathe air in oxygen-depleted waters and burrow into mud to avoid desiccation or thermal extremes (Wang and Li 2005; Zhang et al. 2012).”

“The species has high reproductive potential and can become sexually mature at 1 or 2 y of age when fish range in length from 100 to 200 mm (Chu et al. 2012; Zhang et al. 2012). The Large-Scale Loach is an omnivorous benthic feeder and its prey consists of zooplankton, macroinvertebrates, and algae (Wang and Li 2005; Kanou et al. 2007).”

## **Human Uses**

From Froese and Pauly (2018):

“Aquaculture: commercial”

From Kirsch et al. (2018):

“The Large-scale Loach is considered to have nutritional, medicinal and ornamental value outside of the species' native distribution (Freyhof and Korte 2005; Wang and Li 2005; Kanou et al. 2007) and the species is commonly exported from eastern Asia for the aquarium or aquaculture trade (Freyhof and Korte 2005; Kanou et al. 2007; Chu et al. 2012). [...] In the United States, cobitids [family Cobitidae] are commonly sold as aquarium fish in retail stores (Courtenay and Stauffer 1990; Rixon et al. 2005) including those within the San Francisco Estuary watershed (Chang et al. 2009) [...]”

From Seriously Fish (2019):

“It’s actually sold in the aquarium hobby on a regular basis but almost always labelled as or mixed in with *Misgurnus anguillicaudatus* and is thus poorly documented.”

## Diseases

No OIE-reportable diseases (OIE 2019) have been documented in this species.

From Froese and Pauly (2018):

“Eustrongylides Disease (larvae), Parasitic infestations (protozoa, worms, etc.)”

## Threat to Humans

From Froese and Pauly (2018):

“Harmless”

## 3 Impacts of Introductions

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From Kirsch et al. (2018):

“The ecological impact of the Large-scale Loach population in the San Joaquin River [California] is unknown. [...] High population densities of Large-scale Loach could potentially alter the invertebrate and algal community within invaded waters. Further, Large-scale Loach could potentially interfere with other benthic feeders (Mills et al. 2004; Hazelton and Grossman 2009), although interference competition has not been documented between Large-scale Loach and other species possessing diet overlap within Japan (Kanou et al. 2007). Additionally, the introduction of Large-scale Loach has the potential to introduce foreign fish parasites.”

From NIES (2019):

“Potentially: Competition and hybridization with native weatherfish.  
Native organism(s) affected: *Misgurnus anguillicaudatus*”

## 4 Global Distribution

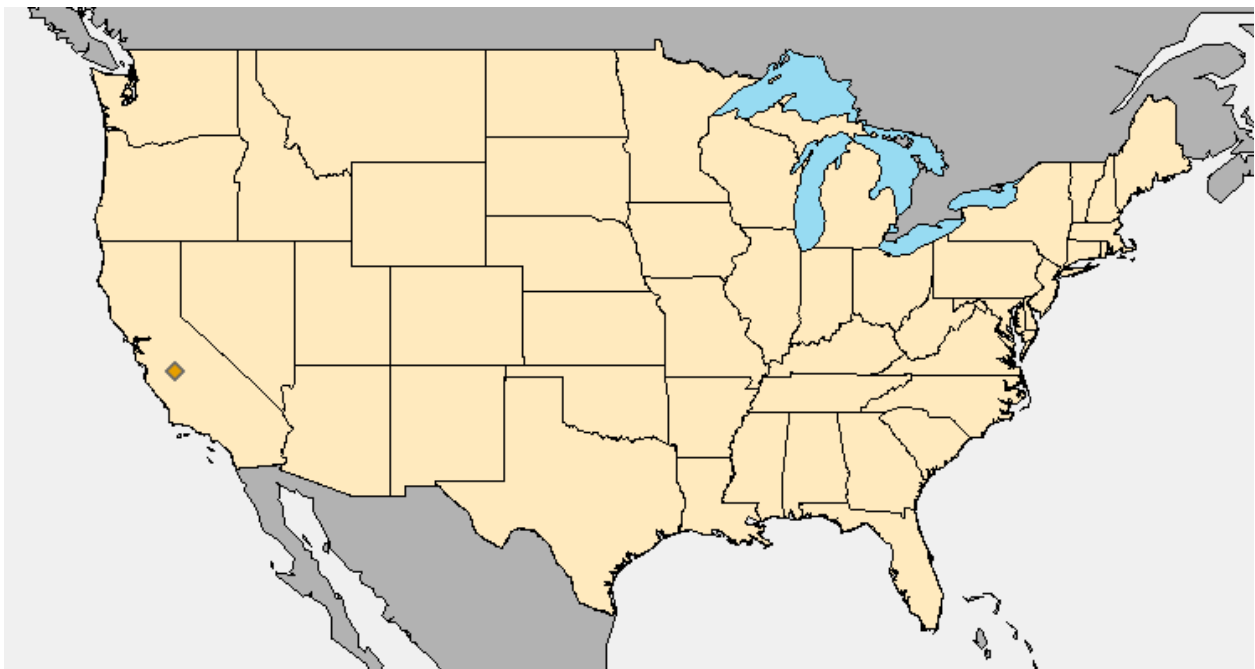
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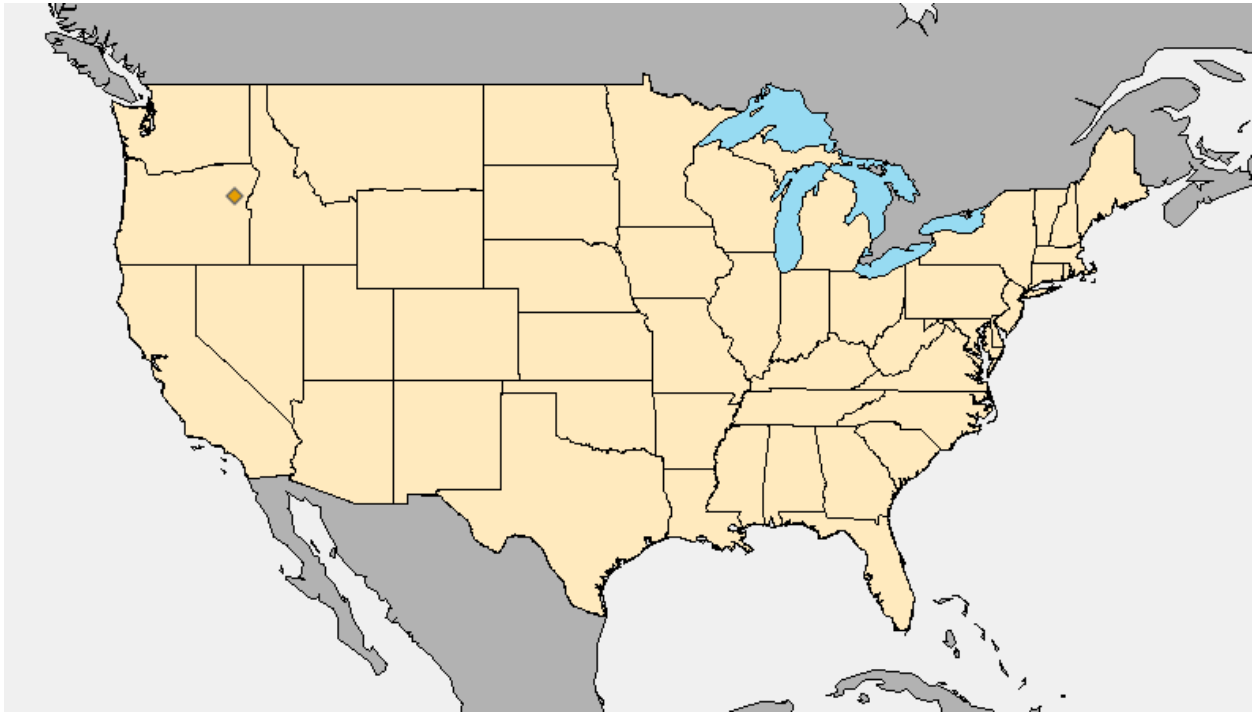
**Figure 1.** Known global distribution of *Paramisgurnus dabryanus*. Map from GBIF Secretariat (2019). No georeferenced occurrences were available for parts of the established range in Russia. Occurrences reported from Hong Kong and the United States were not included in the climate matching analysis because species establishment at these locations has not been confirmed.

## 5 Distribution Within the United States

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**Figure 2.** Distribution of *Paramisgurnus dabryanus* in the San Joaquin River, California. This occurrence was not included in the climate matching analysis because it is unknown if it is an established population. Map from Neilson (2018).



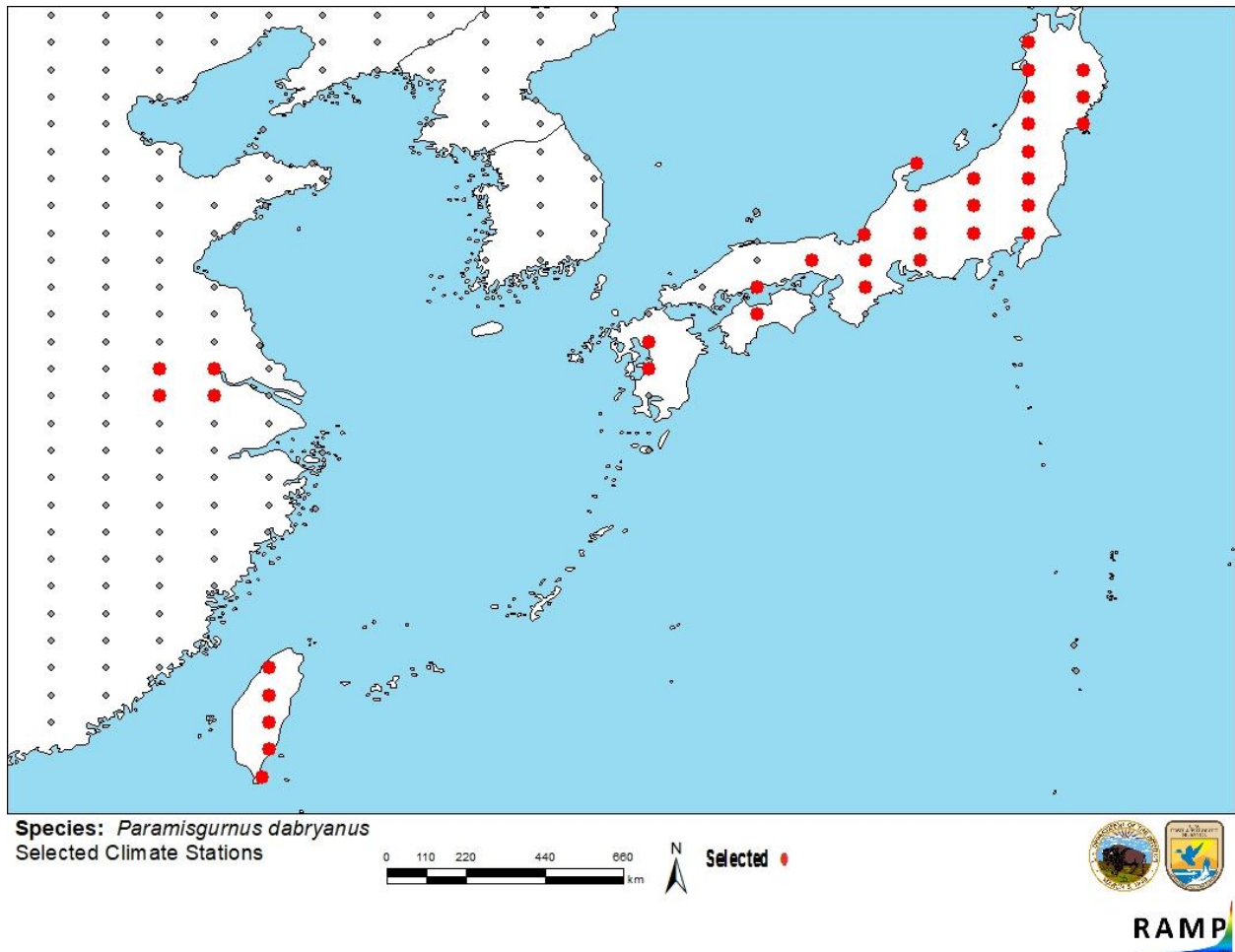
**Figure 3.** Distribution of *Misgurnus mizolepis* (now synonymized with *Paramisgurnus dabryanus*; Eschmeyer et al. 2018) in the Powder River drainage, Oregon. This occurrence was not included in the climate matching analysis because it does not represent an established population. Map from Nico et al. (2018).

## 6 Climate Matching

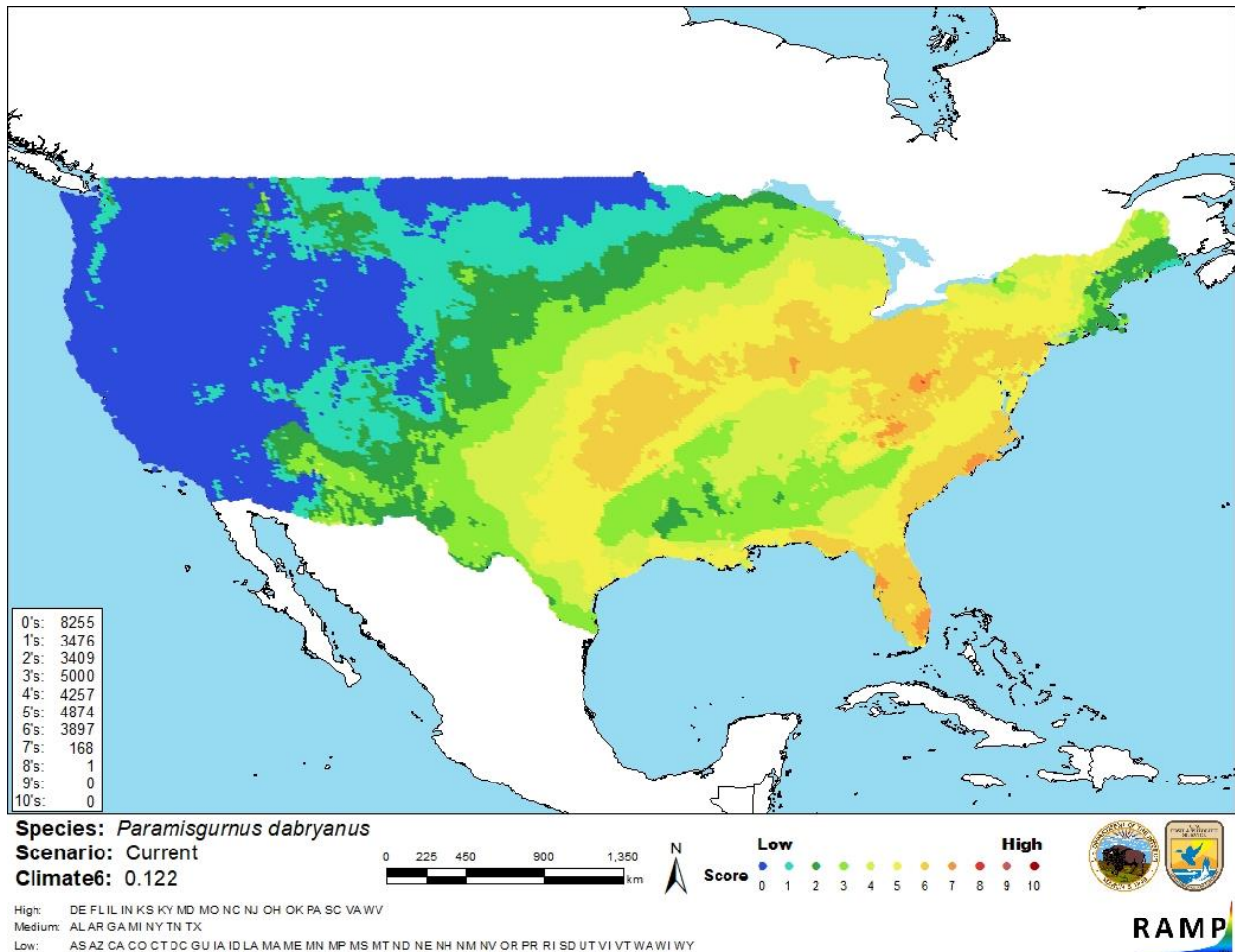
### Summary of Climate Matching Analysis

The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean Distance) for *Paramisgurnus dabryanus* in the contiguous United States is 0.122, indicating a high overall climate match. (Scores of 0.103 or greater are classified as high.) Locally, there were high matches in Florida (especially north of Miami and north of Tampa), on the southern Atlantic coast (highest near Wilmington, North Carolina), and in the Midwest (highest near Pittsburgh, Pennsylvania, in eastern Kentucky, and near Springfield, Illinois). The climate match was medium for much of the eastern half of the contiguous United States outside the high match areas, except for low matches along the New England coast, the northwestern Midwest, and the interior South-Central region. The climate match was low throughout the western contiguous United States.





**Figure 4.** RAMP (Sanders et al. 2018) source map showing weather stations in eastern Asia selected as source locations (red; China, Taiwan, Japan) and non-source locations (gray) for *Paramisgurnus dabryanus* climate matching. Source locations from GBIF Secretariat (2019) and NIES (2019).



**Figure 5.** Map of RAMP (Sanders et al. 2018) climate matches for *Paramisgurnus dabryanus* in the contiguous United States based on source locations reported by GBIF Secretariat (2019) and NIES (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
$\geq 0.103$	High

## 7 Certainty of Assessment

Information on the biology and distribution of *Paramisgurnus dabryanus* currently exists, although more is needed to provide clarity on the native and introduced ranges of the species. It can be very difficult to distinguish between Asian cobitid fishes without genetic analysis, so trade, introductions, and establishment of this species may go undetected. In addition, little is known about impacts of introduction of *P. dabryanus* outside its native range. Given these factors, the certainty of assessment is low.

## 8 Risk Assessment

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### Summary of Risk to the Contiguous United States

*Paramisgurnus dabryanus*, the Large-scale Loach, is a species of fish native to parts of Russia, mainland China, and Taiwan. It is present in the aquarium and aquaculture trade, as fish bait and for human consumption. *P. dabryanus* has been introduced and is established in Japan. No negative impacts of introduction have been reported. Within the contiguous United States, introductions have been reported in the Powder-Snake River drainage, Oregon (as *Misgurnus mizolepis*), and in the San Joaquin River, California. The introduction failed in Oregon, and the status of the introduction in the San Joaquin River is uncertain. History of invasiveness is classified as “none documented.” The climate match within the contiguous United States is high, with high matches occurring in the Southeast and Midwest, and low matches occurring in the West where previous introductions of *P. dabryanus* have occurred. Certainty of assessment is low because of the lack of information on impacts of introduction as well as the difficulty of distinguishing between this and related species on the basis of external morphological characteristics. The overall risk assessment category for *P. dabryanus* is uncertain.

### Assessment Elements

- **History of Invasiveness (Sec. 3): None Documented**
- **Climate Match (Sec. 6): High**
- **Certainty of Assessment (Sec. 7): Low**
- **Overall Risk Assessment Category: Uncertain**

## 9 References

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**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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**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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