

Black Carp (*Mylopharyngodon piceus*)

Ecological Risk Screening Summary

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1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2019):

“Asia: Amur river basin to southern China [Nico et al. 2005]. Reported from Vietnam [Kottelat 2001]. [...] native stocks in Russia have declined sharply [Kottelat and Freyhof 2007].”

From Nico and Neilson (2019):

“Most major Pacific drainages of eastern Asia from the Pearl River (Zhu Jiang) basin in China north to the Amur River (Heilong Jiang) basin of China and far eastern Russia; possibly native to the Honghe or Red rivers of northern Vietnam (Nico et al. 2005).”

Status in the United States

Nico and Neilson (2019) report observations of *M. piceus* in the following states, with years of observation and hydrologic units where observations occurred in parentheses: Arkansas (2005-2018; Lower Mississippi-Greenville, Lower White, Lower White-Bayou Des Arc), Illinois (2003-2019; Bear-Wyaconda, Big Muddy, Cache, Cahokia-Joachim, Lower Illinois, Lower Illinois-Lake Chautauqua, Lower Illinois-Senachwine Lake, Lower Kaskaskia, Lower Ohio, Middle Kaskaskia, Peruque-Piasa, The Sny, Upper Mississippi-Cape Girardeau), Kentucky (2016-2019; Bayou De Chien-Mayfield, Kentucky Lake, Lower Cumberland, Lower Mississippi-Memphis, Lower Ohio), Louisiana (2004-2019; Atchafalaya, Lower Mississippi-Baton Rouge, Lower Red), Mississippi (2015-2019; Lower Mississippi-Greenville, Lower Mississippi-Helena), Missouri (1994-2019; Cahokia-Joachim, Lake of the Ozarks, Lower Mississippi-Memphis, Lower Missouri, Lower Missouri-Moreau, Peruque-Piasa, The Sny, Upper Mississippi-Cape Girardeau, Whitewater), Tennessee (2012-2019; Kentucky Lake, Lower Mississippi-Memphis, Obion), and West Virginia (2015; Conococheague-Opequon).

From Nico and Neilson (2019):

“The fact that black carp have been in the wild well over a decade in the lower Mississippi basin, including diploid adults, is evidence that the species may already be established or is on the verge of establishment in the United States (Nico et al. 2005; L. G. Nico, pers. comm.). [...] To date there have been no confirmed collections of larval or small juvenile black carp in the wild; however, there have been no studies conducted for the expressed purpose of identifying spawning grounds or for targeting capture of larval black carp in the wild.”

Despite the uncertainty described above, Nico and Neilson (2019) report numerous individual occurrences of *M. piceus* in the Mississippi River basin as representing established populations (see Section 5).

From Hunter and Nico (2015):

“The first confirmed records of wild Black Carp in open waters of the Mississippi River Basin date back to the early 1990s, when the species began appearing in catches of commercial fishers in Louisiana (Nico et al. 2005). [...] In contrast, it was not until early 2003 that there was a confirmed record of a wild Black Carp in the upper Basin (Chick et al. 2003).”

“At present, Arkansas and Mississippi are the primary states that still permit use of Black Carp in aquaculture and together now hold all or most of the known captive Black Carp in the Mississippi River Basin (Nico and Jelks 2011).”

From USFWS (2007):

“The U.S. Fish and Wildlife Service (Service or we) adds all forms of live black carp (*Mylopharyngodon piceus*), gametes, viable eggs, and hybrids to the list of injurious fish under the Lacey Act. By this action, the Service prohibits the importation into or transportation between the continental United States, the District of Columbia, Hawaii, the Commonwealth of Puerto Rico, or any territory or possession of the United States of live black carp, gametes,

viable eggs, and hybrids. The best available information indicates that this action is necessary to protect the interests of wildlife and wildlife resources from the purposeful or accidental introduction and subsequent establishment of black carp in the ecosystems of the United States.”

Means of Introductions in the United States

From Hunter and Nico (2015):

“The first confirmed records of wild Black Carp in open waters of the Mississippi River Basin date back to the early 1990s, when the species began appearing in catches of commercial fishers in Louisiana (Nico et al. 2005). These fish were likely escapes or releases from aquaculture farms, possibly during large-scale flood events that occasionally occur in lowland areas where many farms are located (Nico et al. 2005).”

From Nico and Neilson (2019):

“This species was first brought into the United States in the early 1970s as a "contaminant" in imported grass carp stocks. These fish came from Asia and were sent to a private fish farm in Arkansas (Nico et al. 2005). Subsequent introductions of black carp into this country occurred in the early 1980s. During this period it was imported as a food fish and as a biological control agent to combat the spread of yellow grub *Clinostomum margaritum* in aquaculture ponds (Nico et al. 2005). The first known record of an introduction of black carp into open waters occurred in Missouri in 1994 when thirty or more black carp along with several thousand bighead carp reportedly escaped into the Osage River, Missouri River drainage, when high water flooded hatchery ponds at an aquaculture facility near Lake of the Ozarks. [...] There is also risk that black carp may be spread by other means. According to one aquaculture farmer, hundreds of young black carp were accidentally included in shipments of live baitfish sent from Arkansas to bait dealers in Missouri as early as 1994 (Nico et al. [2005]). In addition, because of the continued widespread distribution of grass carp across the United States, there remains the possibility that shipments may inadvertently contain black carp (Nico et al. 2005). Juveniles, in particular, are difficult to distinguish from grass carp young. As such, Nico et al. (2005) expressed concern over the increased risk that the species be misidentified and unintentionally introduced as "grass carp" to some areas.”

Remarks

Fricke et al. (2019) report the following scientific names as synonyms of *M. piceus*: *Barbus tonkinensis*, *Leucisculus fuscus*, *Leuciscus aethiops*, *Leuciscus piceus*, and *Mylleleuciscus atripinnis*. All of the above scientific names were used in searching for information for this report.

From Nico and Neilson (2019):

“Chick et al. (2003) believed that their Illinois capture was the first wild record of black carp in the United States, but Nico et al. (2005) provided new information indicating that Louisiana commercial fishers had been collecting black carp in Louisiana since the early 1990s. However, until recently the Louisiana commercial fishers thought that the black carp in their nets were just

an unusual type of grass carp—somewhat darker and with a higher dorsal fin and more pointed head or snout (Nico et al. 2005:xiii).”

“The black carp closely resembles the grass carp *Ctenopharyngodon idella*. The two species are similar in overall body shape, size and placement of fins. Both black carp and grass carp have very large scales. In contrast to grass carp, the black carp is slightly darker in coloration (not black) and its pharyngeal teeth (throat teeth) are large and similar in appearance to human molars, an adaptation for crushing the shells of mollusks (Nico et al. 2005)[.] Commercial fishers in Louisiana have noted that black carp also have a somewhat pointed snout, a character they find useful in distinguishing it from grass carp. Juveniles and larvae may be difficult to distinguish from those of grass carp and certain other cyprinids.”

From Hunter and Nico (2015):

“Captive and wild populations of Black Carp in the USA include individuals with diploid and triploid genomes (Nico et al. 2005; Jenkins and Thomas 2007; Thomas et al. 2011; Papoulias et al. 2011). Production of triploid fish in aquaculture has been a common practice over the past few decades to prevent reproduction and to control non-native species in the event of escape or release into the wild (Thorgaard and Allen 1987; Tiwary et al. 2004; Nico et al. 2005).”

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 Ostariophysi
Order Cypriniformes
Superfamily Cyprinoidea
Family Cyprinidae
Genus *Mylopharyngodon*
Species *Mylopharyngodon piceus* (Richardson, 1846)”

From Fricke et al. (2019):

“Current status: Valid as *Mylopharyngodon piceus* (Richardson 1846). Xenocyprididae.”

Size, Weight, and Age Range

From Froese and Pauly (2018):

“Maturity: L_m 91.5, range 100 - ? cm

Max length : 180 cm TL male/unsexed; [IGFA 2001]; common length : 12.2 cm SL male/unsexed; [Nichols 1943]; max. published weight: 35.0 kg [Novikov et al. 2002]; max. reported age: 13 years [Nico et al. 2005]”

From Nico and Neilson (2019):

“Based on Asian records, large adults may be more than 1.5 m total length and 70 kg or more in weight; the largest specimen, unconfirmed, from the Chang (Yangtze) River basin reportedly measured 2.2 m.”

Environment

From Froese and Pauly (2019):

“Freshwater; brackish; demersal; pH range: 7.5 - 8.5; potamodromous [Riede 2004]; depth range 5 - 30 m [Shao and Lim 1991].”

According to CABI (2019), water temperatures below 0.5°C or above 40°C are harmful to adult *M. piceus*. Optimum water temperatures are 18-30°C for adults and 22-28°C for eggs and larvae. Dissolved oxygen concentrations of less than 2.0 mg/l are harmful to adults and concentrations greater than 5.0 mg/l are optimal. Water pH less than 6.0 or greater than 10 are harmful to adult *M. piceus*.

Climate/Range

From Froese and Pauly (2019):

“Subtropical; [...] 53°N - 15°N, 100°E - 140°E [Nico et al. 2005]”

Distribution Outside the United States

Native

From Froese and Pauly (2019):

“Asia: Amur river basin to southern China [Nico et al. 2005] Reported from Vietnam [Kottelat 2001]. [...] native stocks in Russia have declined sharply [Kottelat and Freyhof 2007].”

From Nico and Neilson (2019):

“Most major Pacific drainages of eastern Asia from the Pearl River (Zhu Jiang) basin in China north to the Amur River (Heilong Jiang) basin of China and far eastern Russia; possibly native to the Honghe or Red rivers of northern Vietnam (Nico et al. 2005).”

Introduced

Froese and Pauly (2019) report that *M. piceus* is established outside its native range in Armenia, Bulgaria, Mexico, Vietnam, Turkmenistan, Uzbekistan, Romania, Japan, and Cuba, and probably established in Serbia and Montenegro (Skadar Lake) and Costa Rica. Introductions have not resulted in establishment in Taiwan, Albania, Austria, the Jordan River, Israel, Thailand, Hungary, Germany, and the Czech Republic. Status of introductions is unknown for Kazakhstan, Latvia, Moldova, Ukraine, Panama, Morocco, Bangladesh, Iran, or Egypt.

From Froese and Pauly (2019):

“Persists only in Europe by stocking or accidental releases [...].”

According to Yankova (2016), *M. piceus* in Bulgaria is maintained by artificial reproduction, with no natural reproduction.

From NIES (2019):

“Breed at Lake Kasumigaura and Lake Kitaura [*sic*] in Ibaraki Pref[ecture, Japan], Tonegawa and Edogawa River System. Released and inhabit Ishikari river in Hokkaido Pref., Harunako Lake in Gunma Pref. and several rivers in Okayama Pref.”

“Establishment in Kasumigaura Lake was confirmed in 1956.”

From Jarić et al. (2015):

“Six non-native fish species have been confirmed as unsuccessful invaders in the Danube River basin (Holčík 2006; Lenhardt et al. 2011; Kottelat and Freyhof 2007) [including] black carp (*Mylopharyngodon piceus*) [...]. These species were reported as either intentionally or unintentionally introduced in the river, but failed to establish viable populations.”

According to Espinosa-Pérez and Ramírez (2015), the status of *M. piceus* in Mexico requires verification.

According to Skolka and Preda (2010), the status of *M. piceus* along the Romanian Black Sea Coast is “questionable.”

Means of Introduction Outside the United States

According to Froese and Pauly (2019), reasons for introduction of *M. piceus* include aquaculture, phyto-zooplankton control, snail control, and research. Some introductions were accidental, and for many introductions, the reason or means of introduction is unknown.

From NIES (2019):

“Accidental: Hitchhiking on seed release of grass carp (*Ctenopharyngodon idella*)”

Short Description

From Froese and Pauly (2019):

“Dorsal spines (total): 0; Dorsal soft rays (total): 7-9; Anal spines: 0; Anal soft rays: 8 - 10. Anatomy of the pharyngeal apparatus is the main distinguishing characteristic; throat teeth typically form a single row of 4-5 large molariform teeth on each of the two arches, with formula typically 1,4 - 4,1.”

From CABI (2019):

“*M. piceus* is a blackish-brown fish with blackish-grey fins and an elongated, relatively compressed body (USGS, 2004). Its scales are very large with dark edges, giving the fish a cross-hatched appearance (Crosier and Molloy, 2004). It has a pointed head with an arc-shaped terminal mouth (FAO, 2004). It has a short and pointed dorsal fin which is located above pelvic fins containing 7-8 rays (Crosier and Molloy, 2004). It can grow to a maximum length of 131 cm (Crosier and Molloy, 2004) and the largest specimen found to date [2004] is around 70 kg (FAO, 2004).”

Biology

From Froese and Pauly (2019):

“Adults inhabit large lowland rivers and lakes, preferably with clear water and high oxygen concentrations. Larvae feed on zooplankton, then on ostracods and aquatic insects. At about 120 mm SL, juveniles start to prey on small snails and clams while larger juveniles and adults feed almost entirely on molluscs. Undertake upriver migration and spawns [*sic*] in open waters. Deposit pelagic or semipelagic eggs which hatch while drifting downstream. Larvae settle into floodplain lakes and channels with little or no current [Kottelat and Freyhof 2007]. Maximum age probably exceeds 15 years; the figure of 20 years is not supported by data [Nico et al. 2005].”

From Nico and Neilson (2019):

“This species can be found in rivers, streams, or lakes; however, it requires large rivers to reproduce (Nico et al. 2005). Reproduction takes place in late spring and summer when water temperatures and/or water levels rise (Nico et al. 2005). Both male and female black carp are broadcast spawners; females are capable of releasing hundreds of thousands of eggs into flowing water, which then develop in the pelagic zone (Nico et al. 2005). After fertilization, the eggs become semiboyant [*sic*] (Sukhanova, 1967 as cited in Nico et al. 2005). They hatch in 1 to 2 days, depending on water temperatures, and the yolk sac is absorbed in 6 to 8 days (Nico et al. 2005). They become sexually mature at 4 to 6 years after which they migrate back to their spawning grounds (Nico et al. 2005). Successful reproduction is known only from riverine habitats (Nico et al. 2005).”

From Nico and Jelks (2011):

“Black carp share certain life history traits with grass carp *Ctenopharyngodon idella*, bighead carp *Hypophthalmichthys nobilis*, and silver carp *H. molitrix*. All require large lowland rivers to complete their life cycles. In particular, their migration and spawning patterns as well as temperature tolerances are quite similar (Nico et al. 2005). However, in many other respects, the black carp is unique. In contrast to grass carp and the bigheaded carps *Hypophthalmichthys* spp., it is a benthic fish with a relatively specialized diet consisting mostly of mussels and snails. Because of their bottom-dwelling habits, black carp are not easily detected when present in large, deep rivers. They do not leap out of the water like silver carp. In North America, wild black carp have rarely been taken by fishing gear other than large hoop nets placed in deep water.”

Human Uses

From Froese and Pauly (2019):

“Fisheries: highly commercial; aquaculture: commercial”

From Nico and Neilson (2019):

“The black carp is a bottom-dwelling molluscivore that has been used by U.S. fish farmers to prey on and control disease-carrying snails in their farm ponds; more recently, this species has been proposed as a biological control for the introduced zebra mussel *Dreissena polymorpha*. Although the subject has been debated, to date, there is no experimental evidence that indicates black carp would be effective in controlling zebra mussels. Because black carp do not have jaw teeth and their mouths are relatively small, it is unlikely that these fish are capable of breaking apart zebra mussel rafts (Nico et al. 2005).”

Diseases

No OIE-reportable diseases have been documented in *M. piceus*.

From CABI (2019):

“*M. piceus* are hosts to parasites, flukes, bacterial and viral diseases. It could possibly transfer these to other fish species. It serves as [*sic*] intermediate host for human parasites (e.g. schistosoma) or parasites relevant to fish culture, such as the yellow and white grubs in channel catfish and stripe bass farming (Mitchell, 1995 as stated in Rothbard et al., 1996).”

From Froese and Pauly (2019):

“Grass Carp Haemorrhagic Disease Reovirus, Viral diseases
Enteritis (Bacterial infection), Bacterial diseases”

From Zhu et al. (2019):

“At present, gill haemorrhagic disease caused by CyHV-2 [Cyprinid herpesvirus 2] is a serious epidemic threat to aquaculture in the Jiangsu province of China. [...] In the spring season of

2015, we noted that diseased fishes including [...] black carp [...] occurred in the Kunshan city of Jiangsu province of China, also have similar clinical features such as those were suffering from gill hemorrhagic disease of *Carassius auratus gibelio*. We suspected that these diseased fishes were caused by infection of CyHV-2. Both LAMP assay and electron microscopy examination confirmed that [...] black carp were positive [...]"

From Zhang et al. (2018):

“*Aeromonas hydrophila* causes serious economic losses to the black carp (*Mylopharyngodon piceus*) industry. [...] We observed Tissue [sic] sections of the spleen infected with *A. hydrophila* and the control group and found that the spleen of the infected group had necrosis.”

From Scholz and Salgado-Maldonado (2000):

“*Centrocestus formosanus* was first reported from Mexico by López-Jiménez (1987) as metacercariae encysted on the gills of the introduced cyprinid, the black carp *Mylopharyngodon piceus*, and other fish from a fish farm in central Mexico.”

“[...] infections with *Centrocestus formosanus* metacercariae are often heavy and [...] this trematode has been reported as a causative agent of diseases of cultured fish in Asia [...]"

From Pérez-Ponce de León et al. (2017):

“The cestode *Schyzocotyle acheilognathi* (syn. *Bothriocephalus acheilognathi*) is commonly known as the Asian fish tapeworm.”

“*Schyzocotyle acheilognathi* is recognized as the most important pathogenic cestode for cyprinid fish, mainly in cultured fry and juvenile carp, and has spread very rapidly throughout the world with the trade of fish. This parasite is a true generalist, exhibiting low host specificity, resulting in its extraordinary capacity to infect a wide range of suitable fish hosts, including native fish species that are not related phylogenetically to those in which it was introduced (Scholz et al., 2012).”

“[*S. acheilognathi*] is also found in [...] the black carp (*Mylopharyngodon piceus*) [...]"

From Stunkard (1970):

“Faust (1922) reported [the trematode parasite] *A[spidogaster] conchicola* from [...] the intestines of fishes, *Leuciscus aethiops* [now *Mylopharyngodon piceus*] all collected in China.”

Threat to Humans

From CABI (2019):

“*M. piceus* [...] serves as [sic] intermediate host for human parasites (e.g. schistosoma) or parasites relevant to fish culture, such as the yellow and white grubs in channel catfish and stripe bass farming (Mitchell, 1995 as stated in Rothbard et al., 1996).”

From Froese and Pauly (2019):

“Potential pest [Bartley 2006]”

From Scholz and Salgado-Maldonado (2000):

“Vélez-Hernández et al. (1998) questioned the possible impact of *Centrocestus formosanus* on human health in Mexico. Taking into account the site of infection of metacercariae (gills of fish [including *M. piceus*]), it seems unlikely that this parasite might have any zoonotic importance in this country. Nevertheless, lightly fried fish are eaten whole, including gills, in some localities in Mexico as Pátzcuaro Lake. In any case, thorough cooking of fish is necessary to prevent potential human diseases caused by *C. formosanus*.”

3 Impacts of Introductions

From Nico and Jelks (2011):

“Overall, there has been little research on wild black carp in the United States, a result of lack of funding and difficulty in collecting these big-river fish. Consequently, there is little information on the types and magnitude of ecological effects.”

From Ip et al. (2014):

“Molluscivorous fish, especially carp, have been adopted as bio-control agents of the invasive apple snail *Pomacea canaliculata*, but previous studies have focused on their effectiveness, with little attention paid to their undesirable effects on non-target plants and animals. We conducted an 8-week mesocosm study to compare the effectiveness of two indigenous fish, common carp (*Cyprinus carpio*) and black carp (*Mylopharyngodon piceus*), in removing *P. canaliculata*, and their potential side effects on macrophytes and non-target mollusks in a freshwater wetland. Three species of macrophytes and a community of mollusks in the wetland sediment were enclosed in 1 × 1 × 1 m enclosures either with apple snails (AS), with apple snails and common carp (AS + CC), with apple snails and black carp (AS + BC), or without apple snails and fish. Both species of carp were effective predators of *P. canaliculata*, removing most of the individuals in the enclosures except a few that were too big to fit into their mouth. By reducing apple snail population, black carp reduced grazing of apple snail on macrophytes. [...] Both species of carp preyed on non-target mollusks.”

From NIES (2019):

“Unknown impact [in Japan].”

Ermakhanov et al. (2012) report “no effect” of *M. piceus* in the Aral Sea.

The following two quotations describe potential impacts of *M. piceus* introduction and establishment, rather than realized impacts of nonnative established populations.

From CABI (2019):

“Establishment of *M. piceus* in the wild could have serious adverse impacts, due to predation on native mollusc species, including threatened and endangered species and fingernail clam populations, a primary food source of migrating waterfowl and fish. *M. piceus* are hosts to parasites, flukes, bacterial and viral diseases. It could possibly transfer these to other fish species. It serves as intermediate host for human parasites (e.g. schistosoma), or parasites relevant to fish culture, such as the yellow and white grubs in channel catfish and stripe bass farming.”

From Nico and Neilson (2019):

“There is high potential that the black carp would negatively impact native aquatic communities by feeding on, and reducing, populations of native mussels and snails, many of which are considered endangered or threatened (Nico et al. 2005). Given their size and diet preferences, black carp have the potential to restructure benthic communities by direct predation and removal of algae-grazing snails. Mussel beds consisting of smaller individuals and juvenile recruits are probably most vulnerable to being consumed by black carp (Nico et al. 2005). Furthermore, based on the fact that black carp attain a large size (well over 1 meter long), both juvenile and adult mussels and snails of many species would be vulnerable to predation by this fish (Nico et al. 2005). Fish farmers report that black carp are very effective in reducing the numbers of snails in some ponds. Recently, Wui and Engle (2007) argued that black carp can eliminate 100% of the snails in a single pond. Although their assumption that black carp are capable of eliminating all common pond snails in ponds is open to debate, the effectiveness of black carp in significantly reducing snail populations in aquaculture ponds indicates that any black carp occurring in the wild may cause significant declines in certain native mollusk populations in North American streams and lakes (Nico et al. 2005). Because the life span of black carp is reportedly over 15 years, sterile triploid black carp in the wild would be expected to persist many years and therefore have the potential to cause harm [to] native mollusks by way of predation (Nico et al. 2005).”

From USFWS (2007):

“The U.S. Fish and Wildlife Service (Service or we) adds all forms of live black carp (*Mylopharyngodon piceus*), gametes, viable eggs, and hybrids to the list of injurious fish under the Lacey Act. By this action, the Service prohibits the importation into or transportation between the continental United States, the District of Columbia, Hawaii, the Commonwealth of Puerto Rico, or any territory or possession of the United States of live black carp, gametes, viable eggs, and hybrids. The best available information indicates that this action is necessary to protect the interests of wildlife and wildlife resources from the purposeful or accidental introduction and subsequent establishment of black carp in the ecosystems of the United States.”

4 Global Distribution



Figure 1. Reported global distribution of *Mylopharyngodon piceus*, recorded in eastern Asia (China, Japan, and Taiwan), Europe (Montenegro) and the United States. Map from GBIF Secretariat (2019). Points in Florida (United States) and Montenegro were excluded from the climate matching analysis because establishment is not confirmed in these locations.

5 Distribution Within the United States



Figure 2. Known distribution of *Mylopharyngodon piceus* in the United States. Yellow points represent confirmed established locations; blue and orange points represent locations where introductions have failed or status is unknown. Only established locations were used in the climate matching analysis. Map from Nico and Neilson (2019).

6 Climate Matching

Summary of Climate Matching Analysis

The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean Distance) for the contiguous United States was 0.420, indicating a high climate match overall. Climate 6 proportions of 0.103 and above indicate a high climate match. The Mississippi River Basin, most of the Great Lakes region, and parts of the Mid-Atlantic region had a high climate match. Other regions of the contiguous United States east of the Rocky Mountains had medium matches, while locations west of the Rocky Mountains had low matches.

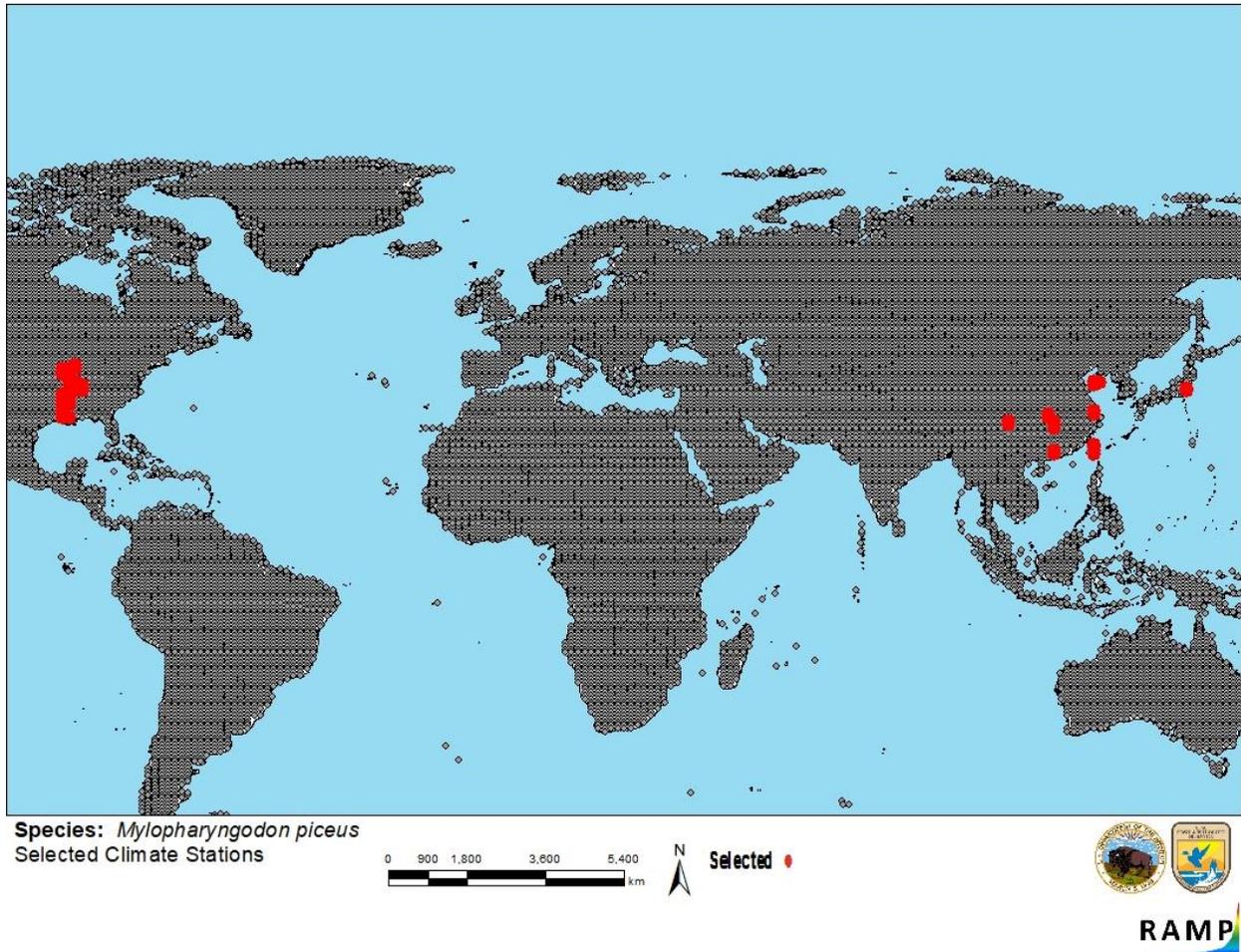


Figure 3. RAMP (Sanders et al. 2018) source map showing weather stations selected as source locations (red; United States, China, Taiwan, Japan) and non-source locations (gray) for *Mylopharyngodon piceus* climate matching. Source locations from GBIF Secretariat (2019).

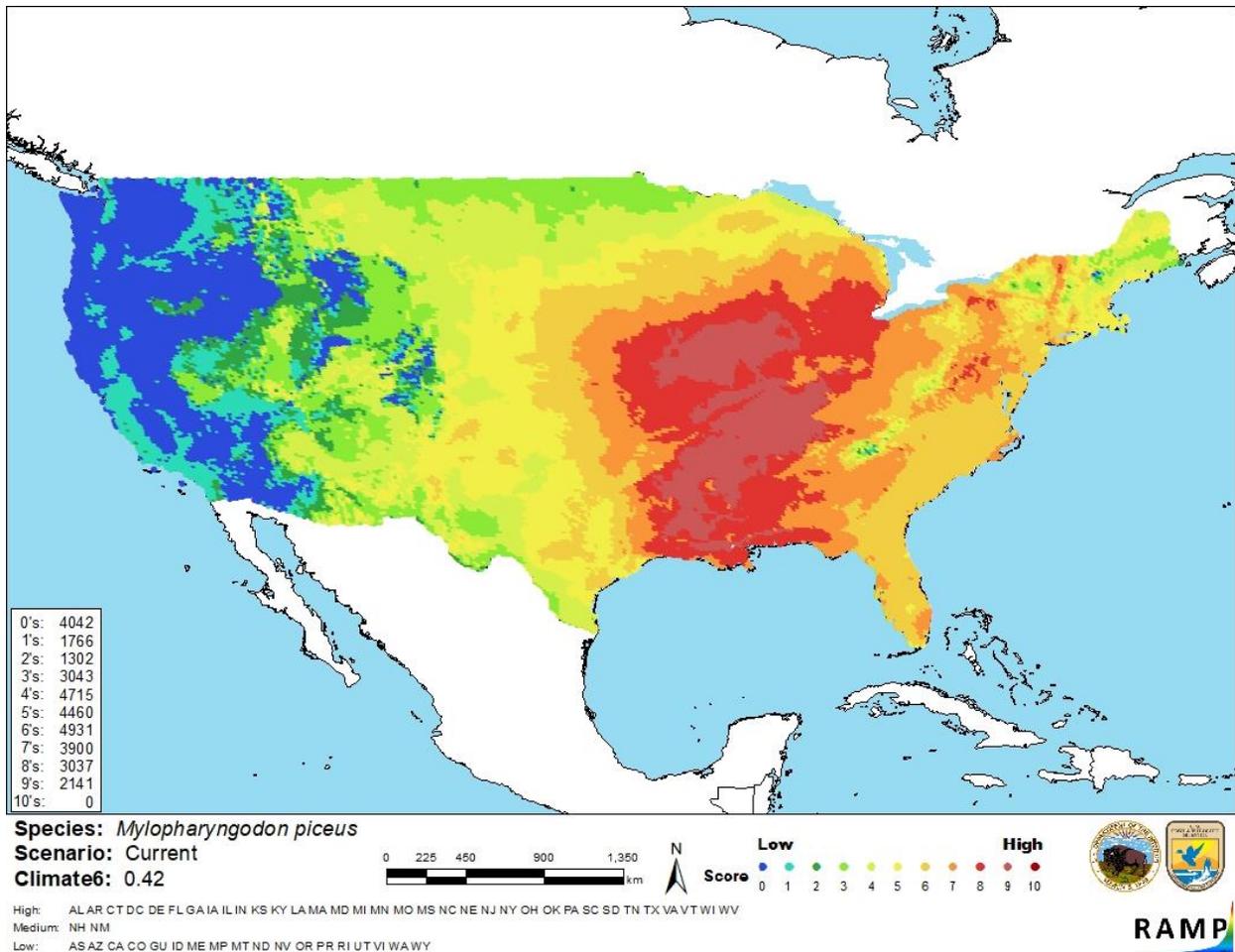


Figure 4. Map of RAMP (Sanders et al. 2018) climate matches for *Mylopharyngodon piceus* in the contiguous United States based on source locations reported by GBIF Secretariat (2019). 0=Lowest match, 10=Highest match. Counts of climate match scores are tabulated on the left.

The “High”, “Medium”, and “Low” climate match categories are based on the following table:

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

7 Certainty of Assessment

Information is available on the biology, ecology, and distribution of *M. piceus*. The species has established nonnative populations in some of the locations where it has been introduced. In the United States in particular, there is some disagreement among and within sources as to the population status of introduced *M. piceus*. Information available on impacts of introduction in the United States and other locations is either too limited to determine its scientific credibility, or focused on potential impacts rather than realized impacts. Further information is necessary to

evaluate fully the risk posed by this species to the contiguous United States. Certainty of this assessment is low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Mylopharyngodon piceus is a freshwater cyprinid fish native to rivers, lakes and streams of China and Vietnam. It has been introduced into Europe, West-Central Asia, and North America for aquaculture purposes or accidentally through contamination of imported grass carp stock. *M. piceus* has escaped captivity and established populations in central North America, Japan, and multiple countries in West-Central Asia. Impacts of introduction are poorly studied, although significant concerns have been stated, as summarized well by CABI (2019): “Establishment of *M. piceus* in the wild could have serious adverse impacts, due to predation on native mollusc species, including threatened and endangered species and fingernail clam populations, a primary food source of migrating waterfowl and fish. *M. piceus* are hosts to parasites, flukes, bacterial and viral diseases. It could possibly transfer these to other fish species. It serves as intermediate host for human parasites (e.g. schistosoma), or parasites relevant to fish culture, such as the yellow and white grubs in channel catfish and stripe bass farming.” Despite these concerns, the lack of documented and defensible realized impacts of *M. piceus* introduction necessitates assessing the history of invasiveness as “none documented.” Additionally, certainty of the assessment is low because of the lack of information on impacts of introduction. *M. piceus* has a high climate match with the contiguous United States, particularly within the area where it is already established (Mississippi River drainage). The overall risk assessment 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**
- **Important additional information: *M. piceus* is federally listed by the U.S. Fish and Wildlife Service as an injurious wildlife species.**
- **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.

CABI. 2019. *Mylopharyngodon piceus* (black amur). In Invasive Species Compendium. CAB International, Wallingford, U.K. Available: <https://www.cabi.org/ISC/datasheet/73511>.

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