

PROJECT TITLE: Determining the Status and Distribution of *Obovaria sp. cf arkansasensis* ("White" Hickorynut) in Arkansas

PROJECT SUMMARY: The purpose of this project is to survey under-sampled drainages to locate individuals and populations of the freshwater mussel *Obovaria sp. cf arkansasensis*, a necessary first step in any conservation effort. *Obovaria sp.* is known to occur in the Little Red River drainage; however, its area of occupation and population numbers are poorly known. In addition, it is unclear whether other historic *Obovaria* populations in the White River and St. Francis River drainages represent *Obovaria sp.* or *Obovaria arkansasensis*; therefore, phylogeographic analysis is required to determine the morphological and distributional boundaries for these species. The objective of this study is to fill data gaps with regard to distribution and population status of *Obovaria sp. cf arkansasensis* to determine if it should be considered a species of greatest conservation need (SWCN) and added to the Arkansas Wildlife Action Plan (AWAP).

PROJECT LEADER:

Dr. Brook L. Fluker, Assistant Professor
Department of Biological Sciences
Arkansas State University
P. O. Box 599
State University, AR 72467
(870)972-3253
bfluker@astate.edu

PROJECT PARTNER:

Dr. John L. Harris, Adj. Asst. Professor
Department of Biological Sciences
Arkansas State University
10846 Plantation Lake Road
Scott, AR 72142
(501)961-1419
joharris@astate.edu

PROJECT BUDGET:

SWG AMOUNT REQUESTED -	\$36,324
MATCH AMOUNT (35%) -	\$19,666
TOTAL AMOUNT -	\$55,990

PROJECT STATEMENT:

Need: Freshwater mussels represent some of the most imperiled species in North America. Locating individuals and populations is a necessary first step in any conservation effort. In order to manage freshwater mussel resources, it is imperative to know the present distributions and population status of species of greatest conservation need (SGCN).

Harris *et al.* (2010) summarized the status of Arkansas mussels and noted that *Obovaria jacksoniana* (Frierson 1912) and *Villosa arkansasensis* (Lea 1862) were likely the same species. Harris *et al.* (2010) chose to retain a conservation status of S2 (imperiled) for both taxa. Inoue *et al.* (2013) resolved the relationship and taxonomy of the two species, and produced a mtDNA phylogeny that revealed five reciprocally monophyletic clades and high levels of evolutionary divergence among clades within the *Obovaria arkansasensis* complex including one unique clade in the White River drainage AR (*Obovaria sp. cf arkansasensis*). White River drainage specimens analyzed by Inoue *et al.* (2013) were exclusively from the Archey Fork Little Red River; however, populations referred to as *Obovaria arkansasensis* have historically occurred in other White River drainage rivers (Cache, Black, Strawberry, and White rivers) and the St. Francis River drainage. Harris and Posey (2015) assessed the statewide conservation status of *Obovaria arkansasensis* and *O. sp. cf arkansasensis* assuming that all White River drainage sites represented *Obovaria sp.*, and the resulting conservation ranks assigned were S4 (apparently secure) and S2 (imperiled), respectively. An accurate assessment of *Obovaria sp. cf arkansasensis* distribution and population status requires determination of whether *Obovaria sp.* is endemic to the Little Red River system or more widespread within the White and St. Francis river drainages.

Purpose and Objectives: The purpose of this project is to fill data gaps for a freshwater mussel species that is potentially a SGCN. Objectives are to determine the distribution and assess population status for *Obovaria sp. cf arkansasensis* in Arkansas.

Location: The proposed project is located within the Mississippi Alluvial Plain and Ozark Highlands ecoregions (Fig. 1). Proposed survey limits / sample sites are as follows:

Archey Fork Little Red River. From Rocky Hill Road (35.70359; -92.45932) downstream to the U.S. Hwy 65 crossing at Clinton, ca. 27.3 stream kilometers (kms) (17.0 river miles).

Black River. From Pochontas, a distance of ca. 8.0 rkm (5.0 rmi) upstream and downstream. From Black Rock, ca. 8.0 rkm (5.0 rmi) upstream and downstream.

St. Francis River. From Parkin downstream to the vicinity of Wittsburg, a distance of ca. 24.4 rkm (15.2 rmi).

White River. From Newport upstream to Oil Trough, ca. 37.3 rkm (23.2 rmi).

Approach: An initial survey through the Archey Fork Little Red River survey area to define locations presenting suitable mussel habitat with evidence of mussel assemblages (live or dead shell visible) will be conducted by wading (water <0.5 meter deep), snorkeling (water >0.5 meter deep), diving (water >1.5 meter deep) or a combination thereof. The qualitative timed-search approach with limited excavation may be the best for detecting mussel presence or demonstrating a reasonable probability of mussel absence (EPA 2013); therefore, our initial survey method will be qualitative timed searches. For *Obovaria sp. cf arkansasensis* specimens and any federally listed threatened or endangered species length, height, and width dimensions will be measured to the nearest 0.1 mm with calipers, and the sex determined when possible. All mussels encountered will be identified to species, recorded on site specific data sheets that include GPS site coordinates, and the mussels replaced in the

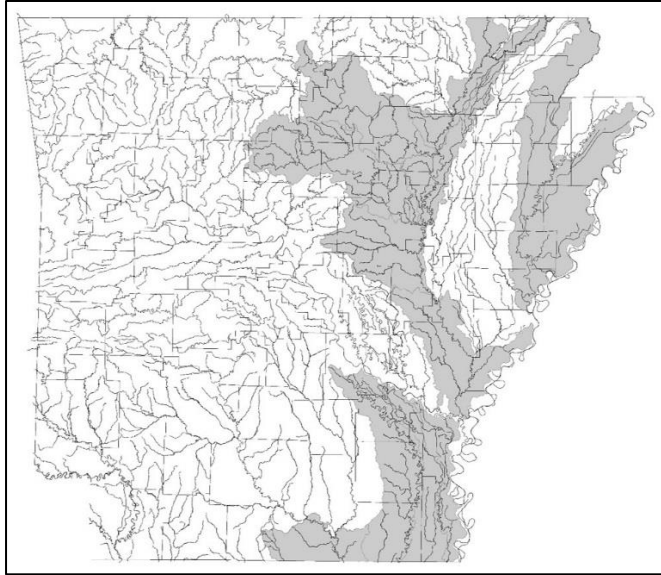


Figure 1. Proposed project is located in the shaded drainage basins in northeast Arkansas (*Obovaria sp. cf arkansasensis*).

substrate. Following the initial survey, mussel assemblages containing *Obovaria sp.* will be quantitatively assessed to provide population estimates using the appropriate sampling protocol (Strayer and Smith 2003, Smith 2006). Specimens obtained during quantitative sampling will be handled and data recorded as previously discussed for qualitative timed searches.

For the Black, White, and St. Francis rivers target areas, timed searches will be conducted using dive techniques to locate *Obovaria arkansasensis* complex individuals. All mussels encountered will be processed as detailed previously for the Archey Fork Little Red River survey. *Obovaria* specimens encountered will be measured to the nearest 0.1 mm with calipers, the sex determined, and all specimens photographed. A subset, not to exceed 5 specimens per site, will be sacrificed by fixing and preserving in 95% ethanol for phylogenetic analyses following the methods employed by Inoue et al. (2013).

Expected Results and Benefits: The taxonomic status of *Obovaria arkansasensis* complex populations in the White and St. Francis River drainage systems will be determined, and the ranges of both *Obovaria arkansasensis* and *Obovaria sp. cf arkansasensis* will be defined. Both semi-quantitative and quantitative data will be obtained to elucidate the relative abundance of these taxa. The proposed project will provide data to bridge distribution and population status data gaps and determine SGCN status for both species.

Proposed start date: October 1, 2017

Completion date: September 30, 2019

Budget:

	Budget Justification	SWG Year 1	Match Year 1	SWG Year 2	Match Year 2	SWG Total	Match Total
PERSONNEL							
Brook Fluker (PI)	0.5 month summer salary, each year	\$3,268		\$3,268		\$6,536	
John Harris (Co-PI)	100 hours at \$22/hr, each year	\$2,200		\$2,200		\$4,400	
Technician	\$10.50/hr, 28hrs/wk, 7 weeks per year	\$2,058		\$2,058		\$4,116	
Brook Fluker (PI)	0.4 month time during 2 academic years		\$2,614		\$2,614		\$5,228
FRINGE BENEFITS							
Brook Fluker (PI)	17.84% of salary base	\$584		\$584		\$1,168	
John Harris (Co-PI)	7.84% of salary base	\$173		\$173		\$346	
Technician	7.84% of salary base	\$162		\$162		\$324	
Brook Fluker (Co-PI)	34.82% of matched salary		\$910		\$910		\$1,820
SUBTOTAL PERSONNEL & FRINGE		\$8,445	\$3,524	\$8,445	\$3,524	\$16,890	\$7,048
TRAVEL							
Travel to study sites	3,433 total mi @ \$0.42/mi (2 vehicles)	\$1,442		\$1,442		\$2,884	
Lodging	28 nights, 2 rooms @ \$89/night	\$2,492		\$2,492		\$4,984	
Per Diem	32 days, 2 people @ \$51/day	\$1,632		\$1,632		\$3,264	
TRAVEL SUBTOTAL		\$5,566		\$5,566		\$11,132	
MATERIALS, SUPPLIES & SERVICES							
DNA processing, extraction, sequencing		\$2,500		\$2,500		\$5,000	
MATERIALS, SUPPLIES & SERVICES SUBTOTAL		\$2,500		\$2,500		\$5,000	
TOTAL DIRECT COSTS		\$16,511	\$3,524	\$16,511	\$3,524	\$33,022	\$7,048
INDIRECT COSTS (10% restricted)		\$1,651		\$1,651		\$3,302	
	Waived Indirects, 29.73% (ASU rate is 39.73%)		\$4,909		\$4,909		\$9,817
	39.73% of matched salary and fringe waived		\$1,400		\$1,400		\$2,800
Totals		\$18,162	\$9,833	\$18,162	\$9,833	\$36,324	\$19,666

Project Title: Determining the Status and Distribution of *Obovaria sp. cf. arkansasensis* ("White" Hickorynut) in Arkansas

Principal Investigator: Brook L. Fluker

QUALIFICATIONS:

Brook L. Fluker: Received Ph.D. in Biology from the University of Alabama in 2011 with an emphasis in phylogenetics, population genetics, and conservation of freshwater fishes. Has 13 years of experience sampling, handling, and collecting tissues from freshwater fishes in North America, including experience assisting with surveys of freshwater mussels and snails and seasonal abundance surveys for several federally protected fishes. This work has resulted in six publications, 10 technical reports, and 40+ presentations at professional conferences and meetings.

John L. Harris: Received Ph.D. in Zoology from University of Tennessee in 1986 with emphasis in taxonomy and systematics of aquatic fauna concentrating on fish and mussels. Has 30+ years experience in performing mussel surveys and impact analyses resulting in numerous peer-reviewed publications and/or agency reports. Has co-directed or been a committee member for 15 graduate students researching distribution and/or life history aspects of freshwater mussels in Arkansas.

References

- Arkansas Game and Fish Commission. 2006. Species reports: mussels, pages 870-1046 in Arkansas Wildlife Action Plan published by AGFC, Little Rock.
- Environmental Protection Agency (EPA). 2013. Technical support document for conducting and reviewing freshwater mussel occurrence surveys for the development of site-specific water quality criteria for ammonia. U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA 800-R-13-003. 59 p.
- Harris, J. L. and W. R. Posey II. 2015. Revised conservation status assessment for Arkansas freshwater mussels. Prepared for the Arkansas Natural Heritage Commission by Welch/Harris, Inc., Scott, AR. 16 p.
- Harris, J. L., W. R. Posey II, C. L. Davidson, J. L. Farris, S. Rogers Oetker, J. N. Stoeckel, B. G. Crump, M. Scott Barnett, H. C. Martin, M. W. Matthews, J. H. Seagraves, N. J. Wentz, R. Winterringer, C. Osborne, and A. D. Christian. 2010. Unionoida (Mollusca: Margaritiferidae, Unionidae) in Arkansas, third status review. *Journal of the Arkansas Academy of Science* 63 (2009):50-86.
- Inoue, K., D. M. Hayes, J. L. Harris, and A. D. Christian. 2013. Phylogenetic and morphometric analyses reveal ecophenotypic plasticity in freshwater mussels *Obovaria jacksoniana* and *Villosa arkansasensis* (Bivalvia: Unionidae). *Ecology and Evolution*. 3(8):2670–2683.
- Smith, D. R. 2006. Survey design for detecting rare freshwater mussels. *J. N. Am. Benthol. Soc.* 25(3):701–711.
- Strayer, D. L., and D. R. Smith. 2003. A guide to sampling freshwater mussel populations. American Fisheries Society, Monograph 8, Bethesda, Maryland.