HELLBENDER ECOLOGY AND GENETICS

Eastern hellbender (photo by Zack Walker)

Current Status

Third year of four-year project

Funding Sources and/or Partners

State Wildlife Grants, Purdue University, The Nature Conservancy, DNR Nongame Fund

Project personnel

Principal investigator, Dr. Rod N. Williams
Shem D. Unger (doctoral student)
Nicholas G. Burgmeier (master's student)

Technicians:

Grant Connette (2009)
Cory Earle (2009)
Joe Fihe (2009)
Bart Kraus (2009)
Cody Marks (2009)
Eric McGee (2009)
Dan Smith (2009)
Aaron Switalski (2009)
Lucas Woody (2009)
Anthony Sipes (2010)
Bart Kraus (2010)

Background

Hellbenders are large, fully aquatic salamanders found throughout the Midwest and Eastern states. They prefer cool, swift flowing rivers and streams with high amounts of oxygen. They require large rocks for cover and usually move around at night. During nightly movement, they feed primarily on crayfish. They breed late in the fall with the males constructing and protecting nests using a method similar to that of sunfish.

Nick Burgmeier locating an Eastern hellbender using radio telemetry. Photo by Marci Skelton.

Sampling for hellbenders. Shown left to right (Shem Unger, Nick Burgmeier, Lucas Woody, Cody Marks and Bart Kraus). Photo by Rod Williams.

Hellbenders have been declining in population throughout their range, most likely because of habitat destruction, persecution by recreationalists, and collection for the pet trade. Hellbenders, like most amphibian species, serve as indicator species ("canaries in a coal mine"). These declines in population could indicate a reduction in local water quality.

Objective

The purpose of this project is to use a combination of field and laboratory techniques to better understand the ecology and overall health of Eastern hellbenders in Indiana and provide valuable information for use in conservation programs. We are studying various aspects of hellbender biology, including population status, habitat use and movements, overall health, water quality, and genetic variability.

Methods

To determine the population status and overall health of hellbenders in Indiana, we surveyed 40 sites, five times each, during a two-year period. Surveying for hellbenders is physically demanding and requires long, hard days in the water, so we hired numerous technicians to help with field sampling. In total, our crew surveyed nearly 53km (33 miles) of river. We took tail snips for genetic testing; blood samples for chemistry, hormone, and parasite analysis, and body swabs for chytrid fungus analysis. Genetic testing will estimate the level of inbreeding and will provide important information for future management. Blood chemistry and parasite analysis (which are similar to veterinary examination procedures) will give us a general idea of the overall health of individual hellbenders. Hormone testing will show us whether hellbenders have been affected by substances that could cause males to express traits similar to those of females.

To understand how hellbenders use their habitat, we implanted 21 individuals with small radio transmitters. We tracked their movements up to three times per week for nearly two years to see what types of habitats hellbenders use and how much space they need, and to identify important areas for breeding and overwintering. We also needed to examine both the quality and amount of existing habitat available to hellbenders. We floated a 120km stretch of the river to map the number of pools and riffles and to document the type of substrate (sand, silt, bedrock, pebbles, etc.) found along the river bottom. We also sampled both crayfish and macroinvertebrates at seven sites to assess the number and quality of prey items available to hellbenders. Finally, water samples were taken weekly during a 10-month period to check for chemicals and nutrients that might negatively affect water quality.

Progress to Date

We have successfully completed three field seasons of this project. The radio telemetry data have revealed that hellbenders move very little and are most often associated with sediment-free, fast-flowing stretches of river. Hellbenders are most active during their breeding season, late summer early fall, while adults are actively searching for mates. We have found that the overall water and habitat

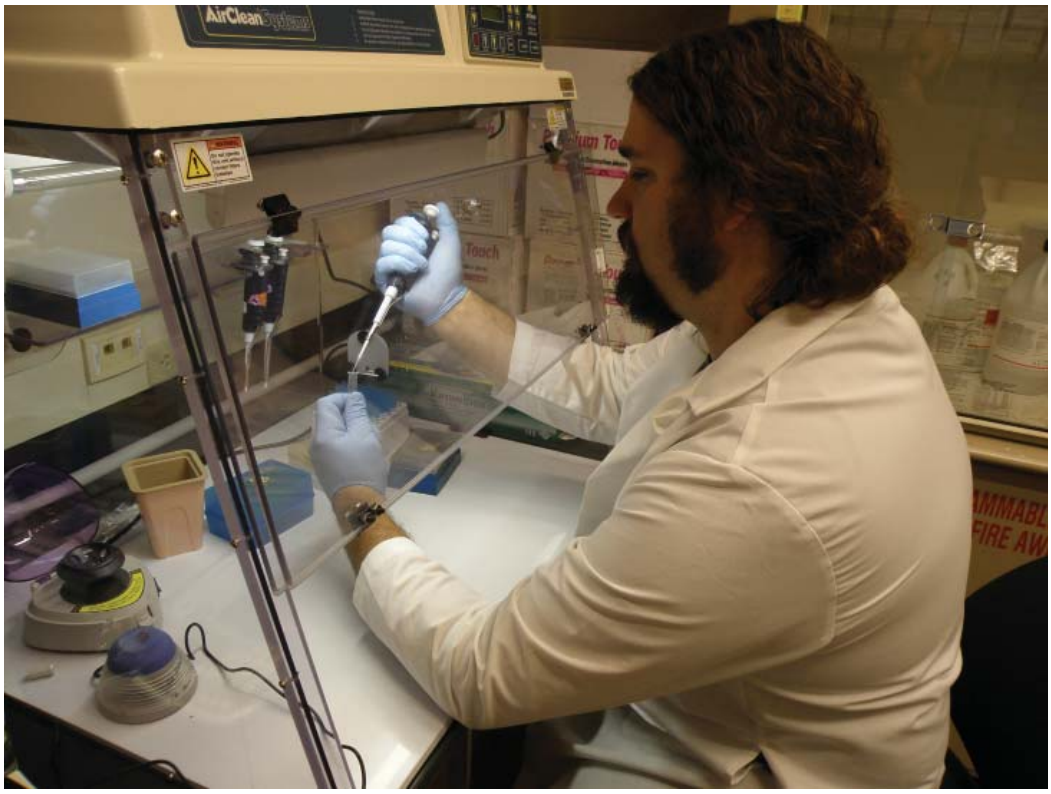
quality is quite good in Indiana; however, our population estimates suggest that hellbender populations are currently at critically low levels. No sub-adults or larvae have been documented, so this population consists almost exclusively of large, older-age-class individuals. Future surveys aimed at locating young hellbenders are planned in upcoming months. Laboratory screens for disease, blood parasites, and malformations have revealed that hellbenders in Indiana are healthy despite their low population numbers.

The field portion of the project has been completed, and now our efforts are focused on assessing the levels of genetic diversity within our Indiana hellbenders and how those levels relate to other populations throughout their geographic distribution. We have collected nearly 800 genetic samples from across the species range. Using the genetic tools developed in our lab, we have isolated DNA from every sample and have begun to obtain a DNA fingerprint of each individual hellbender. Genetic analyses will continue throughout the upcoming year, and we anticipate a few more collections will be necessary in several key locations. At the conclusion of this portion of the project, we will be able to assess the genetic health of Indiana hellbenders relative to other populations across the eastern United States.

This project has enabled several graduate students and numerous undergraduate technicians to learn important skills for their future careers. Data obtained from this project will be used both for graduate students to obtain their degrees from Purdue University and to provide information to help manage Eastern hellbenders in Indiana.

Cost: $685,958 for total five-year project

Shem Unger searching underwater for Eastern hellbenders. Photo by Robert Chapman.



Shem Unger processes genetic samples in the lab. Photo by Rod Williams.