Blue Tiger Piranha (*Serrasalmus gouldingi*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, April 2012

Revised, July 2018 and September 2019

Web Version, 8/22/2019

Photo: Flávio Lima. Licensed under Creative Commons BY-NC. Available: http://eol.org/data_objects/26104605. (July 2018).

1 Native Range and Status in the United States

Native Range

From Eschmeyer et al. (2018):

“Amazon and Orinoco River basins: Brazil, Ecuador, Colombia and Venezuela.”

Status in the United States

This species has not been reported as introduced or established in the wild in the United States.

It is unclear whether this species is in trade in the United States. No United States-based commercial sellers of this species were found.

Possession or importation of fish of the genus *Serrasalmus,* or fish known as “piranha” in general, is banned or regulated in many States. Every effort has been made to list all applicable State laws and regulations pertaining to this species, but this list may not be comprehensive.

From Alabama Department of Conservation and Natural Resources (2019):

“No person, firm, corporation, partnership, or association shall possess, sell, offer for sale, import, bring, release or cause to be brought or imported into the State of Alabama any of the following live fish or animals: […] Any Piranha or any fish of the genera *Serrasalmus*, *Pristobrycon*, *Pygocentrus*, *Catorprion*, or *Pygopristus*; […]”

From Alaska State Legislature (2019):

“Except as provided in (b) - (d) of this section, no person may import any live fish into the state for purposes of stocking or rearing in the waters of the state.
(b) Live oysters native to and originating from the Pacific Coast of North America may be imported […]
(c) Ornamental fish not raised for human consumption or sport fishing purposes may be imported into the state, but may not be reared in or released into the waters of the state. Fish wastes and waste water from ornamental fish may not be released directly into the waters of the state.
(d) Weathervane scallops originating from wild stocks or cultured stocks in the Southeastern Alaska and Yakutat Areas may be imported for aquaculture purposes and may be released only into the waters of the Southeastern Alaska and Yakutat Areas under a stock transport permit required by this chapter […]”

From Arizona Office of the Secretary of State (2013):

““Restricted live wildlife” means wildlife that cannot be imported, exported, or possessed without a special license or lawful exemption.”

“Fish listed below are considered restricted live wildlife […]

Piranha, all species of the genera *Serrasalmus*, *Serrasalmo*, *Phygocentrus*, *Teddyella*, *Rooseveltiella*, and *Pygopristis* […]"

From Arkansas Game and Fish Commission (2019):

"It is unlawful to import, transport, or possess any species commonly known as […] piranha […]"

"EXCEPTION: These species may be possessed for display and educational purposes by written permit approved by the Commission."

From California Department of Fish and Wildlife (2019):

"All species of piranha are on California's list of restricted animals and cannot be imported, transported, or possessed without a permit."

From Colorado Secretary of State (2019):

"For the following aquatic species or viable gametes thereof, because of the potential for a detrimental affect [*sic*] on existing fish and their habitat in Colorado, and except as enumerated in these regulations, or as authorized in writing by the Division of Wildlife for management purposes only; the release or the importation, transportation, stocking, sale, acquisition or possession for release is prohibited. Persons who have proof of possession issued prior to January 1,1978 or who obtain prior approval from the Division of Wildlife may possess the following species:

a. Piranha: including members of the genera *Serrasalmus*, *Roosevelthiella*, and *Pygocentrus*."

From Connecticut Secretary of State (2016):

"The importation or possession of piranha of the subfamily: Serrasalminae, genera *Serrasalmus*, *Serrasalmo*, *Pygocentrus*, *Teddyella*, *Rooseveltiella* and *Pygopristus*, […] is prohibited except that the Commissioner may at his discretion issue permits for the importation and possession, when it is in the public interest, for public display purposes, of specimens of piranha […]"

Serrasalmus gouldingi is listed on Florida's Prohibited Nonnative Species List (FFWCC 2019).

From Georgia Department of Natural Resources (2019):

"The animals listed below are examples of the exotic species regulated under Georgia Law. […] The exotic species listed below, except where otherwise noted, may not be held as pets in Georgia. […] Piranha; all species"

From Hawaii Department of Agriculture (2019):

"For example, the following are prohibited from entry or possession by private individuals in the State. […] *Piranhas*"

From Idaho Office of the Administrative Rules Coordinator (2019):

"No person may possess, cultivate, import, ship, or transport any invasive species […] into or through the state of Idaho following the effective date of this rule, unless the person possessing, importing, shipping or transporting has obtained a permit under Section 103, or unless otherwise exempt by this rule, as set forth in Section 104."

"INVASIVE SPECIES – FISH. […]

05. Piranhas, *Serrasalmus* spp., *Rosseveltiella* spp., *Pygocentrus* spp. […]"

From Illinois Department of Natural Resources (2015):

"For the purposes of Section 20-90 of the Fish and Aquatic Life Code [515 ILCS 5/20-90], the Aquatic Life Approved Species List is established. The following aquatic life categories will be considered approved for aquaculture, transportation, stocking, importation and/or possession in the State of Illinois."

Serrasalmus gouldingi does not appear on the Aquatic Life Approved Species List for Illinois.

From Kentucky General Assembly (2019):

“The live aquatic organisms established in subsections (1) through (7) of this section shall not be imported, bought, sold, or possessed in aquaria:

(1) Subfamily Serrasalminae - piranha, piraya, pirae, or tiger characins; […]”

From Louisiana State Legislature (2019):

“No person shall have in possession or sell in this state [Louisiana] a piranha or Rio Grande Cichlid; except that, piranha may be possessed and displayed at the Aquarium of the Americas, Audubon Institute, New Orleans, as authorized by a special permit issued by the department, under conditions the department deems necessary to prevent their introduction into waters of the state.”

From Maine Department of Inland Fisheries and Wildlife (2019):

“Unrestricted List […] (no permit needed): Maine law allows the Department to maintain a list of species of fish and wildlife, including tropical fish and invertebrates, which do not require an importation, exhibition, or possession permit, and may be traded by commercial pet shops.”

Serrasalmus gouldingi does not appear on the Maine Department of Inland Fisheries and Wildlife’s Unrestricted List.

From Massachusetts Division of Fisheries and Wildlife (2014):

“All aquarium trade fish may be kept without a permit except species categorically non-exempt pursuant to 321 CMR 9.01(3), and except that the following species are prohibited without a permit: […]

(b) Piranha (*Pygocentrus* spp. and *Serrasalmus* spp.)”

From Mississippi Secretary of State (2019):

“All species of the following animals and plants have been determined to be detrimental to the State's native resources and further sales or distribution are prohibited in Mississippi. No person shall import, sell, possess, transport, release or cause to be released into the waters of the state any of the following aquatic species or hybrids thereof. However, species listed as prohibited may be allowed under a permitting process where environmental impact has been assessed.”

"[The list includes all piranhas and all species of] Subfamily Serrasalminae"

From State of Nevada (2016):

"Except as otherwise provided in this section and NAC [Nevada Administrative Code] 504.486, the importation, transportation or possession of the following species of live wildlife or hybrids thereof, including viable embryos or gametes, is prohibited: […]

Piranhas..... All species in the genera *Serrasalmus*, *Serrasalmo*, *Pygocentrus*, *Teddyella*, *Rooseveltiella* and *Pygopristis*"

From New Mexico Department of Game and Fish (2010):

"Species importation list group IV may be for live non-domesticated animals that are considered dangerous, invasive, undesirable, state or federal listed threatened, endangered, a furbearer or any other species of concern as identified by the director. The importation of these species are prohibited for the general public but may be allowed for, scientific study, department approved restoration and recovery plans, zoological display, temporary events/entertainment, use as service animal or by a qualified expert."

All piranha and pacu (Family Characidae) are listed in Group IV of the Director's Species Importation List for New Mexico.

From New York State Senate (2019):

"No person shall import, export, own, possess, acquire or dispose of live piranha fish (*Serrasalmus*, *Rooseveltiella* or *Pyrocentrus* [*sic*]), grass carp (*Ctenopharyngodon idella*) or hybrid grass carp within the state without a license or permit issued at the discretion of the department for scientific, biological or exhibition purposes."

From North Carolina Office of Administrative Hearings (2019):

“It shall be unlawful to transport, purchase, possess, sell, or stock in the public or private waters of North Carolina any live individuals of […] piranha; […]”

From Oklahoma Secretary of State (2019):

“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: […]

“Piranha group: *Serrasalmus* spp., *Pygocentrus* spp., *Rooseveltiella* spp., *Catoprion* spp., *Hydrocynus* spp., and *Salminus* spp.”

From South Carolina Legislature (2019):

“A person may not possess, sell, offer for sale, import, bring, cause to be brought or imported into this State [South Carolina], or release in this State the following species at any stage of its life cycle: […] piranha (all members of *Serrasalmus*, *Rooseveltiella*, and *Pygocentrus* genera) […]”

From Texas Parks and Wildlife (2019):

“The organisms listed here are legally classified as exotic, harmful, or potentially harmful. No person may possess or place them into water of this state except as authorized by the department.”

“Piranhas, Family Characidae

All species of genera *Catoprion*, *Pristobrycon*, *Pygocentrus*, *Pygopristis*, and *Serrasalmus*”

From Utah Office of Administrative Rules (2019):

“All species of fish listed in Subsections (2) through (30) are classified as prohibited for collection, importation and possession […]

(22) Piranha, (*Serrasalmus*, All species) family Characidae.”

From Virginia Department of Game and Inland Fisheries (2019):

"A special permit is required, and may be is- sued [*sic*] by the Department, if consistent with the Department's fish and wildlife management program, to import, possess, or sell the following non-native (exotic) amphibians, fish, mollusks, aquatic invertebrates, and reptiles: […] piranhas […]"

Means of Introduction into the United States

This species has not been reported as introduced or established in the wild in the United States.

Remarks

Blue Tiger Piranha is a trade name; *S. gouldingi* is also called Goulding's Piranha (Seriously Fish 2018).

2 Biology and Ecology

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 Ostariophysi
Order Characiformes
Family Characidae
Genus *Serrasalmus*
Species *Serrasalmus gouldingi* Fink and Machado-Allison, 1992"

From Eschmeyer et al. (2018):

"**Current status:** Valid as *Serrasalmus gouldingi* Fink & Machado-Allison 1992. Serrasalmidae."

Size, Weight, and Age Range

From Froese and Pauly (2018):

“Max length : 27.9 cm SL male/unsexed; [Jégu 2003]”

Environment

From Froese and Pauly (2018):

“Freshwater; benthopelagic.”

From Prudente et al. (2015):

“The piranha *Serrasalmus gouldingi* Fink and Machado-Allison 1992 is widely distributed in the Amazon and Orinoco basins, where it is found predominantly in lentic and blackwater habitats (Fink and Machado-Allison 1992).”

From Seriously Fish (2018):

“Temperature: 24 – 28 °C
pH: 4.0 – 7.0
Hardness: 18 – 179 ppm”

The above parameters from Seriously Fish (2018) refer to recommended aquarium water conditions.

Climate/Range

From Froese and Pauly (2018):

“Tropical”

Distribution Outside the United States

Native

From Eschmeyer et al. (2018):

“Amazon and Orinoco River basins: Brazil, Ecuador, Colombia and Venezuela.”

Introduced

No introductions of this species have been reported.

Means of Introduction Outside the United States

No introductions of this species have been reported.

Short Description

From Froese and Pauly (2018):

"Dorsal soft rays (total): 13-17; Anal soft rays: 29 - 33; Vertebrae: 36 - 38. Proximal black band on caudal fin, vertically elongated stripes on the lateral body and no prominent vertical humeral blotch."

From Seriously Fish (2018):

"Following Fink and Machado-Allison (1992), it can be distinguished from other members of the genus by the following combination of characters: body shape deep and rhomboid; head robust, snout blunt; eye large; mouth moderate, jaw projecting; 1-3 ontogeneticlly [*sic*] variable ectopterygoid teeth; 2 unbranched and 14-16 branched dorsal-fin rays; first pterygiophore level with the fifth vertebral neural process; pre-anal spine present; 37-38, usually 38, vertebrae; body scales small and numerous; 93-97, usually 95, lateral line scales; 24-25 pre-pelvic serrae, 8-10 post-pelvic serrae; 23-27, usually 25, short, wide-based gill rakers."

"Some components of the colour pattern are also useful for identification, including: eye bluish or coppery; vertically-elongate dark spots on the body; caudal-fin with a basal blackish band; humeral spot absent."

Biology

From Prudente et al. (2015):

"This species is among the most abundant fishes on the lower Anapu River [northeastern Brazil] (Montag et al. 2009) […]"

"The reproductive biology of *S. gouldingi* was unusual in comparison with that of other *Serrasalmus* species found in tropical rivers (Lamas and Godinho 1996; Agostinho 2003; Honorato-Sampaio et al. 2009), including those of the Amazon region (Leão et al. 1991; Maciel et al. 2011). Modifications in population-level parameters, such as the gonadosomatic index, the relative frequency of the different stages of maturity, and the factor condition, indicated two peaks in reproductive activity in the piranha *S. gouldingi*, which occurred during the periods of transition between the two major fluctuations observed annually in the level of the rivers in the lower Anapu basin."

"In the present study, an increase in the proportion of *S. gouldingi* females was observed during the peaks of reproductive activity, followed by an increase in the proportion of males following

the first peak. […] As *Serrasalmus* species are known to form small shoals (Sazima and Machado 1990), the predominance of females during the reproductive peaks suggests the formation of harems, in which a single male fertilizes the oocytes of a number of different females."

"Given the reproductive characteristics of *Serrasalmus* species, such as their sticky eggs and the construction of nests in the marginal vegetation (Ledecky 1966; Géry 1997; Honorato-Sampaio et al. 2009), it seems likely that female *S. gouldingi* spend most of their time searching for appropriate spawning sites in areas subject to periodic flooding, which were undersampled during this period."

"Sexual maturity began at 12.24 cm in males and 16.33 cm in females."

From Prudente et al. (2016):

"A total of 279 stomachs [from *S. gouldingi* individuals captured in northeastern Brazil] were analyzed, showing a predominance of fish fragments, followed by fruits and seeds. The diet composition of *S. gouldingi* differed only between drought and flood season, although it did not differ between juveniles and adults. An increase in feeding intensity was recorded during the rise in the water level, with a lower feeding intensity observed during transitional season. *Serrasalmus gouldingi* showed lower niche breadth during flood season, attributed to the high consumption of fruits and seeds, presenting an omnivorous diet with high tendency towards piscivory."

Human Uses

From Seriously Fish (2018):

"This species occasionally appears in the ornamental trade […]"

Diseases

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

From Froese and Pauly (2018):

"Procamallanus Infection 10 Parasitic infestations (protozoa, worms, etc.)"

"Caus[ative] agent: *Procamallanus inopinatus*"

"Infection commonly occurs in the intestine, and also reported from stomach and pylroic caeca."

Agarwal and Kritsky (1998) report *S. gouldingi* as a host for the following monogenoid parasites: *Amphithecium diclonophallum*, *A. falcatum*, *A. minutum*, *A. pretiosum*, *Enallothecium aegidatum*, *E.*

cornutum, *Heterothecium globatum*, *Mymarothecium galeolum*, *Notothecium circellum*, *N. cyphophallum*, *N. deleastum*, *Notozothecium teinodendrum*.

Threat to Humans

From Froese and Pauly (2018):

"Harmless"

3 Impacts of Introductions

No information available. No introductions of this species have been reported; therefore, there is no information on impacts of introductions.

The importation, possession, or trade of the piranha *Serrasalmus gouldingi* is prohibited or restricted in the following states: Alabama (Alabama Department of Conservation and Natural Resources 2019), Alaska (Alaska State Legislature 2019), Arizona (Arizona Office of the Secretary of State 2013), Arkansas (Arkansas Game and Fish Commission 2019), California (California Department of Fish and Wildlife 2019), Colorado (Colorado Secretary of State 2019), Connecticut (Connecticut Secretary of State 2016), Florida (FFWCC 2019), Georgia (Georgia Department of Natural Resources 2019), Hawaii (Hawaii Department of Agriculture 2019), Idaho (Idaho Office of the Administrative Rules Coordinator 2019), Illinois (Illinois Department of Natural Resources 2015), Kentucky (Kentucky General Assembly 2019), Louisiana (Louisiana State Legislature 2019), Maine (Maine Department of Inland Fisheries and Wildlife 2019), Massachusetts (Massachusetts Division of Fisheries and Wildlife 2014), Mississippi (Mississippi Secretary of State 2019), Nevada (State of Nevada 2016), New Mexico (New Mexico Department of Game and Fish 2010), New York (New York State Senate 2019), North Carolina (North Carolina Office of Administrative Hearings 2019), Oklahoma (Oklahoma Secretary of State 2019), South Carolina (South Carolina Legislature 2019), Texas (Texas Parks and Wildlife 2019), Utah (Utah Office of Administrative Rules 2019), and Virginia (Virginia Department of Game and Inland Fisheries 2019).

4 Global Distribution

Figure 1. Known global distribution of *Serrasalmus gouldingi*, reported from northern South America. Map from GBIF Secretariat (2017).

5 Distribution within the United States

This species has not been reported as introduced or established in the United States.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2018; 16 climate variables; Euclidean Distance) for *Serrasalmus gouldingi* was low throughout the contiguous United States. The highest climate matches occurred in southern Florida; however, these matches are still considered low. The Climate 6 score for the contiguous United States was 0.000. This score is classified as a low overall climate match (scores between 0.000 and 0.005, inclusive, are classified as low). Furthermore, all states had low individual Climate 6 scores.

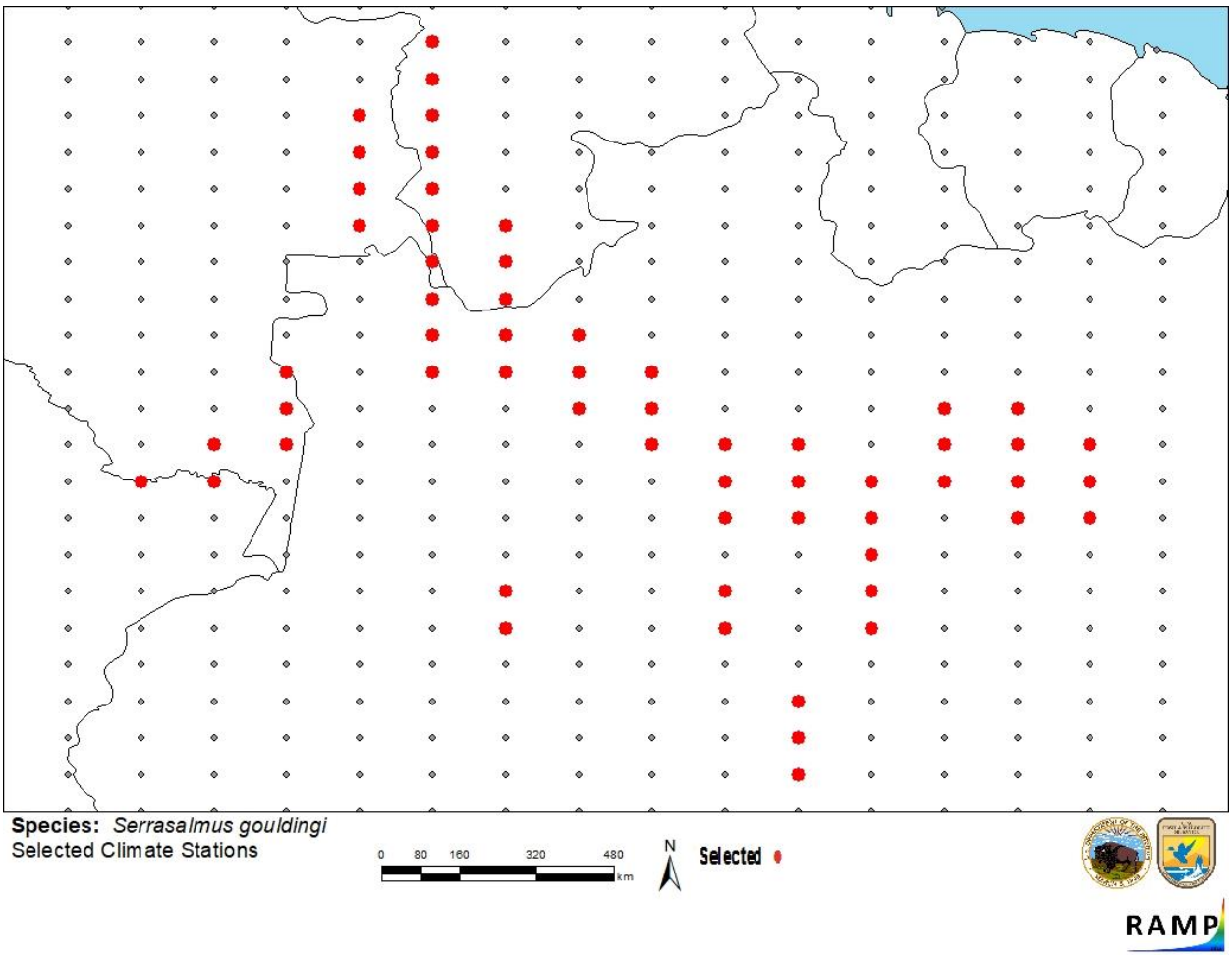

Figure 2. RAMP (Sanders et al. 2018) source map showing weather stations selected as source locations (red; Brazil, Colombia, Venezuela, Peru) and non-source locations (gray) for *S. gouldingi* climate matching. Source locations from GBIF Secretariat (2017). Selected source locations are positioned within 100 km of a species occurrence, and do not represent the exact location of an occurrence.

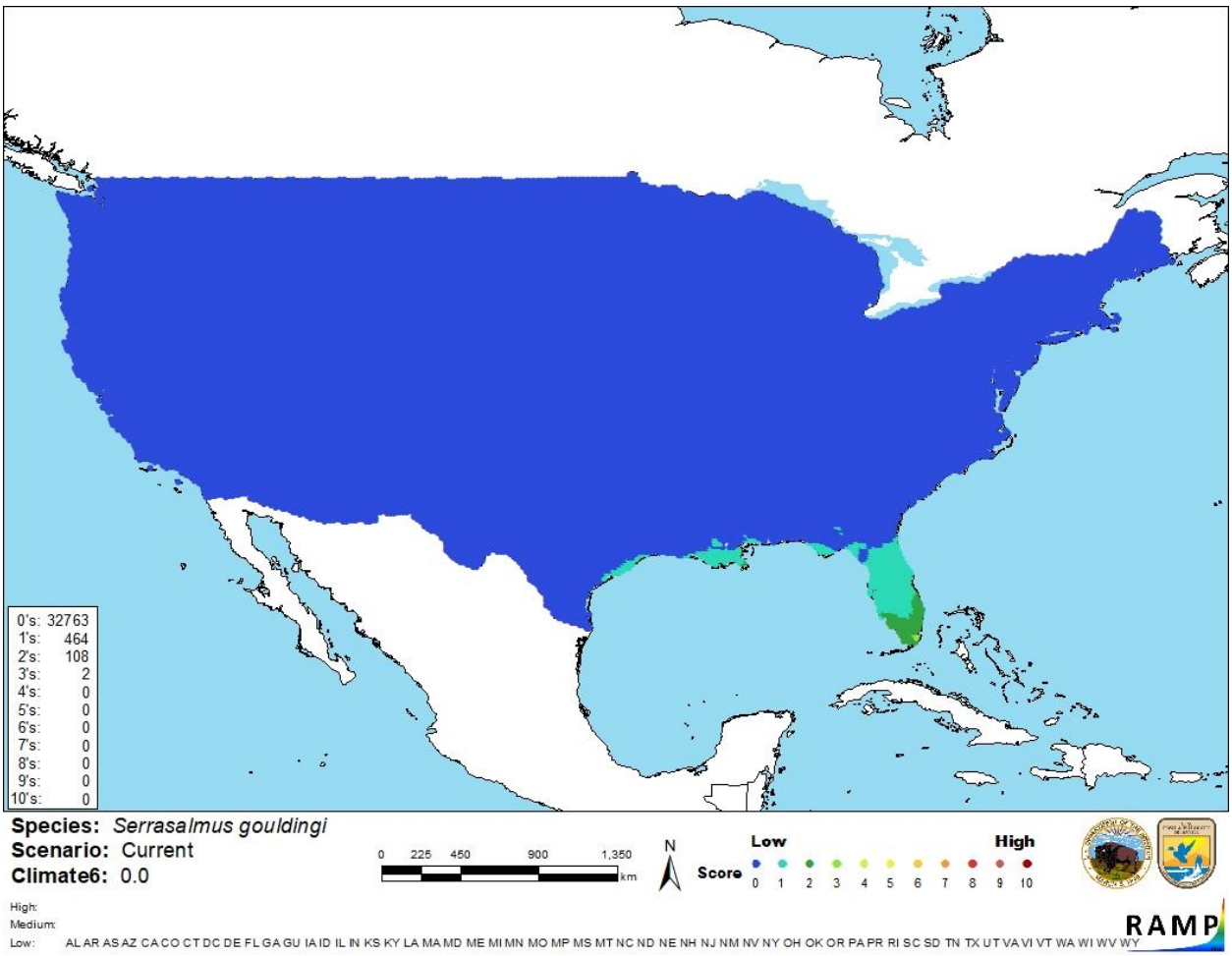

Figure 3. Map of RAMP (Sanders et al. 2018) climate matches for *S. gouldingi* in the contiguous United States based on source locations reported by GBIF Secretariat (2017). 0=Lowest match, 10=Highest match.

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≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

7 Certainty of Assessment

Information is available on the biology, ecology, and distribution of *Serrasalmus gouldingi*. However, no introductions of this species have been reported, so any impacts of its introduction outside the native range remain unknown. For that reason, certainty of this assessment is low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Blue Tiger Piranha (*Serrasalmus gouldingi*) is a species of piranha native to the Amazon and Orinoco River basins of northern South America. It is sometimes found in the aquarium trade, although its trade status in the United States is unclear. Many States prohibit the possession or trade of piranhas. The history of invasiveness is uncertain. *S. gouldingi* hosts numerous monogenoid parasites within its native range. Climate match is consistently low across the contiguous United States. Due to lack of information, the certainty of assessment is low. The overall risk assessment category for *S. gouldingi* is uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 3): Uncertain**
- **Climate Match (Sec. 6): Low**
- **Certainty of Assessment (Sec. 7): Low**
- **Overall Risk Assessment Category: Uncertain**

9 References

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

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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