

Bighead Carp (*Hypophthalmichthys nobilis*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, December 2023
Revised, December 2024
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Organism Type: Fish
Overall Risk Assessment Category: High



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<https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=551> (December 2024).

1 Native Range and Status in the United States

Native Range

From Jennings (1988):

“The bighead carp is endemic to eastern China, [...] in the lowland rivers of the north China plain and South China, including the Huai (Huai Ho), Yangtze, Pearl, West (Si Kiang), Han Chiang and Min rivers (Herre 1934; Mori 1936; Chang 1966; Chunsheng et al. 1980).”

Status in the United States

From Santiago (2021):

“Bighead carp are now found within or along the borders of at least 23 states in the USA and are reportedly growing in number in many midwestern rivers (Ramussen, [2000]; Nico and Fuller, 2005, 2010). [...] More recently, four bighead carp have been reportedly caught in Lake Erie [...]”

From Nico et al. (2024):

“There is evidence of reproducing populations in the middle and lower Mississippi and Missouri rivers and the species is apparently firmly established in the states of Illinois and Missouri (Burr et al. 1996; Pflieger 1997). Pflieger (1997) received first evidence of natural reproduction, capture of young bighead carp, in Missouri in 1989. Burr and Warren (1993) reported on the taking of a postlarval fish in southern Illinois in 1992. Subsequently, Burr et al. (1996) noted that bighead carp appeared to be using the lower reaches of the Big Muddy, Cache, and Kaskaskia rivers in Illinois as spawning areas. Tucker et al. ([1998]) also found young-of-the-year in their 1992 and 1994 collections in the Mississippi River of Illinois and Missouri. Douglas et al. (1996) collected more than 1600 larvae of this genus from a backwater outlet of the Black River in Louisiana in 1994. The first open water record of this species in Arkansas is based on two specimens taken from the Arkansas River in 1986; however, as of the late 1980s there has been no evidence of natural reproduction in that state (Robison and Buchanan 1988). According to Dill and Cordone (1997), there is evidence that the California ponds containing Chinese carp have spilled since 1989, opening the door for bighead carp and grass carp to gain access to the Sacramento River. The West Virginia record involved a single fish taken in 1997 (Hoeft, personal communication).”

Nico et al. (2026) report *Hypophthalmichthys nobilis* as established in Alabama, Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Nebraska, Ohio, Oklahoma, South Dakota, Tennessee, West Virginia, and Wisconsin. They report introductions with failed or unknown status in Arizona, California, Colorado, Florida, North Carolina, North Dakota, Pennsylvania, Texas, and Virginia.

According to Froese and Pauly (2024), *H. nobilis* has been introduced in Guam, but the current status of the introduction is unknown.

No records of *Hypophthalmichthys nobilis* in live trade in the United States were found.

Regulations

Species within the genus *Hypophthalmichthys* are listed as injurious under the Lacey Act (USFWS 2022).

Hypophthalmichthys nobilis is regulated at the genus level (*Hypophthalmichthys*) in Arkansas (AGFC 2022), Arizona (Arizona Game and Fish Commission 2022), Colorado (CPW 2023), Florida (FFWCC 2022), Georgia (State of Georgia 2023), Idaho (IDDA 2022), Illinois (Illinois DNR 2015), Indiana (Indiana DNR 2022), Iowa (Iowa NRC 2015), Kansas (KDWP 2023),

Kentucky (KDFWR 2022), Louisiana (LDWF 2022), Maryland (Code of Maryland Regulations 2022), Michigan (Michigan Compiled Laws 2022), Minnesota (Minnesota DNR 2022), Montana (Montana FWP 2023), Nebraska (Nebraska Game and Parks Commission 2023), Nevada (Nevada Board of Wildlife Commissioners 2022), New Hampshire (NHFG 2022), New Jersey (NJFW 2022), New Mexico (NMDGF 2023), New York (New York DEC 2022), North Carolina (North Carolina DEQ 2022), North Dakota (North Dakota Game and Fish Department 2023), Ohio (ODNR 2022), Oklahoma (ODWC 2023), Oregon (ODFW 2022), Pennsylvania (PFBC 2022), South Dakota (South Dakota GFP 2022), Texas (TDPW 2022), Virginia (Virginia DWR 2022), Washington (WDFW 2022), Wisconsin (Wisconsin DNR 2022), and Wyoming (WGFD 2022). It is regulated under its old scientific name (*Aristichthys nobilis*) in California (CDFW 2021), Connecticut (Connecticut DEEP 2020), Hawaii (HDOA 2019), and Tennessee (TWRA 2022). It is regulated at the family level (Cyprinidae) in Alaska (ADF&G 2023) and Utah (Utah DWR 2023). Please refer back to state agency regulatory documents for details on the regulations, including restrictions on activities involving this species. While effort was made to find all applicable regulations, this list may not be comprehensive. Notably, it does not include regulations that do not explicitly name this species or its genus or family, for example, when omitted from a list of authorized species with blanket regulation for all unnamed species.

Means of Introductions within the United States

From Nico et al. (2024):

“Bighead carp were first imported into the United States in 1973 by a private fish farmer in Arkansas who wanted to use them in combination with other phytophagous fishes to improve water quality and increase fish production in culture ponds. In 1974 the Arkansas Game and Fish Commission and Auburn University, Alabama, obtained stock to assess their potential benefits and impacts (Jennings 1988). The species first began to appear in open waters, the Ohio and Mississippi rivers, in the early 1980s, likely as a result of escapes from aquaculture facilities (Jennings 1988). In April 1994, several thousand bighead carp, along with a few black carp *Mylopharyngodon piceus*, escaped into the Osage River, Missouri, when high water flooded hatchery ponds at an aquaculture facility near Lake of the Ozarks (Anonymous 1994). Fish that escaped into the Missouri River have increased and spread, since 1990, into the lower Kansas River of Kansas, and elsewhere (Cross and Collins 1995). The species may have dispersed into Oklahoma waters from fish illegally brought into southeast Kansas by a commercial fish farmer in 1988 (Pigg et al. 1993). According to Pigg et al. (1997), collections in the Grand River of Oklahoma since 1991 indicate a gradual downstream dispersal. The species was illegally stocked along with grass carp in one or a few ponds in California; these were brought into the state by a commercial aquaculturist. The live fish were reportedly transported in a concealed compartment under a load of black bass in the fall of 1989 from a fish grower in Oklahoma or Arkansas (Dill and Cordone 1997). The species was illegally stocked in Cherry Creek Reservoir, Colorado (P. Walker, personal communication).”

Remarks

This ERSS was previously published in August 2018. Revisions were completed to incorporate new information and conform to updated standards.

From Santiago (2021):

“Silver carp [*Hypophthalmichthys molitrix*] and bighead carp have been reported to be capable of hybridizing in the wild (Fuller, 2005). Although they most closely resemble the bighead carp, the hybrids have traits intermediate between the parental species (Jennings, 1988). The hybrids are more omnivorous than the parents, which is not desirable in polyculture because they would compete with other fish species for food.”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2023):

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 *Hypophthalmichthys* Bleeker, 1860 – bighead carps
Species *Hypophthalmichthys nobilis* (Richardson, 1845)

According to Fricke et al. (2024), *Hypophthalmichthys nobilis* (Richardson 1845) is the valid scientific name.

The following synonym of *Hypophthalmichthys nobilis* from Fricke et al. (2024) was also used to search for information for this report: *Aristichthys nobilis*.

Size, Weight, and Age Range

From Froese and Pauly (2024):

“Maturity: L_m 64.2, range 55 - 70 cm. Max length : 146 cm SL [standard length] male/unsexed; [Kottelat and Freyhof 2007]; common length : 60.0 cm TL [total length] male/unsexed; [Baensch and Riehl 1991]; max. published weight: 40.0 kg [Kottelat and Freyhof 2007]; max. reported age: 20 years [Kottelat and Freyhof 2007]”

From Santiago (2021):

“In China, maximum growth in length is attained at 2-3 years of age and maximum weight gain at 3 years of age (NACA, 1989).”

Environment

From Froese and Pauly (2024):

“Freshwater; brackish; benthopelagic; potamodromous [Riede 2004]; [...] 1°C - 38°C [FAO 2019]”

From Jennings (1988):

“Bettoli et al. (1985) reported the preferred temperature range of bighead carp in a laboratory gradient as 25.0 °-26.9 °C, and the critical thermal maximum temperature as 38.8 °C. No information was found on the lower lethal temperature of bighead carp; however, considering their native range in China, they are able to tolerate extremes in water temperature, [...]”

From Santiago (2021):

“Considering its native origin, bighead carp can tolerate extremes in water temperature and high turbidity. The adults are able to live in the Caspian Sea at salinities of 5-8 ppt and a few have been found at 10-12 ppt ([Coad], 2005). The fry can also tolerate exposure to low salinities (up to 2 ppt) (Garcia et al., 1999).”

Climate

From Froese and Pauly (2024):

“Temperate; [...]; 34°N - 21°N, 101°E - 123°E [Huckstorf 2012]”

From Jennings (1988):

“[...] temperate to tropical.”

Distribution Outside the United States

Native

From Jennings (1988):

“The bighead carp is endemic to eastern China, [...] in the lowland rivers of the north China plain and South China, including the Huai (Huai Ho), Yangtze, Pearl, West (Si Kiang), Han Chiang and Min rivers (Herre 1934; Mori 1936; Chang 1966; Chunsheng et al. 1980).”

Introduced

Africa

For Africa, Froese and Pauly (2024) report *Hypophthalmichthys nobilis* as introduced and **probably not established** in Madagascar; introduced and **not established** in Egypt, Lesotho, and Mozambique; and introduced with **unknown** status in Morocco.

Additionally, Santiago (2021) reports *Hypophthalmichthys nobilis* as introduced and **present** in Algeria but does not indicate establishment status.

Asia

From Jennings (1988):

“Natural reproduction of bighead carp in the Soviet Union has been documented in the Karakum canal [Turkmenistan] (Aliev 1979) and the Syr-Dar'ya River [Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan] (Verigin et al. 1978), and self-sustaining populations have been reported in the basins of the Amudarya [Afghanistan, Tajikistan, Turkmenistan, Uzbekistan] and Kuban [southwestern Russia] rivers (Aliev 1965; Anon. 1970).”

“In the Philippines, the bighead carp reportedly reproduces in the Pampanga River (Datingaling 1976); however, there is no record of its permanent establishment there.”

“Tang (1960) collected bighead carp fry from the Ah Kung Tian Reservoir in Taiwan, suggesting natural reproduction; however, this incident could have been caused by unusual hydrological and climatic conditions.”

From Abdullah et al. (2021):

“The species is artificially reproduced in southern Iraq and Syrian reservoirs. [...] The abundance of the species is at the minimum in the inland waters, depending on the individuals that can escape from the fields and artificial hatcheries.”

Joshi et al. (2021) state that this species is established in the West Bengal region of India.

Kuljanishvili et al. (2021) report *H. nobilis* as introduced but not established in Armenia, Azerbaijan, or Georgia.

From NIES (2024):

“Established in Kasumigaura and Kitaura Lakes and Tonegawa and Edogawa river systems [Japan]. Also introduced to Yodogawa River [sic], without establishment.”

Additionally, for Asia, Froese and Pauly (2024) report *Hypophthalmichthys nobilis* as introduced and **established** in Cambodia, Indonesia, Iran, Laos, and Myanmar; introduced and **probably established** in Brunei, Thailand, and Vietnam; introduced and **probably not established** in Israel; introduced and **not established** in Fiji, Jordan, Malaysia, Nepal, Singapore, and Sri Lanka; and introduced with **unknown** status in Bangladesh, Bhutan, Korea, and Pakistan.

Additionally, Santiago (2021) reports *Hypophthalmichthys nobilis* as introduced and **present** in Hong Kong but does not indicate establishment status.

Europe

From Milardi et al. (2017):

“Some sources claim that the species is established at least in the Danube River, e.g. [Jankovic 1998; Ciolac 2006; Kolar et al. 2007], but others report they are only present in Europe through stocking and escapes [Kottelat and Freyhof 2007].”

“Bighead carp were found to have recruited in northeastern Italy, the first time that bighead carp are known to successfully recruit in west Europe.”

From GISD (2026):

“*Hypophthalmichthys nobilis* was first intentionally introduced into fish-farm ponds of Belarus was in 1965. Its known to be present in natural lakes since 1971 (Zhukov 1988).”

Olenin (2005) reports *H. nobilis* as introduced but not established in Estonia, Latvia, or Lithuania.

Jonsson and Jonsson (2016) report *H. nobilis* as introduced with no natural reproduction in Sweden.

Additionally, for Europe, Froese and Pauly (2024) report *Hypophthalmichthys nobilis* as introduced and **established** in Denmark and Turkey; introduced and **probably established** in Albania, Bulgaria, Netherlands, Poland, and Slovakia; introduced and **probably not established** in Greece and Hungary; introduced and **not established** in Austria, Czech Republic, France, Germany, Switzerland, United Kingdom, and Yugoslavia; and introduced with **unknown** status in Croatia, Hungary, and Ukraine.

Additionally, Santiago (2021) reports *Hypophthalmichthys nobilis* as introduced and **present** in Belgium, Romania, Serbia, and Slovenia but does not indicate establishment status.

North America

For North America, Froese and Pauly (2024) report *Hypophthalmichthys nobilis* as introduced and **probably established** in Mexico; introduced and **not established** in Cuba, Costa Rica, Dominican Republic, and Panama; and introduced with **unknown** status in Canada and Haiti.

South America

For South America, Froese and Pauly (2024) report *Hypophthalmichthys nobilis* as introduced and **not established** in Bolivia, Brazil, Colombia, and Peru; and introduced with **unknown** status in Argentina.

Means of Introduction Outside the United States

From Santiago (2021):

“Introduction of bighead carp in some European countries (e.g., Hungary and England) was initially inadvertent; bighead carp were mixed with shipments of grass carp (Jennings, [1988]).

Subsequent introductions, however, were intentional for use in culture and/or nutrient removal (Stott and Buckley, 1978; Jennings, 1988). Similarly, initial introduction of bighead carp in India was accidental and the fish were confined to a fish farm of a government institute but they totally disappeared later (Shetty et al., 1989). Bighead carp reappeared in 1987 most likely through private trade from Bangladesh.”

From Milardi et al. (2017):

“One of the earliest introductions in West Europe was in Italy, where bighead carp were reported as early as 1975 [Gandolfi 1991]. Because there are no records of authorized stocking in open waters, the species probably was introduced through escapes from aquaculture or unintentional introductions when stocking other [invasive] carps, especially grass carp [Melotti et al. 1987].”

Short Description

From Froese and Pauly (2024):

“Dorsal spines (total): 3; Dorsal soft rays (total): 7; Anal spines: 1-3; Anal soft rays: 12 - 14. Body with numerous scattered small black blotches. Keels extend from pelvic base to anus. Barbels absent. Posterior margin of last simple dorsal ray not serrated. Branched anal rays 13-14.5 [Kottelat et al. 1993]. Differs from *Hypophthalmichthys molitrix* by having scaled keel from pelvic to anal, 240-300 long gill rakes, head length 27-35% SL, dark overall coloration, flank with dark, large, very irregularly shaped blotches, fin bases and inferior parts of head and belly yellowish [Kottelat and Freyhof 2007].”

From Jennings (1988):

“The general shape of the bighead carp [...] is characterized as deep-bodied and moderately compressed laterally (Henderson 1976). It has no spines in the fins. The scales are cycloid and very small. [...] The head and mouth of the bighead carp are disproportionately large. The premaxillary and protruding mandible form rigid bony lips and the terminal mouth is not expandable. The eyes are located anteriorly on the head and have a definite ventral positioning. A smooth keel is between the base of the caudal fin and the pelvic fins.”

From Santiago (2021):

“There are 98-100 scales found in the lateral line, 26-28 scale rows above the lateral line, and 16-17 scale rows below the lateral line (Jennings, 1988). [...] The tip of the pectoral fin reaches beyond the origin of the ventral fin (i.e., about one-third to two-fifths of the base of the ventral fin). The dorsal fin origin is distinctly behind the ventral fin insertion. The fins of small specimens lack spines. Large specimens have a stiff, non-serrate spine at the dorsal fin origin and a slightly stiff spine at anal fin origin.”

“Front rays of the pectoral fins of male bighead carp have a sharp edge along the dorsal surface. The pectoral fins of female fish are smooth. It is easier to distinguish a male from a female fish during spawning season. Mature males have a rough (sandpaper-like) body surface and they develop callosities on the pectoral fins. Mature females are smooth to the touch.”

Biology

From Froese and Pauly (2024):

“In its natural environment, it occurs in rivers with marked water-level fluctuations, overwinters in middle and lower stretches. Forages in shallow (0.5-1.5 m deep) and warm (over 24°C) backwaters, lakes and flooded areas with slow current. Feeds on zooplankton throughout its life under natural conditions [FAO 2019]. Breeds in very deep, very turbid and warm water above 18°C (usually 22-30°C), with high current (1.1-1.9 m/s) and high oxygen concentrations. [...] In aquaculture, adults can survive brackish water (up to 7 ppt) when released into estuaries and coastal lakes. Feeds mainly on zooplankton, but also takes algae as food [Kottelat and Freyhof 2007]. Bottom feeding fish [Ukkatawewat 1984]. Undertakes long distance upriver migration at start of a rapid flood and water-level increase (in April-July depending on locality). Spawns in upper water layer or even at surface during floods. Spawning ceases if conditions change and resumes again when water level increases. After spawning, adults migrate for foraging habitats, Larvae drift downstream and settle in floodplain lakes, shallow shores and backwaters with little or no current. During autumn-winter, when temperature drops to 10°C, juveniles and adults form separate large schools and migrate downstream to deeper places in main course of river to overwinter [Kottelat and Freyhof 2007].”

From Nico et al. (2024):

“Bighead carp lack a true stomach which requires them to feed almost continuously (Henderson 1976).”

“Female bighead carp reach sexual maturity at three years of age, while males can reach sexual maturity in two years; however, this varies significantly with changing environmental conditions (Huet 1970; Kolar et al. 2007). Bigheaded carps are only known to spawn in large, turbulent rivers and it is believed that a rising hydrograph (flood event) is a primary spawning cue (Kolar et al. 2007). Fecundity increases with age and body weight and is directly related to growth rate (Verigin et al. 1990). In its native range, Bighead Carp has a fecundity ranging from 280,000-1.1 million eggs. In North America, fecundity ranged from 4,792-1.6 million eggs (Kipp et al. 2011). Bighead carp produce eggs that are semi-buoyant and require current to keep them from sinking to the bottom (Soin and Sukhanova 1972; Pflieger 1997). The eggs float for 40-60 hours before hatching.”

From NatureServe (2026):

“Daily time of peak feeding activity often in late afternoon and early evening, sometimes mid-morning also (Jennings 1988).”

“Larvae feed on diatoms, protozoans, cyanobacteria, infusoria, phytoplankton, and zooplankton; adults filter feed on phytoplankton and zooplankton, and also may consume detritus (Jennings 1988).”

Human Uses

From Jennings (1988):

“The bighead carp (*Hypophthalmichthys nobilis*) is recognized throughout the world, primarily because of its versatility in aquaculture operations. It [...] has been introduced worldwide as an important food fish. It also has been used in combination with other species of phytophagous fish to improve water quality and increase fish production, both in culture facilities and natural systems.”

From Nico et al. (2024):

“[*Hypophthalmichthys nobilis*] has been used in many parts of the world as a food fish and sometimes introduced in combination with silver carp into sewage lagoons and aquaculture ponds (Jennings 1988). In the United States bighead carp are frequently stocked into catfish culture ponds. According to Stickney (1996), studies have not confirmed that bighead carp actually do improve water quality in culture ponds.”

From Santiago (2021):

“Bighead carp ranks fifth among freshwater fish cultured globally (FAO, 2005). In 2002, global production of cultured bighead carp reached 1,722,832 tonnes valued at US \$1.48 billion. China is by far the main producer of bighead carp. In 2002, the bighead carp production in China was 1.7 million tonnes which was 98.7% of the global total (FAO, 2005).”

Santiago (2021) also reports this species is used for fertilizer and animal feed.

Diseases

***Hypophthalmichthys nobilis* has been documented as a susceptible host species of *Aeromonas invadans* (causative agent of epizootic ulcerative syndrome) and spring viraemia of carp virus (causative agent of spring viraemia of carp; WOA 2025). Both epizootic ulcerative syndrome and spring viraemia of carp are diseases listed by the World Organisation of Animal Health (WOAH 2025).**

***Hypophthalmichthys nobilis* may also be susceptible to viral hemorrhagic septicemia virus (causative agent of viral hemorrhagic septicemia), which is also listed by the World Organisation of Animal Health (WOAH 2025).**

From Thurner et al. (2017):

“We also conducted in vitro studies on BHC tissues (skin, gill, fin, and fry) and found high sensitivity to Largemouth Bass virus, viral hemorrhagic septicemia virus, and infectious pancreatic necrosis virus.”

From Jennings (1988):

“A number of protozoan parasites are known to infect bighead carp at these stages of development [fry and fingerling stages] (Molnar 1971; Lucky 1984). *Cryptobia branchialis* is a flagellate that infects the gills. Sporozoa include *Eimeria sinensis* and *E. cheni*, which infect the intestine; *Myxobolus pavlovskii*, which infects the gills, and *Chloromyxum cyprini*. Ciliates include *Chilodonella cyprini*, *Ichthyophthirius multifiliis*, *Trichodinella epizootica*, *Trichodina* sp., and *Apiosoma cylindriciformis*, all of which infect the gills of bighead carp fry.”

““White-skin disease” of bighead carp is caused by the bacterium *Pseudomonas dermoalba*, and is recognized by a whitening of the skin at the base of the dorsal and caudal fins. [...] The most infectious fungal disease is caused by *Saprolegnia*, and is characterized by a cotton-like growth on the epidermis; it develops mainly as a result of the fish being stressed.”

“*Ichthyophthirius multifiliis*, which parasitizes the skin and gill epithelium, is characterized by the presence of small white tubercles on the body. Lesions of the cornea and blindness may also occur. This disease often causes mass mortalities in culture situations. Trichodiniasis is a disease caused by infusoria of the genera *Trichodina*, *Trichodinella*, and *Tripartiella*. These protozoans infect the skin and gills of bighead carp and inhibit circulation. Migala (1978) discovered several species of these genera, as well as other ciliates, infecting bighead carp reared in ponds in Poland. Another protozoan that parasitizes the gill epithelium of bighead carp is *Myxobolus pavlovskii*.”

“Trematodes reported to parasitize bighead carp include *Dactylogyrus* sp., which infects the gill filaments; *Diplostomum* sp., the metacercariae of which parasitize the eyes; and *Posthodiplostomum* sp., in which the larva infects the skin and subcutaneous tissue, depositing a black pigment around the cyst it forms in the skin. This infection is termed black-spot disease (Bauer et al. 1973; Musselius 1979).”

“The bighead carp also may be parasitized by cestodes, including *Ligula intestinalis* and *Diagramma interrupta*, which occur in the body cavity. Diagrammosis is reported in culture situations in the Soviet Union (Bauer et al. 1973). In China, the bighead carp is reported to be a carrier of *Bothriocephalis gowkongensis*, an intestinal parasite that causes mass mortalities of numerous pond cultured species (Bauer et al. 1973).”

“The bighead carp is parasitized by the copepod *Lernaea*, which attaches to the body surface, musculature, or gills, forming a deep ulcer, abscess, or fistula at the point of attachment. Harding (1950) first described this infection in bighead carp from Singapore, and Shariff (1981) reported its occurrence in the eyes and on the body surface of bighead carp in Malaysia. The copepod *Sinergasilus lieni* parasitized the gill filaments of bighead carp, compressing and rupturing the gill tissue and resulting in embolism and necrosis (Bauer et al. 1973).”

Additionally, Poelen et al. (2014) report *Hypophthalmichthys nobilis* as a host of the viruses and bacteria *Aeromonas jandaei*, *Aeromonas salmonicida*, *Aeromonas veronii*, *Camallanus hypophthalmichthys*, Carp edema virus, *Inustiatius aristichthys*, *Laribacter hongkongensis*, *Sinergasilus polycolpus*, *Yersinia ruckeri*; and the parasites *Acanthogyrus multispinus*,

Acanthogyrus pseudoholospinus, *Bothriocephalus acheilognathi*, *Carassotrema koreanum*, *Carassotrema schistorchis*, *Carassotrema wui*, *Centrocestus formosanus*, Chinese liver fluke (*Clonorchis*), *Eucreadium aristichthydis*, *Gyrodactylus katharineri*, *Gyrodactylus nevadensis*, *Inustiatius aristichthydis*, *Inustiatius inustiatius*, *Ligula interrupta*, *Paradilepis scolecina*, *Parasymphylodora japonica*, *Philometroides pseudaspis*, *Platydidymus kui*, *Rhipidocotyle campanula*, *Sanguinicola armatus*, *Sanguinicola lungensis*, and *Valipora campylancristrota*.

Santiago (2021) also report the following diseases and disorders for *H. nobilis*: cyprinid herpesvirus 1 infection and grass carp haemorrhagic disease.

Threat to Humans

From Froese and Pauly (2024):

“Potential pest”

3 Impacts of Introductions

From Ji et al. (2022):

“In Ulungur Lake [northwestern China] in 2016, compared with the period before-stocking Bighead Carp, an increase of 10.41 times in the cell density and an increase of only 1.11 times in the biomass of phytoplankton in 2016 indicated that phytoplankton communities tended to be miniaturized (Liu et al. 2009 [...]) following stocking. The miniaturization of phytoplankton could make it difficult for the affected phytoplankton to be eaten as prey by other fishes; this may partially explain the significantly decreased nutritional contribution of phytoplankton to the fish species (except for Bighead Carp).”

“Furthermore, the turbidity in Ulungur Lake was higher after the stocking of Bighead Carp than before (Ji et al. 2018), which may reflect the increased availability of POM [particulate organic matter] and partly explain the obviously increased nutritional contributions of POM to the fishes.”

From Collins and Wahl (2018):

“We conducted an experiment where we compared responses of zooplankton in the presence of a native fish assemblage (control, n = 5 ponds) and a native fish assemblage plus bighead carp (invaded, n = 5 ponds). The experiment lasted 3 months (June–September, 2014) and was conducted in clay-lined ponds (0.04 ha. wetted area; 1.5–1.75 m water depths). We quantified the predatory effects of bighead carp on overall changes to the size structure of zooplankton assemblages, body lengths of zooplankton taxa and taxa-specific changes to standing crop biomass and daily secondary production.”

“Our findings indicate intense predation by bighead carp reduced the body size of [zooplankton] individuals, shifted [zooplankton] community size structure towards smaller individuals, reduced the biomass and daily production of zooplankton and reduced immature copepod *nauplii*.”

From Singh et al. (2013):

“Has initiated displacement of *Catla catla* [in India] leading to declining commercial catches. Possibility of natural hybridization of *A. nobilis* with *Catla catla*.”

From Santiago (2021):

“The effect of bighead carp on biodiversity in many countries has not been well assessed or is not adequately known (FishBase, 2004; Nico and Fuller, 2005).”

The following quotations describe the combined effects of *H. nobilis* and other nonnative fishes on the ecosystems into which they were introduced. Because the impact of *H. nobilis* cannot be separated from the impacts of other species in these cases, they were not used to determine the History of Invasiveness.

From Santiago (2021):

“Jennings (1988) reported various works in Soviet Union [sic] wherein bighead carp, silver carp and grass carp have been used extensively in the management of inland waters that resulted to [sic] the prevention of intense blooms of phytoplankton particularly blue-green algae, and the increase in biomass of zoobenthos especially chironomids. Introduction of filter-feeding fish (silver carp, bighead carp, and their hybrid) in irrigation reservoirs prevented blooms of blue-green algae and reduced the concentration of filamentous algae as well as that of copepods and cladocerans (Sagi, 1992). In a shallow lake in India, the introduction of silver carp, bighead carp and tilapia *O. niloticus* led to a 60-93% decrease in the *Microcystis* population with bighead carp being next only to silver carp in grazing efficiency ([Datta (Saha)] and Jana, 1998). However, nutrient enrichment also occurred in the system (ichthyoeutrophication), but was attributed mainly to the faecal waste of tilapia.”

From Irons et al. (2007):

“Despite variable recruitment, [invasive] carps [*Hypophthalmichthys nobilis* and *H. molitrix*] abundance and biomass have increased since 2000, as evidenced by commercial landings, and [invasive] carps now dominate the fish community on La Grange Reach. Previous research suggests dietary overlap among bighead and silver carps and two native Illinois River fishes, gizzard shad *Dorosoma cepedianum* and bigmouth buffalo *Ictiobus cyprinellus*. Total length and mass data from c. 5000 fishes were used to test for changes in gizzard shad and bigmouth buffalo body condition after [invasive] carps establishment and investigate potential competitive interactions and changes in fitness. Analyses revealed significant declines in body condition of gizzard shad (-7%) and bigmouth buffalo (-5%) following the [invasive] carps invasion from 2000 to 2006. Segmented regression analyses showed no significant change in the rate of decline in gizzard shad condition after 2000, whereas the rate of decline in bigmouth buffalo condition increased significantly after 2000. Statistically significant differences in gizzard shad condition after [invasive] carps establishment (2000–2006) was observed, whereas condition of bigmouth buffalo was significantly lower in all years following [invasive] carps establishment as compared to 2000. Declines in gizzard shad and bigmouth buffalo condition were significantly correlated

with increased commercial harvest of [invasive] carps and poorly correlated with other abiotic and biotic factors (e.g. temperature, chlorophyll a and discharge) that may influence fish body condition. These results may suggest that [invasive] carps are influencing native planktivore body condition, and future research should focus on determining whether food is limited in the Illinois River for native planktivores and other fish species.”

From Sass et al. (2014):

“Mean total zooplankton, cladoceran, and copepod abundances (55 µm filter) decreased significantly between pre- and post-bighead and silver carp establishment time periods in the La Grange reach, Illinois River [...]. Mean rotifer abundance (55 µm filter) increased significantly among time periods [...]. Mean total zooplankton abundance decreased from 166.1 to 121.7/L before and after bighead and silver carp establishment, respectively (N = 257, T255 = 2.17, P = 0.03). Between time periods, the mean rotifer abundance increased from 75.2 to 117.0/L (N = 257, T255 = 2.16, P = 0.03). Mean cladoceran and copepod abundances declined significantly from 19.7 to 2.0 and from 71.2 to 2.7/L, respectively prior to and after bighead and silver carp establishment in the La Grange reach, Illinois River (cladocerans, N = 257, T255 = 13.15, P < 0.001; copepods, N = 257, T255 = 16.52, P < 0.001).”

“Our results suggest that the establishment of invasive bighead and silver carp is correlated with an alteration of the zooplankton community to potentially benefit themselves. Increases in rotifer abundances directly benefit bighead and silver carp because their capacities to filter very small particles far exceed those of many native fishes and rotifers are a dominant prey item in their diets (Sampson et al., 2009; Williamson and Garvey, 2005).”

From Freedman et al. (2012)

“Based on stable isotope signatures, [Invasive] Carp [i.e., *Hypophthalmichthys nobilis* and *H. molitrix*] appear to compete more directly with [native] Gizzard Shad, Bluegill, and Emerald Shiner than with native filter feeding planktivores such as Bigmouth Buffalo and Paddlefish. [Invasive] carps may thus alter where and on what competing fish species feed, and by reducing the overall prey base may be able to outcompete native species.”

This species is regulated in at least 40 U.S. States as well as being federally listed as injurious under the Lacey Act. See section 1.

4 History of Invasiveness

The History of Invasiveness for *Hypophthalmichthys nobilis* is classified as High. This species has many known introductions across the world and is widely established in the United States. *H. nobilis* introduction has been documented in the scientific literature as altering phytoplankton and zooplankton communities, with cascading effects for fish communities.

5 Global Distribution

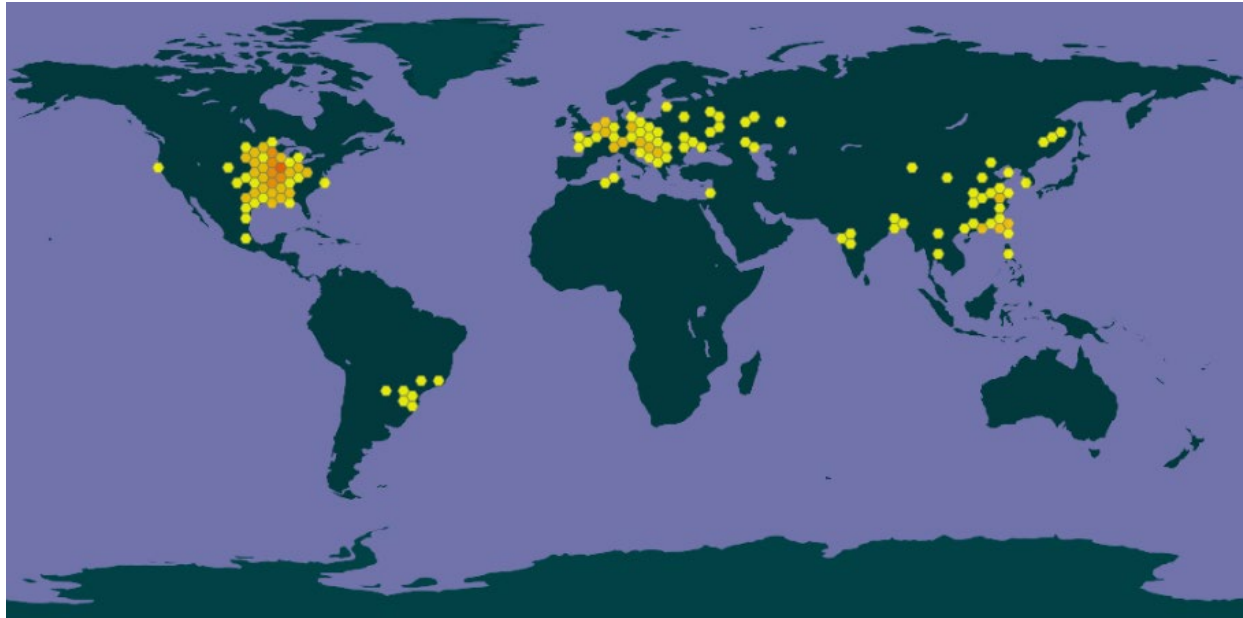


Figure 1. Reported global distribution of *Hypophthalmichthys nobilis*. Map from GBIF Secretariat (2023). Observations are reported throughout Europe, eastern Asia, and central North America, with additional scattered observations in eastern South America, northern Africa, and southwestern Asia. Locations in Albania, Algeria, Austria, Bangladesh, Belgium, Brazil, Bulgaria, Canada, northeastern China, Croatia, the Czech Republic, France, Germany, Hong Kong, central India, Israel, Hungary, northwestern Italy, Kosovo, Latvia, Luxembourg, Mexico, Montenegro, the Netherlands, North Macedonia, Paraguay, the Philippines, Poland, Romania, southeastern Russia, Serbia, Slovenia, South Korea, Sweden, Switzerland, Thailand, Ukraine, the United Kingdom, and parts of the United States (see section 6) do not represent confirmed established populations and were not included in the climate matching analysis. Points in northwestern China were not included in the climate matching analysis due to incorrect coordinates or coordinates representing the country centroid rather than an exact occurrence location.

No georeferenced occurrences were available to represent the established range of *H. nobilis* in Afghanistan, Cambodia, Kazakhstan, Kyrgyzstan, Indonesia, Iran, Myanmar, Tajikistan, Turkmenistan, or Uzbekistan.

Additional source locations were available for climate matching from Milardi et al. (2017; Italy) and NIES (2024; Japan).

6 Distribution Within the United States

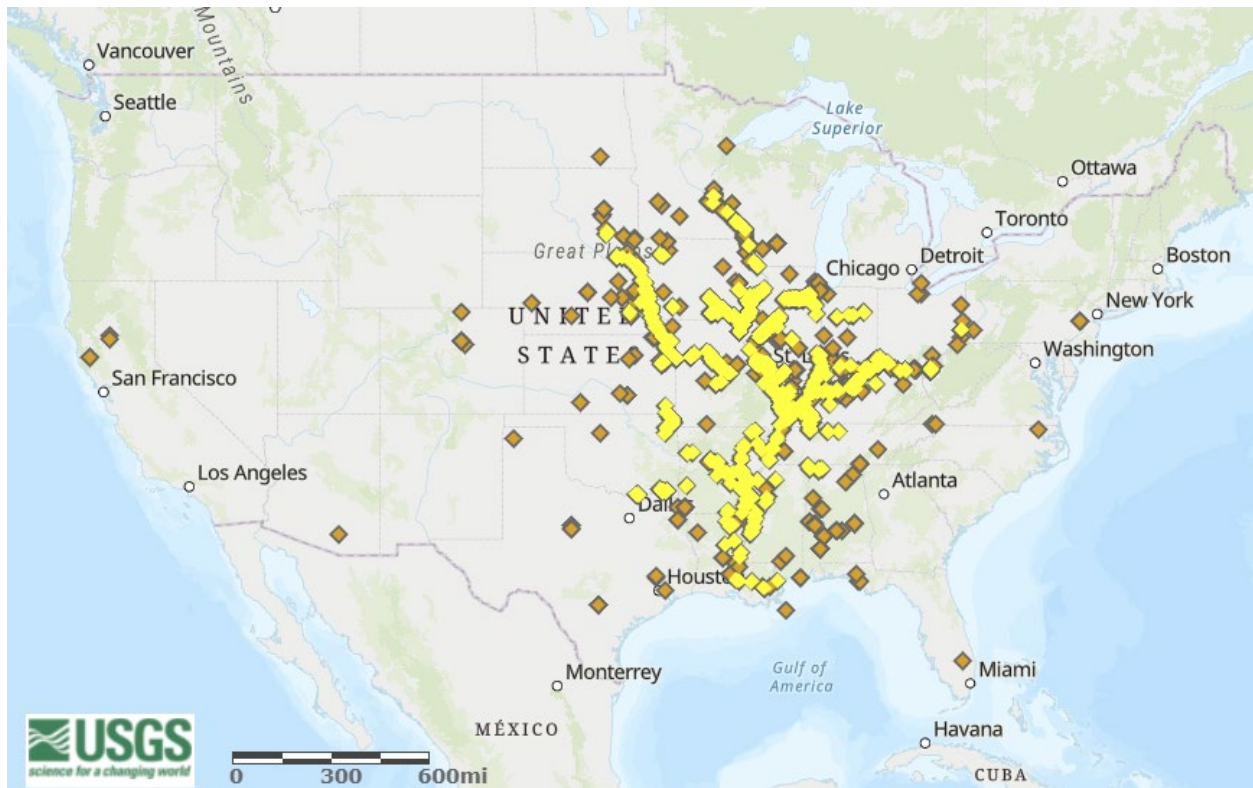


Figure 2. Reported distribution of *Hypophthalmichthys nobilis* in the United States. Map from Nico et al. (2026). Observations are reported from Alabama, Arkansas, Arizona, California, Colorado, Florida, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, South Dakota, Tennessee, Texas, Virginia, West Virginia, and Wisconsin. Yellow points represent established nonnative populations of *H. nobilis* and orange points represent other reported nonnative occurrences. Only established populations and points in the native range were used to select source locations for the climate matching analysis.

No distribution map is available showing the location of observations of *Hypophthalmichthys nobilis* in Guam.

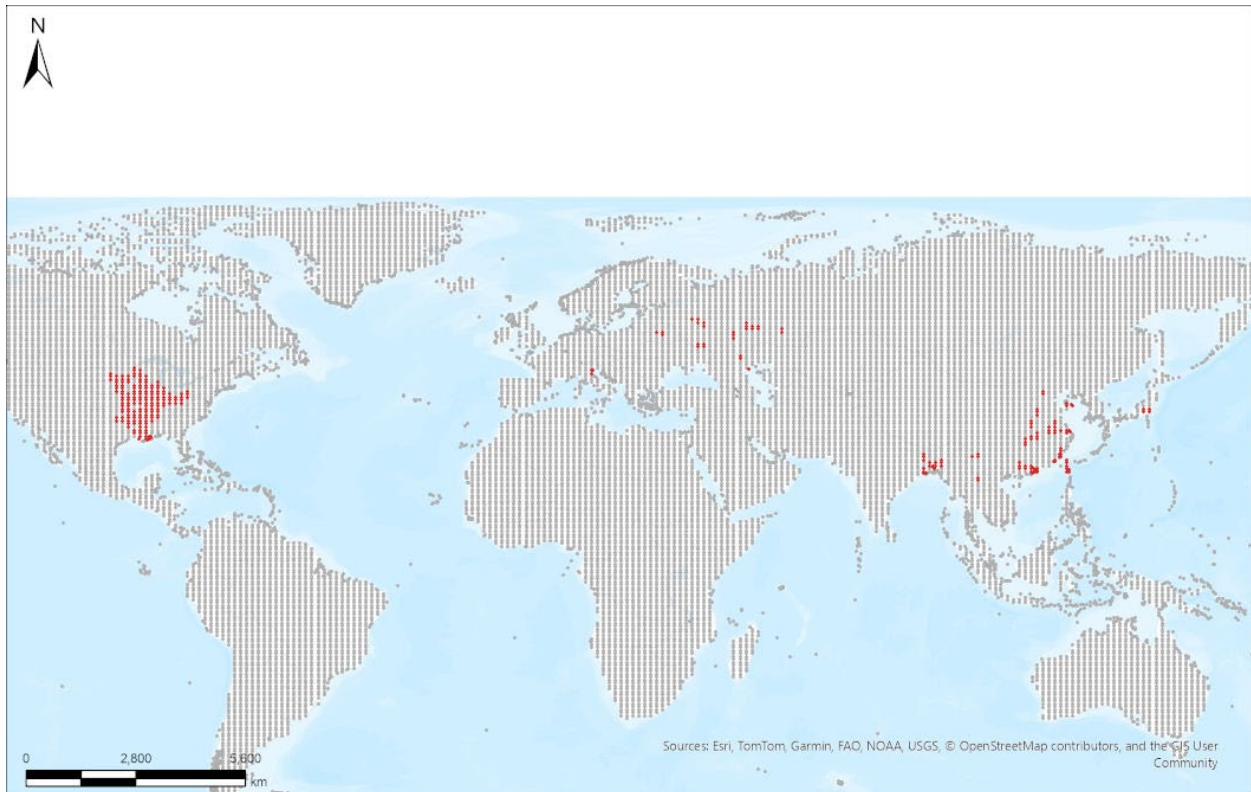
7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Hypophthalmichthys nobilis* to the contiguous United States was high from the Rocky Mountains east to the Atlantic Coast and from the Canadian border to the Gulf Coast. The highest matches occurred in the Mississippi River basin where this species is currently established. The climate match was medium to medium-high in the Northeast and in parts of the Southwest and Great Basin, but much of the western third of the contiguous United States had a low climate match. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.809 (scores ≥ 0.103 , are

classified as high), indicating that Yes, there is establishment concern for this species. The Climate 6 score is calculated as: (count of target points with scores ≥ 6)/(count of all target points). Establishment concern is warranted for Climate 6 scores greater than or equal to 0.002 based on an analysis of the establishment success of 356 nonnative aquatic species introduced to the United States (USFWS 2024).

Projected climate matches in the contiguous United States under future climate scenarios are available for *Hypophthalmichthys nobilis* (see Appendix). These projected climate matches are provided as additional context for the reader; future climate scenarios are not factored into the Overall Risk Assessment Category.



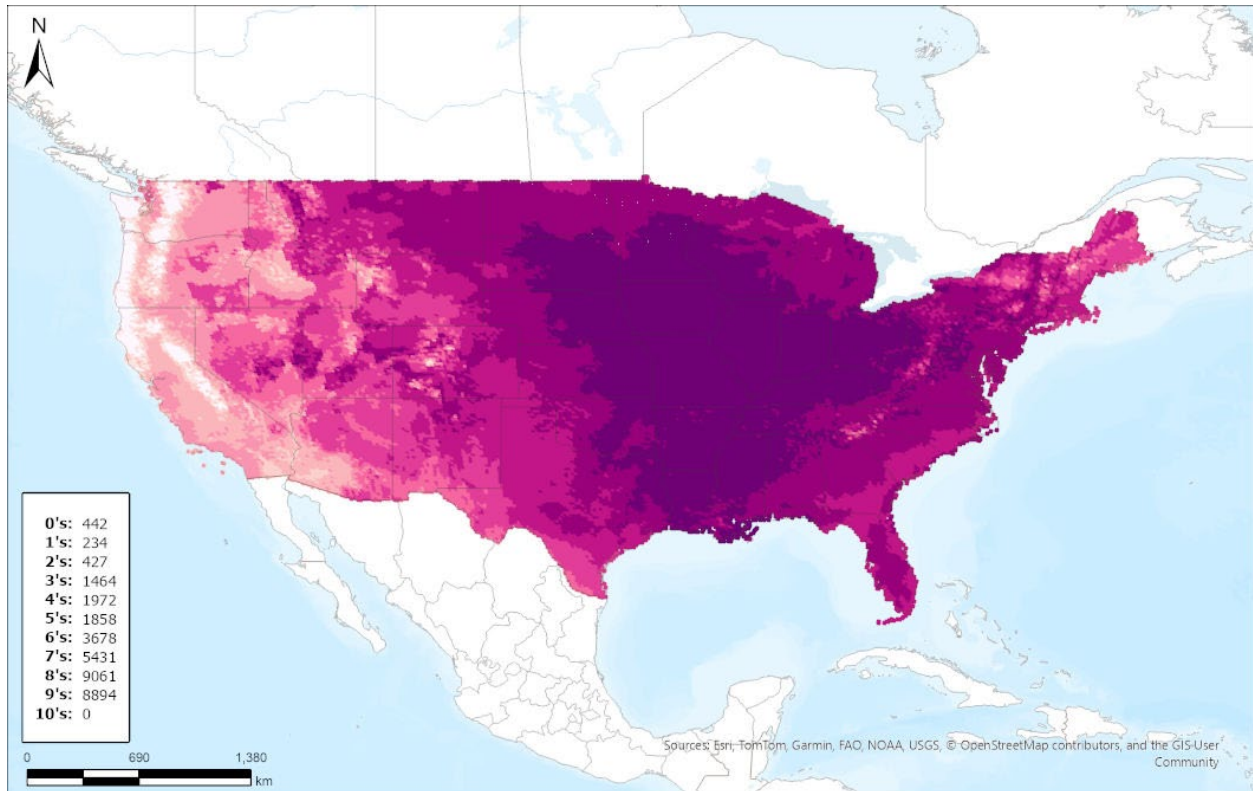
Species: *Hypophthalmichthys nobilis*

Selected Climate Stations ●



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Figure 3. RAMP (Sanders et al. 2023) source map showing global weather stations selected as source locations (red; United States, Italy, Belarus, Russia, India, Laos, China, Taiwan, Japan) and non-source locations (gray) for *Hypophthalmichthys nobilis* climate matching. Source locations from GBIF Secretariat (2023), supplemented by Milardi et al. (2017) and NIES (2024). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.



Species: *Hypophthalmichthys nobilis*

Current

Climate 6 Score: 0.809



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Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for *Hypophthalmichthys nobilis* in the contiguous United States based on source locations reported by GBIF Secretariat (2023), Milardi et al. (2017), and NIES (2024). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Hypophthalmichthys nobilis* is classified as Medium. There is clear evidence of introduction and establishment of this species outside its native range. Information on impacts of introduction is available, but most of this research combines impacts from *H. nobilis* with congener *H. molitrix*. Few studies were found that have clearly and convincingly documented impacts of *H. nobilis* introduction in isolation from other introduced species.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Hypophthalmichthys nobilis, Bighead Carp, is a freshwater fish native to lowland rivers of eastern China. This species is a planktivorous filter feeder. *H. nobilis* is used globally in aquaculture as a food fish and to improve water quality in culture ponds. Escape from

aquaculture is one of the introduction pathways for this species, along with illegal stocking and release of contaminated grass carp stock. *H. nobilis* has become established outside its native range from Asia to Europe to the United States. It is listed as injurious by the U.S. Fish and Wildlife Service under the Lacey Act and is regulated in at least 40 U.S. States. The History of Invasiveness for *Hypophthalmichthys nobilis* is classified as High because of its ability to alter plankton community structure with cascading effects to fish communities. The climate matching analysis for the contiguous United States indicates Yes, there is establishment concern for this species outside of its already established range (the Mississippi River drainage and its major tributaries). The Certainty of Assessment for this ERSS is classified as Medium because much of the information available regarding impacts confounds the impacts from *H. nobilis* with impacts from other introduced fishes. The Overall Risk Assessment Category for *Hypophthalmichthys nobilis* in the contiguous United States is High.

Assessment Elements

- **History of Invasiveness (see Section 4): High**
- **Establishment Concern (see Section 7): Yes**
- **Certainty of Assessment (see Section 8): Medium**
- **Remarks, Important additional information: Susceptible to multiple diseases listed by the World Organisation for Animal Health.**
- **Overall Risk Assessment Category: High**

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Appendix

Summary of Future Climate Matching Analysis

Future climate projections represent two Shared Socioeconomic Pathways (SSP) developed by the Intergovernmental Panel on Climate Change (IPCC 2021): SSP5, in which emissions triple by the end of the century; and SSP3, in which emissions double by the end of the century. Future climate matches were based on source locations reported by GBIF Secretariat (2023), Milardi et al. (2017), and NIES (2024).

Under the future climate scenarios (figure A1), on average, high climate match for *Hypophthalmichthys nobilis* was projected to occur in the Appalachian Range, Great Lakes, Mid-Atlantic, Northeast, Northern Plains, Southeast, and Southern Atlantic Coast regions of the contiguous United States. Areas of low climate match were projected to occur in the Northern Pacific Coast region primarily, but there were also significant areas of low match in California, the Great Basin, and the Southwest region. From SSP3 to SSP5 and from time step 2055 to time step 2085, the areas of highest match in the Great Lakes and Northern Plains regions decreased in extent substantially. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.641 (model: UKESM1-0-LL, SSP5, 2085) to a high of 0.786 (model: IPSL-CM6A-LR, SSP3, 2055). All future scenario Climate 6 scores were above the Establishment Concern threshold, indicating that Yes, there is establishment concern for this species under future scenarios. The Climate 6 score for the current climate match (0.809, figure 4) falls above the range of scores for future projections. The time step and climate scenario with the most change relative to current conditions was SSP5, 2085, the most extreme climate change scenario. Under multiple time step and climate scenarios, areas within the Colorado Plateau, Northeast, and Western Mountains saw a moderate increase in the climate match relative to current conditions. There was a very small area in western Wyoming where a large increase in climate match was predicted under all scenarios. Under the SSP5, 2085 scenario, areas within the Northern Plains and Southern Plains saw a large decrease in the climate match relative to current conditions. Additionally, areas within the Appalachian Range, Colorado Plateau, Great Basin, Great Lakes, Gulf Coast, Mid-Atlantic, Southeast, Southern Atlantic Coast, Southern Florida, Southwest, and Western Mountains saw a moderate decrease in the climate match relative to current conditions under multiple scenarios. Additional very small areas of large or moderate change may be visible on the maps (figure A3).

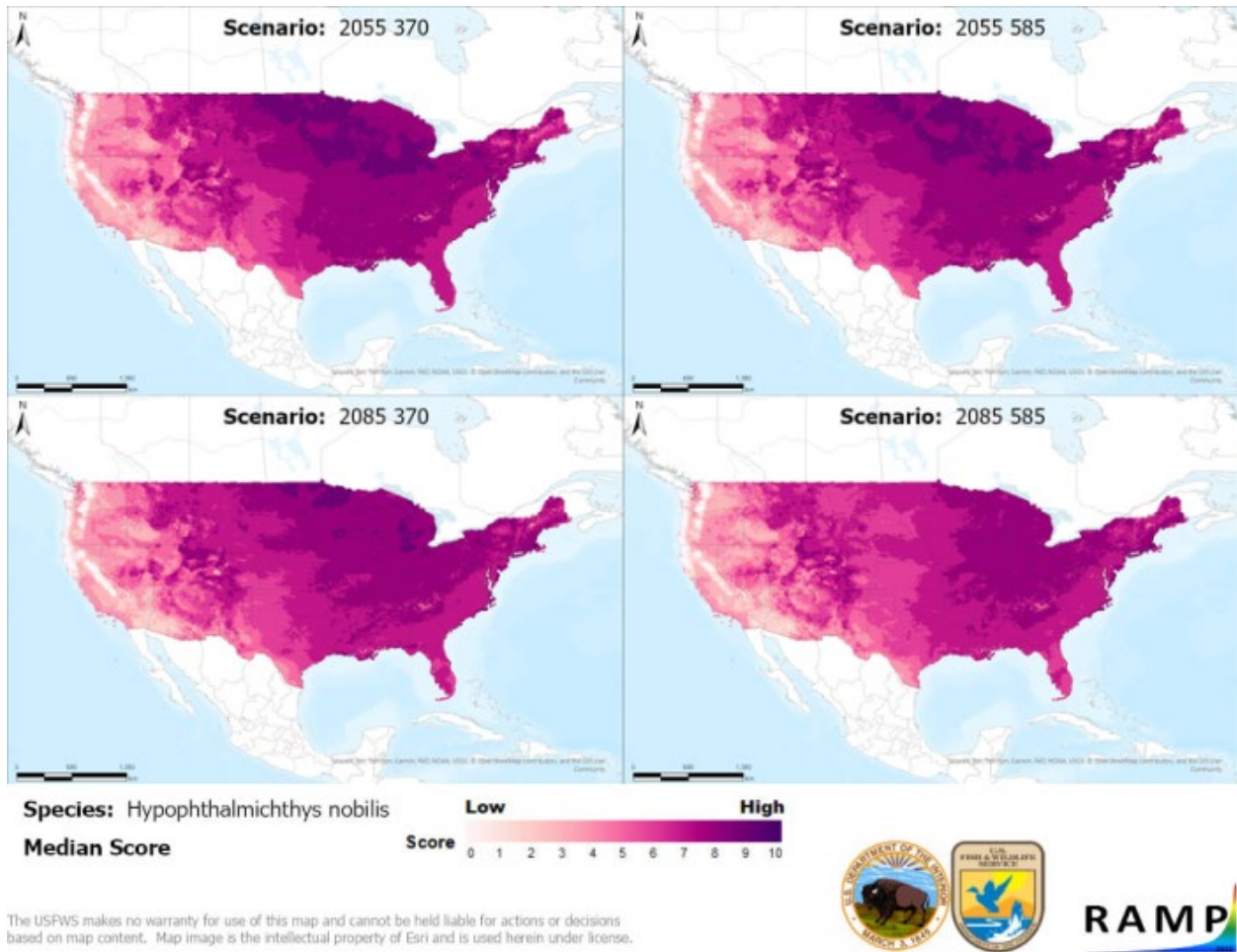


Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Hypophthalmichthys nobilis* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2023), Milardi et al. (2017), and NIES (2024). Shared Socioeconomic Pathways (SSPs) used (from left to right): SSP3, SSP5 (IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global climate models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

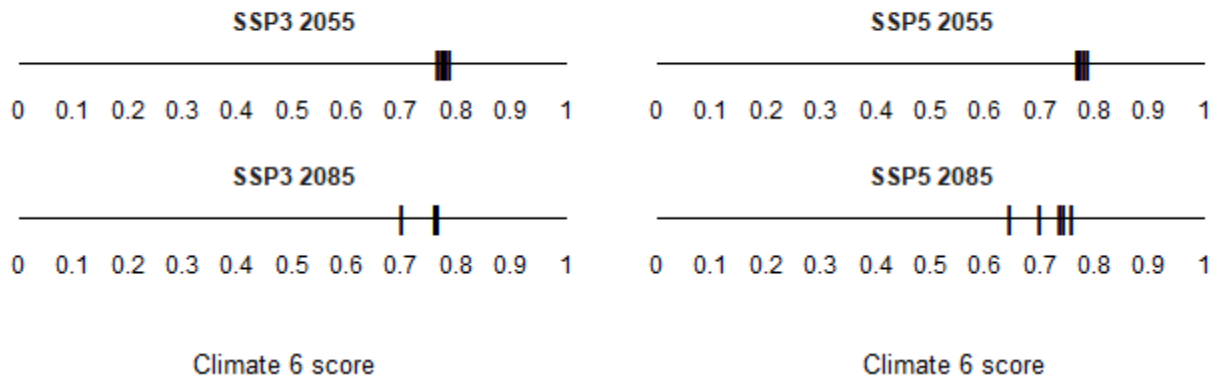


Figure A2. Comparison of projected future Climate 6 scores for *Hypophthalmichthys nobilis* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018; IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global climate models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0.

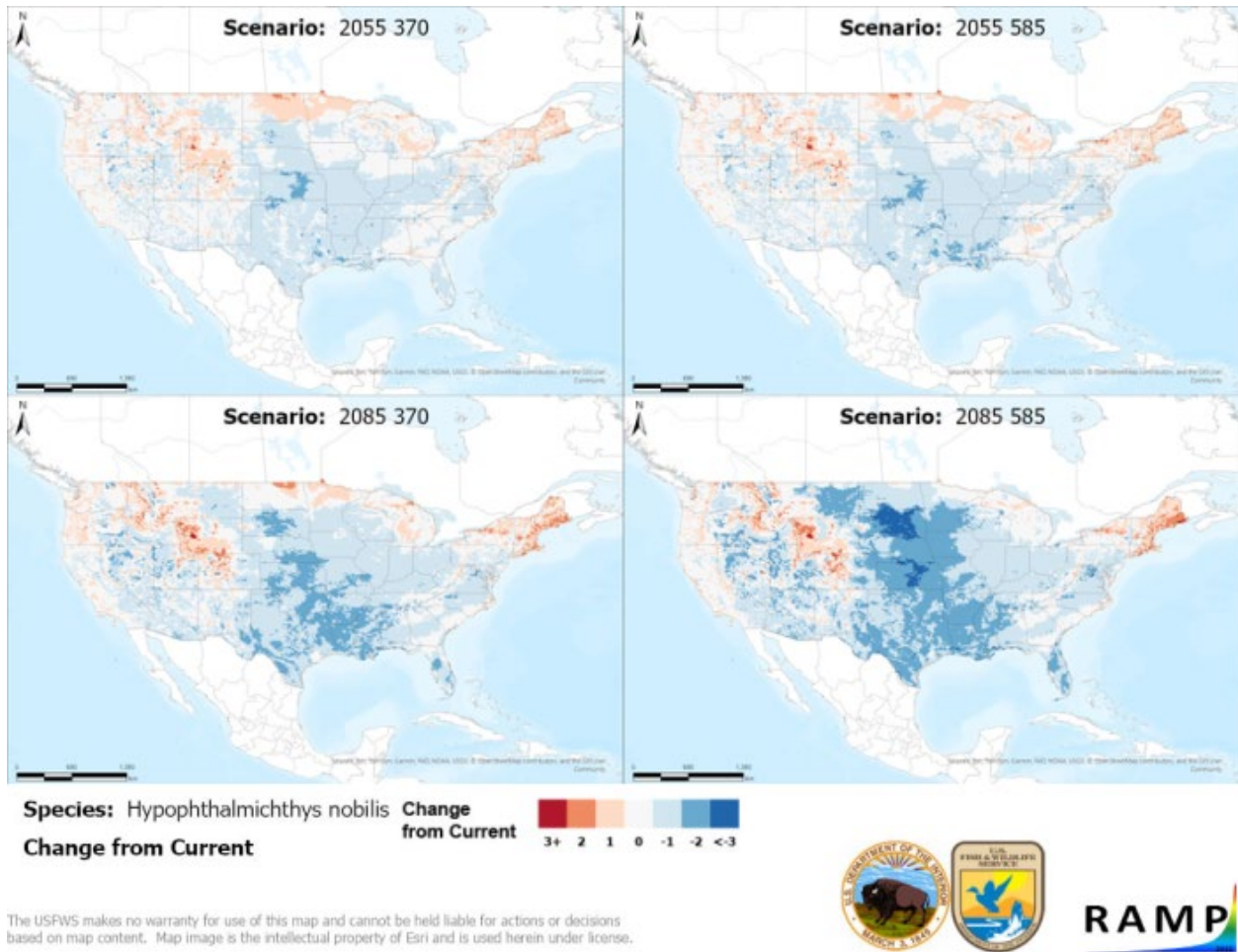


Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Hypophthalmichthys nobilis* based on source locations reported by GBIF Secretariat (2023), Milardi et al. (2017), and NIES (2024). Shared Socioeconomic Pathways (SSPs) used (from left to right): SSP3, SSP5 (IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0. Shades of blue indicate a lower target point score under future scenarios than under current conditions. Shades of red indicate a higher target point score under future scenarios than under current conditions. Darker shades indicate greater change.

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