

Speckled Pirahna (*Serrasalmus maculatus*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, April 2012

Revised, July 2018

Web Version, 7/15/2020

Organism Type: Fish

Overall Risk Assessment Category: Uncertain



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1 Native Range and Status in the United States

Native Range

From Eschmeyer et al. (2018):

“Amazon and Paraguay-Paraná River basin: Argentina, Bolivia, Brazil, Colombia, Paraguay, Peru and Uruguay.”

Status in the United States

This species has not been reported as introduced or established in the United States. This species was not currently available for sale on aquarium websites within the United States, but it may be in trade at times.

From AquaScapeOnline (2020):

“Gold Piranha 3-4” (*Serrasalmus maculatus*) [...] This item is currently out of stock”

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*, *Phygocestrus*, *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 [...]”

FFWCC (2019) lists *S. maculatus* as a prohibited nonnative species in Florida.

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 maculatus 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 maculatus 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 (2018):

“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 issued [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 United States.

Remarks

From Seriously Fish (2018):

“Most experts agree that a detailed revision of *Serrasalmus* is necessary since historically the genus has been viewed as something of a “catch-all” for similar-looking fin-biting/predatory characins for decades and has long-been recognised [sic] a polyphyletic grouping. There have been several attempts to reorganise the group with the most recent major revision published by Géry in the late 1970s but a handful of new species have been described since then and an exhaustive molecular analysis of member species remains lacking.”

“It’s sometimes referred to by the alternative vernacular names “gold piranha” or “golden mac” in the hobby.”

Seriously Fish (2018) also refers to this species as “Mac”.

From ITIS (2018):

“Synonym(s): *Pygocentrus melanurus* Kner, 1860”

Information searches for this ERSS were conducted using the above synonym, as well as the accepted scientific name, *Serrasalmus maculatus*, as search terms.

From Seriously Fish (2018):

“*S. maculatus* and *S. spilopleura* have often been confused in the past, but can be separated by the following characters: infraorbital series bones wider in *S. maculatus* vs. narrower in *S. spilopleura*; naked cheek zone narrower vs. broader; possession of subterminal black bar in the caudal fin vs. distal portion of caudal fin hyaline. This conclusion remains in dispute with claims that mistakes were made in the review of the species by Jégu and Dos Santos (2001), but it remains unclear what those purported errors are.”

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 maculatus* Kner, 1858”

From Eschmeyer et al. (2018):

“**Current status:** Valid as *Serrasalmus maculatus* Kner 1858. Serrasalmidae.”

Size, Weight, and Age Range

From Froese and Pauly (2018):

“Max length : 26.4 cm TL male/unsexed; [Marques et al. 2016]; 34.5 cm TL (female); max. published weight: 420.00 g [Marques et al. 2016]; max. published weight: 420.00 g”

Environment

From Froese and Pauly (2018):

“Freshwater; pelagic.”

From Seriously Fish (2018):

“[Aquarium Water] Temperature: 70 – 86°F/21.1 – 30°C
pH: 6.5 – 7.5
Hardness: 5 – 15°H”

Climate

From Froese and Pauly (2018):

“Tropical”

Distribution Outside the United States

Native

From Eschmeyer et al. (2018):

“Amazon and Paraguay-Paraná River basin: Argentina, Bolivia, Brazil, Colombia, Paraguay, Peru and Uruguay.”

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): 16; Anal soft rays: 33 - 35; Vertebrae: 36”

From AquaScapeOnline (2020):

“Juvenile *S. maculatus* look very similar to other very young *Serrasalmus* piranha's (and *Pygocentrus* species as well), and have a silverish coloration, often with hints of green towards the upper body. They are covered with numerous [sic] small dark spots and have a very concave head shape. The older this fish gets, the more convex the shape of the head gets, until it very much resembles *Pygocentrus* piranha's. The usual color is bright gold to yellow in the lower body, changing to a silverish yellow the further you get to the back. Some specimen [sic] are covered [sic] faded dark spots, but this is not very common. The fins on the lower side of the body are yellowish, the dorsal and adipose fin are dark grey. The caudal fin is lightly colored with a darker base, and has a dark terminal band. The eyes are red.”

Biology

From Froese and Pauly (2018):

“Occurs usually in small groups of up to 20 individuals which appear to have a definite range within a pond or a creek. Observed to be active mainly during the day. Larger fish extend their foraging until about 9 at night. where [sic] it stays [sic] in the shallows near the bottom, sheltered among vegetation [Sazima and Machado 1990]. Larvae and juveniles hide and feed within the root tangle of water hyacinths, which also act as a dispersal agent during floods [Sazima and Zamprogno 1985]. Larvae feed on microscopic crustaceans and small aquatic insects; very small size juveniles (about 1.2 cm) already clip fins of other fishes [Sazima and Zamprogno 1985]. Juveniles and adults feed mostly on fins and muscle portions of fishes [Sazima and Pombal 1988; Sazima and Machado 1990]. Adults may scavenge on dead mammals, including humans [Sazima and de Andrade Guimaraes 1987].”

From Wildner et al. (2013):

“[...] prolonged spawning season and indeterminate annual fecundity [...]”

Human Uses

This species was not currently available for sale on aquarium websites within the United States, but it may be in trade at times.

From AquaScapeOnline (2020):

“Gold Piranha 3-4" (*Serrasalmus maculatus*) [...] This item is currently out of stock”

Diseases

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

Fontana et al. (2012) report that *S. maculatus* is parasitized by the following Branchiura (fish ectoparasites): *Dolops bidentata*, *D. longicauda*, *D. hirundo*, and *Argulus multicolor*. Prevalence ranged from around 3% to 27% depending on the parasite species, the sex of the fish, and the season.

Pomaro Casali and Massato Takemoto (2016) report the following endoparasites of *S. maculatus*: *Kritskyia annakohnae* (Monogenea); *Echinorhynchus* sp. (Acanthocephala); and *Procamallanus (Spirocamallanus) inopinatus*, *Procamallanus (Spirocamallanus) neocaballeri*, and *Contracaecum* sp. (Nematoda). Prevalence ranged from about 9% to 66% depending on the parasite species.

Eiras et al. (2016) report that *S. maculatus* is a host for the zoonotic nematode *Eustrongylides ignotus*.

From Eiras et al. (2016):

“In the family Dioctophymatidae, *Eustrongylides* spp. [...] are fish-borne zoonotic nematodes rarely causing human disease.”

Threat to Humans

From Froese and Pauly (2018):

“Traumatogenic [Haddad and Sazima 2003]”

“Attacks on humans with bite outbreaks may occur in dammed portions of rivers during the breeding season, related to brood protection by the spawning adults [Haddad and Sazima 2003].”

Eiras et al. (2016) report that *S. maculatus* is a host for the zoonotic nematode *Eustrongylides ignotus*.

From Eiras et al. (2016):

“In the family Dioctophymatidae, *Eustrongylides* spp. [...] are fish-borne zoonotic nematodes rarely causing human disease.”

3 Impacts of Introductions

No introductions of this species have been reported.

The importation, possession, or trade of the piranha *Serrasalmus auriventris* 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 2018), 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 History of Invasiveness

There are no reports of introductions of *S. maculatus* and very limited information on its presence in trade. Therefore, the history of invasiveness for *S. maculatus* is classified as No Known Nonnative Population.

5 Global Distribution



Figure 1. Known global distribution of *S. maculatus* reported from South America. Map from GBIF Secretariat (2017). The occurrence reported on the border of Brazil and French Guiana was excluded from the climate matching analysis because of taxonomic issues reported by GBIF Secretariat (2017). No georeferenced occurrences are available in GBIF Secretariat (2017) for portions of the species range in Paraguay, Colombia, or Peru.

6 Distribution Within the United States

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

7 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2018; 16 climate variables; Euclidean Distance) was high in peninsular Florida, along the Atlantic coast from Delaware and Maryland to northern Georgia, and in eastern Texas. The climate match was medium across most of the southeastern, south-central, and Mid-Atlantic regions of the United States, as well as in scattered locations in New

Mexico and Arizona. The remainder of the contiguous United States had a low climate match. The Climate 6 score indicated that the contiguous United States has a medium climate match overall (scores between 0.005 and 0.103, exclusive, are classified as medium). The Climate 6 score for *S. maculatus* was 0.079. The following States had high individual climate scores: Delaware, Florida, Georgia, Louisiana, Maryland, North Carolina, South Carolina, Texas, and Virginia. The following States had medium individual climate scores: Alabama, Arkansas, Mississippi, Oklahoma, and Tennessee. All other States had low individual climate scores.

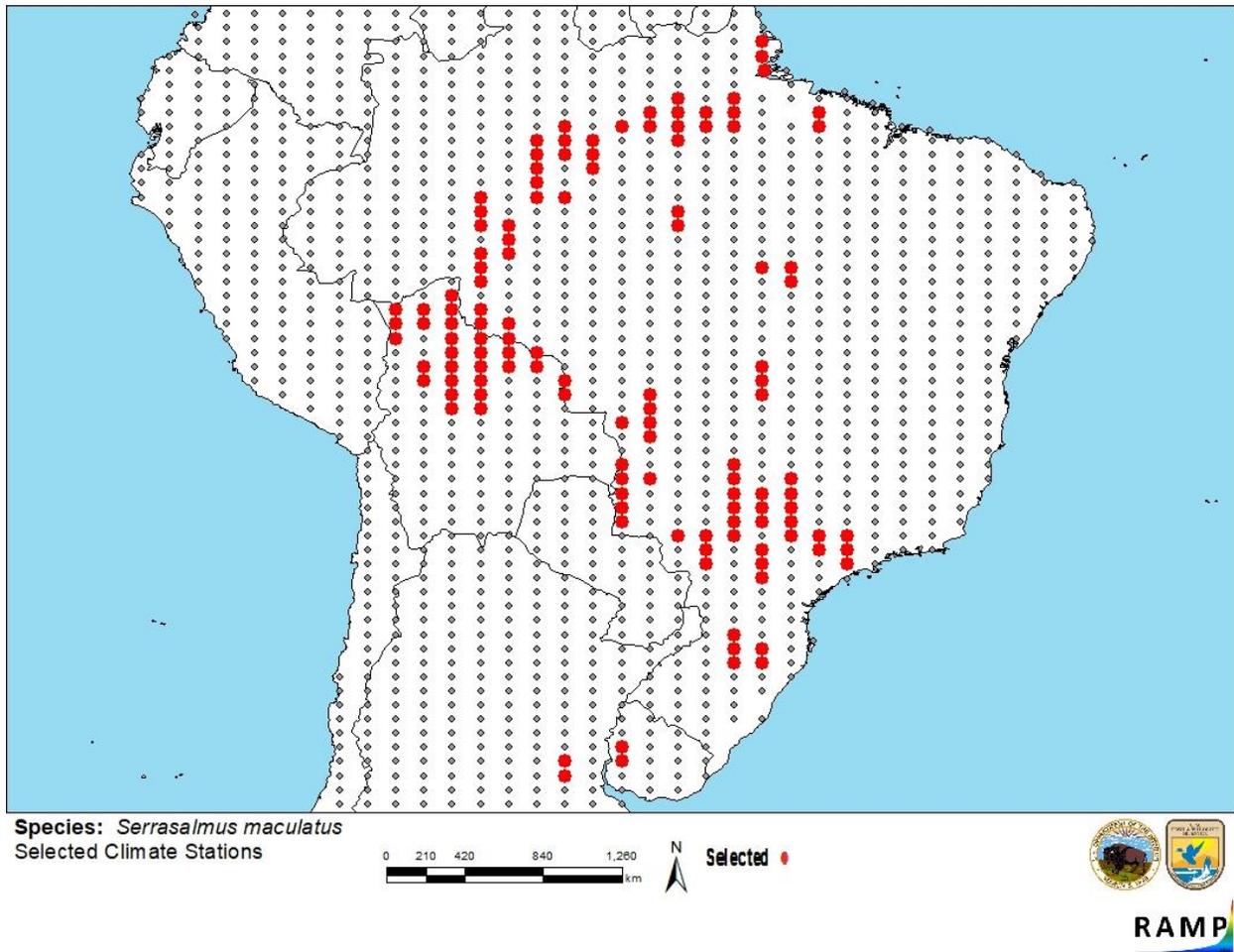


Figure 2. RAMP (Sanders et al. 2018) source map showing weather stations selected as source locations (red; Brazil, Bolivia, Uruguay, Argentina) and non-source locations (gray) for *S. maculatus* climate matching. Source locations from GBIF Secretariat (2017). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

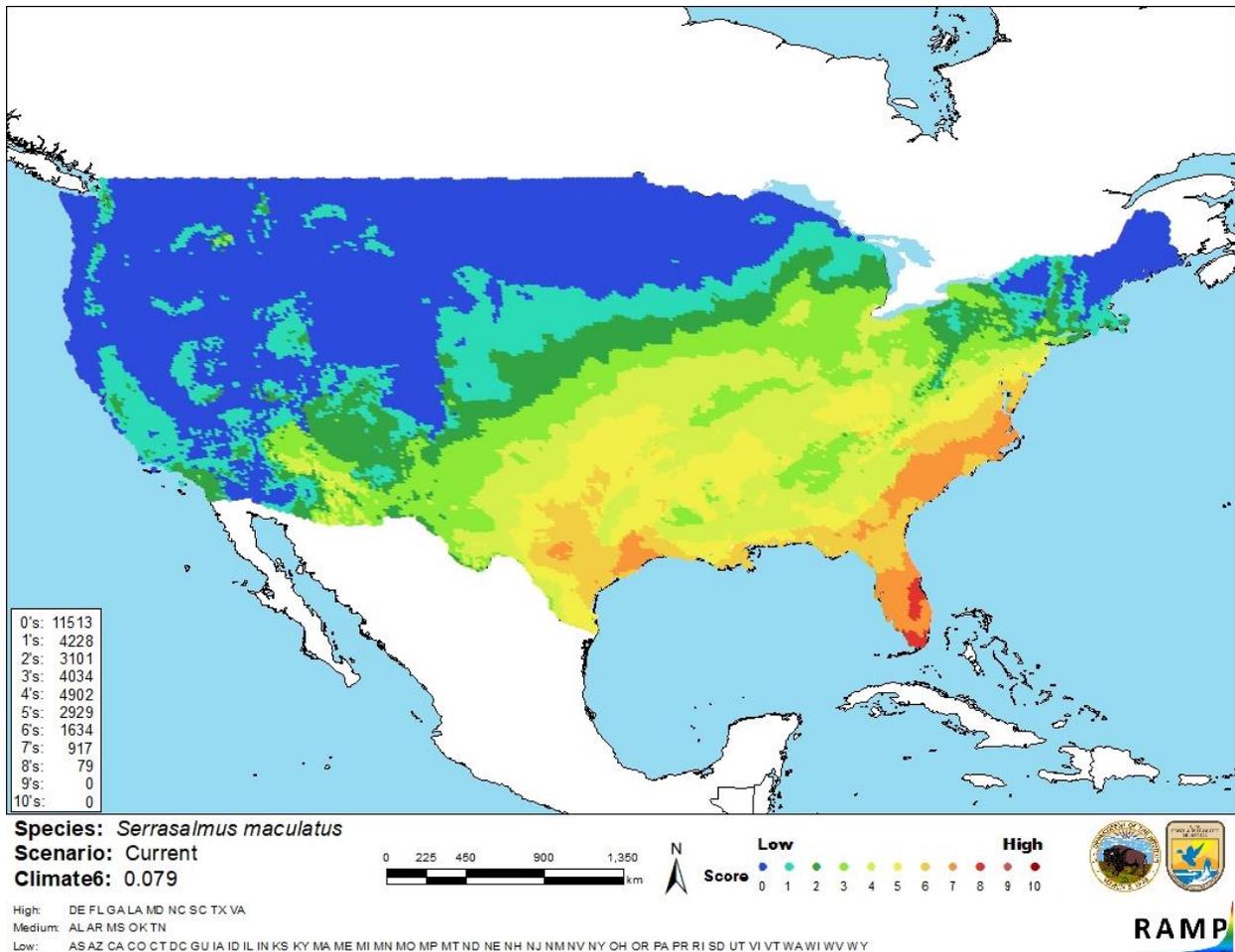


Figure 3. Map of RAMP (Sanders et al. 2018) climate matches for *S. maculatus* in the contiguous United States based on source locations reported by GBIF Secretariat (2017). Counts of climate match scores are tabulated on the left. 0/Blue = Lowest match, 10/Red = Highest match.

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
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

8 Certainty of Assessment

Information was available on the biology, ecology, and distribution of *S. maculatus*. The species is widely distributed in South America and better studied than many species of the genus. However, any impacts of introduction of *S. maculatus* remain unknown because the species has not been reported as introduced outside its native range. For that reason, certainty of this assessment is low.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Speckled Piranha (*Serrasalmus maculatus*) is a species of fish native to the Amazon and Paraguay-Paraná River basins in South America. It feeds mostly on fins and muscles of other fish and has a prolonged spawning season. It is host to numerous ectoparasites and endoparasites, including at least one that is rarely zoonotic. *S. maculatus* is known to bite humans. At times, it may be present in the aquarium trade in the United States, although possession or trade of piranhas is prohibited by many U.S. States. No introductions of this species have been reported, so any impacts of introduction remain unknown. The history of invasiveness is classified as No Known Nonnative Population. The certainty of assessment is low due to lack of information. The climate match to the contiguous United States is medium overall, with a high climate match along most of the coast from Delaware to Texas, and a medium match ranging inland primarily from the Mid-Atlantic to Texas. The overall risk posed by *S. maculatus* is uncertain due to the lack of introduction history.

Assessment Elements

- **History of Invasiveness (Sec. 4): No Known Nonnative Population**
- **Climate Match (Sec. 7): Medium**
- **Certainty of Assessment (Sec. 8): Low**
- **Remarks, Important additional information: Traumatogenic; susceptible to a nematode parasite that can infect humans.**
- **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.

Alabama Department of Conservation and Natural Resources. 2019. Restrictions on possession, sale, importation and/or release of certain animals and fish. Alabama Department of Conservation and Natural Resources Administrative Code, Chapter 220-2-.26.

Alaska State Legislature. 2019. Prohibitions on importation and release of live fish. Alaska Administrative Code, Title 5, Chapter 41, Section 70.

AquaScapeOnline. 2020. Gold Piranha 3-4" (*Serrasalmus maculatus*). Available: <https://www.aquascapeonline.com/products/gold-piranha-3-4-serrasalmus-maculatus.html> (July 2020).

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Colorado Secretary of State. 2019. Prohibited species. Code of Colorado Regulations, Chapter 00, Article VIII #008.

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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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