Southern Platyfish (*Xiphophorus maculatus*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, May 2014
Revised, March 2018
Web Version, 11/17/2019

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1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2018):

"North and Central America: Ciudad Veracruz, Mexico to northern Belize."

From Fricke et al. (2019):

"Atlantic slope of Central America: Mexico, Belize and Guatemala […]"

From CABI (2018):

"*X. maculatus* is native to Mexico, Belize, Guatemala and Honduras."

Status in the United States

From Nico et al. (2018):

"This species has been recorded from Orange County, California, near Westminster (St. Amant and Hoover 1969; Courtenay et al. 1984, 1991; Swift et al. 1993); near a fish farm in Conejos County and the South Platte drainage, Colorado (Woodling 1985; Zuckerman and Behnke 1986; Rasmussen 1998); several counties in Florida (Courtenay et al. 1974; Courtenay and Hensley [1979]; Dial and Wainright 1983; museum specimens); Hawaii (Brock 1960; Maciolek 1984; Devick [1991]; Mundy 2005); an unnamed tributary to Big Branch Bayou in Lacombe, Louisiana (K. Piller, pers. comm.); Beaverhead Rock Pond (Madison County), Montana (Page and Burr 1991); Clark County, Nevada (La Rivers 1962; Bradley and Deacon 1967; Courtenay and Deacon 1982; Courtenay et al. 1984, 1991; Deacon and Williams 1984; Vinyard 2001); several drainages around Puerto Rico (Erdsman 1984; Lee et al 1983); South Carolina (museum record), and Texas (Hubbs 1982; Courtenay et al. 1984, 1991)."

"It is locally established, or possibly established locally, in several states, including Florida (Courtenay and Meffe 1989; Nico, personal communication), Colorado (Zuckerman and Behnke 1986), Hawaii (Kanayama 1968; Devick [1991]), and Montana (Page and Burr 1991). It was reported from Texas (Courtenay et al. 1984, 1991). The species was mentioned as being extirpated from California (Swift et al. 1993), but there is no evidence that it was ever established in that state (Courtenay and Meffe 1989). Uncertain in Louisiana. The species was introduced into Blue Point Springs near Lake Mead, in Nevada (Deacon and Williams 1984); the status of that population is assumed to be established locally."

"This species has long been a popular ornamental fish and exhibits a wide range of color patterns (Rosen 1960, 1979; Dawes 1991; Wischnath 1993). […] Aquaculturists have hybridized it with related species to create a variety of forms and colors, and Florida fish farms raise tremendous numbers of these each year for the aquarium trade."

Means of Introductions in the United States

From Nico et al. (2018):

"Probably the result of fish farm or aquarium releases. Specimens in Louisiana were collected near a tropical fish farm."

Remarks

From Nico et al. (2018):

"A second population, inhabiting Indian Springs, Clark County, Nevada, was considered to be a hybrid with *X. hellerii* (Deacon and Williams 1984; Courtenay and Meffe 1989); however, in

1989 M. Rauchenberger examined specimens (UF 91919) taken from Indian Spring[s] and determined that they represented *X. hellerii* and not a hybrid."

"Myers (1940) received unconfirmed reports that *X. maculatus*, along with several other introduced species, had breeding populations in the Florida Everglades but the location of unspecific [sic]; no specimens have ever been taken in the Everglades wetlands (Loftus and Kushlan 1987, Shafland 2008). There is some confusion surrounding the positive identification of a Nevada population (see account for *X. hellerii*). Courtenay and Meffe (1989) indicated that the Nevada record of Courtenay and Deacon (1982) and Deacon and Williams (1984) was actually a hybrid with *X. hellerii*. As such, the listing of pure *X. maculatus* for Nevada is obviously tentative."

"Formerly known as *Platypoecilus maculatus*."

Both the former scientific name and the current, valid scientific name were used in searching for information on this species.

From CABI (2018):

"*Xiphophorus* spp. commonly hybridise (Dawes, 1995; Bailey and Sandford, 1999; Balon, 2004), and most ornamental varieties have resulted from hybridisation and artificial selection of three species; i.e. *X. hellerii*, *X. maculatus* and *X. variatus* (Dawes, 1995; Balon, 2004)."

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 Cyprinodontiformes
Suborder Cyprinodontoidei
Family Poeciliidae
Subfamily Poeciliinae
Genus *Xiphophorus*
Species *Xiphophorus maculatus* (Günther, 1866)"

From Fricke et al. (2019):

"**Current status:** Valid as *Xiphophorus maculatus* (Günther 1866). Poeciliidae: Poeciliinae."

Size, Weight, and Age Range

From Nico et al. (2018):

"Females to about 6 cm TL; males to 4 cm TL."

From Froese and Pauly (2018):

"Max length : 4.0 cm TL male/unsexed; [Keith et al. 2006]; 6.0 cm TL (female); common length : 2.3 cm TL male/unsexed; [Hugg 1996]"

Environment

From CABI (2018):

"*X. maculatus* has fairly broad environmental tolerances and, as it is common as an introduced species in many countries, occurs in many different habitats. […] *X. maculatus* has been observed to survive winter in outdoor ponds at a latitude of 32°S, in Perth, Western Australia (M Maddern, University of Western Australia, personal communication, 2010)."

"Milton and Arthington (1983) noted that reproduction was influenced by temperature and occurred between approximately15°C [*sic*] and 30°C, though no published data of the species within its native range is available for comparison."

From Froese and Pauly (2018):

"Freshwater; benthopelagic; pH range: 7.0 - 8.0; dH range: 9 - 19; non-migratory."

Climate/Range

From Froese and Pauly (2018):

"Tropical; […] 23°N - 17°N, 99°W - 86°W"

From CABI (2018):

"The species has a "native" latitude of 17-23°N though has exists [*sic*] outside of this range as an introduced species in some states of USA. Based on this [*sic*] data and the fact that other introduced *X. maculatus* populations occur only in tropical/subtropical locales it appears that the species tolerance of low water temperatures is less than that of the closely related *Xiphophorus hellerii*."

Distribution Outside the United States

Native

From Froese and Pauly (2018):

"North and Central America: Ciudad Veracruz, Mexico to northern Belize."

From Fricke et al. (2019):

"Atlantic slope of Central America: Mexico, Belize and Guatemala […]"

From CABI (2018):

"*X. maculatus* is native to Mexico, Belize, Guatemala and Honduras."

Introduced

From CABI (2018):

"The southern platyfish *X. maculatus* […] occurs as an introduced species in the aquatic habitats of at least 18 countries, principally because of human-mediated translocation and release."

According to CABI (2018), *X. maculatus* has been introduced to India, Indonesia, Japan, Saudi Arabia, Singapore, Sri Lanka, Madagascar, Mauritius, Nigeria, Bahamas, Honduras, Jamaica, Réunion, Canada, Brazil, Colombia, Australia, and Palau.

According to Froese and Pauly (2019), *X. maculatus* is established outside its native range in Jamaica, Japan, Madagascar, Palau, Saudi Arabia, India, Colombia, Sri Lanka, Brazil, Bahamas, and Australia; and probably established outside its native range in Nigeria, Indonesia, and Singapore. Its status is unknown in Spain, Mauritius, Reunion, and Canada.

Means of Introduction Outside the United States

From CABI (2018):

"**Natural Dispersal (Non-Biotic)**
Further spread of *X. maculatus* by natural dispersal may occur (e.g. flooding), though is most likely in areas with substantial populations, i.e. Queensland, Australia."

"**Intentional Introduction**
X. maculatus may be intentionally introduced to aquatic habitats as unwanted ornamental fishes, and possibly as mosquito biocontrol agents."

Short Description

From Nico et al. (2018):

"Distinguishing characteristics were given by Rosen (1960, 1979) and Page and Burr (1991). It is included in identification keys of Rosen (1960, 1979) and Greenfield and Thomerson (1997).

Photographs or illustrations appeared in Rosen (1960), Mills and Vevers (1982), Petrovicky (1988), Dawes (1991), Sakurai et al. (1993), and Wischnath (1993)."

From Froese and Pauly (2018):

"Dorsal soft rays (total): 8-10. Distinct line of black pigment midventrally on caudal peduncle absent. Greatest body depth about 2 times in SL. Ventral rays of caudal fin of males not elongated into a sword. Male gonopodium falling short of caudal fin base, without a membranous protuberance, third ray with a strong hook [Greenfield and Thomerson 1997]."

Biology

From Froese and Pauly (2018):

"Feed on worms, crustaceans, insects and plant matter [Mills and Vevers 1989; Yamamoto and Tagawa 2000]."

"[…] attain sexual maturity after 3-4 months and reproduce easily [Riehl and Baensch 1991]."

From CABI (2018):

"*X. maculatus* is omnivorous and the diet of introduced populations in Queensland included plant material, aquatic and terrestrial insects and Crustacea (atyid and caridian shrimps) (Arthington, 1989). The diet in an Indonesian lake was predominantly detritus and lesser quantities of chironomid larvae and cyclopoid copepods (Green et al., 1978)."

"*X. maculatus* is ovoviviparous (i.e. livebearing), with insemination occurring by the males' gonopodium. Like many poeciliids, *X. maculatus* has fairly large brood sizes, short gestation periods and multiple broods per year (Milton and Arthington, 1983). Males do not perform a courtship display (Farr, 1989) though complex male dominance hierarchies are established (Sontirat, 1984). Little peer-reviewed research has been conducted on the reproductive biology of *X. maculatus*. *X. maculatus* can reach maturity at approximately 20 mm (Kallman and Borowski, 1978; Milton and Arthington, 1983), and 8-10 weeks of age (Travolga and Rugh, 1947). The gestation period may be between 26-90 days (Travolga, 1949). Large females in southern Queensland exhibited a maximum fecundity of approximately 90 offspring (Milton and Arthington, 1983). Favourable water temperatures in subtropical and tropical areas lead to almost continuous reproduction (Travolga and Rugh, 1947; Milton and Arthington, 1983)."

Human Uses

From CABI (2018):

"*X. maculatus* is a very popular ornamental species worldwide (Froese and Pauly, 2007), and accounts for 5.4% of the total number of ornamental fish imported into the USA (Chapman et al., 1997). It is considered of "high" importance as an ornamental fish in Australia (Corfield et al., 2007)."

According to CABI (2018), other uses of *X. maculatus* include biological control, laboratory use, and research model.

Diseases

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

From Froese and Pauly (2018):

"Fin-rot Disease (late stage), Bacterial diseases
White spot Disease, Parasitic infestations (protozoa, worms, etc.)
Costia Disease, Parasitic infestations (protozoa, worms, etc.)
Fin Rot (early stage), Bacterial diseases
Skin Fungi (Saprolegnia sp.), Fungal diseases
Fish tuberculosis, Bacterial diseases
Turbidity of the Skin (Freshwater fish), Parasitic infestations (protozoa, worms, etc.)
Bacterial Infections (general), Bacterial diseases
Fish louse Infestation 1, Parasitic infestations (protozoa, worms, etc.)
Malnutriton, Nutritional deficiencies
Fish tuberculosis (FishMB), Bacterial diseases"

From Nolan et al. (2014):

"Members of the genus *Megalocytivirus* cause severe systemic disease with characteristic inclusion bodies seen in both freshwater and marine fish (Hyatt & Chinchar 2008). *Megalocytivirus* is a genus within the family Iridoviridae which also includes the genera *Iridovirus*, *Chloriridovirus*, *Lymphocystivirus* and *Ranavirus* (Chinchar et al. 2005)."

"The presence of *Megalocytivirus* was confirmed by PCR in all 3 species of freshwater ornamental livebearer fish examined which included platys *Xiphophorus maculatus* […]"

Threat to Humans

From Mehrdana et al. (2014):

"A popular and frequently exported fish *Xiphophorus maculatus*, also known as platy fish (family Poecilidae), is susceptible to a number of parasite species, including digenetic trematodes in their metacercarial stage, which use the fish as their second intermediate host (Thilakaratne et al. 2003, Piazza et al. 2006, Garcia et al. 2009). […] Some of these parasites have also a zoonotic potential and may be considered a public health threat, if inadequately processed fish are consumed (WHO 1995, Chai and Lee 2002, Keiser and Utzinger 2005, Rim et al. 2013)."

3 Impacts of Introductions

From Nico et al. (2018):

"Southern platys, and other introduced poeciliids, have been implicated in the decline of native damselflies on Oahu, Hawaii. Often the distributions of the damselflies and introduced fishes

were found to be mutually exclusive, probably resulting from predation by the fish on the insects (Englund 1999)."

From Froese and Pauly (2018):

"At least one country reports adverse ecological impact after introduction."

From CABI (2018):

"Little information is available on specific deleterious ecological impacts though *X. maculatus* and other poeciliids are considered responsible for the decline of indigenous aquatic invertebrates in Hawaii. Furthermore, research has suggested that impacts on aquatic ecosystems are increased when multiple poeciliid species are present. Ecological impacts may include resource competition and predation, and predation of aquatic invertebrate communities as a whole."

From Krishnakumar et al. (2009):

"The insectivorous feeding habit of platy, *Xiphophorus maculatus* makes them potential competitors for indigenous barbs like *Puntius fasciatus, Puntius ticto, Puntius vittatus* and Killi fishes like *A*[*plocheilus*] *lineatus, A. panchax* and *A. dayi*."

4 Global Distribution

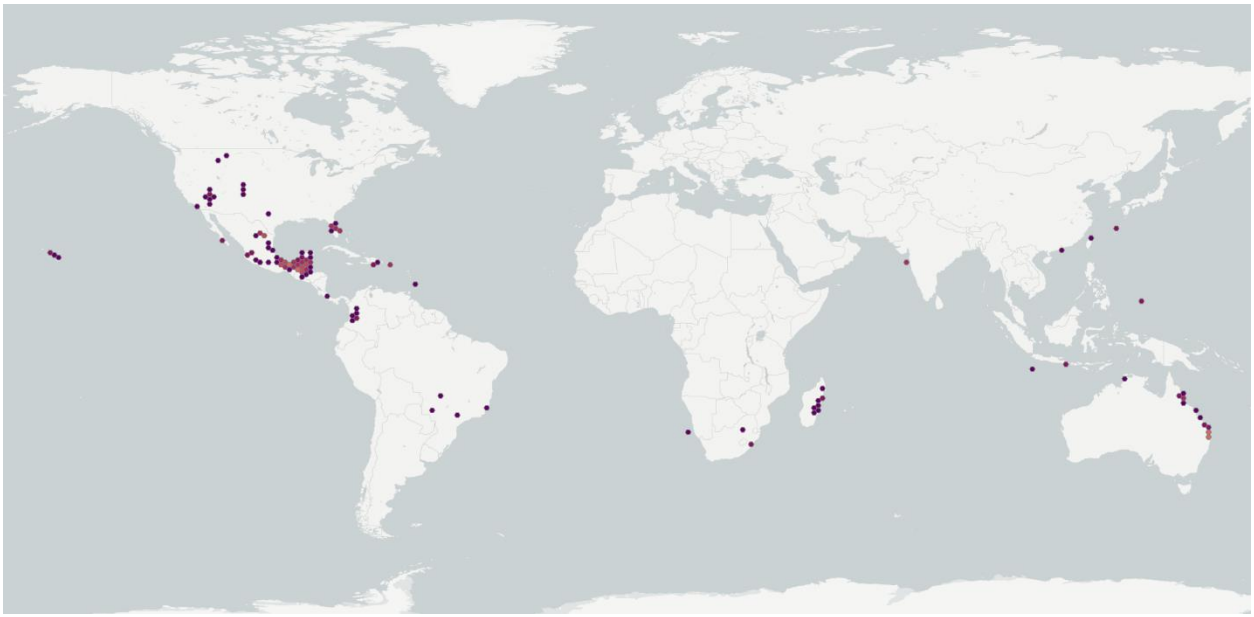

Figure 1. Known global distribution locations of *Xiphophorus maculatus*. Map from GBIF Secretariat (2019). Occurrences reported from the Dominican Republic, Barbados, South Africa, Hong Kong, and Taiwan were excluded from the climate matching analysis because no established populations of *X. maculatus* have been confirmed in these locations. See Section 5 for occurrences within the United States used or excluded from the climate matching analysis. No georeferenced occurrences were available for parts of the species established range located in Jamaica, Saudi Arabia, Sri Lanka, Bahamas, Nigeria, or Singapore.

5 Distribution Within the United States

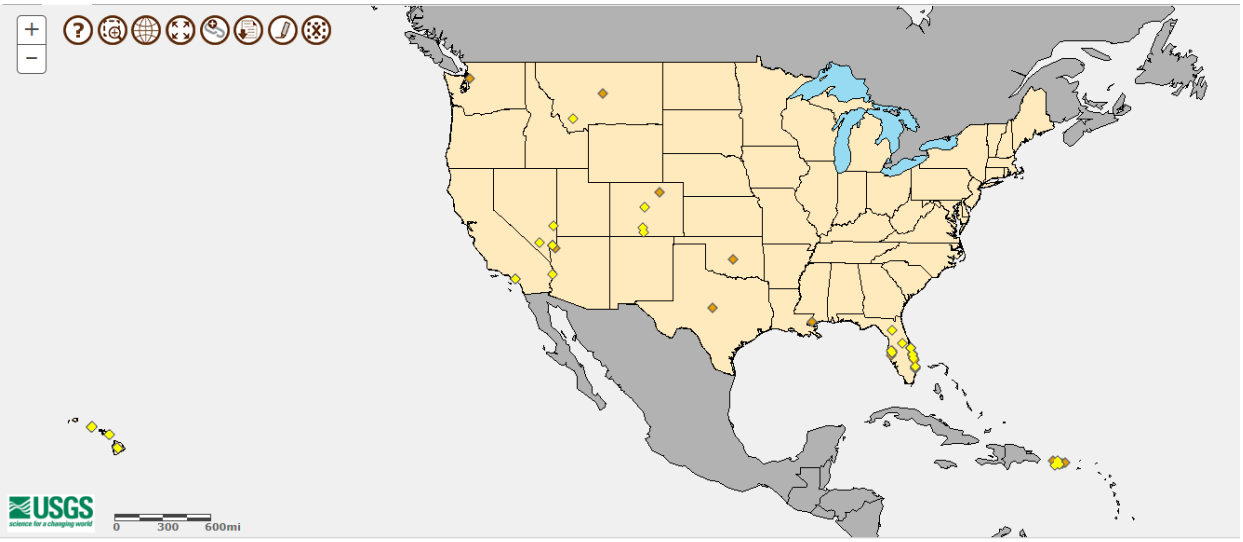

Figure 2. Known distribution of *Xiphophorus maculatus* in the United States. Map from Nico et al. (2019). The yellow diamonds represent established populations, while orange diamonds represent introductions that failed or for which the status is unknown. Only established populations were included in the climate matching analysis.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2018; 16 climate variables; Euclidean Distance) for *Xiphophorus maculatus* was high overall, with a Climate 6 score of 0.506. Scores of 0.103 and greater are classified as high match. Locally, there were high matches in Florida, southern Georgia, southern Texas, and much of the western United States. Other coastal areas of the Southeast had medium matches, along with the Upper Midwest and Great Plains. There were low matches across the remainder of the eastern half of the contiguous United States, as well as in the Pacific Northwest.

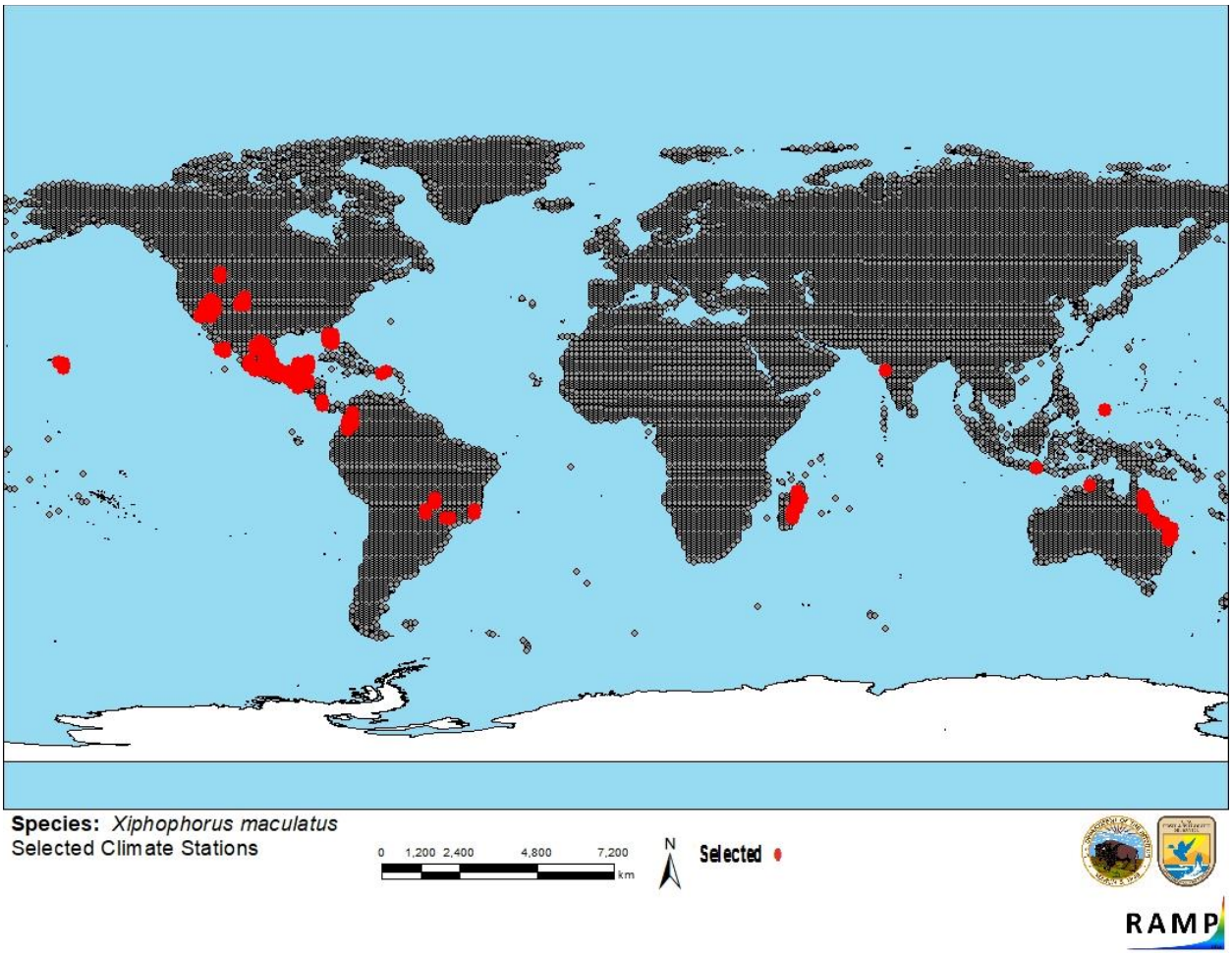

Figure 3. RAMP (Sanders et al. 2018) source map showing weather stations across the globe selected as source locations (red; United States, Mexico, Belize, Guatemala, Honduras, Colombia, Brazil, Madagascar, India, Palau, Indonesia, Australia) and non-source locations (gray) for *Xiphophorus maculatus* climate matching. Source locations from GBIF Secretariat (2019).

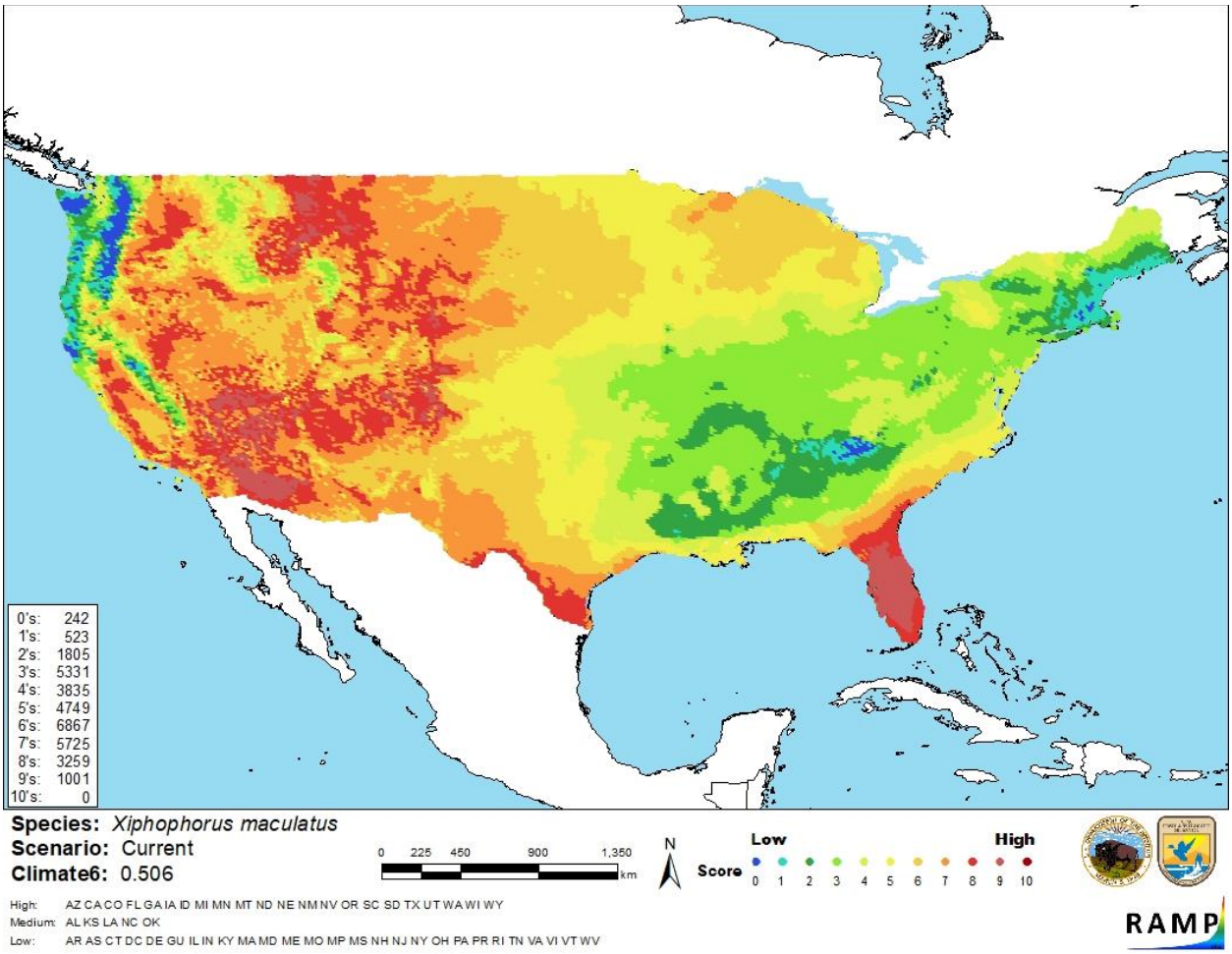

Figure 4. Map of RAMP (Sanders et al. 2018) climate matches for *Xiphophorus maculatus* in the contiguous United States based on source locations reported by GBIF Secretariat (2019). Counts of climate match scores are tabulated on the left. 0=Lowest match, 10=Highest match.

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

7 Certainty of Assessment

Information on the biology, ecology, and distribution of *Xiphophorus maculatus* was readily available upon review. However, information on impacts from introduction of *X. maculatus* are poorly understood. A fair amount of scientific literature suggests negative impacts, but further research is needed to reach definitive conclusions. Certainty of assessment for *X. maculatus* is low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Xiphophorus maculatus, Southern Platyfish, is a fish species native to northern Central America. The omnivorous *X. maculatus* feeds on worms, crustaceans, insects and plants, and is a livebearer that attains sexual maturity after 3-4 months. A popular ornamental fish in the United States and internationally, this species has a wide distribution beyond its native range, with established populations in Asian, African, Caribbean, Oceanic, South American, and North American countries. The species has been associated with potential negative impacts in some of these locations, although the direct influence of *X. maculatus* relative to other introduced species is unclear and more research is needed in this area. The history of invasiveness is classified as "none documented" based on currently available information. *X. maculatus* is currently established in several States within the contiguous United States, including Hawaii, Florida, Colorado, Montana, California, and Nevada, as well as the Commonwealth of Puerto Rico. There is a high overall climate match with the contiguous United States. The certainty is low for this assessment because of the lack of clear and convincing evidence on impacts of *X. maculatus* introduction or the lack thereof. The overall risk posed by *X. maculatus* to the contiguous United States is uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 3): None Documented**
- **Climate Match (Sec. 6): High**
- **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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