

Asian Carp Risk Analysis for Arizona



Name

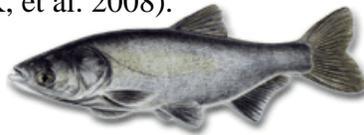
Asian carp (*Cyprinidae*); five species now occur in the contiguous United States, four are considered invasive, these include: grass carp (*Ctenopharyngodon idella*), silver carp (*Hypophthalmichthys molotrix*), bighead carp (*Aristichthys nobilis*), and black carp (*Mylopharyngodon piceus*)

Description

The grass carp is a large riverine fish that can weigh over 45 kg and grow to 1.5 m total length. This carp is a voracious herbivore feeding on both aquatic and terrestrial macrophytes as adults, but will also take aquatic invertebrates especially as juveniles. Grass carp can live to be over 30 years old. This carp prefers shallow backwaters of rivers, but deeper water is used as temperatures drop (Aitkin, J.K, et al. 2008).



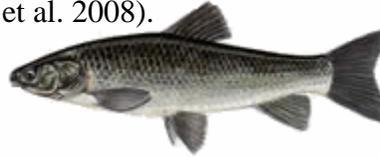
The silver carp is a large riverine fish that can weigh over 35 kg and grow to over 1 m total length. This carp is also a filter feeder, like the bighead carp, that feeds mainly on phytoplankton, but is also known to eat zooplankton and detritus. Silver carp can live to be 20 years old. This carp usually occupies the upper portion of the water column and has a habit of leaping out of the water when disturbed. The sound of a boat or personal watercraft motor can initiate this behavior, and jumping silver carp have caused numerous personal injuries and property damage to recreational boaters and anglers in the Midwest (Aitkin, J.K, et al. 2008).



The bighead carp is a large riverine fish that may grow over 1 meter (m) total length and weigh up to 40 kilogram (kg) in nine years. This carp is a water column filter feeder that feeds mainly on zooplankton, but is also known to eat phytoplankton and detritus. Bighead carp likely live to be 10 to 20 years old, maximum age reported = 16 years (Aitkin, J.K, et al. 2008).



The black carp is a large riverine fish that can weigh 70 kg or more and grow to more 1.5 m total length. Black carp are bottom feeding molluscivores that can consume just about any size mollusk that will fit in their mouth. Although the maximum age of black carp is unknown, black carp are thought to live more than 13 years (Aitkin, J.K, et al. 2008).



Life History

Asian carp are native to temperate and sub-tropical eastern Asia. In general, they require large, low gradient, turbid rivers to complete their life cycle. Asian carps have a similar life cycle and are known to migrate together and spawn simultaneously in the same river reach. Bighead and silver carp can hybridize together. The life cycle of Asian carps starts with pre-spawn upstream migration of adults in the spring or summer, usually triggered by an increase in water temperature and an increase in water flow (Aitkin, J.K, et al. 2008).



Reproductive Strategy

Spawning usually takes place in turbulent water such as downstream from the confluence of two rivers or tributaries. Asian carps are broadcast spawners and the fertilized eggs drift downstream with the current. Post spawning adults do not die, but migrate back downstream in late summer. Eggs hatch in the flowing river and the larvae move into nursery areas such as floodplain lakes or backwater areas. Adults and sub adults feed in both the riverine and backwater habitats. The age of sexual maturation in Asian carps is climate dependent, and males generally become sexually mature before females. Bighead carp become sexually mature at 5 to 7 years, black carp at 6 to 11 years, grass carp at 4 to 7 years, and silver carp at 4 to 6 years of age in temperate regions. Fecundity of females is size dependent in Asian carps. Fecundity ranges from 280,000 to > 1,000,000 eggs in bighead carp, 129,000 to > 1,000,000 eggs in black carp, 255,000 to 2,000,000 eggs in grass carp, and 265,000 to 2,000,000 eggs in silver carp (Aitkin, J.K, et al. 2008).

Environmental Tolerances and Restrictions

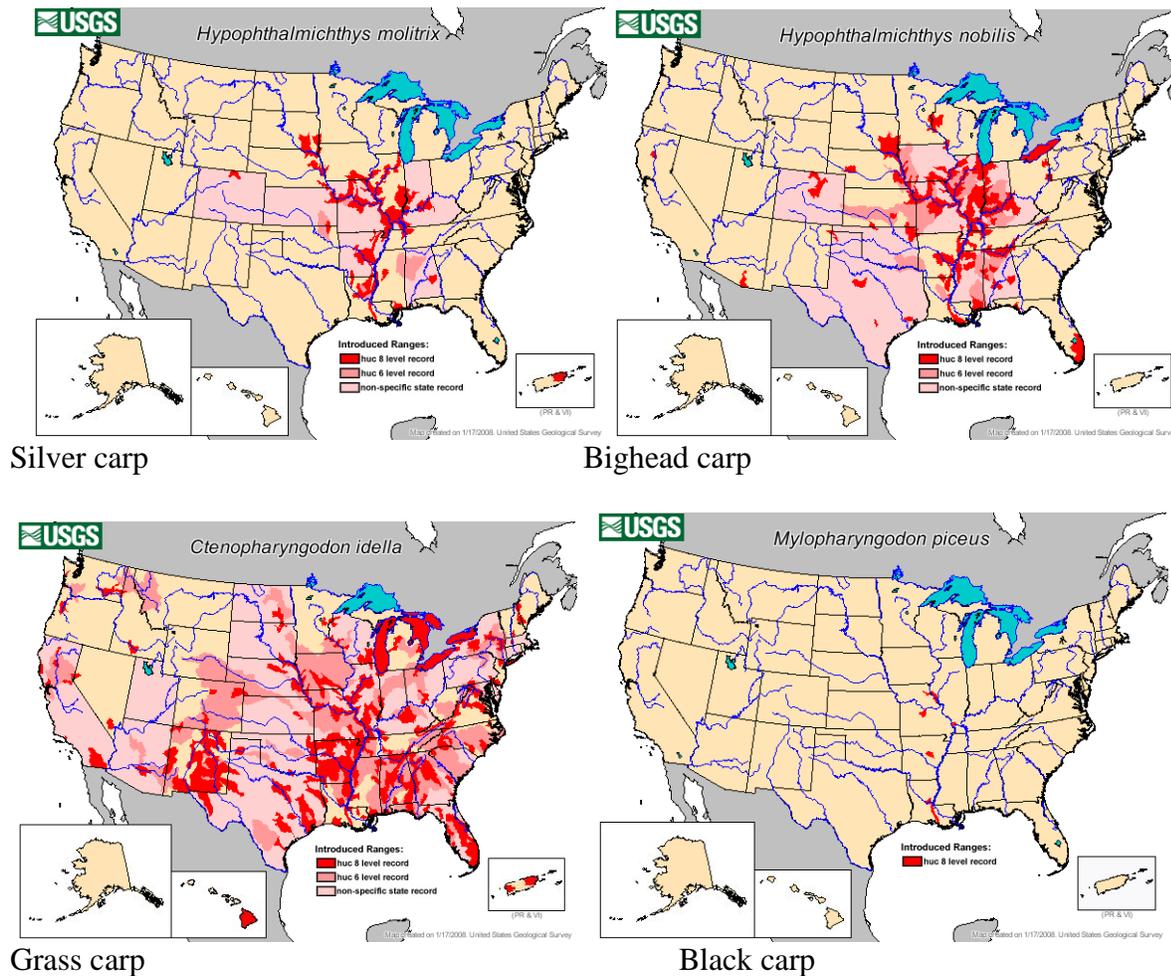
Asian carp spread quickly after introduction, becoming very abundant, and hurt native fishes either by damaging habitats or by consuming vast amounts of food. Grass carp destroy habitat and reduce water quality for native fishes by uprooting or consuming aquatic vegetation. Bighead and silver carps are filter-feeders that compete with larval fishes (Koel, T.M., et al. 2000).

Preferred Habitat

Asian carp prefer large, slow moving riverine systems, lakes, or reservoirs. For water temperature, adult Asian carps have been found to survive in waters exhibiting a wide range of temperatures, from 0°C to 30°C (Aitkin, J.K, et al. 2008).

Distribution

- **Native Range:** **Grass Carp**; rivers of eastern Asia, from the Amur River of far eastern Russia and China, south to the West River of southern China. **Silver Carp**; eastern China. **Bighead Carp**; eastern Asia from southern China north into far eastern Russia. **Black Carp**; Pacific Ocean drainages of eastern Asia from the Amur River Basin south to the West-Pearl River Basin, and possibly the Red River of northern Vietnam (Schofield, P.J., et al. 2005).
- **Expanded Range Globally:** Africa, Asia, Australasia-Pacific, North American and South America (Wiedemer, S. and Chan, S. 2008).
- **Expanded Range in United States:** See distribution maps below (Aitkin, J.K, et al. 2008).



Current Status in Arizona

Asian carp, in general, are not currently known in Arizona. However, State permitted triploid grass carp have been stocked in some waters in Arizona, particularly Salt River Project canals and various golf course ponds, for intensive aquatic weed control. In addition, some bighead carp have been noted in Kennedy Lake in Tucson (AGFD Urban Fishing Program lake). Indian carp, black carp, crucian carp, bighead carp and silver carp are already listed as Restricted Live Wildlife in Arizona (R12-4-406).

Pathways

All species were introduced into North America from multiple pathways. Grass carp were first introduced into the United States in 1963, whereas bighead, silver, and black carp arrived in the 1970s. All four species escaped into the Mississippi River basin and all but the black carp are known to have developed self-sustaining populations (Koel, T.M., et al. 2000). Silver and bighead carp have been introduced to new regions by accidental release from aquaculture facilities and these Asian carp species have been intentionally introduced to create a food source and to control phytoplankton blooms in eutrophic waters (Wiedemer, S. and Chan, S. 2008).

Known/Potential Impacts

Asian carp filter-feed on phytoplankton and zooplankton and graze on aquatic vegetation, thus putting pressure on the base of the food chain and, in high numbers, can dramatically alter aquatic ecosystems with these behaviors. Asian carp can potentially carry and transmit new diseases to invaded ecosystems. Competition with native fish species can diminish recreational fisheries. Silver and bighead carp are notorious for their leaping. They tend to reside in surface water and leap out of the water (up to two meters) when startled, causing boaters a serious safety risk (Wiedemer, S. and Chan, S. 2008).



Benefits

Asian carp can filter pond water in fish farms and may improve water quality in aquaculture ponds and sewage treatment lagoons (Aitkin, J.K, et al. 2008). Grass carp may also have a recreational fishing (bow and arrow) nexus.

Effective Treatments

Once established in an ecosystem, Asian carp are virtually impossible to physically remove or eradicate (www.nwf.org). Various piscicides and copper sulfate treatments may kill these species, but those treatments will also kill all other fishes and some aquatic life.

Threats to Arizona

All of these Asian carp can filter-feed on phytoplankton and zooplankton and graze prodigiously on aquatic vegetation in Arizona's limited riverine systems. These large bodied fish, which have very few if any predators, can thus put extreme pressure on the base of the food chain (plants, algae) and dramatically alter aquatic ecosystems. Introduced Asian carp can also carry and transmit new aquatic diseases into these invaded environments. In addition, direct competition with young fish species can diminish recreational fisheries and native fish population structure.

Recommendation

Silver carp, black carp, and bighead carp should be formally placed on AGFD Aquatic Invasive Species Director's Orders (A.R.S. §17-255). Grass carp is more problematic (due to it being a permitted species as a triploid in Arizona) and further consideration is warranted as to that species listing as an aquatic invasive. Education and awareness measures are needed to reduce the negative consequences of future introduction and expansion possibilities in Arizona.

References

Wiedemer, S. and Chan, S. 2008. On the Lookout for Aquatic Invaders; Identification Guide for the Pacific Northwest. Oregon Sea Grant. Oregon State University. 62-3.

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<http://www.nwf.org/Wildlife/Wildlife-Conservation/Threats-to-Wildlife/Invasive-Species/Asian-Carp.aspx>

