Suckermouth Catfish (*Hypostomus plecostomus*)
Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, Web Version – 1/29/2018

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1 Native Range and Status in the United States

Native Range
From Nico and Neilson (2015):

"South America: Guyana, Surniame [*sic*] and French Guiana, between the Essequibo and Oyapock River basins (Weber et al. 2012)"

Status in the United States
From Nico and Neilson (2015):

"*Hypostomus plecostomus* was collected from Six Mile Creek in Tampa, Florida in 1972 (museum specimens). Various other reports from around the state (Florida FWC 2000), including a borrow pit in Wayside Park in Perrine, Miami-Dade County (Shafland 1976). Collected in

Indian Spring, Nevada, in 1983 (museum specimens). Reported in several watersheds in Texas: the San Antonio River (Texas Parks and Wildlife Department 2001; museum specimens), San Felipe Creek (Gleason 2004), the San Marcos River (museum specimens), Comal River (Howells 1992; Whiteside and Berkhouse 1992), and White Oak Bayou (T. White, personal communication).
A single specimen was collected from Dos Bocas Reservoir and several specimens collected from an irrigation canal in Lajas, Puerto Rico (F. Grana, personal communication)."

"Established in Texas. Reported from Florida, Nevada, and Puerto Rico."

From CABI (2015):

"Although *H. plecostomus* was reported from Indian Spring, Nevada, in 1983, the single specimen was later determined to be an unidentified species of *Hypostomus* and not *H. plecostomus* (USGS NAS, 2015)."

From NatureServe (2017):

"The identity of the species in this genus [*Hypostomus*] that are established in the United States is uncertain."

Means of Introductions in the United States

From Nico and Neilson (2015):

"Aquarium release or escape from aquaculture facilities."

From FAO (2013):

"Reason of Introduction: ornamental"

Remarks

There is some taxonomic uncertainty that interferes with obtaining a clearly defined distribution for *Hypostomus plecostomus*.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2013):

"Kingdom Animalia
Phylum Chordata
Subphylum Vertebrata
Superclass Osteichthyes
Class Actinopterygii

Subclass Neopterygii
Infraclass Teleostei
Superorder Ostariophysi
Order Siluriformes
Family Loricariidae
Subfamily Hypostominae
Genus *Hypostomus* Lacepède, 1803
Species *Hypostomus plecostomus* (Linnaeus, 1758)"

"Taxonomic Status:
Current Standing: valid"

From Eschmeyer et al. (2017):

"***plecostomus, Acipenser*** Linnaeus [C.] 1758:238 [Systema Naturae, Ed. X v. 1 […]] Suriname River. Lectotype: NRM 32 (57.8 mm SL). Paralectotypes: ?NRM 32 (82.0 and 81.4 mm), NRM 32 (smallest). Type catalog and nomenclatural discussion: Fernholm & Wheeler 1983:222 […], Ferraris 2007:258 […]. Type information: Isbrücker 1980:30 […], Wheeler 1989:215 […]. Neotype designation by Boeseman 1968 (RMNH 18240 is considered to be invalid since at least the smallest specimen in NHRM LP 32 is regarded as part of the type series); Lectotype selected by Weber et al. 2012:210 […]. •Valid as *Hypostomus plecostomus* (Linnaeus 1758) -- (Isbrücker 1980:30 […], Burgess 1989:432 […], Galvis et al. 1997:86 […], Britski et al. 1998:135 […], Isbrücker 2001:25, 27 […], Isbrücker 2002:19 […], Camargo & Isaac 2001:145 […], Ferraris 2003:865 […], Weber in Reis et al. 2003:361 […], Armbruster 2004:79 […], Nelson et al. 2004:83 […], Scharpf 2006:20 […] as cf. *plecostomus*, Armbruster et al. 2007:67 […], Ferraris 2007:258 […], Zawadzki et al. 2010:724 […], Weber et al. 2012:196 […], 210, Page et al. 2013:81 […], Zawadzki et al. 2014:103 […], Sarmiento et al. 2014:191 […], Cardoso et al. 2016:22 […], Zhang et al. 2016:211 […], Melo et al. 2016:134 […]). **Current status:** Valid as *Hypostomus plecostomus* (Linnaeus 1758). Loricariidae: Hypostominae."

Size, Weight, and Age Range

From Froese and Pauly (2013):

"Max length : 50.0 cm SL male/unsexed; [Galvis et al. 1997]; common length: 28.0 cm TL male/unsexed; [Hugg 1996]"

From CABI (2015):

"Limited data are available on the lifespan of *H. plecostomus*. Pectoral fin rays, used in traditional age assessments, may not be accurate due to lumens that form with the growth of the fish (i.e. they become hollow) and due to non-annual formation of growth rings. Lifespans of *Hypostomus* spp. in the wild of range from 7-8 years; however, aquaria specimens are commonly reported to live for 10-15 years (Hoover et al., 2004)."

Environment

From Froese and Pauly (2013):

"Freshwater; demersal; pH range: 6.2 - 8.2; dH range: ? - 28. […]; 20°C - 28°C [assumed to be recommended aquarium temperature range] [Baensch and Riehl 1985]; […]"

From CABI (2015):

"*Hypostomus* sp. tolerate brackish water of 6-12 ppt, though are not found in higher adjacent salinities (Barletta et al., 2000; Hoover et al., 2014)."

"Although *Hypostomus* sp. can tolerate hypoxic conditions using accessory breathing, no data are available on oxygen levels necessary to promote this response."

Climate/Range

From Froese and Pauly (2013):

"Tropical; […]; 12°N - 25°S, 60°W - 51°W"

From CABI (2015):

"*Hypostomus* sp. are found living in areas where waters reach 32°C (Barletta et al., 2000). *Hypostomus* sp. are tolerant of cooler temperatures (16°C) though at 13°C they exhibit a distinctive reddening of fins due to cold stress (Grier, 1980; Hoover et al., 2014). In controlled laboratory experiments Shafland and Pestrak (1982) determined that a *Hypostomus* spp. reduced feeding at 20.5°C, stopped feeding at 18.7°C and died at 11.2°C. Hoover et al. (2014) suggested a lower lethal temperature of 12-14°C, which was supported by the absence of low temperature 'winter kills' above 15°C at Galveston Bay, Texas (Robinson and Culbertson, 2005) and the presence of winter kills at Hillsborough River at 10-12°C (Hoover et al., 2014)."

Distribution Outside the United States

Native

From Nico and Neilson (2015):

"South America: Guyana, Surniame [*sic*] and French Guiana, between the Essequibo and Oyapock River basins (Weber et al. 2012)"

Introduced

From Froese and Pauly (2013):

"Have been introduced to several Asian countries for the aquarium trade [Baensch and Riehl 1985]."

"Established: Bangladesh, Florida and Texas, Thailand, Vietnam, Malaysia, Taiwan, Sri Lanka, Philippines. Introduced: Singapore, Hong Kong, China, UK."

From Maceda-Veiga et al. (2013):

"Besides the species highlighted in our study, other ornamental species have been recorded in Iberian waters: tinfoil barb (*Barbonymus schwanenfeldi*) in Portugal (Gante et al. 2008); and, Oscar (*Astronotus ocellatus*), red piranha (*Pygocentrus nattereri*), and suckermouth catfish (*Hypostomus plecostomus*) in Spain (Elvira and Almodo´var 2001; Doadrio 2002)."

From Zięba et al. (2010):

"Other released specie of particular note are […] an armoured suckermouth catfish *Hypostomus plecostomus* (Linnaeus, 1758) in St-John's Pond of Epping Forest [England]"

From CABI (2015):

"It has been introduced to 17 countries in the Americas, Asia and Europe."

"It is possible that specimens collected and recorded as *H. plecostomus* from Brazil (Silvano and Begossi, 2001) and Argentina (Lopez et al., 1987) may be introduced populations of *H. plecostomus*, or more likely other *Hypostomus* sp., because these locations are geographically isolated from the natural distribution of *H. plecostomus* (northern South America)."

"Although introduced populations of *H. plecostomus* occur in at least 17 countries, these populations have not been well documented, particularly in many Asian countries. This has been exacerbated by the taxonomic uncertainty of loricariids in general, and *Hypostomus* and *Pterygoplichthys* spp. in particular."

"In China, *H. plecostomus* was recorded in the Huizhou segment of the Dongjiang River in 2007. It was not recorded in previous surveys in the 1980s (Liu et al., 2011). Ma et al. (2003) reported that *H. plecostomus* was introduced to aquatic habitats in the country in 1990, though provided no further details."

"In Columbia, introduced populations of *H. plecostomus* are well established in the anthropogenically-impacted upper basin of the Cauca River. Lopez Macias et al. (2009) cited the field collections of Ortega et al. (1999), where it was found that *H. plecostomus* was the most abundant fish species captured. *H. plecostomus* was introduced to Columbia from Guyana (Lopez Macias et al., 2009)."

From Pallewatta et al. (2003):

"[…] not yet considered invasive, but on "watch list"; introduced in 1990s by ornamental fish industry; escaped from breeding ponds into Laguna de Bay/nearby rivers; […]"

"*Hypostomus plecostomus* (tank cleaner), a species imported to Sri Lanka by the ornamental fish industry, […]"

Means of Introduction Outside the United States

From FAO (2013):

"Reasons of Introduction: ornamental"

From CABI (2015):

"The majority of nonindigenous populations of *H. plecostomus* are the result of the release of unwanted ornamental fishes (Mendoza-Alfaro et al., 2009; USGS NAS, 2015)."

Short Description

From Froese and Pauly (2013):

"Dorsal spines (total): 1; Dorsal soft rays (total): 7; Anal spines: 1; Anal soft rays: 3 - 5. Body short and robust; caudal peduncle not depressed. Upper parts of head and body encased in longitudinal rows of scutes; lower surface of head and abdomen naked."

"Adipose fin: present. Pectoral fins: 1 spine, 3-5 soft rays. Pelvic fins: 1 spine 5 soft rays."

From CABI (2015):

"*H. plecostomus* and other Loricariidae (including *Pterygoplichthys* sp.) can be distinguished from native North American catfishes (Ictaluridae) by the presence of flexible bony plates covering the body (absent in ictalurids) and a ventral suckermouth (terminal in ictalurids) (Nico et al., 2015)."

"In comparison with *Pterygoplichthys* sp., *H. plecostomus* is usually shorter and stouter, the head is broader relative to the length and there are small discrete dark spots on the head (Florida Fish and Wildlife Conservation Commission, 2015)."

"A commonly-introduced species of the latter genus, *Pterygoplichthys multiradiatus*, may also be differentiated from *H. plecostomus* by the connection of the last dorsal ray by a small membrane to the base of the following bony plate. The species also has a granular edge on the snout (Page and Burr, 1991)."

Biology

From CABI (2015):

"Parental care is common in loricariids and many species are cavity builders and nest guarders. Male *H. plecostomus* burrow into banks and bottom sediments to create chambers in which females lay eggs. Males guard the mass of eggs (Burgess, 1989) which hatch in 3-5 days (Baensch and Riehl, 1985). Burrows of *H. plecostomus* observed in Florida ponds exhibit a single opening but then subdivide into three or four different tunnels that extend 0.9-1.2 m parallel to the surface of the water (Grier, 1980). In Texas, burrows are reported to be 1.2-1.5 m deep (Texas Parks and Wildlife, 2012). Burrows are typically located in steeply sloping banks with soils containing almost no gravel, and they are especially evident in highly disturbed urban ponds (Hoover et al., 2014)."

"*H. plecostomus* grows rapidly and may mature at lengths of 150 mm in introduced populations in Florida (Grier, 1980), which is less than half the typical adult size of 400-500 mm (Burgess, 1989). Size at maturity of *H. plecostomus* is comparable with other *Hypostomus* sp. in their native range in South America (Nomura and Mueller, 1980; Mazzoni and Caramaschi, 1995)."

"The total fecundity of *H. plecostomus* is reported to be approximately 3000 eggs (Azevedo, 1938). The batch fecundity of female fish from the San Marcos River in Texas ranged from 871-3367 eggs per ovary (Cook-Hildreth, 2008). Data are similar to those from various *Hypostomus* sp. in their native range, which have total fecundities of several thousand eggs, and batch fecundities of approximately 1000 eggs (Mazzoni and Caramaschi, 1997; Duarte and Araújo, 2002). Egg masses of *H. plecostomus* typically contain 500-700 eggs (Grier, 1980; Hoover et al., 2014)."

"*H. plecostomus* is believed to spawn multiple times throughout a protracted spawning season. In Texas, multiple-sized oocytes, which are indicative of multiple spawning events, are documented for the species (Cook-Hildreth, 2008). The spawning season, based on gonadosomatic indices, is from March through September (Hoover et al., 2014). In their native range, *Hypostomus* sp. also exhibit protracted spawning periods of greater than 5 months, which usually coincides with the warm rainy season (Mazzoni and Caramaschi, 1997)."

"Loricariids have evolved several modifications of their digestive tracts that function as accessory respiratory organs or hydrostatic organs. These modifications include an enlarged stomach in the *Pterygoplichthys* and *Hypostomus* spp., where veins in the stomach walls uptake oxygen into the bloodstream. Loricariids are facultative air breathers and will only breathe air if subject to hypoxia (Armbruster, 1998; Texas Parks and Wildlife, 2012)."

"Loricariid catfish are generally nocturnal (PlecoInvasion, 2015) and non-migratory (Froese and Pauly, 2014). Although not migratory, loricariids exhibit a tendency to disperse throughout and between aquatic habitats. *Hypostomus* spp. can reportedly cross damp land to reach new water bodies if necessary (Texas Parks and Wildlife, 2012; Hoover et al., 2014). According to Gerstner (2007), the dispersal and station-holding ability of *Hypostomus* spp. in flowing water is facilitated by diverse behaviours distinctive to the unusual morphology of the group. These include the ability to hold onto solid substrates using the oral disc (suckermouth), pelvic fin beats, and hooking and bracing using the studded spines of the pectoral fins. These behaviours enable even comparatively small individuals (approximately 80 mm total length) to negotiate flows up to 145 cm/s. Consequently, a single population can quickly colonize adjacent water bodies (Hoover et al., 2014)."

From Nico and Neilson (2015):

"Occurs in quiet, slow-moving waters and swamps of the lower reaches of rivers between the lower falls and the estuarine zone (Weber et al. 2012)."

Human Uses

From Froese and Pauly (2013):

"Fisheries: subsistence fisheries; aquarium: highly commercial"

"Is cultured in ponds in Singapore and Hong Kong for the aquarium trade, where it is very popular [Baensch and Riehl 1985]."

From CABI (2015):

"According to Sterba (1966), the ornamental trade in 'suckermouth catfishes' began in 1893 with commercial imports of *H. plecostomus*. *Hypostomus* spp. were common in the ornamental trade in the 1960s and 1970s, when loricariids were exported from Venezuela, Suriname and the Guyanas (the natural distribution of *H. plecostomus*) (PlanetCatfish, 2015)."

"*H. plecostomus* are consumed in parts of their native range (Burgess, 1989) and in Mexico (around the Infierinillo Reservoir) (Hoover et al., 2014)."

"In Mexico, *Hypostomus* and *Pterygoplichthys* sp. have been used to produce collagen, fish paste and fishmeal (Mendoza-Alfaro et al., 2009)."

"During the 1960s, *H. plecostomus* was used to control algae in pools at a zoo in Texas (Barron, 1964). They have also been introduced into the Balsas Basin, Mexico, to control macrophytes and algae (Mendoza-Alfaro et al., 2009). It is not recorded whether these attempts at biological control were successful."

Diseases

No records of OIE reportable diseases were found.

From Froese and Pauly (2013):

"White spot Disease, Parasitic infestations (protozoa, worms, etc.)
Skin Flukes, Parasitic infestations (protozoa, worms, etc.)
Velvet Disease, Parasitic infestations (protozoa, worms, etc.)"

Threat to Humans

From Froese and Pauly (2013):

"Harmless"

3 Impacts of Introductions

From Nico and Neilson (2015):

"In Texas, Hubbs et al. (1978) reported possible local displacement of algae-feeding native fishes such as *Campostoma anomalum* by *Hypostomus*, and López-Fernández and Winemiller (2005) suggest that reductions in *Dionda diaboli* abundance in portions of San Felipe Creek are the result of population increases of *Hypostomus*. Because of their abundance in Hawaii, introduced *Hypostomus*, *Pterygoplichthys*, and *Ancistrus* may compete for food and space with native stream species (Devick 1989; Sabaj and Englund 1999)."

From Marambe et al. (2011):

"The tank cleaner (*Hypostomus plecostomus*) can out-compete native biota. The species is an omnivore with a diet varying from plankton to plant matter and invertebrates. Further invasion to inland waters may pose a threat to endemic fish species (Wijethunga and Epa 2008). The scrape feeding habits of the tank cleaner could change habitat quality, leading to detrimental effects on co-occurring species (Amarasinghe et al. 2006)."

From CABI (2015):

"Economic impacts of introduced populations of *Hypostomus* and *Pterygoplichthys* sp. have been quantified for commercial tilapia fisheries in Florida and Mexico (Mendoza-Alfaro et al., 2009). During the period 1993-2006, tilapia catch in six lakes in Florida decreased from 45-80% of the total catch to 17-30% of the total catch after *Hypostomus* and *Pterygoplichthys* sp. became established. Concurrently, the representation of loricariids increased to 11-65% of the commercial catch (Hoover et al., 2014)."

"The tilapia catch in a reservoir in Mexico decreased 83% after proliferation of *Hypostomus* and *Pterygoplichthys* sp.. As a result, individual fishermen spend an additional $1400-$2600/year to replace damaged nets, work an additional 2 hr/day, and lose more than $29,000 (US) per year. Total economic losses are approximately $16.4 million: $11.63 million from commercial fishing (losses in gear, hours worked, revenue from catch, health status), $4.74 million from natural capital (water quality, shoreline formation, native fauna), and an unknown quantity from effects on aquarium trade (sale of illegally traded wild-caught *Hypostomus* and *Pterygoplichthys* sp.) (Hoover et al., 2014)."

"The burrows created by *Hypostomus* sp. during reproduction may cause erosion, sedimentation and increased turbidity. Bank failure, shoreline collapse and terracing have been observed in Mexico, Texas, and Florida where burrow densities were high (Hoover et al., 2014)."

"Grazing *H. plecostomus* may reduce algal standing crops and composition. Extensive grazing may promote a change in algal composition from green algae-dominated communities to diatoms (Flecker, 1992) or diatom-dominated communities to blue-green algae (Power, 1984). Resultant impacts include reduced quality of habitat for algae-dwelling invertebrates and fishes, and reduction in food sources for other grazing aquatic organisms (Hoover et al., 2014)."

“Impacts on aquatic biodiversity have been observed as a result of introduced populations of *H. plecostomus* in Texas (San Antonio and San Marcos rivers, and San Felipe Creek). *H. plecostomus* may compete for resources (food and habitat) with sympatric fishes and aquatic organisms, disturb nest sites, eat eggs of native fishes and disrupt trophic flows and nutrient cycling aquatic habitats.”

“In the San Antonio River, *H. plecostomus* has been implicated in the reduced abundance of the algae-eating central stoneroller *Campostoma anomalum* (Hubbs et al., 1978; Hoover et al., 2014).”

“In San Felipe Creek, *H. plecostomus* is believed to be impacting populations of the IUCN endangered Devils River minnow *Dionda diaboli*. *D. diaboli* was once abundant in San Felipe Creek, but the species has undergone a major decrease in abundance concurrent with the dramatic increase in the population of *H. plecostomus* (Howells, 2005). *D. diaboli* is an algivore and is probably subject to resource competition with *H. plecostomus* (Hoover et al., 2014). Other algal-feeding species have also declined, including the native snail *Elimia comalensis* (Howells, 2005).”

“In the San Marcos River, considerable research has been conducted on the biology and ecology of introduced populations of *H. plecostomus*. Pound et al. (2011) investigated the diet of introduced populations of *H. plecostomus* from the San Marcos River using gut contents and stable isotope analyses. They found that *H. plecostomus* primarily consumed amorphous detritus with small quantities of filamentous red algae and picoplankton. They concluded that the large populations of *H. plecostomus* in the San Marcos River probably compete with several native herbivorous fishes and may be disrupting trophic flows and nutrient cycling in spring-influenced streams of central and west Texas.
One of the herbivorous fishes impacted by *H. plecostomus* in the San Marcos River is the IUCN endangered fountain darter *Etheostoma fonticola* (Hoover et al., 2014). *E. fonticola* deposits its eggs on algae and is believed to be impacted by loss of spawning habitat and egg predation. Cook-Hildreth (2008) conducted experiments on the egg survival of *E. fonticola* and the results suggested that survival was reduced in the presence of *H. plecostomus*. The observation of *E. fonticola* eggs in the stomach of *H. plecostomus* indicated that direct predation of eggs also occurs.”

“Scott et al. (2012) reported that *H. plecostomus* has a wide range and occurs in high densities in the San Marcos River. They conducted mesocosm experiments to determine the impacts of *H. plecostomus* on aquatic ecosystem function and found that it impacted on ecosystems by decreasing periphyton biomass, altering periphyton nutrient ratios, and facilitating detrital decomposition. The presence of *H. plecostomus* altered the aquatic invertebrate community composition in leaf packs and produced ecosystem engineering effects by altering the benthic habitat. Mesocosm experiments by Hoover et al. (2013) demonstrated that *Hypostomus* sp. and *Pterygoplichthys* sp. did not impact water quality or an insectivorous fish after three months, but reduced the abundance of a floating macrophyte, increased phytoplankton-based turbidity and eliminated periphyton.”

"Hoover et al. (2014) theorized that *H. plecostomus* can monopolize nutrient resources in the San Marcos River due to the species rapid maturation, high densities and longevity. The large size and high density of *H. plecostomus* may constitute a significant phosphorus sink in the oligotrophic San Marcos River system. This may lead to reduced primary productivity in the form of a reduction in algal standing crops, which may in turn may impact secondary productivity and invertebrate standing crops."

From Pallewatta et al. (2003):

"*Hypostomus plecostomus* (tank cleaner), a species imported to Sri Lanka by the ornamental fish industry, has been observed to attach itself by its ventral sucker to the bodies of larger fish. When it detaches, the slime layer covering the outside of the fish which acts as a protective covering is also removed, making the host susceptible to diseases (Bambaradeniya et al., 2001)."

4 Global Distribution

Figure 1. Known global distribution of *Hypostomus plecostomus*. Map from GBIF Secretariat (2017).

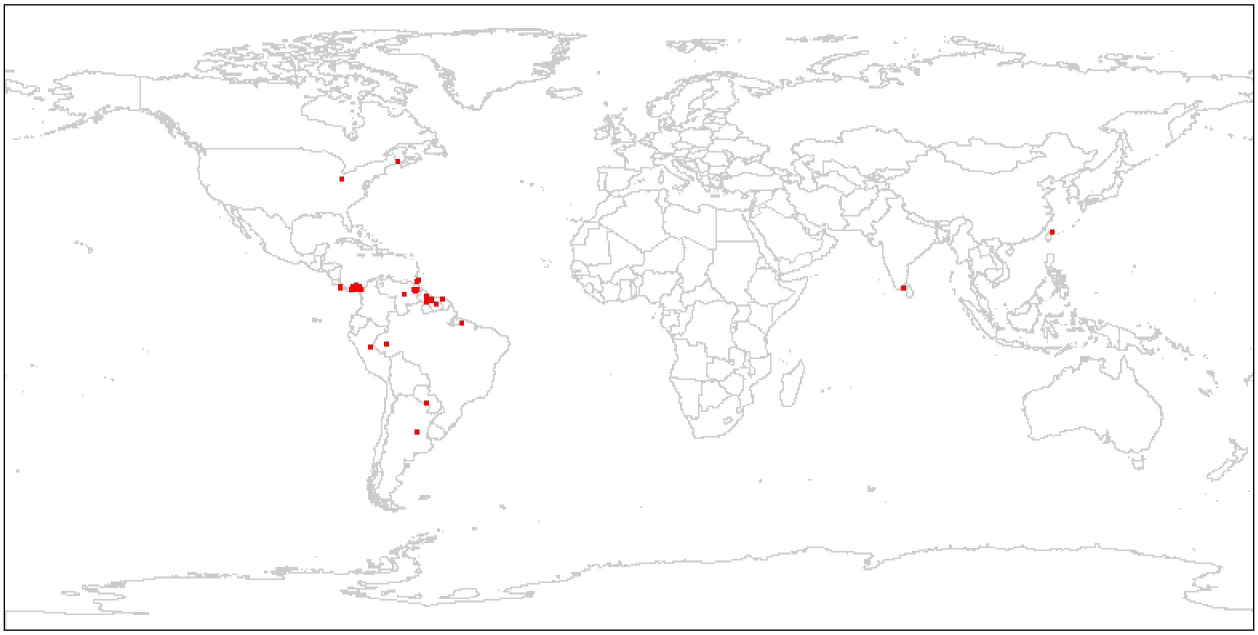

Figure 2. Known global distribution of *Hypostomus plecostomus*. Map from Froese and Pauly (2015).

Locations reported in Canada and Ohio were from aquarium collections and not wild observations (GBIF Secretariat 2017). Locations in South America that were south of the described native range were not included due to confusion about the species identification of those populations (CABI 2015). The record England (Zięba et al. 2010) did not have more specific location data. None of these locations were used as source points in the climate match.

5 Distribution Within the United States

Figure 3. Known distribution of *Hypostomus plecostomus* within the United States. Map from USGS NAS Database (Nico and Neilson 2015).

The record in Nevada did not represent an established population (CABI 2015) and was not used as a source point in the climate match.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Hypostomus plecostomus* was very high through Texas, Florida, the southern Atlantic coast, the southern Pacific Coast, and along the border with Mexico. Parts of the Middle Atlantic States and the Great Lakes Basin had a medium to high match. Elsewhere had a low match. The Climate 6 score (Sanders et al. 2014; 16 climate variables; Euclidean distance) for the contiguous U.S. was 0.205, high, and individually high in Arizona, Arkansas, California, Florida, Georgia, Louisiana, Maryland, Mississippi, New Mexico, North Carolina, Oklahoma, South Carolina, Texas, and Virginia.

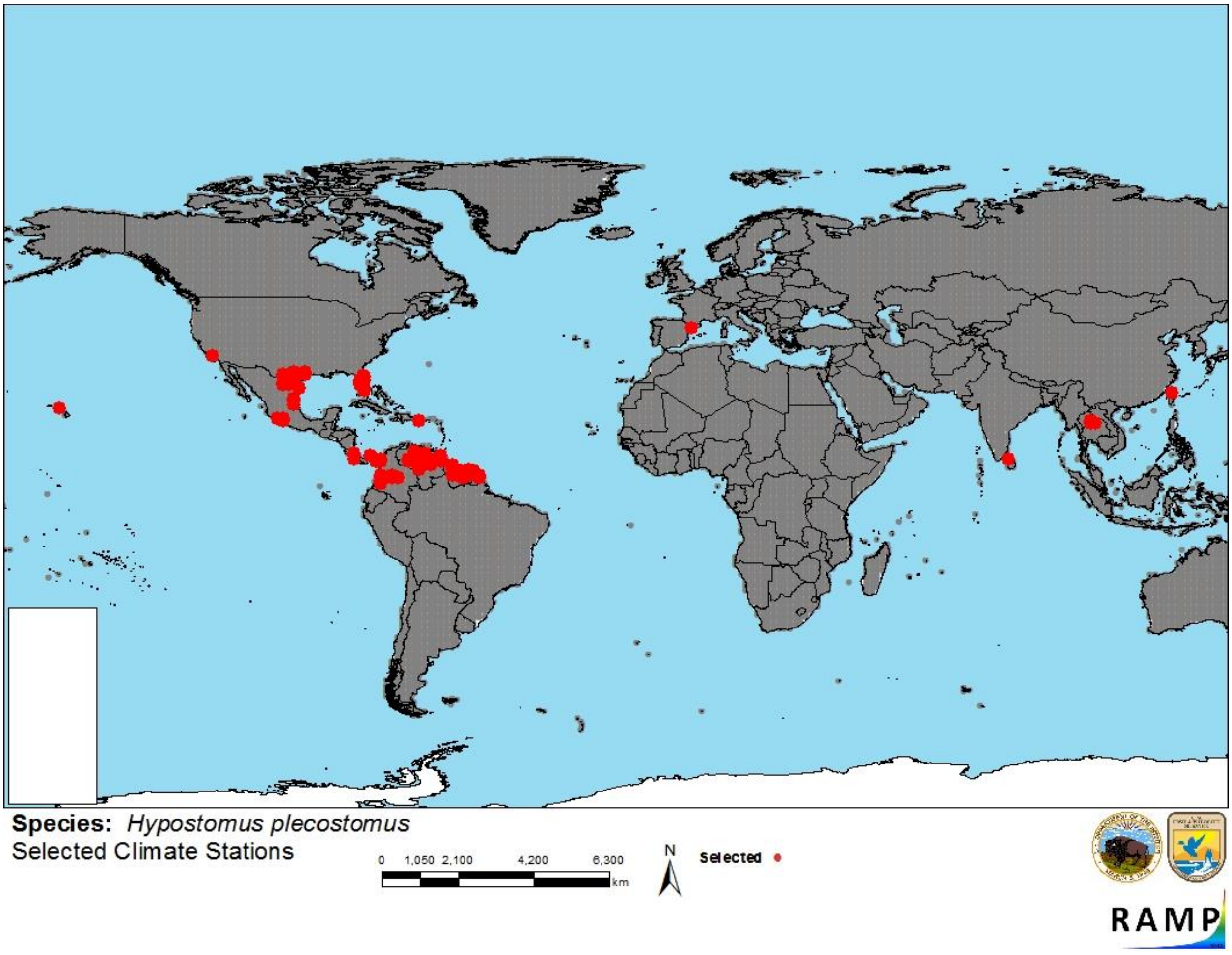

Figure 4. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (grey) for *Hypostomus plecostomus* climate matching. Source locations from CABI (2015), Froese and Pauly (2015), USGS NAS Database (Nico and Neilson 2015), and GBIF Secretariat (2017).

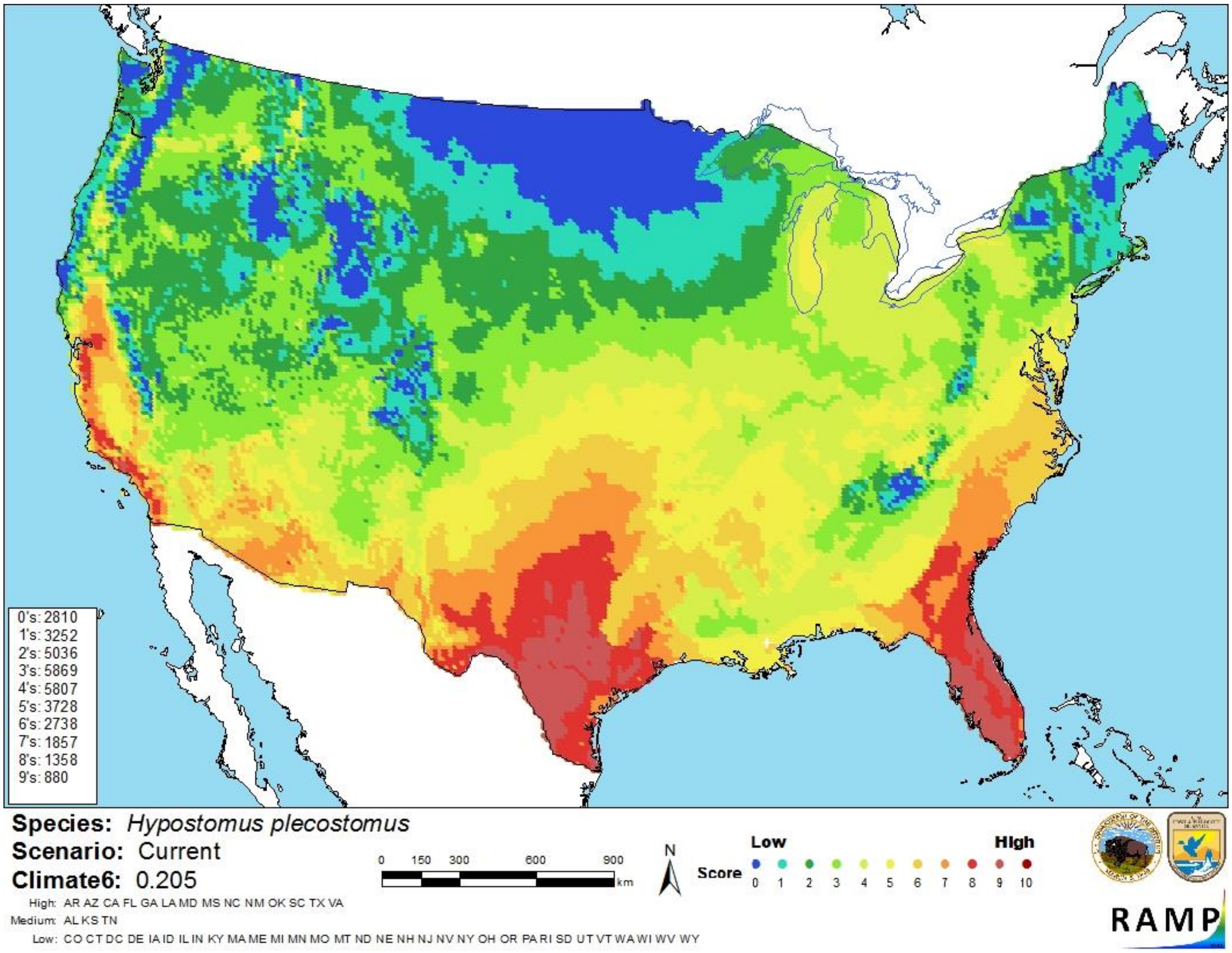

Figure 5. Map of RAMP (Sanders et al. 2014) climate matches for *Hypostomus plecostomus* in the contiguous United States based on source locations reported by CABI (2015), Froese and Pauly (2015), USGS NAS Database (Nico and Neilson 2015), and GBIF Secretariat (2017). 0 = Lowest match, 10 = Highest match.

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

7 Certainty of Assessment

The certainty of assessment is medium. There was a good amount of information available from reliable sources for this species. Many records of introductions and impacts of introductions were found for *Hypostomus plecostomus*. There is some doubt to the native distribution of *H.*

plecostomus. Many records were incomplete and doubt has been cast on the species identification of populations in South America outside of *H. plecostomus*' native range.

8 Risk Assessment

Summary of Risk to the Contiguous United States

The history of invasiveness for *Hypostomus plecostomus* is high. Established populations easily expand their range in favorable conditions. There are many well documented ecological and economic impacts due to introductions of *Hypostomus plecostomus*. The climate match of this species is high. Most of the contiguous United States had at least a medium match, many places had high matches. The certainty of assessment is medium. The overall risk assessment category is high.

Assessment Elements

- **History of Invasiveness (Sec. 3): High**
- **Climate Match (Sec. 6): High**
- **Certainty of Assessment (Sec. 7): Medium**
- **Remarks/Important additional information** The identity of the species in this genus that is established in the United States is uncertain (NatureServe (2017).
- **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.

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