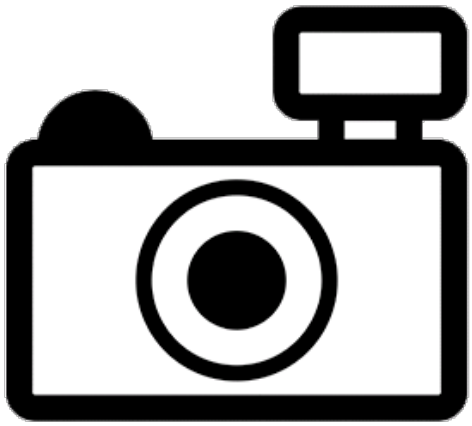
Arapaima leptosoma (a fish, no common name)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, 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: Solimões River in Brazil."

From Stewart (2013a):

"Brazil, Amazonas State, Solimões River about 200 km W of Manaus and 21 km SW of confluence with Purus River, near Anori, approximately 3.75583˚S, 61.67388˚W, […] this is the only known specimen."

Status in the United States

No records of *Arapaima leptosoma* in trade or in the wild in the United States were found.

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 leptosoma* in the wild in the United States were found.

Remarks

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

From Stewart (2013a):

"The genus *Arapaima* Müller, with type species *A. gigas* (Schinz, in Cuvier, 1822), has been considered to be a monotypic genus for the past 145 years (Ferraris, 2003). That perspective follows from a half-page account by Günther (1868), who summarily listed three species described by Valenciennes (in Cuvier and Valenciennes, 1847) in synonymy of *A. gigas* without rationale or analysis. […] A review of the scant literature on species-level taxonomy of *Arapaima* (e.g., Cuvier, 1822; Spix and Agassiz, 1829; Schomburgk, 1841; Cuvier and Valenciennes, 1847; Günther, 1868) and the existing holotypes for two species of *Arapaima* in Museum national d'Histoire naturelle, Paris, revealed that the four nominal species of *Arapaima* recognized by Valenciennes appear to be valid (e.g., Stewart, 2013[b]). In the course of my studies on alpha taxonomy of *Arapaima*, I also encountered what appears to be a new, fifth species of *Arapaima* [*A. leptosoma*] represented by a single specimen from the central Amazon in Brazil."

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 leptosoma* is the current valid and original name for this species.

From Bailly (2019):

"Animalia (Kingdom) > Chordata (Phylum) > Vertebrata (Subphylum) > Gnathostomata (Infraphylum) > Osteichthyes (Parvphylum) > Actinopterygii (Gigaclass) > Actinopteri (Class) > Teleostei (Subclass) > Osteoglossiformes (Order) > Arapaimidae (Family) > *Arapaima* (Genus) > *Arapaima leptosoma* (Species)"

Size, Weight, and Age Range

From Froese and Pauly (2021):

"Max length : 77.6 cm SL male/unsexed; [Stewart 2013a]"

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: Solimões River in Brazil."

From Stewart (2013a):

"Brazil, Amazonas State, Solimões River about 200 km W of Manaus and 21 km SW of confluence with Purus River, near Anori, approximately 3.75583˚S, 61.67388˚W, […] this is the only known specimen."

Introduced

No records of introductions were found for *Arapaima leptosoma.*

Means of Introduction Outside the United States

No records of introductions were found for *Arapaima leptosoma.*

Short Description

From Froese and Pauly (2021):

"Dorsal soft rays (total): 40; Anal soft rays: 38; Vertebrae: 83. Diagnosed from all congeners by having the following characters: extremely slender dorsal most lateralis sensory cavity on preopercle, strongly angled ventrolateral margin of head where third infraorbital meets anterior limb of preopercle such that ventral surface of head is almost flat, and enlarged thickened sheath on anterior third of dorsal-fin base that hides anterior dorsal-fin rays when adpressed. Differs also from all other *Arapaima* except *A. agassizii* by having extremely long fourth infraorbital. Distinguished from *A. arapaima* and all other examined non-type specimens by having notably slender body; from *A. mapae* and *A. agassizii* by having relatively deep caudal peduncle (6.0% SL, vs. ,4.0 in both of latter two taxa); from *A. gigas* by having dentary teeth in a single row (vs. dentary teeth in 2-2.5 irregular rows); and from *A. agassizii* by having 28 teeth on maxilla (vs. 43) and on single ramus of dentary (30-32, vs. 44) [Stewart 2013a]."

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

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

No information on the biology of *Arapaima leptosome* was found, the following information pertains to the genus *Arapaima* which includes *A. leptosoma.*

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

No information on human uses of *Arapaima leptosome* was found, the following information pertains to the genus *Arapaima* which includes *A. leptosoma.*

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."

From Stewart (2013a):

"Aquaculture of *Arapaima* also is being developed farther upstream in the Purus basin, and in time, that may lead to undesirable translocations of non-native species if possible taxonomic diversity is not considered (e.g., Castello and Stewart, 2010)."

Diseases

No records of OIE-reportable diseases (OIE 2021) were found for *Arapaima leptosoma.*

No information on diseases was found for *Arapaima leptosoma*.

Threat to Humans

From Froese and Pauly (2021):

"Harmless"

3 Impacts of Introductions

No records of introductions were found for *Arapaima leptosoma*; therefore there is no information on impacts of introduction.

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

4 History of Invasiveness

Arapaima leptosoma has not been reported as introduced or established outside of its native range. It is only known from the type specimen. The history of invasiveness is classified as No Known Nonnative Population.

5 Global Distribution

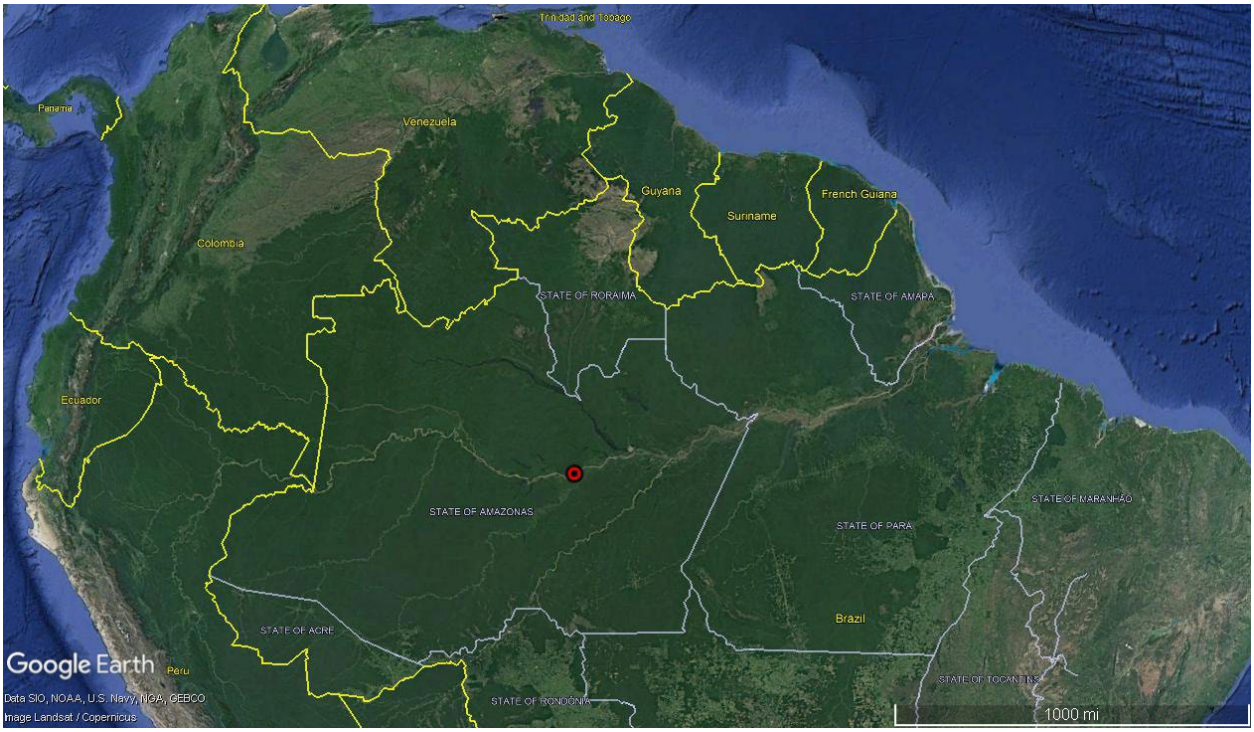


Figure 1. Known global distribution of *Arapaima leptosoma,* based on geographic coordinates for the collection of the type specimen in northern Brazil, as reported by Stewart (2013a). Map from Google Earth (2021).

6 Distribution Within the United States

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

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Arapaima leptosoma* was low for virtually all of the contiguous United States, except for areas of medium match along the Gulf Coast between eastern Texas and western Florida and in scattered locations along the Atlantic Coast. The highest climate match was found in coastal Louisiana. 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 had low individual Climate 6 scores.

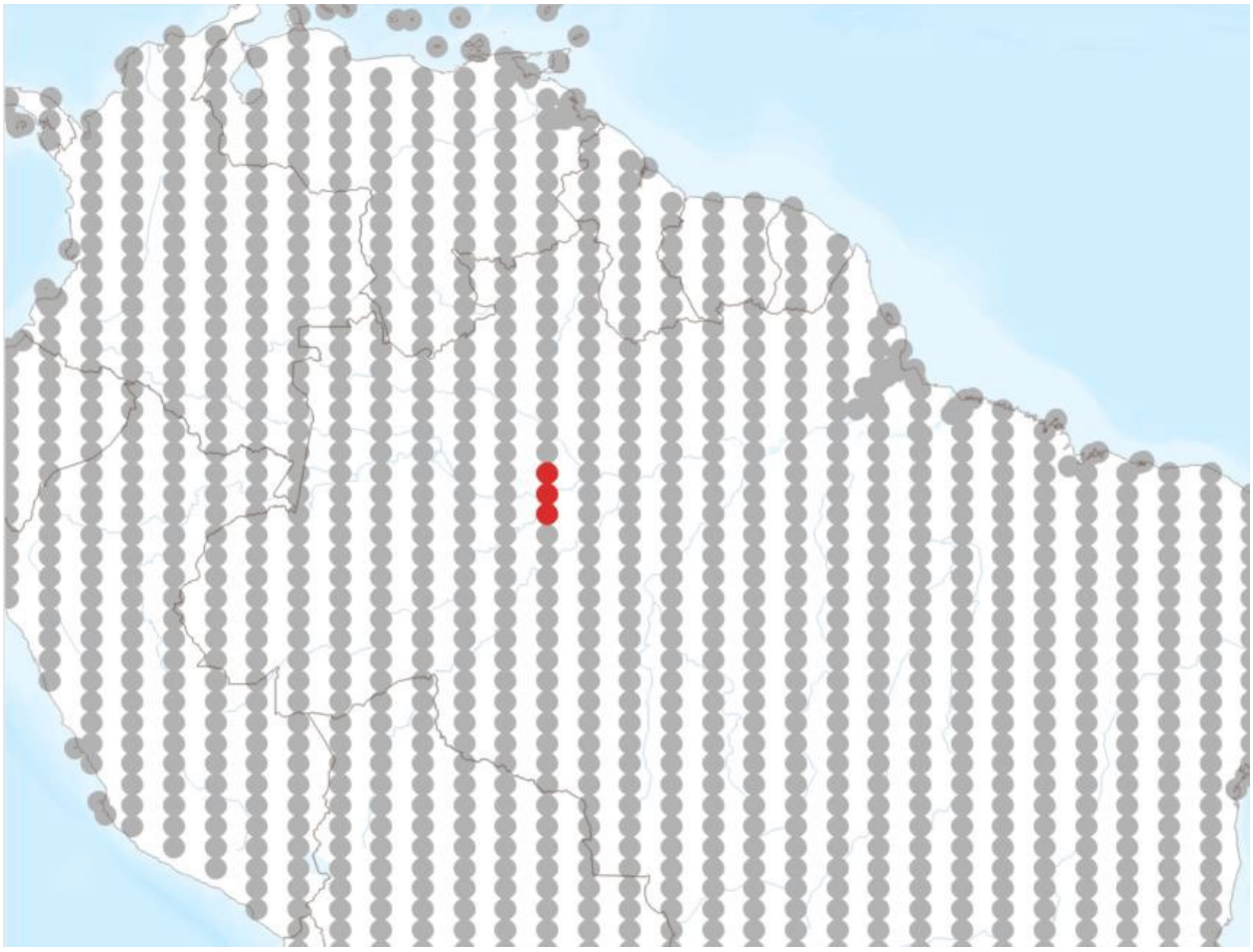


Figure 2. RAMP (Sanders et al. 2021) source map showing weather stations in Brazil selected as source locations (red) and non-source locations (gray) for *Arapaima leptosoma* climate matching. Source location from Stewart (2013a). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

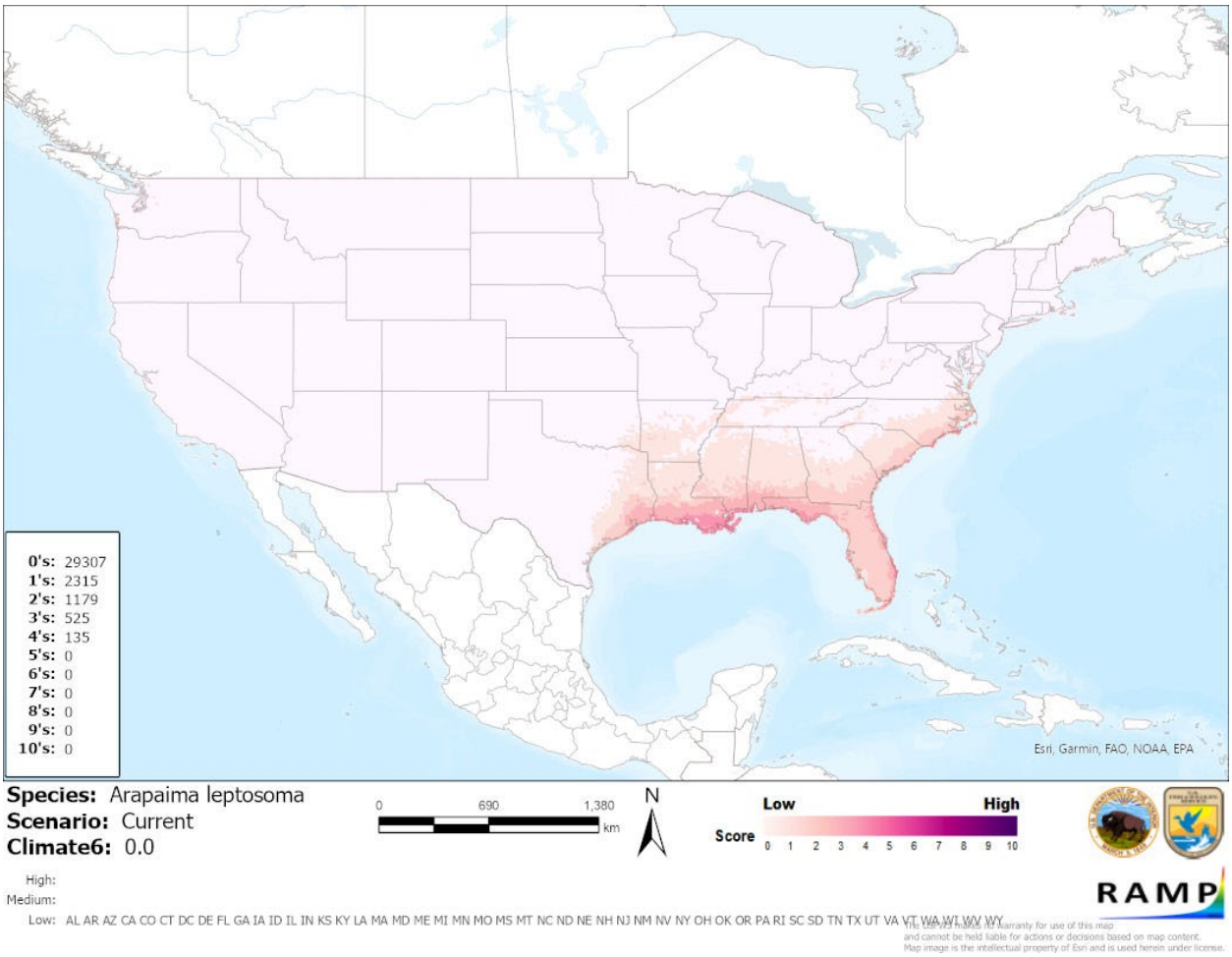


Figure 3. Map of RAMP (Sanders et al. 2021) climate matches for *Arapaima leptosoma* in the contiguous United States based on source location reported by Stewart (2013a). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match. The High, Medium, 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 assessment is low. There was no biological information specific to *Arapaima leptosoma* beyond its description and reported collection site. This species is only known from the type specimen. There were no records of introductions found, thus impacts of introductions are unknown.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Arapaima leptosoma is a freshwater fish native to the Solimões River in northern Brazil, within the Amazon River basin. Little information is available on this species, as it is known from only a single specimen. The history of invasiveness is classified as No Known Nonnative Population. The importation, possession, or trade of *A. leptosoma* is prohibited or restricted in the States of Florida and Oklahoma. The climate match for the contiguous United States was Low; all States had a low individual Climate 6 score. The certainty of this assessment is Low due to lack of information. The overall risk posed by *A. leptosoma* to the contiguous United States 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: Known only from the type specimen.**
- **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.

Bailly N. 2019. *Arapaima leptosoma*. World Register of Marine Species. Available: http://www.marinespecies.org/aphia.php?p=taxdetails&id=1384684#sources (November 2021).

Castello L, Stewart DJ. 2010. Assessing CITES non-detriment findings procedure for *Arapaima* in Brazil. Journal of Applied Ichthyology 26:49–56.

[FFWCC] Florida Fish and Wildlife Conservation Commission. 2021. Conditional nonnative species list. Tallahassee: Florida Fish and Wildlife Conservation Commission. Available: https://myfwc.com/wildlifehabitats/nonnatives/conditional-species-list/ (November 2021).

Fricke R, Eschmeyer WN, van der Laan R, editors. 2021. Eschmeyer's catalog of fishes: genera, species, references. California Academy of Science. Available: http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp (November 2021).

Froese R, Pauly D, editors. 2021. *Arapaima leptosoma* Stewart, 2013. FishBase. Available: http://www.fishbase.us/summary/SpeciesSummary.php?ID=67123&genusname=Arapaima&speciesname=leptosoma&AT=Arapaima+leptosoma&lang=English (November 2021).

GBIF Secretariat. 2021. GBIF backbone taxonomy: *Arapaima leptosoma* Stewart, 2013. Copenhagen: Global Biodiversity Information Facility. Available: https://www.gbif.org/species/7541046 (November 2021).

Google. 2021. Google Earth desktop. Map data from SIO, NOAA, U.S. Navy, NGA, GEBCO, Landsat/Copernicus.

[OIE] World Organisation for Animal Health. 2021. Animal diseases. Available: https://www.oie.int/en/what-we-do/animal-health-and-welfare/animal-diseases/ (November 2021).

Oklahoma Secretary of State. 2019. List of restricted exotic species. Oklahoma Administrative Code, Title 800, Chapter 20-1-2.

Procopio J. 2021. *Arapaima* sp. Gainesville, Florida: U.S. Geological Survey, Nonindigenous Aquatic Species Database. Available: https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=3148 (November 2021).

Sanders S, Castiglione C, Hoff M. 2021. Risk Assessment Mapping Program: RAMP. Version 4.0. U.S. Fish and Wildlife Service.

Stewart DJ. 2013a. 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.

Cuvier G. 1822. Das Thierreich eingetheilt nach dem bau der Thiere als grundlage ihrer Naturgeschichte und der vergleichenden anatomie. Stuttgart and Tübingen, Germany: Cotta.

Cuvier G, Valenciennes A. 1847. Histoire naturelle des poissons. Tome dix-neuvième. Suite du livre dix-neuvième. Brochets ou Lucioides. Livre vingtième. De quelques familles de Malacoptérygiens, intermédiaires entre les Brochets et les Clupes. i-xix + 1-544 + 6 pp., Pls. 554-590.

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.

Günther A. 1868. Catalogue of the physostomi, containing the families Heteroptygii, Cyprinidae, Gonorynchidae, Hyodontidae, Osteoglossidae, Clupeidae, Chirocentridae, Alepocephalidae, Notopteridae, Halosauridae, in the collection of the British Museum. London: British Museum Trustees.

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.

Queiroz HL. 2000. Natural history and conservation of pirarucu, *Arapaima gigas*, at the Amazonian Várzea: red giants in muddy waters. Doctoral dissertation. St. Andrews, Scotland: University of St. Andrews.

Sánchez JR. 1960. El paiche. Aspectos de su historia natural, ecología y aprovechamiento. Pesca y Caza 10:17–61.

Schomburgk RH. 1841. The natural history of fishes of Guiana. Part I. Pages 1–16, 17–263, Plates 1–30 in Jardine W, editor. The Naturalists' Library. Volume 3. Edinburgh, Scotland: W. H. Lizars.

Spix JBV, Agassiz L. 1829–31. Selecta genera et species piscium quos in itinere per Brasiliam annis MDCCCXVII-MDCCCXX : jussu et auspiciis Maximiliani Josephi I. Bavariae regis augustissimi peracto / collegit et pingendos curavit Dr. J.B. de Spix ; digessit, descripsit et observationibus anatomicis illustravit Dr. L. Agassiz, praefatus est et edidit itineris socius dr. F.C. Ph. de Martius. Selecta Piscium Brasiliam. Part 1:i–xvi + i–ii + 1–82, pls. 1–48, Part 2:83–138, pls. 49–101 [Part 1, published June 1829; Part 2, January 1831]. Munich: Typis C. Wolf.

Stewart DJ. 2013b. Re-description of *Arapaima agassizii* (Valenciennes), a rare fish from Brazil (Osteoglossomorpha: Osteoglossidae). Copeia 2013:38–51.

Yang W, Sherman V, Gludovatz B, Mackey M, Zimmermann EA, Chang EH, Schaible E, Qin Z, Buehler MJ, Ritchie RO, Meyers MA. 2014. Protective role of *Arapaima gigas* fish scales: structure and mechanical behavior. Acta Biomaterialia 10(8):3599–3614.