Blue Catfish (*Ictalurus furcatus*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, August 2014
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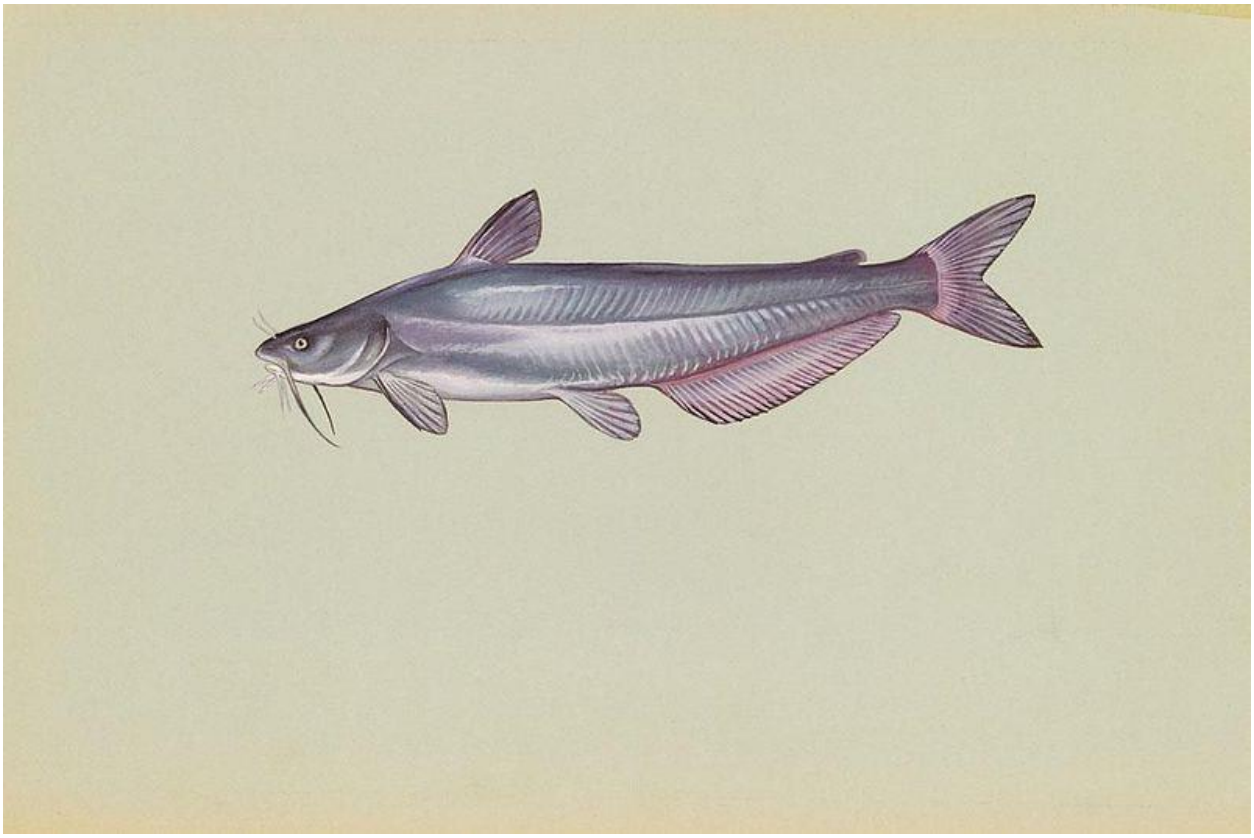

Image: D. Raver, U.S. Fish and Wildlife Service.

1 Native Range and Status in the United States

Native Range

From Fuller and Neilson (2019):

"Native Range: Mississippi River basin from western Pennsylvania to southern South Dakota and the Platte River, southwestern Nebraska, south to the Gulf of Mexico; tributaries of the gulf from Mobile Bay basin, Alabama, to the Rio Grande drainage, Texas and New Mexico. *Ictalurus furcatus* is endemic to the Mississippi, Missouri, and Ohio River basins of the central and southern United States and inhabits Gulf Coast streams from Alabama south into Mexico. Also,

native to the Atlantic Slope of Mexico (Page and Burr 1991) if not distinguished separately from *I. meridionalis* (Gilbert 1998). Rarely found in the Mississippi above the confluence with the Missouri River (Becker 1983). Two historic records from Wisconsin (one from Lake Pepin, and one from Lansing Iowa) are believed to be misidentifications of Channel Catfish (Becker 1983). As such, Becker does not consider the species native to Wisconsin."

From CABI (2019):

"The blue catfish, *Ictalurus furcatus*, is native to central and southern states of the USA, Mexico and Guatemala."

"*I. furcatus* is native to the major rivers of Mississippi, Missouri, and Ohio basins of central and southern USA, south into Mexico and northern Guatemala (Glodek, 1980)."

"In Texas, the species is present in all parts of the state but is absent from the northwest (Hubbs et al., 1991). Warren et al. (2000) listed the following drainage units for distribution of *I. furcatus* in the state: Red River (from the mouth upstream to and including the Kiamichi River), Sabine Lake (including minor coastal drainages west to Galveston Bay), Galveston Bay (including minor coastal drainages west to mouth of Brazos River), Brazos River, Colorado River, San Antonio Bay (including minor coastal drainages west of mouth of Colorado River to mouth of Nueces River) and Nueces River. Warren et al. (2000) also reported that the populations in southern drainages are currently stable."

Status in the United States

According to Fuller and Neilson (2019), nonindigenous occurrences of *Ictalurus furcatus* have been reported in the following states, with range of years and hydrologic units in parentheses:

- Alabama (1971-2012; Apalachicola Basin; Lower Chattahoochee; Middle Chattahoochee-Walter F; Upper Choctawhatchee; Upper Conecuh)
- Arizona (1973-2011; Imperial Reservoir; Upper San Pedro)
- California (1966-2014; Los Angeles; Lower Sacramento; Middle San Joaquin-Lower Chowchilla; San Diego; San Joaquin Delta; Santa Ana; Santa Clara; Santa Margarita; Santa Maria)
- Colorado (1952-2009; San Luis; South Platte; Upper Arkansas; Upper Arkansas-John Martin Reservoir; Upper Arkansas-Lake Meredith)
- Delaware (2010-2019; Brandywine-Christina; Nanticoke)
- District of Columbia (2010-2010; Middle Potomac-Anacostia-Occoquan)
- Florida (1968-2008; Apalachicola; Escambia; Lower Choctawhatchee; Lower Conecuh; Lower Suwannee; Yellow)
- Georgia (1971-2016; Altamaha; Cumberland-St. Simons; Etowah; Hiwassee; Lower Chattahoochee; Lower Flint; Middle Chattahoochee-Lake Harding; Middle Chattahoochee-Walter F; Middle Savannah; Satilla; Upper Ocmulgee; Upper Oconee; Upper Savannah; Upper Tallapoosa)
- Idaho (1985-1990; Bear Lake; Brownlee Reservoir; C.J. Strike Reservoir; Lake Walcott; Upper Snake-Rock)
- Iowa (1900-1987; Coon-Yellow)

- Kansas (1980-2003; Denton; Lower Marais Des Cygnes; Lower Republican; Medicine Lodge; Middle Republican; Neosho Headwaters; Smoky Hill; South Fork Ninnescah; Upper Cimarron; Upper Marais Des Cygnes; Upper Neosho; Upper South Fork Solomon)
- Kentucky (2002-2002; Salt)
- Maryland (2010-2015; Lower Potomac; Lower Susquehanna; Middle Potomac-Anacostia-Occoquan; Monocacy; Patuxent)
- Minnesota (1900-2001; Lower St. Croix; Rush-Vermillion; St. Croix)
- Nebraska (1980-2011; Lower Platte-Shell; Salt; Upper Republican)
- New Jersey (1920-1978; Hackensack-Passaic; Lower Hudson; Mid-Atlantic Region)
- New Mexico (1955-2007; Conchas; Upper San Juan)
- North Carolina (1975-2018; Albemarle; Black; Cape Fear; Chowan; Contentnea; Lower Cape Fear; Lower Pee Dee; Lower Roanoke; Lower Tar; Lumber; Meherrin; Middle Neuse; Northeast Cape Fear; Roanoke Rapids; Upper Cape Fear; Upper Catawba; Upper Neuse; Upper Pee Dee; Upper Pee Dee; Upper Yadkin; Waccamaw)
- North Dakota (1980-1980; Upper Lake Oahe)
- Ohio (1975-2013; Licking; Lower Great Miami; Muskingum; Upper Great Miami; Upper Scioto)
- Oklahoma (1947-2007; Arkansas-White-Red Region; Blue-China; Cache; Caney; Chikaskia; Clear Boggy; Deep Fork; Lake O' The Cherokees; Little; Lower Canadian; Lower Canadian-Walnut; Lower Cimarron; Lower Cimarron-Skeleton; Lower Neosho; Lower North Canadian; Lower North Fork Red; Lower Verdigris; Middle North Canadian; Middle Verdigris; Middle Washita; Muddy Boggy; Poteau; Upper Little; West Cache)
- Oregon (1910-1946; Brownlee Reservoir; Middle Willamette)
- South Carolina (1964-2018; Carolina Coastal-Sampit; Congaree; Cooper; Edisto River; Lake Marion; Lower Pee Dee; Middle Savannah; Salkehatchie; Santee; Seneca; Waccamaw; Wateree)
- South Dakota (19800-1980; Fort Randall Reservoir; Lower Lake Oahe)
- Tennessee (1993-1993; Conasauga)
- Texas (1965-2018; Atascosa; Austin-Travis Lakes; Bosque; Brady; Buchanan-Lyndon B. Johnson Lakes; Cedar; Chambers; Cibolo; Colorado Headwaters; Concho; Cowhouse; Denton; Double Mountain Fork Brazos; East Fork Trinity; Elm Fork Trinity; Hondo; Hubbard; Jim Ned; Lake Meredith; Lake O'the Pines; Lampasas; Leon; Little; Little Wichita; Llano; Lower Angelina; Lower Brazos-Little Brazos; Lower Colorado-Cummins; Lower Frio; Lower Pecos-Red Bluff Reservoir; Lower Prairie Dog Town Fork Red; Lower Trinity-Kickapoo; Lower Trinity-Tehuacana; Lower West Fork Trinity; Medina; Middle Brazos-Lake Whitney; Middle Brazos-Millers; Middle Brazos-Palo Pinto; Middle Colorado; Middle Colorado-Elm; Middle Guadalupe; Middle Neches; Middle Nueces; Middle Sabine; Navasota; North Bosque; North Concho; North Fork Double Mountain Fork Brazos; North Llano; Nueces Headwaters; Paint; Pecan Bayou; Pedernales; Richland; San Gabriel; San Marcos; San Miguel; San Saba; South Concho; South Llano; Sulphur Headwaters; Tule; Turkey; Upper Angelina; Upper Clear Fork Brazos; Upper Colorado; Upper Frio; Upper Guadalupe; Upper Neches; Upper North Fork Red; Upper Nueces; Upper Salt Fork Red; Upper San Antonio; Upper Trinity; Upper West Fork Trinity; West Nueces; White; Wichita; Yegua)

- Virginia (1974-2016; Albemarle; Appomattox; James; Lower Chesapeake Bay; Lower James; Middle James-Willis; Middle Potomac-Anacostia-Occoquan; Middle Roanoke; Pamunkey; Rapidan-Upper Rappahannock; Shenandoah)
- Washington (1910-1910; Lower Snake)
- Wisconsin (1998-2006; South Fork Flambeau; Upper Fox)

From Fuller and Neilson (2019):

"Not listed as occurring in South Carolina by Loyacano (1975). Not listed as occurring in Idaho by Simpson and Wallace (1978). Reports of *I. furcatus* in the New drainage in West Virginia and Virginia are more likely misidentified *I. punctatus* (Burkhead et al. 1980)."

"There is considerable doubt about the introduction of this species in the Potomac River near the turn of the century. Although numerous authors (Bean and Weed 1911; McAtee and Weed 1915; Wiley 1970; Jenkins et al. 1972; Stauffer et al. 1978; Graham 1999) report that the species was introduced between 1898 and 1905, it appears that statement is based on misidentified I. punctatus (Burkhead et al. 1980), or if any of those fish actually were *I. furcatus*, the introduction failed. Starnes et al. (2011) reported that young *I. furcatus* were increasing in number in the lower reaches of the Potomac, and that this species is established in river and the Chesapeake and Ohio Canal up through the Plummers Island region."

NatureServe (2013):

"In Missouri, stocking of this species in small impoundments has not resulted in the establishment of self-sustaining populations (Pflieger 1997)."

"Locally, impoundments have eliminated or reduced some populations. For example, a population in the White River, Missouri, disappeared after construction of Bull Shoals and Table Rock reservoirs (Pflieger 1997)."

From CABI (2019):

"This species is ranked in the top five "species of concern" in Virginia and also as a high priority in Maryland by the US Environmental Protection Agency's Chesapeake Bay Program. It was further identified as a species for which a risk assessment plan is required (Moser, 2002)."

"It is, however, ranked among the most invasive species in Chesapeake Bay in the United States (Higgins, 2006)."

"Within the United States, stocking programs and unauthorized introductions have established *I. furcatus* populations in reservoirs and rivers of several states, including tributaries of the Chesapeake Bay in Maryland and Virginia. The species was intentionally introduced to three major tributaries of Chesapeake Bay watershed and a number of impoundments between 1974 and 1989 for sport fishing, and has since spread into three additional tributaries (Higgins, 2006)."

"Although *I. furcatus* were reported as introduced to the Chesapeake Bay region between 1898 and 1905 in the Potomac River, this purported introduction has been attributed to a misidentified *Ictalurus punctatus* (Burkhead et al., 1980). From 1974 to 1985, juvenile *I. furcatus* were introduced into coastal rivers of Virginia to establish self-sustaining fisheries (Higgins, 2006)."

Means of Introductions in the United States

Ictalurus furcatus has been intentionally stocked outside its native range within the United States by State fishery managers to achieve fishery management objectives. State fish and wildlife management agencies are responsible for balancing multiple fish and wildlife management objectives. The potential for a species to become invasive is now one important consideration when balancing multiple management objectives and advancing sound, science-based management of fish and wildlife and their habitat in the public interest.

From Fuller and Neilson (2019):

"Means of Introduction: Intentionally stocked for food and sport. Stocked in the Cape Fear River, North Carolina, in 1966 (Guire et al. 1984). Introductions in the Choctawhatchee River, Alabama, were due to flooding of a private lake in 1993 (Mettee et al. 1996). Recent introductions into the Chattahoochee River in Alabama and Georgia were due to flooding of catfish farms in Alabama during a storm in March 1990 (Ober, personal communication). Presumably these fish moved downstream into the Apalachicola in Florida. Sources of introductions in Escambia and Yellow rivers of Florida are unknown (R. Cailteux, personal communication)."

"Blue Catfish has been stocked to feed on the introduced Asian clam *Corbiucula fluminea*. Although the species may not actually control clam populations, it is hoped that clam biomass could be converted to fish biomass and create trophy-sized catfish to catch (Dill and Cordone 1997). Blue Catfish are known to consume the invasive Asian clam, *Corbicula fluminea*, in Lake Norman (NC Wildlife Resources Commission, pers. comm.), and feed almost exclusively on Corbicula in the Cape Fear River, North Carolina, (M. Moser, personal communication)."

From CABI (2019):

"Within the United States, stocking programs and unauthorized introductions have established *I. furcatus* populations in reservoirs and rivers of several states, including tributaries of the Chesapeake Bay in Maryland and Virginia. The species was intentionally introduced to three major tributaries of Chesapeake Bay watershed and a number of impoundments between 1974 and 1989 for sport fishing, and has since spread into three additional tributaries (Higgins, 2006). According to Guire et al. (1984), the intentional stocking of this species for food and sport fishery took place in 1966. Introductions in the Choctawhatchee River, Alabama, were due to flooding of a private lake in 1993 (Mettee et al., 1996). It is assumed that these fish moved downstream into the Apalachicola in Florida (Fuller and Neilson, 2012). Sources of introductions in Escambia and Yellow rivers of Florida are unknown (R. Cailteux, personal communication as stated in Fuller and Neilson, 2012)."

"Main means of dispersal of *I. furcatus* is natural dispersal and intentional introductions. It has been reported that *I. furcatus* has established secondary populations outside its native range due to its natural movement and/or intentional introductions. Higgins (2006), using genetic variation in fish populations, tested the sources of the secondary populations of two primary invasions within the United States. The tested means of secondary populations are (1) Natural dispersal (recruits moved from a nearby stocked river through the Chesapeake Bay during periods of significant freshwater influx), and (2) Intentional introductions (Bubba). It is widely believed that the *I. furcatus* range expansion was intentionally facilitated by anglers or commercial fisherman. Although not inconceivable, Higgins (2006) found that genetic evidence did not support the Bubba mechanism as the primary mode of expansion and natural dispersal was found to be the most probable mode underlying the range expansion. Though not tested, he also stated that it is worth investigating a separate scenario, i.e. escapement from impoundments, as a number of characteristics of the population genetic and mixed stock analyses suggested that this could also be a possible mechanism."

Remarks

From CABI (2019):

"Alterations made to their native riverine habitats, particularly on the peripheries, has seen their numbers reduced in their native range. Changes to their native range leading to a decline in abundance may include construction of impoundments, channelization and increases in siltation (Graham, 1999; Higgins, 2006)."

"*I. furcatus* most closely resembles the headwater catfish (*Ictalurus lupus*) and the channel catfish (*Ictalurus punctatus*) (Virginia Department of Game and Inland Fisheries, 2012). Juvenile *I. punctatus* typically will have spots that are lacking in the juvenile *I. furcatus*. However, large *I. punctatus* and medium-sized *I. furcatus* can be more difficult to tell apart as they are often similar in colour and general body shape. *I. furcatus* can be distinguished from I. lupus and I. punctatus by having smaller eyes situated more anteriorly; a longer and straighter margin on the anal fin; a median keel-like crest anterior to the dorsal fin; a crest on the dorsal edge of the opercle; the sides lacking dark spots; and a higher number of anal rays (*I. furcatus* usually has >32; *I. puntatus* usually has 25-28; I. lupus usually has <25;) (Sublette et al., 1990)."

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 *Ictalurus furcatus* (Valenciennes 1840)."

From ITIS (2019):

"Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Ostariophysi
Order Siluriformes
Family Ictaluridae
Genus *Ictalurus*
Species *Ictalurus furcatus* (Valenciennes in Cuvier and Valenciennes, 1840)"

Size, Weight, and Age Range

From Froese and Pauly (2019):

"Max length : 165 cm TL male/unsexed; [Page and Burr 2011]; max. published weight: 68.0 kg [Frimodt 1995]; max. reported age: 21 years [Hugg 1996]"

From Fuller and Neilson (2019):

"Size: 165 cm (maximum length); 40-50 kg (Graham et al. 1999)"

From CABI (2019):

"It has the ability to grow to a large size, to exceed 165 cm in length and 45 kg in weight and has a lifespan of around 20 years (Graham, 1999)."

"It is reported that *I. furcatus* lives at least 14 years (Kelley, 1969 as stated in Hassan-Williams and Bonner, 2007). Due to its large size, Ross (2001) and Smith (1979) noted that the life span of *I. furcatus* is likely to be over 20 years. Some records of lifespan for this fish are from 21 years to 29 years (Hugg, 1996; Graham, 1999)."

Environment

From Froese and Pauly (2019):

"Freshwater; brackish; demersal; depth range 50 - ? m [Page and Burr 1991]."

From Fuller and Neilson (2019):

"The harsh winters in their native and introduced range region make it likely Blue Catfish can survive low temperatures. They can be found in the Missouri River near Bismarck, North Dakota

(Fuller and Neilson 2013). A CLIMATCH analysis included in the USFWS risk assessment for Blue Catfish found that the climate of the Great Lakes Basin closely matches the climate of their current range (Australian Bureau of Rural Sciences 2008).This species migrates toward warmer waters during winter and to cooler waters during summer (Graham 1999). Their preferred temperature is between 28 and 30°C. In fish farms in Mississippi Delta, 95% survive after winter with temperatures as low of 5.1°C (Bosworth 2012)."

Climate/Range

From Froese and Pauly (2019):

"Subtropical; 44°N - 25°N, 108°W - 80°W [Page and Burr 2011]"

Distribution Outside the United States

Native

From Fuller and Neilson (2019):

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"In Texas, the species is present in all parts of the state but is absent from the northwest (Hubbs et al., 1991). Warren et al. (2000) listed the following drainage units for distribution of *I. furcatus* in the state: Red River (from the mouth upstream to and including the Kiamichi River), Sabine Lake (including minor coastal drainages west to Galveston Bay), Galveston Bay (including minor coastal drainages west to mouth of Brazos River), Brazos River, Colorado River, San Antonio Bay (including minor coastal drainages west of mouth of Colorado River to mouth of Nueces River) and Nueces River. Warren et al. (2000) also reported that the populations in southern drainages are currently stable."

Introduced
Froese and Pauly (2019) lists *Ictalurus furcatus* as introduced from the United States to China.

From CABI (2019):

"*I. furcatus* has been introduced to China from its native United States for fisheries and aquaculture purposes. Neither records of its establishment in natural waters in China nor its spread to other geographical areas from China and its subsequent ecological effects are reported."

Means of Introduction Outside the United States
From CABI (2019):

"In China, it has been introduced for aquaculture but is not known as invasive."

Short Description
CABI (2019):

"*Ictalurus* has the Greek meaning of "fish cat", and *furcatus* has the Latin meaning of "forked", a reference to the species' forked tail fin (Texas Parks and Wildlife, 2012). It has a moderately robust, elongated body with a deeply forked tail and a rounded head, which has a sub-terminal mouth (Hubbs et al., 1991; Goldstein and Simon, 1999; Ross, 2001; Virginia Department of Game and Inland Fisheries, 2012). The lower jaw of the mouth never protrudes beyond the upper jaw (Graham, 1999). *I. furcatus* has a bluish-grey colouration on the back, silvery grey sides and a greyish-white abdomen (Sublette et al., 1990). The breeding male is dark blue in the body (Moyle, 1976). Blue catfish populations in Rio Grande River in Texas differ from blue catfish in other areas in that the juvenile and young are very speckled and many adults retain their spots (Wilcox, 1960).

The deeply forked caudal fin of *I. furcatus* has no adipose adjoining it and the genital orifices of the male and female are distinct (Hubbs et al., 1991). In the male, the papilla is more prominent with a circular opening whereas in the female it is more recessed and the opening is slit-like (Moyle, 1976). It has 30-36 anal fin rays (Hubbs et al., 1991), 6 dorsal fin rays, 8-10 pectoral fin rays, 8 pelvic fin rays; and a gill raker count of 14-21 (Ross, 2001)."

Biology
From Froese and Pauly (2019):

"Inhabits deep water of impoundments and main channels and backwaters of medium to large rivers, over mud, sand and gravel [Page and Burr 1991; Page and Burr 2011]. Stays on the bottom during the day in deep areas and moves into swifter water at night to feed [NatureServe 2013]. Feeds on small aquatic invertebrates, clams and fishes [Murdy and Musick 2013]. Prefers clear, strongly flowing water. Deposits eggs in nests under under logs, brush, or riverbank [NatureServe 2013]. Males build nest often in pools or backwaters [NatureServe 2013].

Marketed fresh and frozen. Eaten steamed, fried, broiled, microwaved and baked [Frimodt 1995]."

From Fuller and Neilson (2019):

"Ecology: *Ictalurus furcatus* can tolerate salinities up to 15 ppt (Christmas and Waller 1973, Dennison et al. 1993, Perry 1968, Ross 2001, Bonvechio et al. 2012). Their survival is 87% in experimental conditions of dissolved oxygen at 1.41 ppm (Torrans et al. 2012)."

"Blue Catfish can live in a variety of habitats. They inhabit river channels which have higher flows and harder substrates (i.e., gravel, boulders, rock rip rap), and floodplain lakes which have lower or no flows and softer substrates (i.e., silt, sand) (Eggleton and Schramm Jr 2004). Blue Catfish prefer open waters of large reservoirs and main channels, backwaters, and embayments of large, flowing rivers where water is normally turbid and substrate varies from gravel-sand to silt-mud (Burr and Warren 1986). Many rivers and reservoirs with *I. furcatus* populations have only mud or silt substrate. Blue Catfish prefer deep, swift channels and flowing pools (Jenkins and Burkhead 1994), and large individuals often are found in tailwaters below dams where currents are swift and substrates consist of sand, gravel, and rock (Mettee et al. 1996, Graham et al. 1999).

Blue Catfish are highly omnivorous. In the lower Mississippi River, across all habitats their diets were composed of 47% fishes (more than 15 identifiable species), 15% molluscs, 12% chironomids and oligochaetes, 7% detritus/plant matter, 6% decapods, 6% scavenging, and 1% terrestrial arthropods (Eggleton and Schramm Jr. 2004). Scavenged items were typically fishes and fish scales, but also included small mammals, birds, and turtles.

Blue Catfish spawns in late spring to early summer at water temperatures of 21 to 25°C (Sublette et al. 1990) In advance of spawning, Blue Catfish seek protected areas to deposit eggs behind rocks, root-wads, depressions, undercut stream banks, or other areas where the currents are minimal (Graham et al. 1999).

Males guard eggs and fry (Graham et al. 1999) which is a strategy associated with animals that have high colonization success."

"Reproductive Biology

The spawning behaviour of *I. furcatus* appears to be similar to that of *I. punctatus*. However, most *I. furcatus* are not sexually mature until they reach about 60 cm in length. Like *I. punctatus*, *I. furcatus* pursues a varied diet, but it tends to eat fish earlier in life. Although invertebrates still comprise the major portion of the diet, blue catfish as small as 10 cm in length have been known to consume other fish. Individuals larger than 20 cm eat fish and large invertebrates. *I. furcatus* commonly attain weights of 20-40 lbs. and may reach weights well in excess of 100 lbs. It is reported that fish exceeding 350 lbs. were landed from the Mississippi River during the late 1800s.

Spawning of *I. furcatus* occurs in late spring and early summer at water temperatures of 21-250C (Sublette et al., 1990). However, the spawning season may vary according to geographic location, in April and May (in Louisiana) or in June (in Illinois) (Jordan and Evermann, 1916; Pflieger, 1975; Smith, 1979). Spawning takes place in nests constructed by the male in sheltered areas, often in pools and backwaters (Sublette et al., 1990; Simon, 1999). Although nesting habits are similar to those of I. punctatus (Pflieger, 1975) no other North American freshwater fish is known to provide the same level of parental care as *I.furcatus*. The young of this species will be guarded by the parents at the nest until the young have hatched (Smith 1979; Higgins, 2006).

Human Uses

From Froese and Pauly (2019):

"Fisheries: commercial; aquaculture: commercial; gamefish: yes; aquarium: public aquariums"

From Fuller and Neilson (2019):

"Blue Catfish has been stocked to feed on the introduced Asian clam *Corbiucula fluminea*. Although the species may not actually control clam populations, it is hoped that clam biomass could be converted to fish biomass and create trophy-sized catfish to catch (Dill and Cordone 1997). Blue Catfish are known to consume the invasive Asian clam, *Corbicula fluminea*, in Lake Norman (NC Wildlife Resources Commission, pers. comm.), and feed almost exclusively on Corbicula in the Cape Fear River, North Carolina, (M. Moser, personal communication)."

From CABI (2019):

"**Economic Value**

I. furcatus is considered as a highly valued food and recreational fish. It has been introduced to at least 16 states in the USA outside of its native range and is used to add diversity to fisheries (Fuller et al., 1999; Graham, 1999). *I. furcatus* populations in tidal rivers of Virginia and Maryland support modest commercial fisheries (Schloesser et al., 2011). Commercial landings of this species from tidal rivers in both states increased from about 9.5–17 tonnes in 2003–2005 to more than 72.5 tonnes in 2008 (VMRC 2010; A. C. Carpenter, Potomac River Fisheries Commission, personal communication as stated in Schloesser et al., 2011).

I. furcatus, or its hybrid with the channel catfish (*I. punctatus*), has also been reared commercially. However, the majority of commercial production of catfish in the United States is from I. punctatus (Stickney 1986; Sublette et al., 1990). Graham (1999) noted that the species lacks popularity with aquaculturists, but hybrids developed with channel catfish are frequently used in fee-fishing lakes because of their rapid growth and aggressive disposition.

From a purely economic and sports point of view, *I. furcatus* could be regarded as a beneficial introduction, but its effects on native fish communities may not have been well studied (NEMESIS, 2012).

Social Benefits

I. furcatus populations in Virginia support a nationally recognized trophy fishery which targets trophy blue catfish at more than 96.5 cm FL or over 13.6 kg (Schloesser et al., 2011)."

Diseases

No OIE-reportable diseases (OIE 2019) were found to be associated with *Ictalurus furcatus.*

From Froese and Pauly (2019):

"Contracaecum Infestation 3, Parasitic infestations (protozoa, worms, etc.)
Enteric Septicaemia of Catfish, Parasitic infestations (protozoa, worms, etc.)"

Poelen et al. (2014) lists *Agamonema vomitor, Tanaorhamphus, Neoechinorhynchus golvani, Choanoscolex lamothei, Megathylacoides giganteum, Megathylacoides lamothei, Proteocephalus, Cleidodiscus, Ligictaluridus mirabilis, Goezia nonipapillata, Dichelyne robusta, Dichelyne mexicanus, Spinitectus marcospinosus, Spinitectus tabascoensis, Crepidostomum cooperi, Megalogonia ictaluri, Allacanthochasmus varius, Prosthenhystera obesa, Phyllodistomum lacustri, Polylekithum ictaluri, Neochasmus ictaluri, Posthodiplostomum minimum, Diplosomum compactum, Genarchella genarchella, Cladocystis, Camallanus lacustris, Corallobothrium fimbriatum, Gnathostoma binucleatum, Pomphorhynchus, Crepidostomum,* and *Spinitectus* as parasites of *Ictalurus furcatus.*

From Griffin et al. (2009):

"Of the species of *Henneguya* known to infect ictalurid fishes, only *Henneguya pellis* (Minchew, 1977) has been reported from the blue catfish *Ictalurus furcatus.*"

Threat to Humans

From Froese and Pauly (2019):

"Harmless"

3 Impacts of Introductions

From Fuller and Neilson (2019):

"Impact of Introduction: Hybridizes with threatened Yaqui catfish *I. pricei* in Mexico (U.S. Fish and Wildlife Service 1994)."

From CABI (2019):

"It is, however, ranked among the most invasive species in Chesapeake Bay in the United States (Higgins, 2006). It has the ability to grow to a large size, to exceed 165 cm in length and 45 kg in weight and has a lifespan of around 20 years (Graham, 1999). These characters coupled with its omnivorous feeding strategy, ability to consume a broad prey base and its high abundance have

raised concerns over the effects of this large predator on fish communities in Chesapeake Bay tributaries (Schloesser et al., 2011). Its potential to expand into a wide geographic area also causes concerns regarding its invasiveness given that it can tolerate a range of habitats from freshwater to estuarine water (Perry, 1969). Spread of *I. furcatus* populations is suspected to have influenced resident fish assemblages. For example, white catfish (*Ictalurus catus*), a native species traditionally utilized by commercial fishers, experienced declines after *I. furcatus* populations became established in the mid-1990s (Tuckey and Fabrizio, 2010). The pattern of establishment followed by a lag phase and then rapid dispersal of *I. furcatus* in Chesapeake Bay tributaries in the USA is consistent with population dynamics of an invasive species (Sakai et al., 2001)."

"Its large size, predatory behaviour, ability to easily increase in abundance and occupy both fresh and saline waters means that this species has a high risk of spread and the potential to negatively impact native ichthyofauna. As a measure to promote sport fishing, the Virginia Department of Game and Inland Fisheries and the US Fish and Wildlife Service introduced *I. furcatus* into 70 impoundments and reservoirs in Virginia and into the James, Rappahannock, and Mattaponi Rivers until the early 1990s, *I. furcatus* were recorded only in the river systems where they had been introduced (Higgins, 2006). Later, secondary breeding populations of *I. furcatus* have been recorded in three additional rivers: Pamunkey, upper Potomac, and Piankatank (Edmonds, 2006) effectively extending their range to all major tributaries in the Virginia portion of Chesapeake Bay (Higgins, 2006).

Its continued spread is likely to affect native icthyofauna but also cause changes to local habitats, particularly because of its nest building behaviour (Courtenay and Stauffer, 1984). Furthermore, alteration of Chesapeake Bay tributaries from historically 'bottom-up biomass' controlled processes to one that is 'top heavy' with predators has been suggested to be a serious consequence of the introduction and spread of *I. furcatus* (Garman et al., 1991)."

"Spread of *I. furcatus* populations is thought to have influenced resident fish populations. A decline in the abundance of white catfish (*Ictalurus catus*), a native species with traditional commercial fisheries value, has been reported after *I. furcatus* populations became established in the mid-1990s (Tuckey and Fabrizio, 2010). *I. furcatus* may represent a relatively new, and potentially significant, source of mortality for economically and ecologically important estuarine fishes such as juvenile American shad (*Alosa sapidissima*), Atlantic menhaden, and river herring (*Alosa* spp.) (Chandler, 1998)."

"The large size, predatory habits, and rapid increase in abundance of this species have raised concerns about its impact on native biota. It is suspected that competition for resources occurs with native White Catfish (*Ictalurus catus*), Brown Bullhead (*Ictalurus nebulosus*), and Yellow Bullhead (*Ictalurusnatalis*) (NEMESIS, 2012). […]

Catch statistics have indicated that *I. furcatus* has adversely affected clupeid (herring-family fishes) populations in the James and Rappahannock Rivers (Austin 1998, personal communication as stated in NEMESIS, 2012). In Virginia, *I. furcatus* has been associated with declines in anadromous clupeid populations of American shad (*Alsoa sapidissima*) and blueback herring (*Alsoaaestivalis*), possibly compromising major restoration programs, and adding to the

documented negative economic and ecological effects of invasive species range expansion (Ashley and Buff, 1987; MacAvoy et al., 2000). NEMESIS (2012) reported that *I. furcatus* is probably an important predator on introduced centrarchids (Sunfishes)."

From Schmitt et al. (2018):

"Blue catfish *Ictalurus furcatus* were first introduced into the Chesapeake Bay during the 1970s, and now form dense populations in several tidal rivers. Despite being labeled as a dangerous invasive, the feeding ecology of this species is largely unknown. We used a stratified random design to collect stomachs from 16,110 blue catfish in tidal freshwater, oligohaline, and mesohaline segments of the James, Pamunkey, Mattaponi, and Rappahannock Rivers. Indices of diet breadth and omnivory reveal that blue catfish are generalist omnivores with some of the highest diet breadths ever observed in an estuarine fish species, while trophic level calculations demonstrate that blue catfish are a mesopredator occupying lower trophic levels than previously claimed. Cumulative prey curves revealed that large numbers of stomachs are necessary to adequately characterize the diet of blue catfish, thus previous diet descriptions of this species should be considered with caution. Blue catfish feed primarily on invasive aquatic vegetation and Asian clams, though the economically-valuable blue crab *Callinectes sapidus* is also consumed regularly. While the per capita impact of blue catfish on imperiled native species appears to be low, this impact could still be substantial due to high population densities."

From Bonvechio et al. (2019):

"Potential impacts by Blue Catfish on native fish and mussel species are unknown. Omnivorous feeding habits have been described in the introduced Blue Catfish population of the Altamaha River (Bonvechio et al. 2011a). Large Blue Catfish can be piscivorous, similar to large Flathead Catfish; thus, there is some concern over potential effects of Blue Catfish foraging on native fish species in the Satilla River (Bonvechio et al. 2009, 2011a). […]. Homer and Jennings (2011) found shifts in the gillnet catch of *Ameiurus catus* (L.) (White Catfish) to Blue Catfish in Lake Oconee, GA, and suggested that competition by introduced Blue Catfish and Flathead Catfish could drive declines in the abundance of native White Catfish. Similarly, White Catfish declines have also been noted in Virginia tidal rivers after Blue Catfish introduction (Schloesser et al. 2011). White catfish are found in high numbers in the tidal areas of the Satilla River. Similar to other recently introduced Blue Catfish populations (Bonvechio et al. 2011a), increased detections suggest establishment in the Satilla River. While Blue Catfish numbers remain low, impacts would be difficult to detect or minimal. However, previous works suggest that displacement and or declines of native species, particularly other native catfishes such as the White Catfish, may be expected."

4 Global Distribution

Figure 1. Known global distribution of *Ictalurus furcatus*. Map from GBIF Secretariat (2019).

5 Distribution Within the United States

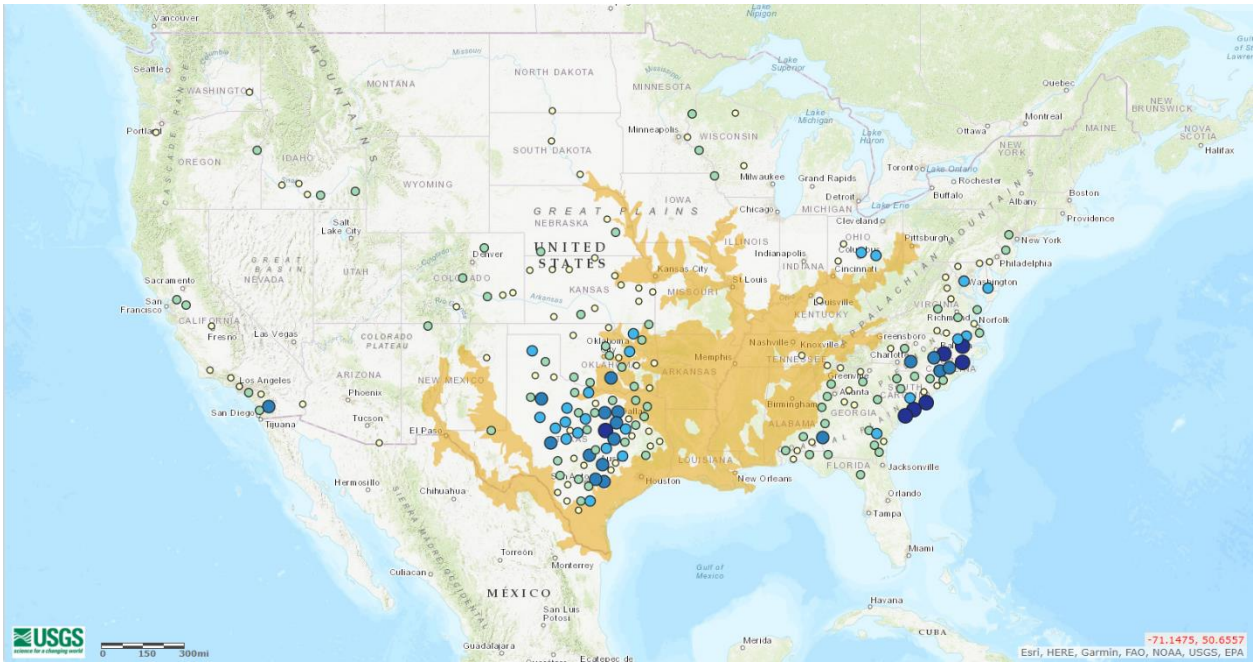

Figure 2. Known distribution of *Ictalurus furcatus* in the contiguous United States. Map from Fuller and Neilson (2019).

6 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Ictalurus furcatus* was high for the majority of the United States. Pacific coastal areas from Washington to central California, as well as eastern California had patches of low to medium match. New England also had areas of medium match. The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.948, high (scores 0.103 and greater are classified as high). All States had high individual Climate 6 scores.

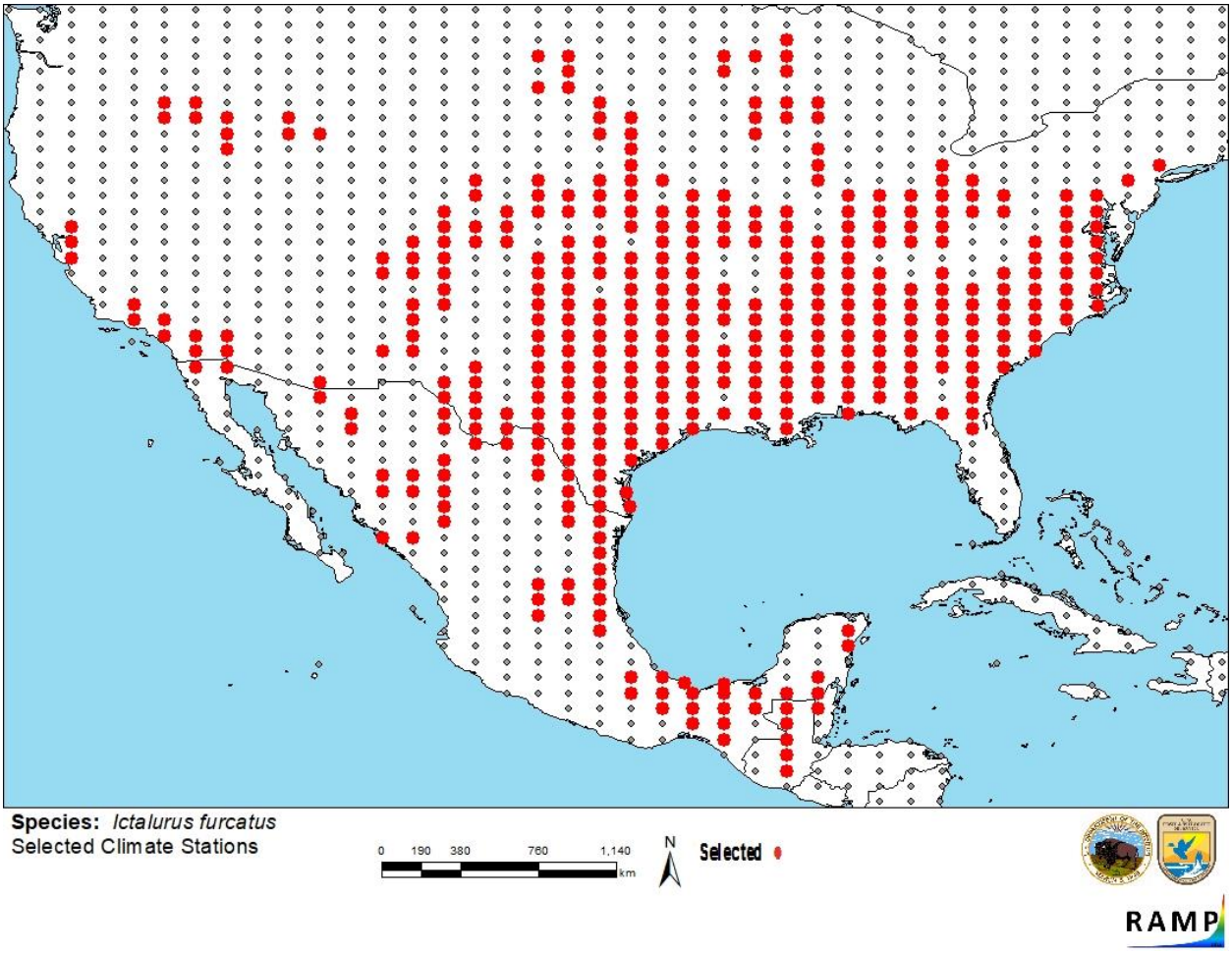

Figure 3. RAMP (Sanders et al. 2018) source map showing weather stations throughout the United States and Mexico selected as source locations (red; United States, and Mexico) and non-source locations (gray) for *Ictalurus furcatus* climate matching. Source locations from GBIF Secretariat (2019) and Fuller and Neilson (2019). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

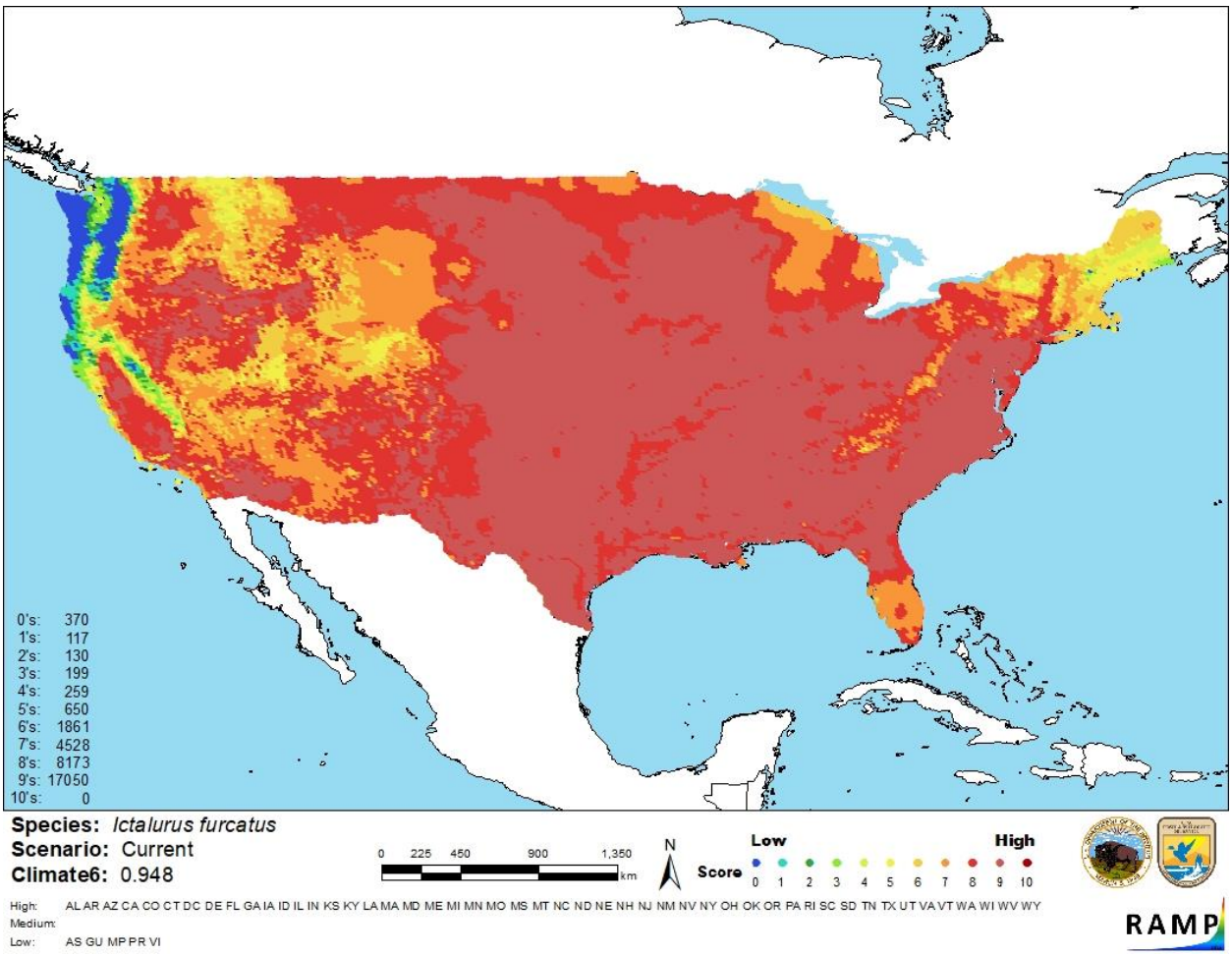

Figure 4. Map of RAMP (Sanders et al. 2018) climate matches for *Ictalurus furcatus* in the contiguous United States based on source locations reported by GBIF Secretariat (2019). Counts of climate match scores are tabulated on the left. 0 = Lowest match, 10 = Highest match.

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≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

7 Certainty of Assessment

The certainty of assessment for *Ictalurus furcatus* is medium. Information on the biology, distribution, and history of introductions was readily available. *I. furcatus* has been established outside of its native range within the United States. The information on impacts of introduction, while not mainly from peer-reviewed sources provides a preponderance of evidence supporting the history of invasiveness classification.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Blue Catfish (*Ictalurus furcatus*) is a freshwater and brackish water catfish native to portions of the Mississippi River basin, Texas, and Mexico. Stocking, aquaculture, and migration have all contributed to the spread of this species throughout much of the southern half of the United States. Impacts such as hybridization with native species, reduction of native fish abundance, and alteration of local habitats have been reported for this species leading to a high history of invasiveness. This species has a high climate match within the United States, with all states in the contiguous United States having individually high climate matches. The overall risk for this species 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:** Refer to "Means of Introduction in the United States" in Section 2 for a caveat on stocking by State fishery managers to achieve fishery management objectives.
- **Overall Risk Assessment Category: High**

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