Jaguar Guapote (*Parachromis managuensis*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, February 2011
Revised, July 2014, July 2015, February 2018
Web Version, 4/10/2018

Photo: Albert Lucientes. Licensed under CC-BY-NC. Available: http://fishbase.org/photos/UploadedBy.php?autoctr=22506&win=uploaded. (February 2018).

1 Native Range and Status in the United States

Native Range

From Nico et al. (2018):

"Tropical America. Atlantic Slope drainages in Central America from Río Ulúa in Honduras to Río Matina in Costa Rica (Bussing 1987)."

Status in the United States

From Nico et al. (2018):

"Established in Florida and Puerto Rico; formerly established in Utah, presumably eradicated; locally established in Hawaii and Nevada; reported from southern Louisiana."

"The first record of this species in **Florida** were based on specimens taken from a farm pond intermittently connected to the Miami (C-2) Canal, Miami-Dade County, in 1992 (Shafland 1996; Gestring and Shafland 1997). More recently, the species has appeared in other canals in the southeastern part of the state (Broward, Collier, Miami-Dade, and Palm Beach counties) including sites west of Miami in canals located in the eastern portions of the Everglades and as far west as Big Cypress National Preserve (Gestring and Shafland 1997; Shafland et al. 2008; Kline et al. 2013; Nico, unpublished data; museum specimens). The species is locally established in a pond on the campus of University of Hawaii on Oahu, **Hawaii**; it was first found at that site ca. 1992 (M. Yamamoto, personal communication). Two specimens were collected from an unnamed tributary to Big Branch Bayou in Lacombe, **Louisiana**, near a tropical fish farm in 2004 (K. Piller, personal communication), and one specimen from a pond in Baton Rouge (M. O'Connell, personal communication). A reproducing population was reported in a 1-acre pond at a private ranch in the south end of the Smoke Creek Desert, **Nevada**, in 2005 (A. Shaul, personal communication). It has become established in the Lajas irrigation canal, Loiza Reservoir, and Boqueron Wildlife Refuge in **Puerto Rico** [F. Grana, Puerto Rico Department of Natural & Environmental Resources, personal communication]. It is established in Boiler Spring, a thermal spring pool in the Virgin-Colorado Rivers drainage of southwestern **Utah**, in the community of Washington, Washington County (Marsh et al. 1989; Courtenay and Stauffer 1990). Boiler Spring fish were first discovered in April 1988 during a rotenone operation by state personnel; the population consisted of 3-4 different size classes totaling an estimated 500 fish (Minckley and C. Knight, personal communication). Voucher specimens were taken in September 1988; at that time, efforts to eliminate the fish with rotenone and explosives failed (Marsh et al. 1989). There were additional unconfirmed reports of fish in other habitats, including at least one breeding population in a local private pond (Marsh et al. 1989). State personnel recently indicated the species has been eradicated from Utah (B. Schmidt, personal communication)."

Means of Introduction into the United States

From Nico et al. (2018):

"Introductions are presumably from aquarium releases, although escapes from fish farms cannot be ruled out in southern Florida. The specimens in Lacombe, Louisiana were collected near a tropical fish farm and are probably escapees."

Remarks

From Nico et al. (2018):

"**Synonyms and Other Names:** *Cichlasoma managuense*; managuense, tiger guapote, Aztec cichlid, jaguar cichlid, guapote tigre"

"On 14 September 1988, Utah Division of Wildlife personnel killed several hundred *P. managuensis* at Boiler Spring with rotenone and explosives, but they were unsuccessful in eradicating the fish (Marsh et al. 1989); however, the most recent report indicates the species has been eradicated throughout the state (B. Schmidt, personal communication). Boiler Spring flows into the Virgin River via Mill Creek and irrigation systems. This aggressive cichlid was considered a potential threat as a predator of native fish fauna of the Virgin River (Marsh et al. 1989)."

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 Acanthopterygii
Order Perciformes
Suborder Labroidei
Family Cichlidae
Genus *Parachromis*
Species *Parachromis managuensis* (Günther, 1867)"

"Taxonomic Status: valid"

Size, Weight, and Age Range

From Froese and Pauly (2017):

"Max length : 55.0 cm TL male/unsexed; [IGFA 2001]; max. published weight: 1.6 kg [IGFA 2001]"

Environment

From Froese and Pauly (2018):

"Freshwater; benthopelagic; pH range: 7.0 - 8.7; dH range: 10 - 15; depth range 3 - 10 m [Agasen et al. 2006]."

"[…] 25°C - 36°C [Bussing 1998; assumed to be water temperature range]"

From Nico et al. (2018):

"Fish in southern Florida are periodically killed during cold winters (W.F. Loftus, personal communication) which allows them only to temporarily inhabit interior wetlands away from the canals that serve as thermal refuges (Kline et al. 2013)."

Climate/Range

From Froese and Pauly (2018):

"Tropical; […] 37°N - 9°N"

Distribution Outside the United States

Native

From Nico et al. (2018):

"Tropical America. Atlantic Slope drainages in Central America from Río Ulúa in Honduras to Río Matina in Costa Rica (Bussing 1987)."

Introduced

Froese and Pauly (2017) report that *P. managuensis* is established in Taiwan, Singapore, Honduras, Guatemala, Panama, Cuba, and the Philippines; probably established in Mexico and El Salvador; and introduced but not established in Canada. The status of *P. managuensis* in China is unknown, although it was introduced there from Taiwan in 1989.

From Barros et al. (2012):

"Two specimens of *Parachromis managuensis*, 13 and 10 cm in length (Günther, 1867) […] were found in July and December of 2011 at the upper Doce River in Rio Doce municipality [southeastern Brazil]."

From França et al. (2017):

"The non-native jaguar guapote *Parachromis managuensis* was recorded in two artificial ponds, four rivers, one stream and two reservoirs, ecosystems belonging to the Una, Ipojuca, Capibaribe and Pajeú River basins, Pernambuco, northeastern Brazil. The sampling period was between October 2006 and July 2015. […] The presence of various ontogenetic life stages in all studied environments is a strong evidence that the species is established."

Means of Introduction Outside the United States

From Froese and Pauly (2017):

"ornamental"

"aquaculture […] widely introduced throughout Central America for the control of juvenile tilapias and other forage fishes in lakes [Welcomme 1988]"

From França et al. (2017):

“The presence of *P. managuensis* detected in several environments of Una, Ipojuca, Capibaribe, and Pajeú river basins in the state of Pernambuco [Brazil] can be due to three factors: (1) accidental release during pond drainage, (2) stocking in reservoirs and (3) aquarium dumping.”

Short Description

From Froese and Pauly (2017):

“Dorsal spines (total): 17 - 18; Dorsal soft rays (total): 10-11; Anal spines: 6-8; Anal soft rays: 11 - 12. This species is distinguished by its large mouth, projecting lower jaw, prominent enlarged canine teeth, black spots on fins and body, a more or less continuous black stripe between the eye and opercular margin, another between the eye and the lower angle of the opercle; a row of black blotches along the middle of the side. Distinguished from other members of the genus by having the preopercle expanded at the angle. Body color silvery or golden-green to purple; back moss green, sides with purple iridescence, belly whitish or yellowish; dorsal, anal and caudal fins with numerous black spots, interspaces whitish, yellowish or with blue iridescence; a black blotch on the caudal-fin base. Breeding females with stronger crimson hue to the gill cover.”

Biology

From Froese and Pauly (2017):

“Inhabits lakes, preferring turbid waters and mud bottoms of the highly eutrophic lakes [Conkel 1993]. Found in springs and ponds over detritus and sand bottom [Page and Burr 1991]. Commonly found in very warm, oxygen depleted inundation lakes [Nassar and Nonell 1992]. Highly predaceous, feeding mainly on small fishes and macroinvertebrates [Conkel 1993; Yamamoto and Tagawa 2000]. Oviparous, spawns in batches […]”

“Deposits up to 5,000 eggs on rocks and other hard substrates; both parents guard the eggs and resulting fry [Yamamoto and Tagawa 2000]. Reported to deposit up to 10,496 eggs [Agasen et al. 2006].”

From Nico et al. (2018):

“*Parachromis managuensis*, as with other guapotes, is highly piscivorous, consuming a variety of fishes. Aquatic invertebrates comprise an important portion of the juvenile diet (Bussing 1987; Gestring and Shafland 1997).”

Human Uses

From Froese and Pauly (2017):

“Fisheries: commercial; aquaculture: commercial; aquarium: commercial”

Diseases

From Froese and Pauly (2017):

"*Raphidascaris* Disease, Parasitic infestations (protozoa, worms, etc.)
Spiroxys Infestation, Parasitic infestations (protozoa, worms, etc.)
Procamallanus Infection 13, Parasitic infestations (protozoa, worms, etc.)
Rhabdochona Infestation 5, Parasitic infestations (protozoa, worms, etc.)
Rhabdochona Disease, Parasitic infestations (protozoa, worms, etc.)
Skin Flukes, Parasitic infestations (protozoa, worms, etc.)
Yellow Grub, Parasitic infestations (protozoa, worms, etc.)
Haplorchis Infestation 2, Parasitic infestations (protozoa, worms, etc.)
Centrocestus Disease, Parasitic infestations (protozoa, worms, etc.)
Posthodiplostomum Infestation 2, Parasitic infestations (protozoa, worms, etc.)
Spiroxys Infestation, Parasitic infestations (protozoa, worms, etc.)
Procamallanus Infection 13, Parasitic infestations (protozoa, worms, etc.)
Rhabdochona Infestation 5, Parasitic infestations (protozoa, worms, etc.)
Crassicutis Infection, Parasitic infestations (protozoa, worms, etc.)
Genarchella Infection, Parasitic infestations (protozoa, worms, etc.)
Oligogonotylus Infection, Parasitic infestations (protozoa, worms, etc.)
Saccocoelioides Infection, Parasitic infestations (protozoa, worms, etc.)
Contracaecum Disease (larvae), Parasitic infestations (protozoa, worms, etc.)
Contracaecum Disease (larvae), Parasitic infestations (protozoa, worms, etc.)
Ascocotyle Infestation 2, Parasitic infestations (protozoa, worms, etc.)
Ascocotyle Infestation 3, Parasitic infestations (protozoa, worms, etc.)
Diplostomum Infection, Parasitic infestations (protozoa, worms, etc.)
Echinochasmus Infestation 2, Parasitic infestations (protozoa, worms, etc.)
Pelaezia Infection, Parasitic infestations (protozoa, worms, etc.)
Perezitrema Infection, Parasitic infestations (protozoa, worms, etc.)
Uvulifer Infection, Parasitic infestations (protozoa, worms, etc.)
Sciadicleithrum Infection, Parasitic infestations (protozoa, worms, etc.)
Sciadicleithrum Infection 2, Parasitic infestations (protozoa, worms, etc.)
Sciadicleithrum Infection 4, Parasitic infestations (protozoa, worms, etc.)
Mexiconema Infestation, Parasitic infestations (protozoa, worms, etc.)
Falcaustra Infection (*Falcaustra* sp.), Parasitic infestations (protozoa, worms, etc.)
Neoechinorhynchus Infestation 6, Parasitic infestations (protozoa, worms, etc.)
Polymorphus Infestation, Parasitic infestations (protozoa, worms, etc.)"

Rubio-Godoy et al. (2010) report that *P. managuensis* is a host for an unidentified gyrodactylid (*Gyrodactylus* sp.), citing Vidal-Martinez et al. (2001).

No OIE-reportable diseases have been documented in this species.

Threat to Humans

From Froese and Pauly (2017):

"Potential pest"

3 Impacts of Introductions

From Rosana et al. (2006):

"*Parachromis managuensis* has established in Talisay [Philippines] and has also settled in Tanauan and Laurel. The estimated production of 8.2MT comprising 57.6% of the total catch suggests that the alien fish has successfully competed for a niche previously occupied by native species such as *L. plumbeus* and *G. guirus*."

"The percentage composition of the five major fishes caught in Taal Lake, shows that *P. managuensis* ranked fourth in abundance with *S. tawilis*-first, *O. niloticus*-second, *C. chanos*-third and *G. guirus*-fifth, hence displacing further the already low population of native species."

"Jaguar guapote is not beneficial after all since it starts to displace the indigenous species that are far more beneficial in terms of their marketability. Though respondents and consumers alike found the fish beneficial since it has been a source of food and income, it was however, low enough to augment their family needs. Jaguar guapote is utilized as substitute to the indigenous fish for food since production of native fish became relatively lower after the advent of the invasive alien fish in Taal Lake."

From Froese and Pauly (2017):

"[In Singapore] Extremely damaging to local ecosystem as it breeds extremely fast and is a voracious predator. The population of all other fish species in the Pandan canal has declined [B. Y. Tang, personal communication]."

"[In El Salavador] Has displaced local predators [Lever 1996]."

4 Global Distribution

Figure 1. Reported global distribution of *Parachromis managuensis*. Map from GBIF Secretariat (2017). The location in west-central Mexico was not included in the climate matching analysis because of uncertainty in the record about the species identification. The locations in China and Brazil were not included in the climate matching analysis because these populations have not been confirmed as established (Barros et al. 2012; Froese and Pauly 2017).

5 Distribution within the United States

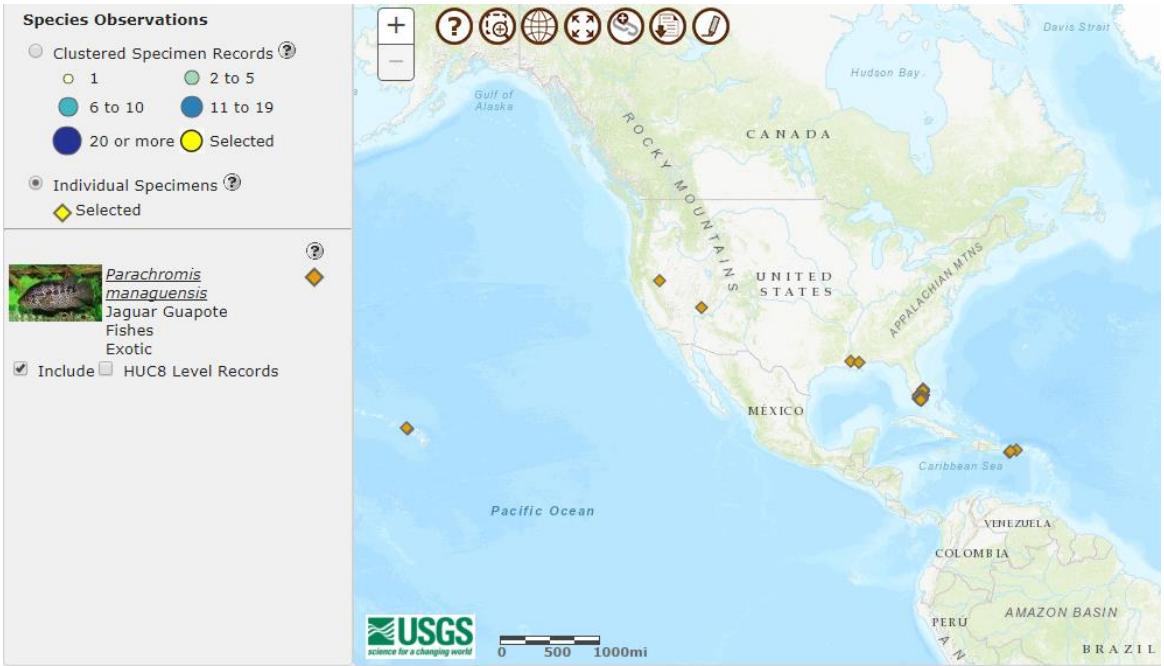

Figure 2. Distribution of *Parachromis managuensis* in the U.S. Map from Nico et al. (2018). Only locations in Florida, Hawaii, and Puerto Rico were included in the climate matching analysis. Locations in Louisiana represent failed populations, fish introduced in Nevada do not overwinter, and fish introduced in Utah are established in a warm spring where water temperatures are not reflective of the overall local climate.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2014; 16 climate variables; Euclidean Distance) is high in peninsular Florida; medium along the coasts of Georgia, South Carolina, Louisiana, Texas, and southern California; and low elsewhere. Climate 6 score indicates that the contiguous U.S. has a medium climate match overall. The range of scores indicating a medium match are those between 0.005 and 0.103; Climate 6 score for *Parachromis managuensis* was 0.017.

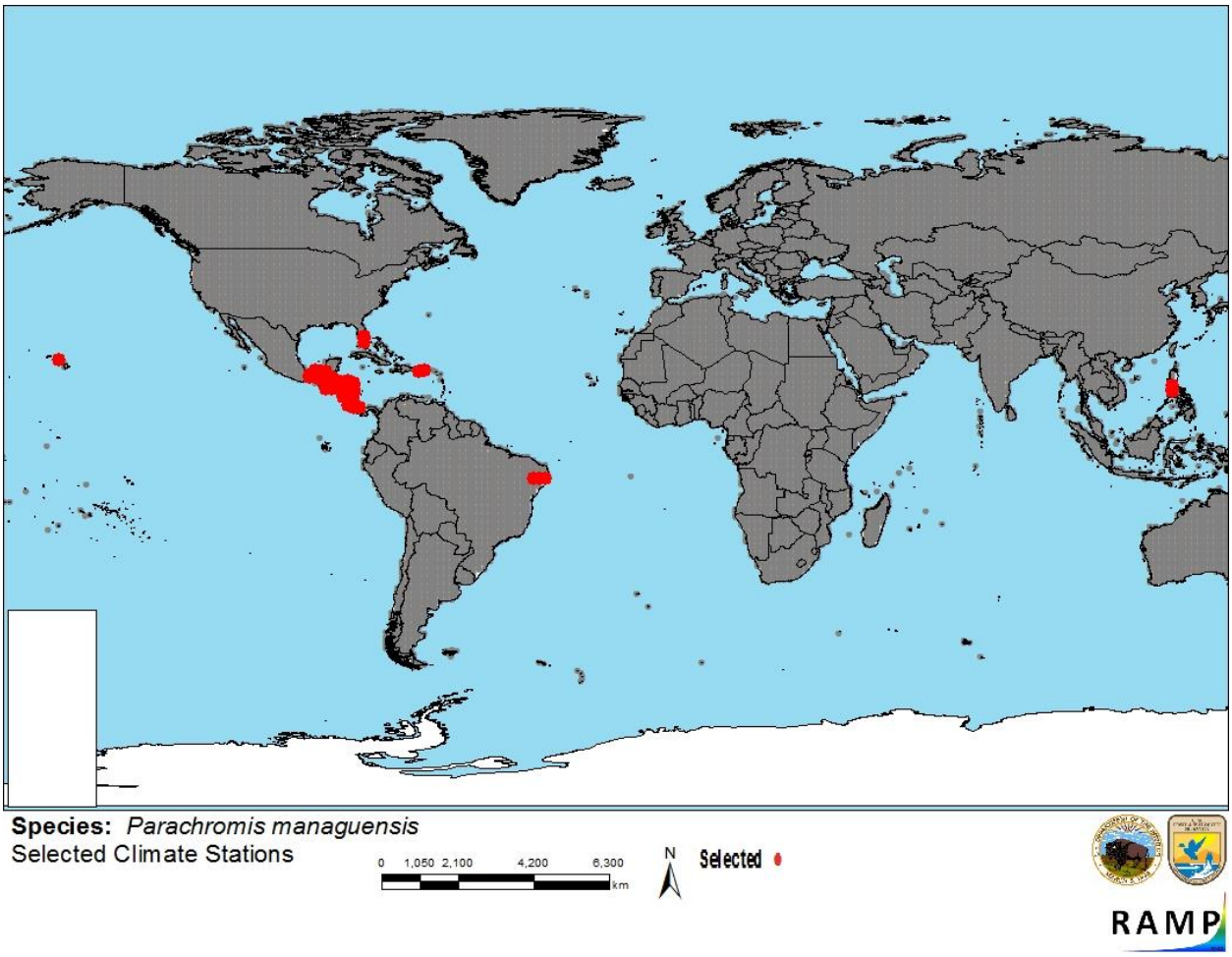

Figure 3. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (gray) for *Parachromis managuensis* climate matching. Source locations from GBIF Secretariat (2017) and Nico et al. (2018). Additional source locations in Brazil from França et al. (2017).

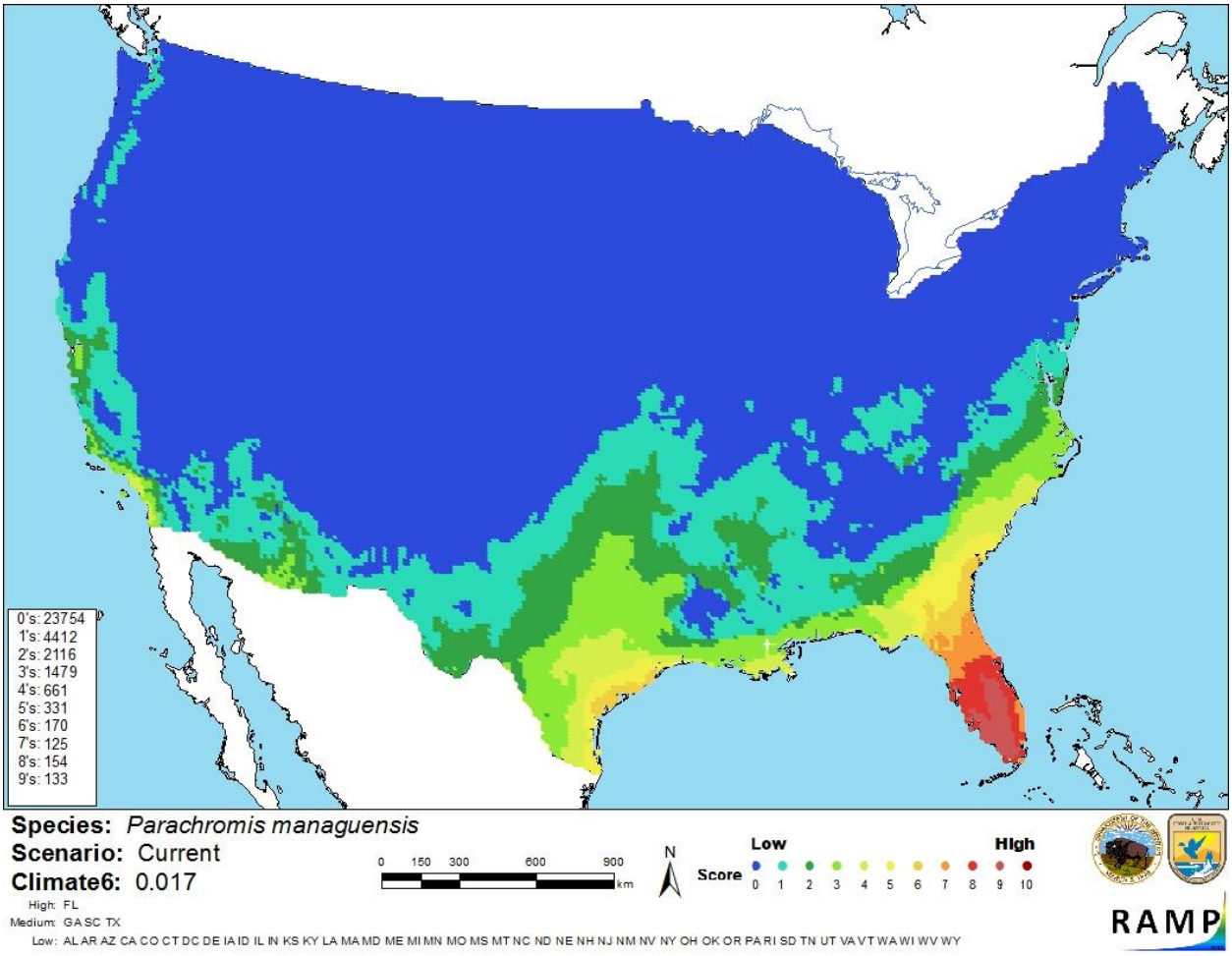

Figure 4. Map of RAMP (Sanders et al. 2014) climate matches for *Parachromis managuensis* in the contiguous United States based on source locations reported by GBIF Secretariat (2017), Nico et al. (2018), and França et al. (2017). 0=Lowest match, 10=Highest match. Climate match scores are tabulated on left.

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 on the biology, distribution, and impacts of *P. managuensis* is available. Negative impacts from introductions of this species are documented a few times in the scientific literature, but further study would be useful to better characterize these impacts. Certainty of this assessment is medium.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Parachromis managuensis has shown an ability to establish populations within the U.S. Although the impacts of this species in the U.S. are not well-studied, *P. managuensis* has been associated with declines of native fish species in multiple locations globally. Climate match to the contiguous U.S. is medium overall, but given reports of *P. managuensis* killed during cold winters even in southern Florida, the suitable locations for *P. managuensis* establishment in the contiguous U.S. are likely to be quite limited; however, the species may establish in thermal springs where the water is warmer than expected for the local climate. The overall risk posed by this species is high.

Assessment Elements

- **History of Invasiveness (Sec. 3): High**
- **Climate Match (Sec. 6): Medium**
- **Certainty of Assessment (Sec. 7): Medium**
- **Remarks/Important additional information:** Known to establish in thermal springs, as seen in Utah.
- **Overall Risk Assessment Category: High**

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.

Barros, L. C., U. Santos, J. C. Zanuncio, and J. A. Dergam. 2012. *Plagioscion squamosissimus* (Sciaenidae) and *Parachromis managuensis* (Cichlidae): a threat to native fishes of the Doce River in Minas Gerais, Brazil. PLoS ONE 7(6):e39138.

França, E. J., C. A. Collier de Almeida, M. S. de Almeida Neto, R. E. Santos, A. L. B. Magalhães, A. C. A. El-Deir, and W. Severi. 2017. Novelty on the market, novelty in the environment: the invasion of non-native fish jaguar guapote (Perciformes) in northeastern Brazil. Neotropical Biology and Conservation 12(1):12-18.

Froese, R., and D. Pauly, editors. 2017. *Parachromis managuensis* (Günther, 1867). FishBase. Available: http://www.fishbase.org/summary/Parachromis-managuensis.html. (February 2018).

GBIF Secretariat. 2017. GBIF backbone taxonomy: *Parachromis managuensis* (Günther, 1867). Global Biodiversity Information Facility, Copenhagen. Available: http://www.gbif.org/species/5208202. (February 2018).

ITIS (Integrated Taxonomic Information System). 2018. *Parachromis managuensis* (Günther, 1867). Integrated Taxonomic Information System, Reston, Virginia. Available:

http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=649548#null. (February 2018).

Nico, L., P. Fuller, and M. Neilson. 2018. *Parachromis managuensis* (Günther, 1867). U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, Florida. Available: https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=445. (February 2018).

Rosana, M. R., E. V. Agasen, L. S. Villanueva, J. P. Clemente Jr., N. S. Kawit, and J. T. de la Vega. 2006. Status and economic impact of *Parachromis maraguensis* in Taal Lake, Philippines. Journal of Environmental Science and Management 9(2):1-19.

Rubio-Godoy, M., G. Paladini, A. García-Vásquez, and A. P. Shinn. 2010. *Gyrodactylus jarocho* sp. nov. and *Gyrodactylus xalapensis* sp. nov. (Platyhelminthes: Monogenea) from Mexican poeciliids (Teleostei: Cyprinodontiformes), with comments on the known gyrodactylid fauna infecting poeciliid fish. Zootaxa 2509:1-29.

Sanders, S., C. Castiglione, and M. Hoff. 2014. Risk Assessment Mapping Program: RAMP. U.S. Fish and Wildlife Service.

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.

Agasen, E. V., J. P Clemente, Jr., M. R. Rosana, and N. S. Kawit. 2006. Biological investigation of jaguar guapote *Parachromis managuensis* (Gunther) in Taal Lake, Philippines. Journal of Environmental Science and Management 9(2):20-30.

Bussing, W. A. 1987. Peces de las aguas continentales de Costa Rica. Editorial de la Universidad de Costa Rica, San Jose, Costa Rica.

Bussing, W. A. 1998. Peces de las aguas continentales de Costa Rica [Freshwater fishes of Costa Rica], second edition. Editorial de la Universidad de Costa Rica, San Jose, Costa Rica.

Conkel, D. 1993. Cichlids of North and Central America. Tropical Fish Hobbyist Publications, Inc., Neptune City, New Jersey.

Courtenay, W. R., Jr., and J. R. Stauffer, Jr. 1990. The introduced fish problem and the aquarium fish industry. Journal of the World Aquaculture Society 21(3):145-159.

Gestring, K., and P. Shafland. 1997. Selected life history attributes of the exotic jaguar guapote (*Cichlasoma managuense*) in Florida. Florida Scientist 60(3):137-142.

IGFA (International Game Fishing Association). 2001. Database of IGFA angling records until 2001. International Game Fishing Association, Fort Lauderdale, Florida.

Kline, J. L., W. F. Loftus, K. Kotun, J. C. Trexler, J. S. Rehage, J. J. Lorenz, and M. Robinson. 2013. Recent fish introductions into Everglades National Park: an unforeseen consequence of water-management? Wetlands 34(1):175-187.

Lever, C. 1996. Naturalized fishes of the world. Academic Press, California.

Marsh, P. C., T. A. Burke, B. D. DeMarais, and M. E. Douglas. 1989. First North American record of *Cichlasoma managuense* (Pisces: Cichlidae). Great Basin Naturalist 49(3):387-389.

Nassar, M. A., and J. G. Nonell. 1992. Growth of jaguar cichlid (*Cichlasoma managuense*) juveniles at different oxygen levels. Uniciencia 9:3-5.

Page, L. M., and B. M. Burr. 1991. A field guide to freshwater fishes of North America north of Mexico. Houghton Mifflin Company, Boston.

Shafland, P. L. 1996. Exotic fishes of Florida – 1994. Reviews in Fisheries Science 4(2):101-122.

Shafland, P. L., K. B. Gestring, and M. S. Stanford. 2008. Florida's exotic freshwater fishes - 2007. Florida Scientist 71(3):220-245.

Vidal-Martínez, V. M., M. L. Aguirre-Macedo, T. Scholz, D. González-Solís, and E. F. Mendoza-Franco. 2001. Atlas of the helminth parasites of cichlid fish of Mexico. Academia, Prague.

Welcomme, R. L. 1988. International introductions of inland aquatic species. FAO Fisheries Technical Paper 294, Rome.

Yamamoto, M. N., and A. W. Tagawa. 2000. Hawaii's native and exotic freshwater animals. Mutual Publishing, Honolulu, Hawaii.