U.S. Fish & Wildlife Service

Brown Hoplo (*Hoplosternum littorale*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, July 2019
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Photo: Cláudio Dias Timm. Licensed under Creative Commons Attribution- ShareAlike 2.0 Generic License. Available: https://fr.wikipedia.org/wiki/Fichier:Hoplosternum_littorale.jpg. (July 2019).

1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2019):

"South America: Most Cis-Andean South American river drainages north of Buenos Aires, Argentina [Reis 2003]."

Froese and Pauly (2019) and CABI (2019) lists *Hoposternum littorale* as native to Trinidad Tobago, Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, and Venezuela.

From Nico et al. (2019):

"Native Range: Tropical America. Occurs in Trinidad, and is widespread in South America east of the Andes and north of Buenos Aires, including the Rio Orinoco, coastal rivers of the Guianas, Rio Amazonas basin, Rio Paraguay, lower Rio Parana and coastal systems in southern Brazil (Reis 1997)."

From CABI (2019):

"Over its native range, this species occurs in lowland areas of Trinidad, Guyana, Suriname, French Guiana, Bolivia, Paraguay, Argentina and Brazil (Nico et al., 1996)."

Status in the United States

From Froese and Pauly (2019):

"Introduced in the USA [Orfinger 2015]."

"A population was discovered in ditches of the Indian River lagoon system of Florida in late 1995 [Bartley 2006]. Populations have been found in the St. Johns and Kissimmee River drainages [Nico et al. 2011]."

According to Nico et al. (2019), nonindigenous occurrences of *Hoplosternum littorale* have been reported in the following states, with range of years and hydrologic units in parentheses:

- Florida (1995-2019; Alafia; Big Cypress Swamp; Caloosahatchee; Cape Canaveral; Charlotte Harbor; Crystal-Pithlachascotee; Daytona-St. Augustine; Everglades; Florida Southeast Coast; Hillsborough; Kissimmee; Lake Okeechobee; Lower St. Johns; Manatee; Myakka; Northern Okeechobee Inflow; Oklawaha; Peace; St. Marys; Tampa Bay; Upper St. Johns; Western Okeechobee Inflow; Withlacoochee)
- Georgia (2016-2018; Lower Flint; St. Marys)

From Nico et al. (2019):

"Status: Established in Florida (Nico et al. 1996), this species has expanded its range throughout peninsular Florida, as far north as the Jacksonville area in Duval County."

Hoplosternum littorale may be in trade within the United States (Nico et al. 2019).

Means of Introductions in the United States

From Nico et al. (2019):

"Means of Introduction: Unknown. Possibly released food fish, aquarium release, or escape from aquaculture ponds. Expanded range around Florida may have been assisted by humans to establish both commercial and subsistence fisheries (Gestring et al. 2009)."

"A small commercial and recreational castnet fishery for *H. littorale* has commenced in Florida, which is a popular food fish in its native range. Part of the species' rapid expansion throughout

peninsular Florida may have resulted from illegal movement by castnet fishermen to enhance local fisheries (Gestring et al. 2009)."

From Hardin (2007):

"Cultural influence appears to have opened new pathways, particularly for non-native fishes. […] Brown hoplo (*Hoplosternum littorale*), a small South American catfish prized as food item, may have been spread by immigrants with no knowledge of laws to the contrary. A Venezuelan immigrant confided to an FWC biologist that he regularly placed hoplo in southeast Florida canals to have a readily available food source."

Remarks

A previous version of this ERSS was published in 2014. Revisions were done to incorporate new information and to bring the document in line with current standards.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From Fricke et al. (2019):

"**Current status:** Valid as *Hoplosternum littorale* (Hancock 1828)."

From ITIS (2019):

"Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Ostariophysi
Order Siluriformes
Family Callichthyidae
Subfamily Callichthyinae
Genus *Hoplosternum*
Species *Hoplosternum littorale* (Hancock, 1828)"

Size, Weight, and Age Range

From Froese and Pauly (2019):

"Maturity: L_m 16.7 […]
Max length : 26.3 cm TL male/unsexed; (Ref. 104645); max. reported age: 4 years [Meunier et al. 2002]"

From CABI (2019):

"A maximum size of 218 mm (standard length) has been reported for this species (Winemiller, 1987). Males grow to a maximum of 200 mm and females to about 150 mm."

Environment

From Froese and Pauly (2019):

"Freshwater; demersal; depth range 1 - ? m [Kenny 1995]. […]; 18°C - 26°C [assumed to be recommended aquarium temperature] [Baensch and Riehl 1985]; […]"

Climate/Range

From Froese and Pauly (2019):

"Subtropical; […]; 11°N - 37°S"

Distribution Outside the United States

Native

From Froese and Pauly (2019):

"South America: Most Cis-Andean South American river drainages north of Buenos Aires, Argentina [Reis 2003]."

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From Nico et al. (2019):

"Native Range: Tropical America. Occurs in Trinidad, and is widespread in South America east of the Andes and north of Buenos Aires, including the Rio Orinoco, coastal rivers of the Guianas, Rio Amazonas basin, Rio Paraguay, lower Rio Parana and coastal systems in southern Brazil (Reis 1997)."

From CABI (2019):

"Over its native range, this species occurs in lowland areas of Trinidad, Guyana, Suriname, French Guiana, Bolivia, Paraguay, Argentina and Brazil (Nico et al., 1996)."

Introduced

No information was found on introductions outside of the United States for *Hoplosternum littorale.*

Means of Introduction Outside the United States

No information was found on introductions outside of the United States for *Hoplosternum littorale.*

Short Description

From CABI (2019):

"*H. littorale* has a bony armour consisting of two rows of large hard scales forming plate-like armour along each side; dark brown to black in colour with two pairs of long barbels on the chin. The barbels are used to detect the presence of food. Breeding males possess enlarged bright red pectoral spines, with hooks at the tips, which are used as weapons in aggressive territorial bouts (Nico et al., 1996). Eyes are not well developed. […]. As the gills are underdeveloped in *H. littorale*, gill breathing is supplemented by its ability to breath air via the intestinal epithelia (Boujard et al., 1990; Ramnarine, 1994a, b; Brauner et al., 1995; Nico et al., 1996)."

Biology

From Froese and Pauly (2019):

"Inhabits swamps [Kenny 1995]. During the rainy season, adults consume a great quantity of chironomids associated with detritus. During the dry season, they feed mostly on terrestrial insects, micro-crustaceans, aquatic Diptera, and detritus. Absorbs a great quantity of anaerobic bacteria from the substrate [Boujard et al. 1997]. First reproduction occurs after one year [Le Bail et al. 2000]."

"Reproduction begins with the rainy season (December-January). The male, at times helped by the female, builds a nest made of a cluster of mucus bubbles and vegetal matter. Responding to a nuptial parade, the female lays down her eggs (5,000 to 20,000, measuring1.8 mm in diameter) which are fertilized by sprinkling sperm previously collected in her mouth. The male guards the eggs during incubation and becomes very aggressive [Le Bail et al. 2000]."

From Nico et al. (2019):

"Ecology: *Hoplosternum littorale* is typically found in a variety of freshwater habitats, including slow-moving rivers, canals, streams, and pools (Nico et al. 1996; Gestring et al. 2009). This species is a facultative air breather, an adaptation that allows it to colonize and survive in habitats with low dissolved oxygen (Winemiller 1987; Brauner et al. 1995), such as the seasonal wetlands of the Florida peninsula (Kline et al. 2013). This species is a benthic scavenger, primarily consuming benthic microcrustaceans (e.g., cladocerans, ostracods), aquatic insect larvae, detritus, and plant matter (Winemiller 1987; Gestring et al. 2009).

Brown hoplos are sexually dimorphic, with males larger than females and possessing enlarged pectoral fin spines and adjacent fat deposits during the reproductive season. These enlarged spines are used in aggressive or defensive encounters (Winemiller 1987; Hostache and Mol 1998). Nico and Muench (2004) describe nesting habits of this species in Florida. Spawning season in Florida occurs [sic] from May to September, coinciding with the rainy season and

generally higher water levels and temperatures, and similar to the timing of the reproductive season in the native range (Winemiller 1987). Numbers of bubble nests and gonadosomatal indices (GSI) for both males and females peak in August-September (Nico and Muench 2004; Gestring et al. 2009)."

From Brauner et al. (1995):

"The armoured catfish (*Hoplosternum littorale*) from the Amazon River system is a facultative air breather that is tolerant to both acidic and hydrogen sulphide rich waters. […]. Thus, in the armoured catfish, air breathing may be more important for surviving in hydrogen sulphide rich and acidic waters than for surviving in mild hypoxia."

From Juca-Chagas (2004):

"*L. paradoxa, H. unitaeniatus* and *H. littorale* can survive for long periods in hypoxic or anoxic waters exclusively through aerial respiration. Therefore, their air-breathing organs (ABO) are sufficient to maintain these fishes under these conditions. Furthermore, we emphasize the greater capacity of *H. littorale* for air breathing."

Human Uses

From Froese and Pauly (2019):

"Used to be cultured commercially in Guyana [FAO 1993]. Cultured in Trinidad on a semi-commercial scale [Kenny 1995]."

"Fisheries: commercial; aquaculture: commercial; aquarium: commercial"

From Nico et al. (2019):

"A small commercial and recreational castnet fishery for *H. littorale* has commenced in Florida, which is a popular food fish in its native range."

From Ramnarine (1995):

"The cascadu is a popular food fish in the neotropics and is heavily exploited in Trinidad, Guyana, French Guiana and Suriname."

Diseases

No records of OIE-reportable diseases (OIE 2019) were found for *Hypomesus nipponensis.*

Poelen et al. (2014) lists *Spasskyellina spinulifera, Crassicutis intermedius, Clinostomum complanatum,* and *Magnivitellinum corvitellinum* as parasites of *Hoplosternum littorale.*

Threat to Humans

From Froese and Pauly (2019):

"Harmless"

3 Impacts of Introductions

From Nico et al. (2019):

"Impact of Introduction: Largely unknown. In several Florida water bodies, this species is locally abundant; […]. This species utilizes atmospheric oxygen by surfacing to breath, and can tolerate a wide range of environmental conditions (e.g., fresh and brackish waters). There is concern that it will eventually invade many natural freshwater wetlands and coastal marshes in Florida (Nico et al. 1996)."

"Stevens et al. (2010) found that *H. littorale* was an important part of the diet of Common Snook (*Centropomus unidecimalis*) in the tidal freshwater portion of the Peace River immediately following Hurricane Charley in 2004. It is also consumed by other large piscivores, including Largemouth Bass (*Micropterus salmoides*), Butterfly Peacock Bass (*Cichla ocellaris*), alligators, Double-crested Cormorant (*Phalacrocorax auritus*), and Great Blue Heron (*Ardea herodias*) (Gestring et al. 2009)."

From Duxbury et al. (2010):

"We used enclosure cages (n = 10) to test the effects of fish on macroinvertebrates. The experimental design included two treatments: fish and a control with no fish, with five replicates per treatment. Cages were 1m (H)×0.82m (L)×0.65m (W) composed of polyvinyl pipes forming the frame and then completely covered with 14 mm mesh size aquaculture screen. Cages were secured to the stream bottom with metal stakes."

"Prior to the start of the experiment (October 2005), we caught the hoplo catfish from the study stream using a cast net. We then placed two catfish into each fish-treatment cage."

"Our results suggest that hoplo catfish impact aquatic macroinvertebrate assemblages on artificial substrates. We found that macroinvertebrate abundances and taxa richness on MAS [macroinvertebrate artificial substrates] in cages with fish were significantly reduced by about 30 and 50%, respectively […]."

"While our results suggest that this invasive catfish could impact macroinvertebrates, clearly there are uncertainties. For example, a mechanistic explanation would help clarify these impacts. Also, environmentally realistic fish densities, especially, as compared to native fish, should be estimated. To our knowledge, there are no published data on the densities of these fish. Finally, the impacts of the hoplo must be compared to native fish. This knowledge would lead to a better understanding of the ecological impacts of this invasive fish."

4 Global Distribution

Figure 1. Known global distribution of *Hoplosternum littorale*. Locations are found in Florida, Colombia, Venezuela, Guyana, Suriname, French Guiana, Brazil, Peru, Bolivia, Paraguay, Argentina, and Uruguay. Map from GBIF Secretariat (2019).

5 Distribution Within the United States

Figure 2. Known distribution of *Hoplosternum littorale* in the United States. Locations are in Florida and Georgia. Map from Nico et al. (2019). It is unknown if the observation in Georgia is representative of an established population so it was not used to select source points for the climate match.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Hoplosternum littorale* in the Southeast and Southern Great Plains was generally high in coastal areas, and medium in interior areas. The majority of the Northwest to northern Midwest and New York through New England had a low match. There were patches of high match in the Southwest United States. The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.114, high (scores 0.103 and greater are classified as high). A majority of the States had low individual Climate 6 scores except for Alabama, Arizona, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Texas, which had high individual scores, and Arkansas, Maryland, New Mexico, Oklahoma, and Virginia, which had medium individual scores.

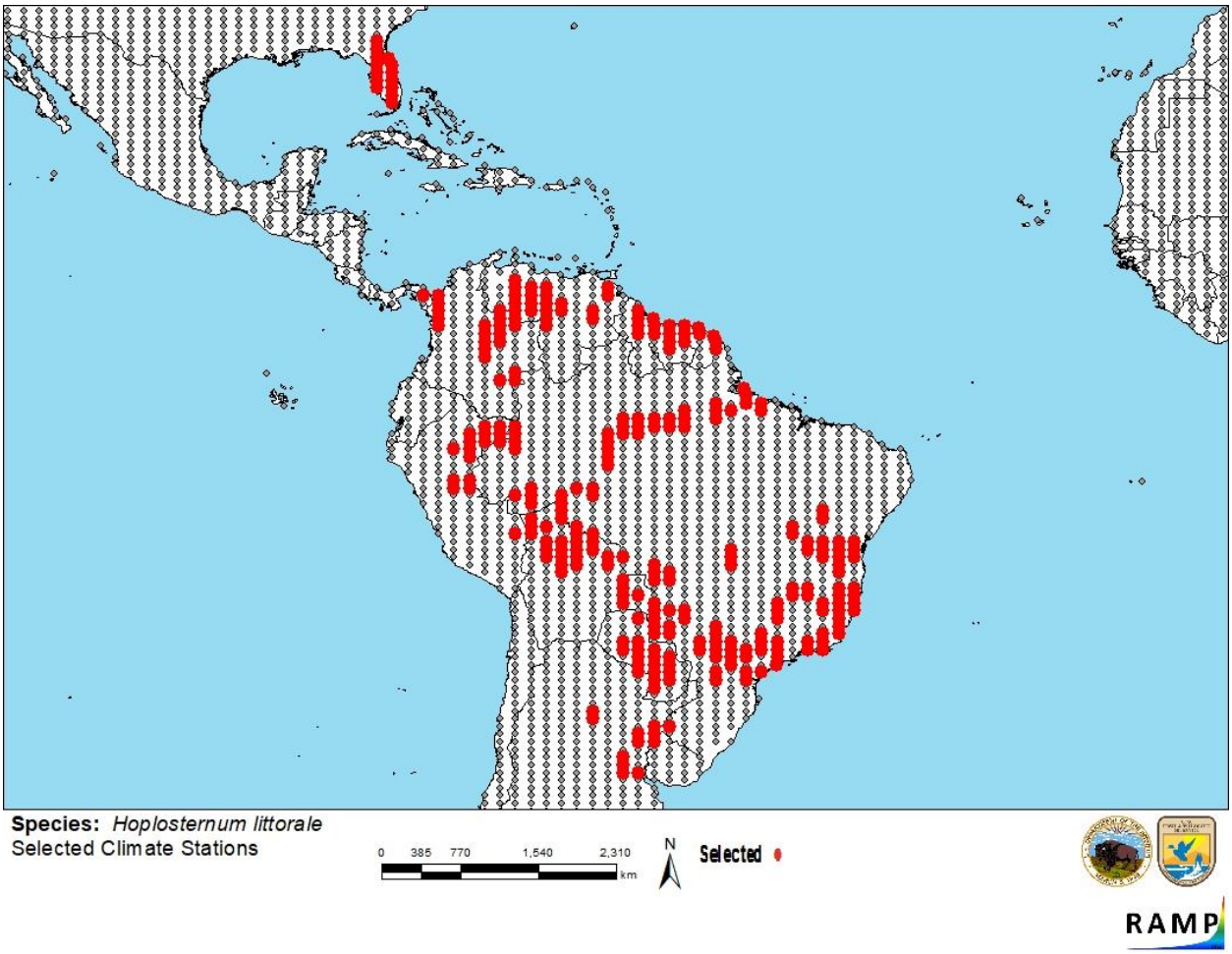

Figure 3. RAMP (Sanders et al. 2018) source map showing weather stations throughout North and South America selected as source locations (red; United States, Trinidad Tobago, Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, and Venezuela.) and non-source locations (gray) for *Hoplosternum littorale* climate matching. Source locations from GBIF Secretariat (2019). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

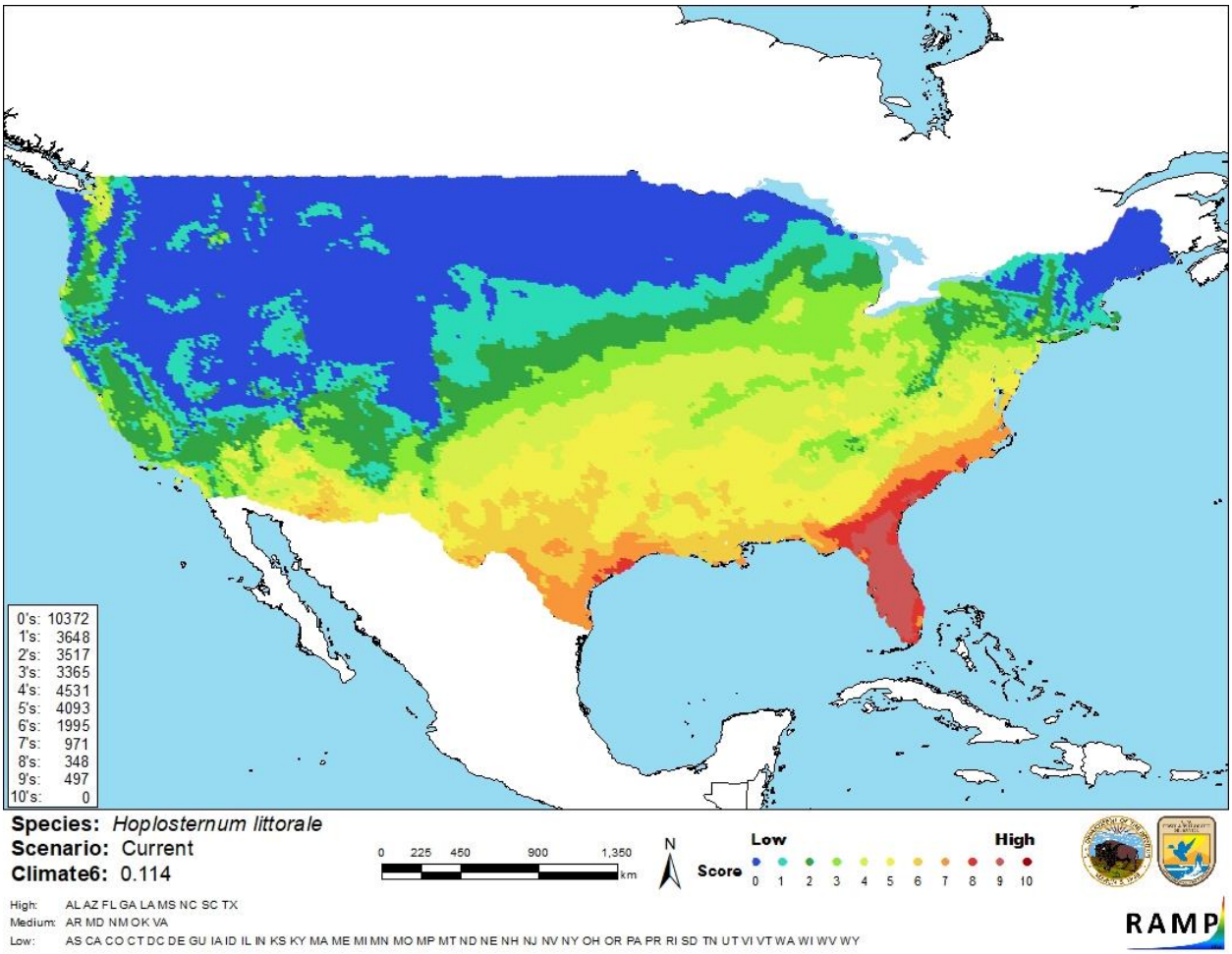

Figure 4. Map of RAMP (Sanders et al. 2018) climate matches for *Hoplosternum littorale* in the contiguous United States based on source locations reported by GBIF Secretariat (2019). 0 = Lowest match, 10 = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)	Climate Match Category
0.000≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

7 Certainty of Assessment

The certainty of assessment for *Hoplosternum littorale* is low. Information on the biology, distribution, and introductions was readily available. *H. littorale* has been established outside of its native range in Florida; however, no evidence of adverse impacts in the wild has been reported. Research in experimental settings have documented a potential impact but the results were not conclusive.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Brown Hoplo (*Hoplosternum littorale*) is a freshwater catfish native to South America. The species is commercially fished for human consumption and there is some recreational use. *H. littorale* has been established in Florida since 1995 and has expanded its range to cover much of the state; it has also been reported from Georgia but it is unknown if there is an establish population there. Most of the expansion may be due to illegal stocking to create a food source. Due to the lack of actual documented impacts of *Hoplosternum littorale* the invasiveness of this species is None Documented. Cage field studies have shown it to impact macroinvertebrate assemblages. This ecosystem interactions could lead to adverse impacts, but as of yet, there is no direct evidence of this. This species has a high climate match with the contiguous United States. The highest areas of match were in the Southeast while the Northeast, northern Midwest, and much of the west had low climate matches. The certainty of assessment is low due to a lack of documented actual impacts. The overall risk for this species is uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 3): None Documented**
- **Climate Match (Sec. 6): High**
- **Certainty of Assessment (Sec. 7): Low**
- **Remarks/Important additional information:** No additional remarks.
- **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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