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THE ASIAN CARP THREAT TO THE GREAT LAKES

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House Committee on Transportation and Infrastructure
Subcommittee on Water Resources & Environment
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INVASIVE SPECIES AND THE DESTRUCTION THEY BRING

Madam Chair, thank you for inviting me to appear before this subcommittee to discuss the threat of the Asian carp invasion into the Great Lakes. My name is Michael Hansen. I am the chair of the Great Lakes Fishery Commission. I am also a professor of fisheries at the University of Wisconsin at Stevens Point.

The Great Lakes are an extremely valuable resource for both the United States and Canada. The Great Lakes' commercial, recreational, and tribal fisheries are valued at more than $7 billion annually (ASA 2008). The lakes provide drinking water for 40 million people and are a rich tourist draw. They are a way of life for the people of the region and a healthy, vibrant Great Lakes ecosystem is immeasurable in economic terms alone.

The Great Lakes—and the way of life they support—are under assault from invasive species. Invasive species are defined as non-native animals and plants, both aquatic and terrestrial, that enter new environments, become established, and spread. The Great Lakes are "ground zero" for aquatic invasions. Today, the lakes harbor more than 185 non-native species (Lodge 2007; Mills et al. 1993; Ricciardi 2001; Sturtevant et al. 2010), many of which entered the lakes accidentally. The rate of introduction into the Great Lakes is not slowing, even with the welcomed institution of some invasive species control measures (e.g., ballast water exchange requirements starting as early as 1989). Some estimate that a new invader enters the system every 9-12 months. Many in the scientific community, however, believe that the Great Lakes contain many more invasive species than have been discovered, because a coordinated, basinwide program to monitor new nonindigenous species does not exist (IAGLR 2008; Sturtevant et al. 2010).

Invasive species have many pathways into new ecosystems. Ballast water is a major vector, as are canals and waterways, the trade of live organisms, recreational activities, and aquaculture. While much of the focus has been on large or prominent organisms, microorganisms and pathogens are also an increasing concern (particularly with the emergence of the VHS virus, an exotic fish disease linked to fish kills in several Great Lakes and just recently detected in Lake Superior). The Great Lakes, essentially, are a welcoming, open door for invaders.

The world and North America are becoming more globalized. With enhanced trade and the movement of goods comes the reality that more species have more pathways than ever to invade the Great Lakes. The Saint Lawrence Seaway, for instance, is a direct pathway for foreign ships into the U.S. heartland. Those ocean going ships have been responsible for more than 1/3 of all Great Lakes invaders (Mills et al. 1993; Sturtevant et al. 2010). Also, the U.S. Fish and Wildlife Service reports that an average of more than 200 million fish, and tens of millions of reptiles and amphibians, birds, and mammals are imported into the United States annually for food and for the pet trade industry. Fish for pet trade, for example, are collected in exotic locations throughout the world or reared in aquaculture facilities (Livengood and Chapman 2007), which are prone to flooding, thereby enabling escapement.

Invasive species are not a local or even a regional problem—they are a national and a global problem. Invasive species spread readily from region to region, so species introduced into one part of the country will, in all likelihood, eventually make it to other parts of the country. Eurasian *Dreissenid* mussels (a.k.a., the "zebra mussel"), for instance, entered the Great Lakes through ballast water from oceanic ships in the mid-1980s and have now spread throughout much of the United States. Asian carp, which are discussed below, escaped from aquaculture in the Deep South and, as they made their way northward through the Mississippi and Illinois Rivers, have become a major economic and ecological nuisance. These carp are now found in Texas, the Ohio River Basin, and are threatening the Great Lakes and even the Columbia River Basin in the Pacific Northwest. Snakeheads were imported for the aquarium trade and for food and are now present in the Northeast, the East, and the Mississippi River system. Specimens have also been found in Alabama, California, Florida, Kentucky, Texas, Washington, and Lake Michigan. The point is, exotic introductions into United States' waters anywhere raise the possibility of spread to other ecosystems. Solutions must be large in scope and based on the assumption that species will multiply and extend their range.

The focus of this hearing is on Asian carp, and the primary pathway for Asian carp to enter the Great Lakes from the Mississippi River basin is through two canals in the Chicago area: the Chicago Sanitary and Ship Canal and the Cal-Sag Canal. Other witnesses during this hearing will address the policies that are being undertaken to try to stop the spread of Asian carp through those canals. I will reflect on these policies toward the end of this statement. Let me first provide a summary of the threat Asian carp pose to the Great Lakes.

THE HAVOC OF ASIAN CARP: A HARBINGER OF WHAT'S TO COME FOR THE GREAT LAKES?

Asian carp have the ability to spread rapidly, reproduce in large numbers, and become the predominant species in an ecosystem. Once established, fishery managers have little chance to control the fish. Like the sea lamprey, they could become a permanent element of the Great Lakes if they enter the system.

The term "Asian carp" is a generic term to describe several species of related fish originating from Asia. Two species of Asian carp primarily comprise the current invasion via the Illinois Waterway System—the "bighead" and "silver" carps. These species were imported into the southern United States to keep aquaculture facilities clean and to serve the food fish industry. Bighead carp were imported from China in 1972. A year later, in 1973, silver carp were brought into the United States from China and eastern Siberia (Chick and Pegg 2001; Hoff 2008; Schrank and Guy 2002; Tucker et al. 1996). By 1980, bighead and silver carps, which had escaped from aquaculture facilities, had been captured in the wild by fishers in Arkansas, Louisiana, and Kentucky (Williamson and Garvey 2005). Flooding events in the 1980s and 1990s allowed the bighead and silver carps to greatly expand their range. The floods provided extensive spawning and rearing habitat that facilitated high survival rates for offspring.

Since their escape nearly two decades ago, bighead and silver carps have overwhelmed the Mississippi and Illinois River systems. Bighead and silver carp are filter feeders. They eat plankton (e.g., algae and microscopic animals), the very foundation of the food web. Their feeding habits were the reason they were imported into the United States by the aquaculture industry: by feasting on plankton, they kept aquaculture facilities clean. Nevertheless, when loose in the wild, where plankton were abundant and predators were few, the Asian carp had a field day. Between 1991 and 2000, as the invasion was unfolding, biologists observed an exponential increase in bighead carp numbers in the Illinois River, near St. Louis (Chick and Pegg 2001)**.** Such increases played out time and again as the carp expanded their range northward. Commercial harvest of bighead carp in the Mississippi River Basin, for instance, increased from 5.5 tons to 55 tons between 1994 and 1997 (Chick and Pegg 2001). Biologists reported dietary overlap among Asian carp and native fishes in the Mississippi and Illinois Rivers, which suggests the Asian carp would likely outcompete native fish for food. In fall 1999, an investigation of a fish kill in off-channel waters of a National Wildlife Refuge near St. Louis documented that Asian carp made up 97% of the biomass (MICRA 2002), which indicates that, at least in that area, the fish community consisted of almost nothing but Asian carp. During this period, commercial fisherman began reporting that they were abandoning their traditional fishing sites because they were unable to lift nets that were "loaded" with Asian carp. Today, commercial fishers in the Illinois River regularly catch upwards of 25,000 pounds (11,000 kg) of bighead and silver carp *per day* (Irons et al. 2007). A half of an acre can often yield thousands of pounds of Asian carp (Chapman 2003), an astonishing amount of fish and an indicator of just how much of total fish biomass Asian carp can represent. The commercial value of Asian carp is extremely low and much less valuable than the native fish they replaced.

Biologists and policy makers are particularly troubled by the fact that Asian cap can grow to extremely large size because an Asian carp is capable of eating 40% of its body weight each day (Hoff 2004). Bighead and silver carp voraciously consume plankton, stripping the food web of the key source of food for small and big fish.

The silver variety of the Asian carp has a unique characteristic that makes it particularly dangerous to humans: the sound of a boat motor startles the fish, causing it to leap as high as ten feet out of the water. These flying fish—some weighing more than twenty pounds—serve as a projectile, landing in boats, damaging property, and injuring people. Biologists on the Illinois River need to follow new safety protocols to avoid serious injuries from these fish. Waterskiing and other aquatic activities have grown extremely dangerous. The newspapers and YouTube are replete with accounts of people being injured by Asian carp, including a story about woman who nearly died in 2004 after being knocked unconscious from her Jet Ski near Peoria, Illinois (Meersman 2004). Said Duane Chapman of the U.S. Geological Survey, a biologists in the thick of these fish, "You may imagine it would be quite novel for a 20-pound fish to jump into your boat, but being hit by a large Asian carp would be similar to being hit by a bowling ball. Even if the fish don't hit you, they can break fishing rods, windshields, electronics or anything else in your boat. As if adding insult, the carp will leave slime, blood and excrement on everything it touches" (Chapman 2010). The public's safety and property are clearly at risk.

The trail of destruction—to the ecosystem, economy, property, and boaters—that these Asian carp have left in their wake has been cause for tremendous concern to the people of the Great Lakes basin. Would Asian carp have a similar impact on the Great Lakes basin as they did in the Mississippi and Illinois River systems? We will have little chance of managing these new fishes if they become established in the Great Lakes.

Risk assessments carried out by officials from the U.S. Department of Interior (Kolar et al. 2005) and the Department of Fisheries and Oceans Canada (Mandrak and Cudmore 2004), and overall experience with

biological invasions, give little reason to be optimistic. For starters, these assessments indicate that the carp are certain to tolerate the Great Lakes basin's climate, because the basin is well within the fishes' native climate range. Mean annual air temperatures range between -2ºC and 22ºC for bighead carp and -6ºC and 24ºC for silver carp, a temperature span that would support Asian carp populations in much of the United States and Canada, including the Great Lakes.

Risk assessments also indicate that the carp would likely find the Great Lakes to contain an abundant and diverse supply of food. In the Great Lakes, the bighead carp would consume zooplankton and silver carp would prey heavily on phytoplankton, thereby competing with the young of many native species and all life stages of native planktivorous fish species. To make matters worse, Asian carp do not appear to be too finicky about what they eat. For instance, bighead carp diet in the Mississippi River is more varied than in their native range, because they feed on algae, detritus, and zooplankton. This means that the carp appear to be able to feed opportunistically. Also, by feeding on plankton, the Asian carp feed on the "low end" of the food web. That is, they will compete for food with the young of many native fish species and with all life stages of planktivorous native fish. Little doubt exists that bighead and silver carp would have significant negative impacts on the food web by causing large-scale changes at the low end of the structure.

The Asian carp need certain types of habitat to feed and spawn successfully, including tributaries greater than 30 miles (50 km) of unimpeded length. The carp would also thrive in areas with vegetated shorelines that afford them suitable habitat for feeding. The Great Lakes basin contains numerous streams with suitable spawning habitat and large areas of vegetated shorelines, particularly large bays, wide river mouths, connecting channels (e.g., the Saint Marys River), wetlands, and lentic areas (areas of still waters). While the carp may not thrive in large portions of the basin—for example, in the deep, cold, open waters of the lakes—all lakes, including Lake Superior, contain ample habitat for spawning and feeding.

Should the silver carp become established in the Great Lakes basin, they will likely inflict harm directly on people. The Great Lakes Commission estimates that nearly 1 million boats and personal watercraft operate on the lakes (GLC 2003), which thereby places millions of people in potential contact with the silver carp. Knowing the hazards of boating, Jet-skiing, and waterskiing on the Illinois River system, the problem of projectile fish would be compounded on the Great Lakes by a significantly larger boating population in the region.

Overall, citizens of the Great Lakes region should be deeply concerned about the prospects of Asian carp. Mandrak and Cudmore (2004) concluded that the probability of bighead and silver carps surviving and reproducing in the Great Lakes is high. If bighead and silver carp colonize the Great Lakes, they will likely spread throughout the basin due to the natural and man-made connections and the widespread distribution of suitable habitat.

POLICY ISSUES

The history of aquatic invasions has shown that people are left with few options to control a species once the species enters an ecosystem and spreads. With sea lampreys, the region has been relatively fortunate in that the species concentrates in streams and is vulnerable to control during several portions of its life cycle. Also, the alewife, while a nuisance, serves as a food fish for predators like trout and salmon, thereby making that species controllable through stocking and rehabilitation programs. Other than those two species, meaningful control mechanisms do not exist in the Great Lakes basin for other invaders.

The short answer to the question "What can be done if Asian carp enter the Great Lakes?" is "Not much." At least, not much at the moment. Currently, control mechanisms do not exist for Asian carp, if they become established. Scientists do not know of a pesticide that would target the carp, nor weaknesses in their spawning behavior that could be exploited, nor predatory pressures that would help reduce populations. That said, the effort to find solutions has not been robust. The sea lamprey control program has been a success because of a concerted effort to apply science to discover control techniques. Sea lamprey control has worked because lines of accountability are clear—the Great Lakes Fishery Commission is responsible. Sea lamprey control has worked because the governments of Canada and the United States have committed resources to do the job. Currently, no such effort exists for other invasive species, including Asian carp. Granted, universities and government agencies are conducting solid, promising research on invasive species, but until governments redouble their efforts—both in terms of resources and in terms of vision—viable solutions for any invasive species are probably decades away. The Great Lakes Regional Collaboration's Aquatic Invasive Species Team noted as much and recommended the establishment of an "Integrated Pest Management Program" to focus attention of government. The commission strongly agrees and recommends a concerted effort to find solutions to some of the most pressing invasive species problems. Such solutions include both the development of control techniques and the establishment of accountability so that an agency remains motivated toward progress.

This paucity of control options has been a strong force motivating prevention. The Great Lakes Fishery Commission has been a partner with other primary agencies to seek preventative measures for Asian carp for more than a decade. These measures were discussed in greater detail by other panelists during today's hearing. The commission has joined its partners over the years in pressing for construction of an electrical dispersal barrier, stopping trade of live Asian carp, and supporting other steps taken by management agencies in the Chicago region. The commission strongly supports current efforts to complete the electrical barrier, to build a structure of some kind to prevent species transfer between rivers that parallel the Chicago Sanitary and Ship Canal, and to plug other holes (such as culverts and pipes) that might allow species migration. The commission is heartened by the strong interest that Cameron Davis, the Senior Advisor to the EPA Administrator, has taken in this issue, because the administration's interest in coordinating a multi-agency response is badly needed.

While current work to prevent Asian carp migration are certainly appropriate, the only solution to this problem is to achieve what is called "ecological separation," that is, altering the canal system in a way where it is *impossible* for species of any kind to move from the Mississippi basin to the Great Lakes or vice versa. This separation was included as a recommendation of the Aquatic Invasive Species Summit convened by Chicago Mayor Richard M. Daley in 2003 (Anonymous 2003).

The recommendation from 2003 was to achieve that separation "within 10 years," so much needs to be done in a short amount of time. In fact, the Great Lakes do not have any time to lose. Ecological separation must occur immediately. To kick-start the investigation into the feasibility of ecological separation, the Great Lakes Fishery Commission and the Great Lakes Fishery Trust co-commissioned a study to examine transportation patterns on the waterways, the hydrology, and options for achieving separation. That report (Brammeier et al. 2008) was completed about a year ago and its conclusions have never been more relevant. The commission appreciates Mr. Brammeier and his co-author's work on this issue and thanks the chair for including him at this hearing, because his insights are critical to understanding ultimate policy solutions.

Finally, the commission recognizes that the Brammeier project is really the start to a serious look at achieving ecological separation. The *Water Resources Development Act of 2007* authorized the U.S. Army Corps of Engineers to conduct a full-scale engineering analysis to identify and propose ways to

achieve this essential separation. The commission was gratified to see the corps begin this study during the first fiscal year after it was authorized. The corps will continue with the study in 2010. The commission urges the corps to complete this study with all haste. The Great Lakes Fishery Commission urges Congress to clearly express that the end objective is ecological separation—not "reduce the risk" or "try to achieve separation while maintaining the status quo," the goal must be "ecological separation." Further, the commission urges Congress to provide the corps with resources to accelerate development of solutions that will achieve ecological separation and for Congress, at this time, to provide the corps with the authority it needs to implement any solution it proposes, so long as the solution fully achieves the separation goal. The Great Lakes Fishery Commission is concerned that the corps' study will be protracted and that separation will be delayed as authorizations and appropriations for a recommended project wind their way through the legislative process. The Great Lakes cannot wait.

LESSONS FROM THE SEA LAMPREY

Before I conclude, I would like to emphasize why prevention is paramount and why all efforts to address Asian carp have been essential. The Great Lakes Fishery Commission, the organization I chair, knows a great deal about invasive species. The commission was established in 1955 by the Canadian and U.S. *Convention on Great Lakes Fisheries* (U.S. Department of State 1956), primarily as a response to one of the most injurious invaders to ever enter the Great Lakes system: the sea lamprey.

Sea lampreys are primitive eel-like fishes native to the Atlantic Ocean. Shipping canals were the primary vector for sea lampreys to invade the upper Great Lakes in the early 1900s through improvements to the Welland Canal, which was built to bypass Niagara Falls. Sea lampreys are parasites in their native environment, but were able to wreak staggering damage on the Great Lakes ecosystem. By the late 1940s, harvest of lake trout, a keystone species, had fallen by 99% from the average catch of the 1930s (Fetterolf and Krueger 1990). The fishery that once sustained native fishers, fueled lucrative commercial operations, and attracted millions of anglers who simply enjoyed the outdoors was devastated. In short, sea lampreys changed the human way of life in the Great Lakes basin. The problem was so great that the governments of Canada and the United States were largely motivated by the sea lamprey's devastation when they agreed to the *Convention on Great Lakes Fisheries*, and included sea lamprey control commitments in the treaty.

Since 1955 when the commission was formed, the commission has delivered a sea lamprey control program, in cooperation with the Department of Fisheries and Oceans Canada, the U.S. Fish and Wildlife Service, the U.S. Geological Survey, and the U.S. Army Corps of Engineers. The commission's control program successfully reduced sea lamprey populations by 90% in most areas of the Great Lakes. Nevertheless, eradication is impossible and the ongoing program is expensive.

The sea lamprey has taught some tough lessons, which we would be well-served to heed as we consider the Asian carp threat:

- A single invasive species can cause significant, permanent damage to the economic and ecological health of a region. We are fortunate that sea lampreys can be controlled, but sea lampreys remain a permanent, destructive element in the Great Lakes basin. Most—if not all—fishery management decisions made by federal, state, tribal, and provincial agencies must forever account for sea lampreys.

- Control of invasive species, if possible, is expensive and ongoing. The commission has spent more than $300 million since 1956 controlling sea lampreys. This amount, while large, does not account

for the billions of dollars of revenue lost to commercial, tribal, and recreational fishers of the Great Lakes basin, nor does it account for billions of dollars spent by state and federal governments over decades to rehabilitate and propagate the fishery after sea lamprey invasion. Moreover, this figure does not include the immeasurable damage to the ecology of the Great Lakes basin.

- **Prevention is key; eradication is not possible**. The Great Lakes fishery will forever contend with sea lampreys.

- Citizens shoulder the costs and consequences of invasive species, not the beneficiaries of open waterways for shipping, fish ponds for aquaculture, or the free trade of live organisms.

- Programs to manage invasive species are costly and borne by taxpayers.

Sea lampreys have taught us that prevention of new invaders is critical. Once a species enters an ecosystem and becomes established, few tools, if any, exist to manage, let alone eradicate, invasive species. In fact, of the more than 180 non-native species in the Great Lakes, sea lampreys and alewives are the only aquatic invasive species that are being managed.

What remains unclear is whether policy makers truly understand the sea lamprey's lesson. Even with all that is known about the damage of invasive species, and even though pathways are generally identified, precious little has been done to prevent new introductions. A meaningful process does not exist to assess the risk of proposed importations of live organisms or to discover ways to manage the harmful species that have become established. Myriad canals and artificial connections exist between naturally distinct watersheds, leaving the Great Lakes region vulnerable to invasions from other parts of the United States and, in turn, being a source of invaders. Ballast water regulations have been proposed but they are far from accepted or implemented.

CONCLUSION

Efforts to prevent the migration of Asian carp into the Great Lakes have been motivated by what has been observed in the Mississippi and Illinois River systems—large-scale ecosystem disruption, loss of once-viable commercial fisheries, and human harm. Risk assessments conclude that the Great Lakes would likely be suitable habitat for Asian carp. Because control techniques for Asian carp are non-existent, agencies have been working non-stop for years to create barriers on the Chicago Sanitary and Ship Canal, to stop the trade of live Asian carp, and to fill all known policy gaps. The job is far from complete. The only true solution is achieving ecological separation. With the administration's strong interest in coordinating the response, the Great Lakes Fishery Commission remains confident that such separation will occur as soon as possible. Madam Chair, thank you for holding this hearing and for any action the committee is willing to take to help us and the administration in its efforts.

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