

eDNA Calibration Study (ECALS)



FACT SHEET



Asian Carp Environmental DNA Calibration Study (ECALS) Interim Study Report February 2013

Overview

Environmental DNA Calibration Study (ECALS) is a three-year study to improve the understanding and interpretation of Asian carp environmental DNA (eDNA) results. eDNA analysis is a process in which genetic material from shed cells in slime, feces and urine is taken from water samples to detect the possible presence of invasive silver or bighead carps.

The purpose of ECALS is to investigate alternative sources and pathways for eDNA detections beyond a live fish, examine how environmental variables such as light, temperature and water velocity impact eDNA detections, explore the correlation between the number of positive samples and the strength of the DNA source, develop more efficient eDNA markers to cut the sampling processing time in half and model eDNA transport specific to the Chicago Area Waterway System. Initial ECALS efforts within this report focus on eDNA vectors, whereas marker development and calibration experiments will receive greater attention in 2013.

ECALS Team

The study involves collaboration between the U.S. Army Corps of Engineers, the U.S. Geological Survey, and the U.S. Fish and Wildlife Service.

Authority and Funding

ECALS is funded through the Great Lakes Restoration Initiative, and the action items are scoped by the Asian Carp Regional Coordinating Committee (ACRCC) Asian Carp Control Strategy Framework.

Interim Results Reported

Vectors (alternative sources of eDNA being present beyond a live fish)

Seven individual vectors were examined in field and laboratory trials. Storm sewers, fisheries sampling gear, piscivorous (fish-eating) birds, dead fish carcasses, barges, and sediments may contribute to a positive eDNA detection without a live fish being present. DNA can stay on these sources for a numbers of days. Fertilizers were investigated but tests of two brands advertising Asian carp as a fertilizer ingredient came back negative. Tagged-bird studies show large variations in bird movement and consumption of Asian carp in the wild.

Markers (a gene or DNA sequence with a known location on a chromosome that can be used to identify a species)

Goal is to develop a suite of markers to improve detection rate, understand the amount of DNA and corresponding sources, and make processing techniques more efficient, which will reduce the current two-week turnaround time for sample results. Additional markers may also help in indicating whether the detected DNA is representing few or many fish and the time of eDNA arrival, and quantitative PCR (qPCR), may also eliminate the need for sequencing, which will also reduce processing times.

Calibration (factors that may influence the detection, degradation or persistence of DNA)

Goal is to examine eDNA release (i.e. shedding) rates and degradation rates under laboratory and mesocosm conditions to understand how abundance of fish and physical conditions influence the likelihood of eDNA detection in the Chicago Area Waterway System, including how it enters, degrades, and moves through the system. Also involves exploration of alternative collection, extractions, and processing techniques to establish the most efficient sampling methods. Initial study found that more DNA is found in scales of Asian carp when compared to slime or feces, shedding rates are consistent over different flow rates of water, and DNA from sperm can be detected for over two weeks.

For more information, including links to previously released reports and future milestones, please visit:

<http://www.asiancarp.us/ecals.htm>

