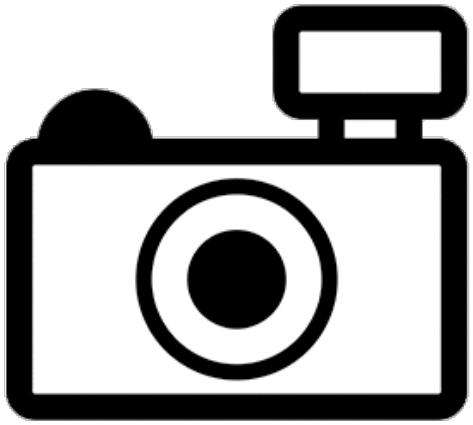
Arapaima mapae (a fish, no common name)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, July 2021
Revised, November 2021
Web Version, 3/7/2022

Organism Type: Fish
Overall Risk Assessment Category: Uncertain



1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2021):

"South America: Lago do Amapá, Brazil."

From Stewart (2013a):

"During most of the 1800s, the area between the Araguari and Oyapock (Oiapoque, in Portuguese) rivers was disputed by Brazil and France, and in that period, there was the village of Mapa and, 9.5 km to the east, lac Mapa (2.03677°N, 50.71047°W). After Brazil annexed the region in 1900, that area was incorporated into what is now Amapá State; the village and lake apparently were renamed Amapá and Lago do Amapá (also sometimes called Lago Grande)."

Status in the United States

No records of *Arapaima mapae* in the United States were found. *A. mapae* is not found in the aquarium trade in the United States.

Procopio (2021) indicates two failed introductions of *Arapaima* sp. in the United States (Florida and Louisiana), however it is unknown which species was introduced and therefore will not be included in this assessment.

The Florida Fish and Wildlife Conservation Commission has listed *Arapaima* spp. as conditional nonnative species (FFWCC 2021). According to FFWCC (2021), "conditional species may be imported and possessed by permitted entities for research, commercial import/export business or public educational exhibition. They may not be acquired or kept as personal pets, […]"

From Oklahoma Secretary of State (2019):

"(a) Until such time as is necessary for the Department of Wildlife Conservation to obtain adequate information for the determination of other harmful or potentially harmful exotic species, the importation into the State and/or the possession of the following exotic fish or their eggs is prohibited: […]

(3) Boney-tongue group: Osteoglossum spp., and Arapaima spp."

Means of Introductions in the United States

No records of *Arapaima mapae* in the United States were found.

Remarks

Although this report follows Fricke et al. (2021) in treating *A. mapae* as a valid species, there has been debate over its standing.

From Procopio (2021):

"Until the work of Stewart (2013a), the genus *Arapaima* was thought to be monotypic, with *Arapaima gigas* considered as the only valid species (Castello and Stewart 2010; Hill and Lawson 2015). His reclassification of *A. agassizii* (Stewart 2013a), and description of new species (Stewart 2013b) uncovered hidden diversity within the genus, identifying a total of 5 distinct species. These species include *A. gigas*, *A. mapae*, *A. arapaima*, *A. agassizii*, and *A. leptosome* [*A. leptosoma*]. Stewart (2013a) and (2013b) present a detailed diagnosis of major morphological features that distinguish these 5 distinct Arapaima species."

From Farias et al. (2019):

"One of the most prominent uncertainties surrounding *Arapaima* is the number of species present in this genus and their distribution. Contrary to the assertions of Stewart [2013a,b], we find no evidence for multiple species of *Arapaima* existing or co-existing in the Amazon basin and satellite river basins."

From Stewart (2013a):

"*Arapaima mapae* is still known only from its holotype."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to Fricke et al. (2021), *Arapaima mapae* (Valenciennes 1847) is the current valid name for this species. The original valid name of this species was *Vastres mapae*.

From GBIF Secretariat (2021):

"Kingdom Animalia
Phylum Chordata
Class Actinopterygii
Order Osteoglossiformes
Family Arapaimidae
Genus *Arapaima*
Species *Arapaima mapae*"

Size, Weight, and Age Range

From Froese and Pauly (2021):

"Max length : 203 cm SL male/unsexed; [Stewart 2013b]"

Environment

From Froese and Pauly (2021):

"Freshwater; benthopelagic."

Climate

From Froese and Pauly (2021):

"Tropical"

Distribution Outside the United States

Native
From Froese and Pauly (2021):

"South America: Lago do Amapá, Brazil."

From Stewart (2013a):

"During most of the 1800s, the area between the Araguari and Oyapock (Oiapoque, in Portuguese) rivers was disputed by Brazil and France, and in that period, there was the village of Mapa and, 9.5 km to the east, lac Mapa (2.03677°N, 50.71047°W). After Brazil annexed the region in 1900, that area was incorporated into what is now Amapá State; the village and lake apparently were renamed Amapá and Lago do Amapá (also sometimes called Lago Grande)."

Introduced

Arapaima mapae has not been reported as introduced outside of its native range.

Means of Introduction Outside the United States

Arapaima mapae has not been reported as introduced outside of its native range.

Short Description

From Stewart (2013b):

"[…] the holotypes of *A. gigas, A. mapae*, and *A. agassizii* also have slender bodies [as compared to *A. arapaima*]"

According to Stewart (2013a), some of the distinguishing features of *A. mapae* relative to other species in the genus include: 37 dentary teeth, 38 maxillary teeth, 1.5 orbit diameter and 5.3 interorbital width.

From Stewart (2013a):

"The caudal fin in the holotype of *A. mapae* is indeed small, as noted by Valenciennes, but now it is too damaged to re-confirm the count reported by Valenciennes."

The following information pertains to the genus *Arapaima* which includes *A. mapae*.

From Procopio (2021):

"*Arapaima*, also known as Pirarucu, are large Neotropical fish with robust cylindrical bodies that become laterally compressed towards their posterior end (tail). Their heads are heavily sculptured with bony plates, and taper to a prominent lower jaw that protrudes upward. The mouth contains a bony structure that is covered in small griping teeth, which distinguishes the family, giving them the name bony tongue fishes (Ferraris 2003; Queiroz 2000). In the wild, juvenile *Arapaima* have a dark brown coloration, which beings [sic] to lighten as they age. Darker patches may be present on their dorsal surface, and red markings begin to appear on their posterior end becoming more prominent as they reach maturity (Queiroz 2000). *Arapaima* have large, heavily mineralized cycloid scales that form an armor-like exterior that protects them from predators such as Piranhas (Ferraris 2003; Queiroz 2000; Yang et al. 2014)."

Biology

The following information pertains to the genus *Arapaima* which includes *A. mapae*.

From Castello and Stewart (2010):

"*Arapaima* make short, seasonal migrations among all eight habitats of the Amazon River floodplain (based on Castello, 2008a,b). Most *Arapaima* inhabit lakes and channels during low-water periods, roughly from September to January each year. At that time, the adults form pairs and reproduce between December and May each year (Queiroz, 2000). Both sexes build their nest in the margins and banks of lakes, temporary lakes, and connecting channels during rising water levels. The males protect their young by staying very close to them for about 3 months, feeding in the food rich environment of flooded forest. As water levels decline, adult *Arapaima* separate from their young, and they all migrate back to lower habitats of flooded forests. With further decline in water levels, they migrate to connecting channels and lakes."

"*Arapaima* inhabit most low-gradient (i.e. lowland) aquatic ecosystems of the Amazon and Essequibo basins, including (flooded) forests, rivers, lakes, and coastal drainages, usually up to the first major rapids or waterfall on a river […]. There are commercially viable populations of *Arapaima* in degraded floodplains such as those in the Lower Amazon (McGrath et al., 1993), suggesting some degree of capacity to adapt to habitat or environmental changes."

"*Arapaima* are large-bodied predators, and thus probably help regulate the stability of their ecosystems. They are primarily piscivorous, and their prey are generally abundant, small-bodied, detritivorous and omnivorous fishes (Sánchez, 1969; Queiroz, 2000)."

Human Uses

From Castello and Stewart (2010):

"Most wild *Arapaima* are harvested by local fishers, commercialized through middlemen, and consumed in regional urban centers. *Arapaima* are key food resources because their air-breathing behavior makes them vulnerable to expert fishers who use harpoons and can choose the larger individuals. Also, a high proportion of their body (Bard and Imbiriba, 1986) is boneless, tasty meat that can be iced or salt-dried for future consumption or commercialization."

Diseases

No OIE-reportable diseases (OIE 2021) were found to be associated with *A. mapae*.

No information on diseases was found.

Threat to Humans

From Froese and Pauly (2021):

"Harmless"

3 Impacts of Introductions

Arapaima mapae has not been reported as introduced or established outside of its native range, therefore no impacts of introduction have been reported.

4 History of Invasiveness

Arapaima mapae have not been reported as introduced or established outside of its native range. This species is not found for sale in the aquarium trade. The history of invasiveness is classified as No Known Nonnative Population.

The importation, possession, or trade of *Arapaima mapae* is prohibited or restricted in Florida (FFWCC 2021) and Oklahoma (Oklahoma Secretary of State 2019).

5 Global Distribution

Figure 1. Map of northern South America showing the location of Amapá State (red) in Brazil, where *Arapaima mapae* is been reported to be native. Map image: R.L. de Abreu. Licensed under Creative Commons BY 2.5. Available: https://commons.wikimedia.org/w/index.php?curid=724813 (March 2022).

Geographic coordinates for the original collection location in Amapá State, Brazil, were given in Stewart (2013a). These coordinates were used to select source locations for the climate matching analysis.

6 Distribution Within the United States

Arapaima mapae has not been reported in the wild within the United States.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Arapaima mapae* was low throughout the contiguous United States. Slightly higher, although still low, climate matches were found along the Pacific Coast from Washington to northern California and in a few isolated locations in inland Washington and California. No areas of high or medium match were found throughout the contiguous United States. The overall Climate 6 score (Sanders et al. 2021; 16 climate variables; Euclidean distance) for the contiguous United States was 0.000, low. (Scores between 0.000 and 0.005, inclusive, are classified as low.) All States received low individual Climate 6 scores.

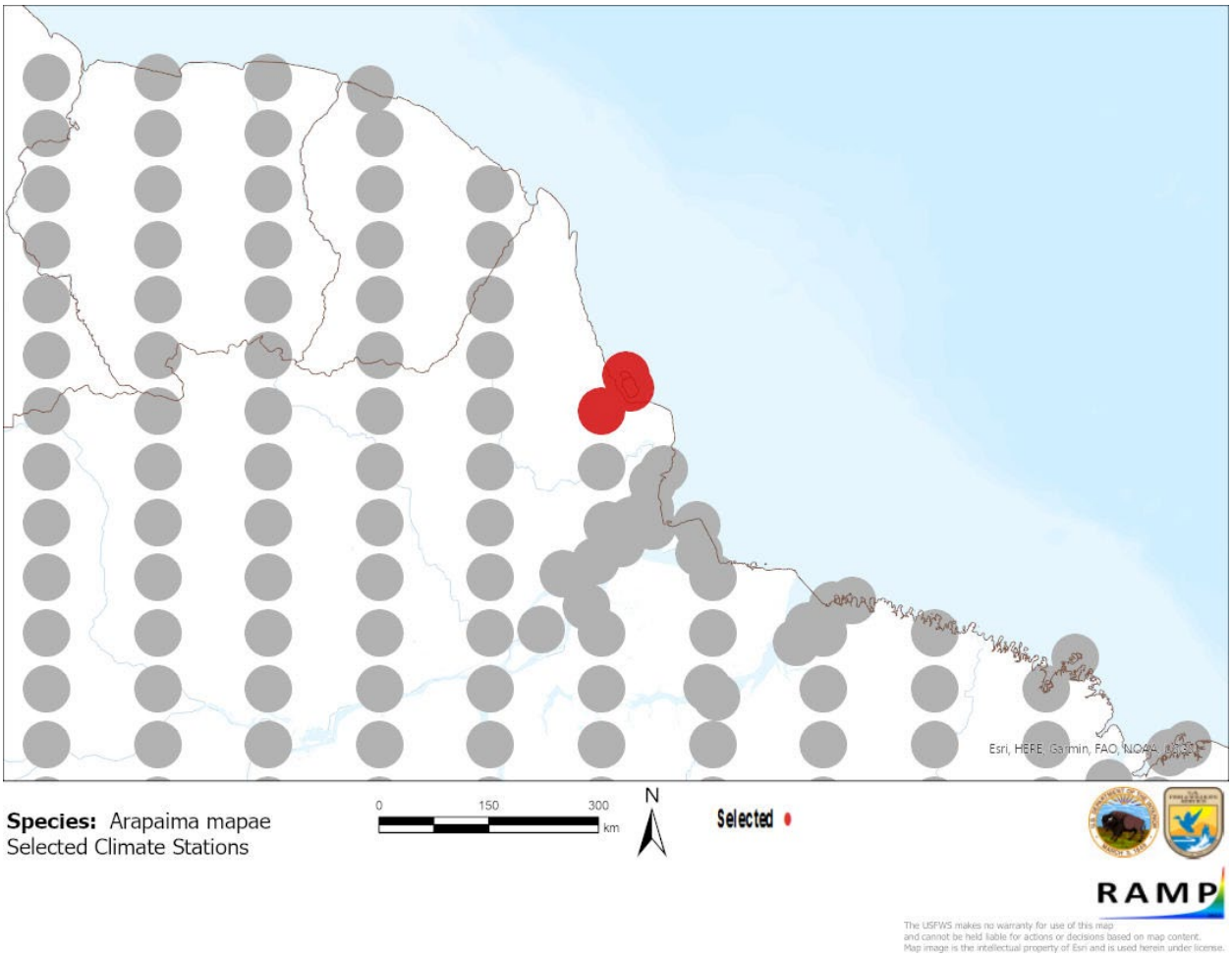


Figure 2. RAMP (Sanders et al. 2021) source map showing weather stations in northeastern South America selected as source locations (red; Brazil) and non-source locations (gray) for *Arapaima mapae* climate matching. Source locations based on coordinates of original collection location as reported by Stewart (2013a). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

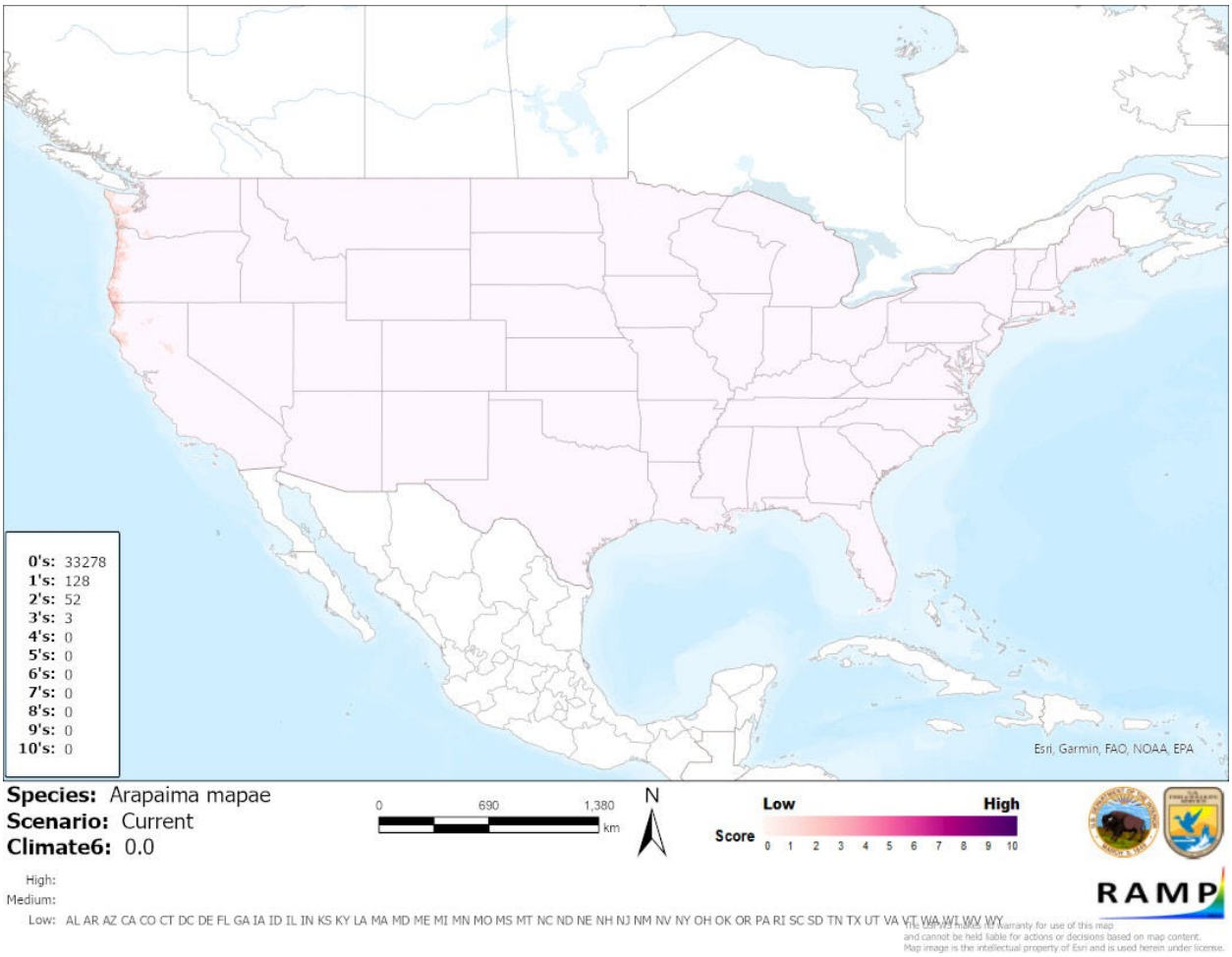


Figure 3. Map of RAMP (Sanders et al. 2021) climate matches for *Arapaima mapae* in the contiguous United States based on coordinates reported by Stewart (2013a). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

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 this assessment is Low. Limited information is known about the species-specific native range, biology, and ecology. No nonnative introductions have been documented; therefore no information is available on the impacts of introduction. No information on the availability of

this species in trade was found. Further information is needed to increase the certainty of this assessment.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Arapaima mapae is a freshwater fish native to the State of Amapá, Brazil. There have been no known collections of the species since it was originally described. Possession of *A. mapae* as a pet is prohibited in the States of Oklahoma and Florida. *A. mapae* has not been reported outside of its native range; therefore no impacts of introduction have been documented. The history of invasiveness is classified as No Known Nonnative Population. The overall climate match for the contiguous United States is Low, with no areas of high or medium match being found. The certainty of this assessment is Low due to limited available information on the native range, biology, and impacts of introduction. The overall risk assessment category for *Arapaima mapae* is Uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): No Known Nonnative Population**
- **Overall Climate Match Category (Sec. 7): Low**
- **Certainty of Assessment (Sec. 8): Low**
- **Remarks, Important additional information: No known collections since the species was originally described in the 1820s.**
- **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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Stewart DJ. 2013b. A new species of *Arapaima* (Osteoglossomorpha: Osteoglossidae) from the Solimões River, Amazonas State, Brazil. Copeia 2013(3):470–476.

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.

Bard J, Imbiriba EP. 1986. Piscicultura do pirarucu *Arapaima gigas*. [Aquaculture of the pirarucu *Arapaima gigas*]. Circular Técnica 52. Belém: EMBRAPA-CPATU.

Castello L. 2008a. Lateral migration of *Arapaima gigas* in floodplains of the Amazon. Ecology of Freshwater Fish 17:38–46.

Castello L. 2008b. Nesting habitat of *Arapaima gigas* (Schinz) in Amazonian floodplains. Journal of Fish Biology 72:1520–1528.

Ferraris CJ Jr. 2003. Family Arapaimatidae (Bonytongues). Page 31 in Reis RE, Kullander SO, Ferraris CJ Jr, editors. Check list of the freshwater fishes of South and Central America. Porto Alegre, Brazil: EDIPUCRS.

McGrath DG, Castro F, Futemma C, Amaral BD, Calabria J. 1993. Fisheries and evolution of resource management on the Lower Amazon floodplain. Human Ecology 21:167–195.

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