



Purdue graduate student Shem Unger poses with an Eastern hellbender. Credit: Bart Kraus

Current Status

Final year of four-year project

Funding Sources and/or Partners

State Wildlife Grants (T07R03), 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 in late fall, with males constructing and protecting nests similar to those made by sunfish.



Purdue graduate student Bart Kraus and research technician Anthony Sipes take body measurements on an Eastern hellbender. Credit: Shem Unger

Hellbender populations have been declining throughout their range, most likely because of habitat destruction, persecution by humans, and collection for the pet trade. Hellbenders, like most amphibian species, serve as indicator species (i.e., “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. We sampled not only within Indiana, but also throughout the geographic range of the Eastern hellbender to determine baseline levels of genetic diversity. Genetic testing estimates the level of inbreeding and provides important information for future management. Blood chemistry and parasite analysis (which are similar to veterinary examination procedures) give us a general idea of the overall health of individual hellbenders. Hormone testing shows 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 over-wintering. We also examined 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 macro-invertebrates 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 the field portion 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 good in Indiana. In addition, laboratory screens for disease, blood parasites, and malformations have revealed that hellbenders are physically healthy. Our population estimates, however, suggest that hellbender populations are currently at critically low levels. Recent surveys targeting young hellbenders revealed no larvae or juveniles, suggesting this population consists almost exclusively of large, older-age-class individuals. During the most recent surveys, however, multiple fertilized clutches of eggs were detected, indicating successful mating has occurred in Indiana.

Our efforts are now focused on evaluating levels of genetic diversity within Indiana and how these compare to other populations throughout their geographic distribution. Thus far, more than 1,000 genetic samples from 50 rivers across 10 states have been collected in order to characterize overall levels of genetic diversity. We are currently using landscape genetic techniques to examine fine-scale genetic variation at multiple spatial scales. Using the genetic tools developed in our lab, we have isolated DNA from every sample and have begun to better our understanding of gene flow within river systems for Eastern hellbenders. This intensive sampling effort represents the most comprehensive genetic survey of Eastern hellbenders to date. Preliminary genetic analyses of Indiana's Blue River population have revealed high levels of genetic diversity, and the overall genetic health appears to be similar to that of other populations across the eastern United States. These genetic markers are useful for understanding other aspects of hellbender biology as well. For example, we are using these markers to identify breeding individuals within the population, confirm our population estimates and identify potential source populations for translocations.

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 direct conservation efforts for Eastern hellbenders in Indiana.

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