

Pest Risk Assessment for Asian Carps in Oregon

IDENTITY

Name: Asian Carps

The common usage of the term “Asian Carps” encompasses the following four species of introduced carp (there are additional species of carp native to Asia that have been introduced into the U.S. but are not commonly included under term “Asian Carps” – see text).

- bighead carp (*Hypophthalmichthys nobilis*)
- silver carp (*Hypophthalmichthys molitrix*)
- black carp (*Mylopharyngodon piceus*)
- grass carp (*Ctenopharyngodon idella*)

Taxonomic Position: order Cypriniformes, family Cyprinidae [carps and minnows]

The family Cyprinidae is very diverse – it includes species that feed on plankton, herbivores, omnivores, piscivores (fish eaters such as our native pike minnow) and species like the black carp whose teeth are specially modified to crush the shells of mussels and snails - and as such it can be difficult to distinguish native versus nonnative species based on a few simple characteristics. Nevertheless, the collection of nonnative species such as Asian carps should be reported to the Oregon Department of Fish and Wildlife. Positive identification is crucial and for this reason we recommend retaining the specimen if possible or documenting the catch with photographs. Well-focused images that show the whole fish from various angles as well as close-ups of the head and fins are ideal. Additional information on identification of Asian and other nonnative carps has been compiled by the US Geological Survey and can be accessed online <http://fisc.er.usgs.gov/Carp_ID/index.html>.

RISK RATING SUMMARY

Relative Risk Rating: HIGH

Numerical Score: 6 (on a 1-9 scale)

Uncertainty: Moderate

This Risk Evaluation summarizes much of the information previously compiled by the USFWS in 2008. Readers interested in further information on Asian Carps are encouraged to read the report: Columbia River Basin Asian Carps Risk Evaluation available on the USFWS Asian Carp Management Web Site < <http://www.asiancarp.org/> >. Additional risk assessments

have been written for black carp (Nico et al. 2005) and silver carp (Kolar et al. 2005) in the U.S. and are available at the same website.

Based on moderate to high risk of introduction, establishment, economic and ecological harm coupled with potential human health hazards we conclude that the risk posed by Asian Carps to Oregon waters is significant. Preventing the introduction and establishment of Asian Carps should remain a high priority for invasive species outreach and education in the state.

Risk assessment is not an exact science. The high level of uncertainty attributed to this risk assessment is due to several factors. The format the risk assessment follows was originally developed for forest pest species and, as such, fails to take into consideration characteristics of invasive species that may be unique to aquatic organisms. Additional uncertainty inherent in this report is in part a result of the lumping together of four different species of carp each with their own associated risks. For example, silver carp pose a human health hazard in certain situations which does not hold true for the other three species. Potential for direct interaction with threatened and endangered species (a situation which elevates the risk of this species considerably in this format) is also driven by specific species rather than by the entire group. Lastly, different invasion scenarios are possible with each new area colonized by aquatic species making predictions about new invasions difficult.

RULES AND REGULATIONS

Under the Federal Lacey Act (50 CFR 16.13) silver carp and black carp are listed as injurious wildlife and banned from import, transport and/or possession. In Oregon, the bighead carp, black carp, and silver carp are unclassified. Unclassified species are prohibited in Oregon (OAR 635-056-0000 to 635-056-0150). Grass carp are a controlled species and triploid (sterile) grass carp may be released for the control of aquatic weeds with a permit from Oregon Department of Fish and Wildlife but the fish must be certified triploid by the U.S. Fish and Wildlife Service (OAR 635-056). Furthermore the import and possession of live baitfish (a common vector for Asian Carp spread in the U.S.) is prohibited in Oregon.

OVERVIEW

The common usage of the term "Asian Carps" encompasses the following four species of introduced carp; bighead carp (*Hypophthalmichthys nobilis*), silver carp (*H. molitrix*), black carp (*Mylopharyngodon piceus*), and grass carp (*Ctenopharyngodon idella*). There are additional species of carp native to Asia that have been introduced into the U.S. but are not commonly included under term "Asian Carps" - this category includes common carp (*Cyprinus carpio*), goldfish (*Carassius auratus*), and crucian carp (*Carassius carassius*). Common carp, goldfish and their hybrids are commonplace in many Oregon waters. Grass carp are a controlled species in Oregon and require a grass carp stocking permit from the Oregon Department of Fish and

Wildlife. Only triploid (e.g. sterile) grass carp from an approved supplier are allowed, and the permit application must be approved by both Oregon Department of Fish and Wildlife district and regional biologists. There are additional, specific rules that apply to grass carp stocking that must be strictly followed to minimize any environmental risk.

Introductions of Asian Carps into United States waters are the result of stocking by or authorized by various agencies, unauthorized stocking by private individuals, and unintentional escapes from research facilities and private aquaculture operations (USGS 2009). Grass carp were imported into the United States in the 1960s for aquaculture use and have subsequently been widely stocked, both legally and illegally, for vegetation control (Schofield et al. 2005). Grass carp were first introduced to private ponds in the Pacific Northwest in the 1970s as illegal fish used for biological control of aquatic vegetation (Aiken et al. 2008). To prevent movement into other waters state agencies eradicated the fish, however, the release of sterile triploid fish for biological control was legalized in Oregon in 1998 (J. Gores, ODFW, personal communication, June 19, 2007 by Aiken et al. 2008). Bighead and silver carps were first imported into the United States in the early 1970s. Both species escaped confinement during flood events and are now well established with reproducing populations in much of the Mississippi River Basin (Kolar et al. 2005). While bighead, grass, and silver carps have all established reproducing populations in the United States (USGS 2009) the status of black carp is less certain. Multiple black carp have been collected and verified from the Mississippi River Basin suggesting a wild reproducing population could be present but this has not been confirmed (Nico et al. 2005). Grass carp is the only one of the four Asian Carps of concern to be reported from Oregon and these are believed to be permitted, sterile specimens.

RISK RATING DETAILS

Establishment Potential is HIGH

Justification:

Appropriate habitats (lakes, ponds, reservoirs, canals, rivers, streams, and associated backwaters), climate, and food resources to support all four species of Asian Carps can be found in Oregon (Kolar et al. 2005, Aiken et al. 2008). Based on an evaluation of flow rates, water temperature and habitat availability, Aiken et al. (2008) concluded that the lower Columbia River could provide suitable conditions for adult survival, spawning and recruitment for Asian Carps and suggest that suitable habitat for the carps may exist throughout more waters of the Pacific Northwest. However, Aiken et al. (2008) also note a substantial variability in the data for habitat and tolerance variables reported in the available literature on Asian Carps.

Bighead carp, native to eastern China, eastern Siberia, and parts of North Korea, occur in rivers, lakes, and reservoirs, but require riverine conditions with moderate to swift currents to support spawning (Kolar et al. 2005) and reportedly can tolerate extremes in water temperature (Aiken et al. 2008).

Silver carp, native to southern Asia, eastern China, and far eastern Russia, can be found in a variety of freshwater habitats including large rivers and backwaters that receive flooding or are otherwise connected to large rivers and have been successfully introduced widely to ponds, lakes, reservoirs, and canals (Kolar et al. 2005)

Typical habitat for grass carp, native to rivers of eastern Asia, includes quiet waters, such as lakes, ponds, pools, and backwaters of large rivers as well as low salinity and brackish water areas of large rivers (Kolar et al. 2005). Given the successful introduction and longevity of triploid grass carp introduced for vegetation control in Oregon, there is no reason to doubt that diploid (reproducing) grass carp would thrive.

In spite of the successful establishment of other cyprinids from Asia (goldfish and the common carp) a ranking of the potential geographic range of black carp by Nico et al. (2005) ranked the Pacific Northwest as a low risk for establishment based on habitat parameters.

Spread Potential is MODERATE

Justification:

Potential pathways for the introduction of Asian Carps into Oregon include importation for aquaculture purposes (primarily biological control); importation and escape or dumping of live bait fish; importation and release of carp for biological control of vegetation; importation and stocking of carps as game fish; and the release of live seafood species. Aiken et al. (2008) considered the following actions to have the greatest risk of Asian Carp introduction into the Pacific Northwest:

- Accidental and deliberate unauthorized releases by individuals
- Incidental inclusion of Asian carps in domestic shipments of food fishes
- Stocking of triploid Asian carps into non-aquaculture waters for biological control

All of the actions described in the above pathways are prohibited at the state level by the Oregon Wildlife integrity rules and any action involving intentional possession and movement of either bighead or silver carp across state lines is illegal at the federal level under the Lacey Act. Additional risk for Asian Carp introduction may be posed by the transport of small fish. Live fingerling carp are not only virtually impossible to identify to species they are also common contaminants in wild caught minnow bait from areas of the Midwest where Asian Carps have become established. Uninformed and or misguided efforts to import and or introduce species for use as bait, biological control and/or as game fish all pose the risk of introducing all four species of Asian Carps. Growing interest in the novel aspects of fishing and bowhunting for the leaping silver carp in the Midwest may also increase the likelihood of their illegal stocking for game purposes.

Environmental Impact Potential is MODERATE to HIGH

Justification:

Due to different feeding preferences by Asian Carps their potential environmental impacts differ greatly. Bighead carp and silver carp are filter feeders targeting zooplankton and phytoplankton respectively. Filter feeding by silver and bighead carp has been demonstrated to alter the planktonic community of large reservoir systems and negatively impact populations of native fishes that are dependant on the same food sources as well as increasing the rate of nuisance algal blooms (Kolar et al. 2005). Many native fishes rely on plankton during larval and early juvenile stages and, because silver carp and bighead carp frequently occur in high densities in reservoirs, the potential for competition with early-life stages of native fishes could be quite high. Black carp are molluscivores having teeth evolved especially for crushing snails and clams and endemic species (several of which are threatened or endangered species in the Pacific Northwest) could be at risk. Bighead, silver and grass carp are also known hosts of the Asian carp tapeworm, a potential threat to native North American fishes (Kolar et al. 2005, Nico et al. 2009). The Asian carp tapeworm is known to have infected native cyprinid of concern in five states: Arizona, Colorado, Nevada, New Mexico, and Utah (Nico et al. 2009).

Grass carp are known for their voracious predation on aquatic plants, both introduced and native. The effects of grass carp introductions to a water body can be complex and seem to depend on the stocking rate, aquatic plant abundance, and the structure of the community into which they have been introduced (Nico et al. 2009). Nuisance algal blooms can be a secondary effect of grass carp introduced to control vegetation. While utilized because of their appetite for plant material, grass carp are inefficient and only digest about half of the plant material consumed on any given day expelling the remaining material back into the water which in turn promotes algal blooms that contribute to reduced water clarity and decreased oxygen levels (Waggy 2002, Nico et al. 2009). In 1986, Devils Lake (near Lincoln City) became the first lake in Oregon to legally introduce triploid grass carp to control unwanted nonnative vegetation (primarily Eurasian watermilfoil and Brazilian elodea). Grass carp were stocked three times between 1986 and 1993 (Waggy 2002). After the final stocking in 1993, Sytsma (1996) reported the elimination of all submersed aquatic plants both target and native species and a subsequent decline in warmwater gamefish was noted (Buckman and Dailey 1999).

Economic Impact Potential is MODERATE

Justification:

The potential negative economic impacts due to successful establishment of Asian Carps in Oregon would likely result from decreases in recreational boating and fishing opportunities as a result of bighead and or silver carp introductions, as well as impacts to lake aesthetics (decreased vegetation, increased turbidity and nuisance, potentially toxic plankton blooms)

resulting from grass carp introductions. Threats to human health are also a potential risk with a resulting economic component and are discussed further in the following section.

Kolar et al. (2005) summarized the potential economic impacts of bighead and silver carp as follows:

Because of the negative effects of potential declines in native fish stocks available for commercial and recreational fishing and because of lost recreational opportunities due to the jumping behavior of Silver Carp, we are reasonably certain that established populations of Bighead and Silver carps present a medium to high risk of causing negative economic consequences on the environment.

The potential for bighead and silver carp to dominate fish populations in large reservoirs and river systems in Oregon (as seen in the Mississippi River Basin) indicates that these species, if established, could significantly reduce populations of both native and economically important gamefish. Impacts to recreational fishing and tourism may result.

Unique to the Asian Carps, silver carp exhibit an unusual jumping behavior in response to disturbance such as that caused by boat motors. Leaping silver carp, which can grow to 100lb in size, are a significant nuisance to recreational boating and reports of serious injuries in areas where silver carp are established are on the rise (Kolar et al. 2005). In addition to personal harm (including significant bruising, broken jaws and concussions), startled silver carp cause property damage to boats including broken radios, depth finders, and other fishing gear. Threats to human health, property damage and reduced boating opportunities may cause a significant decline in recreational boating on large lakes and reservoirs should silver carp become established.

Human Health Impact Potential is MODERATE to HIGH

Justification:

Human health hazards attributed to Asian Carps are likely limited to impacts from two species: silver and grass carp.

Silver carp usually swim just beneath the water surface however, when disturbed (including by the noise and high RPMs of boat motors), silver carp routinely jump out of the water (Kolar et al. 2005). Reports of injured boaters and water-skiers as well as severely damaged watercraft are becoming commonplace in the Mississippi River Basin (Nico et al. 2009). High boat speeds and large (25 lb plus) fish are a dangerous combination and broken noses, jaws and concussions have all been attributed to leaping carp. Currently, no deaths have been attributed to silver carp. Waterskiers, wake boarders, and passengers in boats or on jet skis traveling in groups or high densities are at greater risk of injury due to increased likelihood of carp jumping in the wake zone of watercraft.

The elimination of aquatic plant beds by grass carp has been connected to the increase in potentially toxic cyanobacteria blooms in Devils Lake, Oregon. Once the nuisance and native plants were eliminated, the resulting changes in light regime, reduced competition for nutrients and increased disturbance of sediment (associated with grass carp feeding behavior) led to increased populations of phytoplankton including potentially toxic blue-green or cyanobacteria (Eilers and St. Amand 2005). Not all algal blooms are harmful but species such as cyanobacteria can produce toxins that can result in serious illness or death in humans as well as pets, wildlife and livestock. In 2009 Devils Lake experience several "Red Level" cyanobacteria alerts in which contact with the water by people and pets was not advised.

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FORMAT

This pest risk assessment (PRA) is based on the format used by the Exotic Forest Pest Information System for North America. For a description of the evaluation process used, see Step 3 – Pest Risk Assessment under Guidelines at:
<<http://spfnic.fs.fed.us/exfor/download.cfm>>

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