ABSTRACT

The invasion of Asian carp has resulted in drastic ecological changes in water bodies throughout North America. Asian carp entered these systems mainly through fish farm escapes. They are able to outcompete native species and also leap from water when disturbed, potentially injuring recreationalists. Innovative and expensive measures have been undertaken to keep Asian carp from entering Great Lakes ecosystems, particularly Lake Michigan. One control method is an electric barrier at the Chicago Sanitary and Ship Canal. The possible consequences of introduction into Lake Superior are unknown, but damage to other systems shows this invasive species has the potential to be detrimental to sport fisheries, native fish populations and the Lake Superior food web as a whole.

INTRODUCTION TO THE ISSUE

An invasive freshwater fish, the Asian carp were first introduced to North America in the 1960's. They were introduced by fish farmers and government agencies for aquaculture purposes and to control pest species of vegetation, algae, mollusks, and crustaceans. After flooding allowed the fish to escape their Arkansas ponds in the 1990's, populations in the wild have grown exponentially, and the fish have steadily spread northward toward the Great Lakes area. There are four species of Asian carp in the United States: silver, bighead, grass, and black carp. Silver and bighead carp are filter feeders and consume zooplankton, phytoplankton, and any other food item that will fit into their mouth. Grass carp and black carp are omnivores and feed on mussels, vegetation, and detritus. These feeding habits compete directly with native fish species and destroy water quality. Asian carp have also become renowned for their tendency to leap through the air in massive swarms when motorboats pass through their waters (Figure 2). This puts recreational boaters at risk, an industry worth an estimated $9 billion/year.

WATER QUALITY IMPACTS

Carp cause eutrophication of pond and lake water - the accumulation of nutrients that support a dense growth of algae and other organisms, the decay of which depletes the dissolved oxygen levels in lakes and ponds. It often causes the extinction and depletion of other organisms, especially sport and recreational fisheries, worth an estimated $7 billion. The carp species of special concern include the bighead and silver carp, which have the ability to alter the food web dynamics currently present in the Lakes. Bighead carp can weigh upwards of 500 lbs (45 kg) and filter up to 20% of their body weight per day in plankton, putting them in direct competition with native species. This alteration has the potential to both displace the native fish and possibly extirpate them once their food source has disappeared, affecting both biodiversity and sport/recreational fishing. If the sport fishing industry plummets, this would put individuals out of work unless we can find value in harvesting carp. These fish pose a major threat to water quality, compete with native fish species, and interfere with human recreational uses of the lakes and rivers they inhabit.

What types of management will be necessary if Asian carp reach the Great Lakes?

The current emphasis on management is preventing the carp from reaching the Great Lakes; little work has been focused on management if the fish manage to establish a sustainable population within the lakes. A great deal of research still needs to be done, and it is important that this has been identified before the fish make it to the Lakes. Specifically, research on potential biological controls needs to be done, including investigating attraction/repellent pheromones, possible ways to disrupt spawning behavior, and ways to decrease egg viability. Research on piscicides should also continue, with an emphasis on developing a carp-specific toxin. Currently, Rotenone is a species-specific and kills any fish that comes in contact with it. This method is an electric barrier at the Chicago Sanitary and Ship Canal Aquatic Nuisance Species Dispersal Barriers. http://www.lrc.usace.army.mil/projects/fish_barrier/index.html

Figure 13: look out! An Asian carp gets dangerously close to a boater, photo by Rolf Simonson

CURRENT DISTRIBUTION

Asian carp impacts on ecosystems

The introduction of Asian carp into the Great Lakes could wreak havoc on the Great Lakes’ sport fisheries, worth an estimated $7 billion. The carp species of special concern include the bighead and silver carp, which have the ability to alter the food web dynamics currently present in the Great Lakes. Bighead carp can weigh upwards of 500 lbs (45 kg) and filter up to 20% of their body weight per day in plankton, putting them in direct competition with native species. This alteration has the potential to both displace the native fish and possibly extirpate them once their food source has disappeared, affecting both biodiversity and sport/recreational fishing. If the sport fishing industry plummets, this would put individuals out of work unless we can find value in harvesting carp. These fish pose a major threat to water quality, compete with native fish species, and interfere with human recreational uses of the lakes and rivers they inhabit.

Figure 2: Leaping carp stirred up by a boat, photo by United States Geological Survey

Figure 4 - 7 United States Geological Survey Nonindigenous Aquatic Species Program

Figures 4 - 7 United States Geological Survey Nonindigenous Aquatic Species Program

POTENTIAL IMPACTS OF ASIAN CARP

Asian carp impacts on ecosystems

The introduction of Asian carp into the Great Lakes could wreak havoc on the Great Lakes’ sport fisheries, worth an estimated $7 billion. The carp species of special concern include the bighead and silver carp, which have the ability to alter the food web dynamics currently present in the Great Lakes. Bighead carp can weigh upwards of 500 lbs (45 kg) and filter up to 20% of their body weight per day in plankton, putting them in direct competition with native species. This alteration has the potential to both displace the native fish and possibly extirpate them once their food source has disappeared, affecting both biodiversity and sport/recreational fishing. If the sport fishing industry plummets, this would put individuals out of work unless we can find value in harvesting carp. These fish pose a major threat to water quality, compete with native fish species, and interfere with human recreational uses of the lakes and rivers they inhabit.

Figure 2: Leaping carp stirred up by a boat, photo by United States Geological Survey

Current Dist: at 3414.0x2064.0

Get started with the carp...for more information on the carp, see: http://www.fws.gov/mn/research/h2o_22010.htm

CURRENT MANAGEMENT

The current focus of management efforts is limiting the spread of Asian carp. At the Chicago Sanitary and Ship Canal, the following tools are used:

- Environmental DNA (eDNA) testing in waterbodies to test for fish presence without seeing the actual organism
- Electric barrier to prevent passage into Lake Michigan (Figures 8-10)
- Rotenone application during maintenance of the electric barrier and to sample for Asian carp presence in waterways

Figure 8: Fish barrier placement in Illinois

Figure 9: Rotenone application

Figure 10: Diagram of the first electric barrier

Figure 11: Look out! An Asian carp gets dangerously close to a boater, photo by Rolf Simonson

Figure 12: Cartoon displaying concern about the spread of carp, from The Capital Times and madison.com

WHAT CAN YOU DO TO HELP PREVENT THE SPREAD OF ASIAN CARP?

There are a number of things that anyone can do to help prevent the spread of Asian carp. Here are a few, simple things that anyone can do to help the cause:

- Become more informed about Asian carp, their habits, and how they spread
- Learn to identify juvenile carp to prevent their movement to new waters
- Support local and large scale prevention efforts
- Know where your baitfish supplier receives their stock and make sure there are no juvenile Asian carp in with your purchase
- Never release unused baitfish into the water, either destroy them or save them for another time
- Empty all bilge water in the lake or river it came from or on dry land
- Try eating Asian carp in place of other fish to reduce the invasive population

For whatever actions you take to reduce the spread of the Asian carp, always remember that anything you can do will make a difference.

Figure 2: Leaping carp stirred up by a boat, photo by United States Geological Survey

Figure 4 - 7 United States Geological Survey Nonindigenous Aquatic Species Program

Figure 4 - 7 United States Geological Survey Nonindigenous Aquatic Species Program

SOURCES