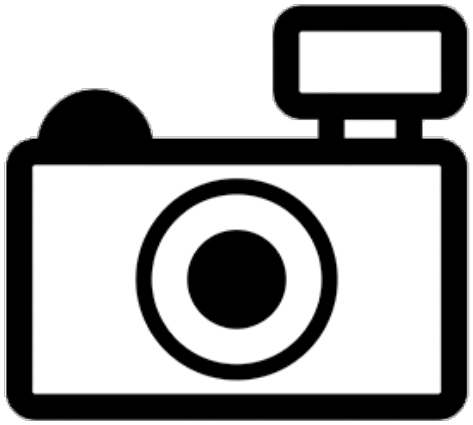
Arapaima agassizii (a fish, no common name)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, August 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: known only from the holotype from Brazilian Amazon."

From Stewart (2013a):

"*Arapaima agassizii* still is known only from the holotype, which was collected in 1817–20 somewhere in lowlands of the Brazilian Amazon."

"The type specimen of *V[astres] agassizii* [now *Arapaima agassizii*] was collected between 1817 and 1820 somewhere in the Brazilian Amazon (Spix and Agassiz, 1929 [sic; 1829]). Spix traveled from the mouth of the Amazon to Tabatinga, Brazil, some 3,000 km upstream near the Peruvian border; he also ascended the Rio Negro to Barcelos (Tiefenbacher, 1983). The type was

deposited in the Zoologische Staatssammlung München, Munich, Germany, but was destroyed […]; there apparently was no catalogue number."

Status in the United States

No records of *Arapaima agassizii* in the United States were found. *A. agassizii* 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 these occurrences 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 agassizii* in the United States were found.

Remarks

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

From Stewart (2013a):

"The bony-tongue fish genus *Arapaima* Müller has been considered monotypic since 1868, with *A. gigas* being the only recognized species. Review of species-level taxonomy of *Arapaima* has revealed that *Arapaima agassizii* Valenciennes (in Cuvier and Valenciennes, 1847) should be considered a valid species. The holotype was destroyed in World War II, but the species can be recognized based on the original description, which included detailed osteological illustrations."

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."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

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

From GBIF Secretariat (2021):

"Kingdom Animalia
Phylum Chordata
Class Actinopterygii
Order Osteoglossiformes
Family Arapaimidae
Genus *Arapaima*
Species *Arapaima agassizii* (Valenciennes 1847)"

Size, Weight, and Age Range

From Stewart (2013a):

"Spix and Agassiz (1829) gave the length of the type as 'more than 3 feet' but never gave the exact length."

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: known only from the holotype from Brazilian Amazon."

From Stewart (2013a):

"*Arapaima agassizii* still is known only from the holotype, which was collected in 1817–20 somewhere in lowlands of the Brazilian Amazon."

"The type specimen of *V[astres] agassizii* [now *Arapaima agassizii*] was collected between 1817 and 1820 somewhere in the Brazilian Amazon (Spix and Agassiz, 1929 [sic; 1829]). Spix traveled from the mouth of the Amazon to Tabatinga, Brazil, some 3,000 km upstream near the Peruvian border; he also ascended the Rio Negro to Barcelos (Tiefenbacher, 1983). The type was deposited in the Zoologische Staatssammlung München, Munich, Germany, but was destroyed […]; there apparently was no catalogue number."

Introduced

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

Means of Introduction Outside the United States

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

Short Description

From Froese and Pauly (2021):

"Can be diagnosed from its congeners by possessing the following characters: 44 dentary teeth, counted on single ramous only; 43 maxillary teeth; orbit diameter 1.5, relatively small compared to similar-sized individuals; interorbital width 4.1, relatively narrow; parietals with pronounced posterior projections that are pointed and curve slightly toward the midline; caudal fin widely separated from dorsal and anal fins by relatively long caudal peduncle, 9.7; caudal-peduncle length divided by peduncle depth 2.4; 26 anal-fin rays, with distinctly shorter basal length than that of dorsal fin; dorsal and anal fins extremely low in profile (dorsal-fin base divided by longest dorsal-fin ray about 7; longest dorsal-fin ray in anterior third of fin); and first pectoral-fin ray not (or only slightly) enlarged in diameter and with proximal tip similar in form to second and subsequent pectoral-fin rays. Can be further distinguished from *Arapaima gigas* by having single row of small teeth on dentary (vs. 2-2.5 rows of enlarged teeth in *A. gigas*) [Stewart 2013a]."

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. agassizii*.

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

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

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. agassizii.*

No information on diseases was found.

Threat to Humans

From Froese and Pauly (2021):

"Harmless"

3 Impacts of Introductions

Arapaima agassizii 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 agassizii 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 agassizii* is prohibited or restricted in Florida (FFWCC 2021) and Oklahoma (Oklahoma Secretary of State 2019).

5 Global Distribution

No georeferenced locations of *Arapaima agassizii* were available (GBIF Secretariat 2021).

Figure 1. Map of northern South America showing the Amazon River (Brazil and Peru) outlined in dark blue. The holotype of *Arapaima agassizii* was collected from the Brazilian Amazon (Froese and Pauly 2021). Map from Kmusser, licensed under Creative Commons Attribution-Share Alike 3.0 Unported. Available: https://commons.wikimedia.org/wiki/File:Amazonrivermap.svg (August 2021).

6 Distribution Within the United States

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

7 Climate Matching

Summary of Climate Matching Analysis

Note: There is broad uncertainty around the native range of *A. agassizii*, and there were no georeferenced occurrences or detailed descriptions of occurrence locations. The source locations for climate matching were chosen to encompass all of the general area (Brazilian Amazon) from which the species was collected rather than a potentially smaller true area of occurrence. Therefore, the climate matching results likely overestimate the true climate match to the contiguous United States.

The climate match for *Arapaima agassizii* was low overall for the contiguous United States. Locally, the climate match was medium in the Southeast, with the highest matches found in coastal Louisiana and in scattered locations along the Atlantic Coast from Florida to North Carolina. 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 along the Amazon River, Brazil selected as source locations (red; Brazil, Peru) and non-source locations (gray) for *Arapaima agassizii* climate matching. Source locations were selected based on a general description of where *A. agassizii* has been collected, according to Froese and Pauly (2021) and Stewart (2013a), and not on georeferenced occurrence data, which were unavailable.

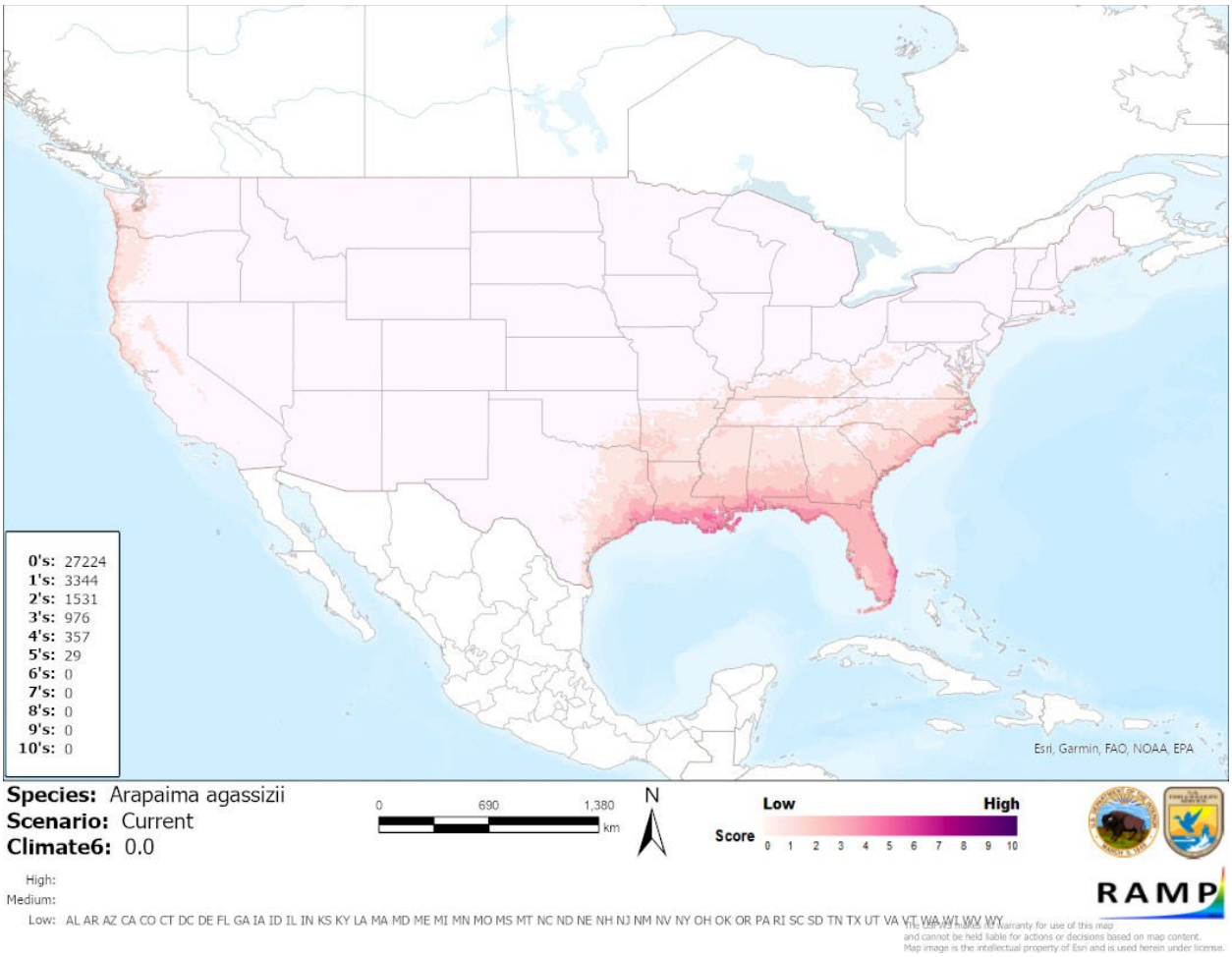


Figure 3. Map of RAMP (Sanders et al. 2021) climate matches for *Arapaima agassizii* in the contiguous United States based on source locations approximated from collection information provided by Froese and Pauly (2021) and Stewart (2013a). Counts of climate match scores are tabulated on the left. 0/Pale 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 native range, biology, and ecology. Individuals of this species have not been reported since the initial description was made 200 years ago. The climate match results presented here may be an overestimate of the true climate match because the analysis was based on a broad description of

the range rather than actual occurrences as source locations. 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 agassizii is a freshwater fish known only from the original type specimen, collected from the Brazilian Amazon. This species was not found for sale in the aquarium trade in the United States, however all species in the genus *Arapaima* are prohibited as pets in the States of Oklahoma and Florida. *A. agassizii* 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 overall, but there were areas of medium match along the Gulf and southern Atlantic coasts. The certainty of this assessment is Low due to limited available information on the native range (including a lack of georeferenced occurrence data), biology, and impacts of introduction. The overall risk assessment category for *Arapaima agassizii* 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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Farias IP, Willis S, Leão A, Verba JT, Crossa M, Foresti F, Porto-Foresti F, Sampaio I, Hrbek T. 2019. The largest fish in the world's biggest river: genetic connectivity and conservation of *Arapaima gigas* in the Amazon and Araguaia-Tocantins drainages. PLoS ONE 14(8):e0220882.

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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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