

**TITLE:** Life history research on the special concern  
Southern Hickorynut, *Obovaria jacksoniana* (Frierson, 1912).

**DESCRIPTION:** By July of 2009, we propose to document the reproductive life history of *Obovaria jacksoniana* in Arkansas within a regional context. The proposed objective of this study is to conduct a life history study of *O. jacksoniana* in multiple drainages to include: a) identification of reproductive events, b) estimate fecundity, c) estimate infestation success, and d) identify suitable host fish.

**PROJECT LEADER:**

Alan D. Christian, Assistant Professor of Aquatic Ecology  
Arkansas State University  
Department of Biological Sciences  
P.O. Box 599  
State University, AR 72467  
E-mail: [achristian@astate.edu](mailto:achristian@astate.edu)  
870-972-3296  
870-972-2638 FAX

**PROJECT PARTNERS:**

John L. Harris, Adjunct Professor  
Arkansas State University  
Department of Biological Sciences  
P.O. Box 599  
State University, AR 72467  
E-mail: [omibob@aol.com](mailto:omibob@aol.com)  
501-569-2285  
870-972-2638 FAX

Jerry L. Farris, Professor  
Arkansas State University  
Department of Biological Sciences  
P.O. Box 599  
State University, AR 72467,  
Email: [jlfarris@astate.edu](mailto:jlfarris@astate.edu)  
(870)-972-3079  
870-972-2638 FAX

William R. Posey, Malacologist, Commercial Fisheries Biologist  
Arkansas Game and Fish Commission, P.O. Box 6740  
Perrytown, AR 71801  
(877) 777-5580

**TOTAL AMOUNT REQUESTED:** \$28,060.00

**AMOUNT AND SOURCE OF MATCHING FUNDS:** \$28,061.72

Graduate Assistantship: \$18,528.44  
Unrecovered Indirect Cost: \$6,013.28  
William R. Posey Field Days: \$3,520.00

**1. WHICH OF THE FUNDING PRIORITIES DOES OUR PREPROPOSAL ADDRESS?**

The global conservation ranking for *O. jacksoniana* is G1G2, critically imperiled, and the Arkansas state ranking is S2, imperiled. As part of the conservation planning process, the Arkansas Game and Fish Commission identified three data gaps / research needs for *O. jacksoniana*: 1) to conduct life history, including host suitability trials, study, and 2) to conduct a status survey.

**2. IN WHAT ECOREGION, ECOBASIN, TERRESTRIAL HABITAT OR AREA WILL OUR PROJECT BE CONDUCTED?**

*Obovaria jacksoniana*, the Southern Hickorynut, North American distribution is from Alabama west to eastern Texas and north to the Mississippi embayment of southeastern Missouri (Parmalee and Bogan 1998). In Arkansas, *O. jacksoniana* is distributed in the Ozark Highlands, Arkansas Valley, and South Central Plains ecoregions. The majority of occurrence in the Ouachita River drainage, but also are distributed in the Red River, Arkansas River and White River drainages (Harris et al 1997).

**3. WHAT IS THE GOAL(S) OF OUR PROJECT AND WHAT MAJOR OBJECTIVES OR TASKS WILL WE UNDERTAKE TO ACHIEVE THAT GOAL?**

By July of 2009, we propose to document the reproductive life history of *Obovaria jacksoniana* in Arkansas within a regional context. The proposed objectives of this study are: 1) to conduct a life history study of *O. jacksoniana* in multiple drainages to include: a) identification of reproductive events, b) estimate fecundity, c) estimate infestation success, and d) identify suitable host fish.

**4. WHAT ARE THE METHODS BY WHICH WE PROPOSE TO CARRY OUT OUR WORK?**

**Life History:** To determine reproductive timing, individual *O. jacksoniana* will be observed on a monthly basis for 2 years for each of the 3 target drainage basins. Gravid *O. jacksoniana* will be identified for taxonomic identification and tagged with an enumerated plastic id tag that will be glued to the left valve. Each female will be carefully inspected for mature and viable glochidia. Adult females with viable glochidia will be collected for transport to the U.S. Fish and Wildlife Service National Fish Hatchery in Mammoth Spring, AR. Glochidia from each females will be removed with a non-invasive technique where a 5- mL syringe (20-gauge needle) filled with synthetic water (hardness = 100 mg/L) will be carefully placed into the marsupial pouch and injected with water to tease the glochidia from the marsupium into a sterilized petri dish. Collected glochidia will be pooled and equal volume subsamples will be made. Two subsamples will be used to estimate fecundity while the remaining subsamples will be infested on various fish species to qualify suitable fish hosts.

Potential fish hosts will be collected from the Ouachita River, Red River, and Arkansas River system and transferred to Mammoth Spring National Fish Hatchery. Distribution of fishes listed in Robison and Buchanan (1988) and cited in the Arkansas Fish Database (Robison 2000) will be used to select fish for transfer to the Mammoth Spring National Fish Hatchery.

Fish will be infested with glochidia using the bucket method. One to six individuals, depending on individual size, of conspecific fish will be placed in 20L plastic containers with approximately 15 cm of water. Viable glochidia will be added to the container and the water will be vigorously aerated to keep the glochidia suspended. Aeration will continue for at least 45 minutes to assure encystment onto gills/fins of exposed fish. To estimate the number of glochidia that actually infested the fish(es) per bucket, we will also count the number of glochidia remaining in each bucket after the encystment period.

Parasitized fish will be isolated in 2 to 5-L flow-through monitoring tanks and siphoned twice weekly after the first 5 days of encystment. Thereafter, tanks will be siphoned for juvenile transformation until inspected fish are no longer parasitized. Siphonate collected from each isolation tank will be filtered through a 300  $\mu\text{m}$  Nitex<sup>®</sup> mesh to remove larger sized organic fractions followed by 105  $\mu\text{m}$  Nitex<sup>®</sup> mesh to retain juveniles for inspection. The contents of the siphon will be inspected with a dissecting microscope fitted with a polarizing lens for efficient identification of both excysted and transformed juveniles, and both excysted and transformed juveniles will be enumerated.

From the host suitability trails, fecundity, number of glochidia encysted, number of glochidia excysted, and number of glochidia transformed to juveniles can be enumerated. Thus a model can be developed to estimate the relative reproductive success each female has on each species of fish.

**5. WHAT MEASURABLE PRODUCTS OR OUTCOMES WILL RESULT FROM OUR PROJECT?**

1. Reproductive events, e.g. period of gravidity and length of gravidity, for *O. jacksoniana* by drainage basin
2. Fecundity of *O. jacksoniana* by drainage basin
3. Reproductive success of *O. jacksoniana* by drainage basin
4. Basin specific lists of suitable and non suitable host fish for *O. jacksoniana*.

**6. TO WHAT EXTENT WILL YOUR PROPOSED PROJECT BE ABLE TO TAKE ADVANTAGE OF EXISTING RESOURCES (E.G., FUNDING, TEAMS, CONSERVATION AREAS, PARTNERSHIPS)?**

1. We will be able to match a graduate student assistantship and the difference in indirect cost to reach the 50% matching requirement.
2. We are working as a team with ASU and AGFC researchers
3. We will be able to use the U.S. Mammoth Spring National Fish Hatchery facilities and personnel for conducting the host suitability trails.

**7. UPDATING THE COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY:**

We commit to and update of the Comprehensive Wildlife Conservation Strategy database at the conclusion of our study

**8. UPDATING THE SCIENTIFIC COMMUNITY:**

In addition to presenting at the funding priorities meeting in the autumn of 2009, we anticipate presenting our scientific findings at the Arkansas Chapter of the American Fisheries Society annual meeting, the 2008 meeting of the North American Benthological Society Meeting, and the Freshwater Mollusk Conservation Society Biannual meeting in Baltimore, MD in 2009.

**9. MAKING A PUBLIC CONNECTION:**

The Department of Biological Sciences at Arkansas State University has a weekly newspaper column that addresses biological and environmental sciences issues that faculty and students are addressing. We will commit to writing a column to educate people on the biology of *Obovaria jacksoniana* to include acknowledging funding provided by the Comprehensive Wildlife Conservation Strategy funding by AGFC.

**10. DELIVERABLES CALENDAR:**

Interim reports will be delivered on, December 15, 2007, 15 June 2008, December 15 2008 and 15 June 2009. These reports will provide a summary of work accomplished, a discussion of difficulties, and a study plan outlining all work that remains to be completed. A final report will

be prepared and submitted by 15 December 2009 and will include a detailed description of methods and results. The discussion of results will include an analysis of reproduction and host suitability of *Obovaria jacksoniana*.

**11. BUDGET JUSTIFICATION:**

The total budget requested from this proposal is \$28,060 over two years, for which \$25,509 are total direct costs and \$2,551 are the indirect cost calculated as 10% of the total budget. We are asking for \$7,200 for a summer research assistantship for 2 summers, \$1,000 summer salary for ADC and JLF, and \$1,000 in consulting fees to JLH. We have asked for \$716 in total fringes. We are asking for \$1,351 in supplies, \$4,000 in travel, and \$540 in publication fees.

In order to achieve a 50% match of \$28,060.00 we are proposing the following: 1) the Department of Biological Sciences is guaranteeing 4 semesters of graduate assistantship to a graduate student associated with this project for a total of \$18,528.44., 2) ASU acknowledges the \$6,013.28 in unrecovered Indirect cost (difference between institutional rate of 46% on salary and fringes versus the negotiated 10% total budget), and 3) Arkansas Game and Fish Commission employee William R Posey has committed to 10 days of field work for a total of \$3,520.

## 12. BUDGET

BUDGET - Arkansas State University		Date:	1/11/2007						
Sponsoring Agency:		Arkansas Game and Fish Program							
Proposed Start & End Dates:		July 1 2007 to December 15 2009							
ASU Principal Investigator:		Alan D. Christian							
Department:		Biological Sciences							
	Base Salary	Type Appoint.	PERSON-MONTHS			Yr 1	Yr 2	Cumulative	
			CAL	AY	SMR				
<b>SALARIES &amp; WAGES</b>									
PI, academic or cal. year sal.		9 mo.				0	0	0	
PI, summer salary					1000.00	0	1,000	1,000	
Co-PI #1, acad. or cal. year		9 mo.				0	0	0	
Co-PI #1, summer					1000.00	0	1,000	1,000	
Graduate Assistant (Masters)			1	3	mo. @	2000	7,200	7,200	14,400
Hourly, enrolled student			1	100	hrs @	\$8	750	750	1,500
<i>Total Salaries &amp; Wages</i>						7,950	9,950	17,900	
<b>FRINGE BENEFITS</b>									
		<u>Institutional Rate:</u>							
Faculty summer salary			20.00%			0	400	400	
GRA(s)			2.00%			144	144	288	
Hourly, non-student			7.65%			0	0	0	
Hourly, enrolled student			2.00%			15	15	30	
<i>Total Fringe</i>						159	559	718	
<b>Total Salaries, Wages &amp; Fringe</b>						<b>8,109</b>	<b>10,509</b>	<b>18,618</b>	
<b>MATERIALS &amp; SUPPLIES (not fees or services, which are "Other")</b>						676	675	1,351	
TRAVEL - Domestic						2,000	2,000	4,000	
TRAVEL - Foreign						0	0	0	
HONORARIUMS (only non-employees can receive honorariums)						0	0	0	
JOURNAL PUBLICATION FEES						0	540	540	
<b>OTHER DIRECT COSTS (Itemize by type; insert extra rows if needed.)</b>									
Consultant Services						0	1,000	1,000	
Computer Services						0	0	0	
<b>Subtotal Other Direct Costs</b>						<b>0</b>	<b>1,000</b>	<b>1,000</b>	
<i>Modified Total Direct Costs (above subtotal costs subject to F&amp;A Cost)</i>						10,785	14,724	25,509	
<b>F &amp; A COST (TMD x RATE):</b>		10%				1,079	1,472	2,551	
<i>First \$25K in subaward salaries</i>						0	0	0	
<b>F &amp; A COST (SWF x RATE) SUB(S):</b>		46%				0	0	0	
Dept of Education F & A (8% Direct)						863	1,178	2,041	
<b>TOTAL DIRECT COST</b>						<b>10,785</b>	<b>14,724</b>	<b>25,509</b>	
<b>TOTAL PROJECT COST</b>						<b>\$11,864</b>	<b>\$16,196</b>	<b>\$28,060</b>	

## QUALIFICATIONS OF THE INDIVIDUALS AND ORGANIZATION INVOLVED

1. Alan D. Christian, has conducted surveys, life history, growth, and ecological research on freshwater mussels in Arkansas since 1992 and received Ph. D in Zoology from Miami University in 2002 with dissertation emphasizing the ecology of freshwater mussels.
2. John L. Harris: Received Ph.D. in Zoology from University of Tennessee in 1988 with emphasis in taxonomy and systematics of aquatic fauna concentrating on fish and mussels. Has 25 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 seven graduate students researching distribution and/or life history aspects of freshwater mussels in Arkansas
3. Jerry L. Farris: Dr. Jerry L. Farris is professor of Environmental Biology and Associate Dean of Sciences and Mathematics at Arkansas State University. He studied aquatic ecology and ecotoxicology and received a Ph.D. in Zoology from Virginia Tech. Having worked for years at Virginia Tech's Center for Environmental and Hazardous Materials Studies and Arkansas State's Ecotoxicology Research Facility, he has focused much of his research efforts upon development of biomonitoring techniques both in field and laboratory settings. He has authored and co-authored more than 80 open literature publications on diverse topics with many of those focusing upon bivalves. He has worked as a consultant, educator, and principal investigator on projects for the past 25 years involving community interactions with disturbed or contaminated habitats to determine relative risks posed to ecosystems and organisms. Most often these investigations have involved aquatic organisms with more recent inclusion of assessment frameworks that include interfacing avian and amphibian populations. His research experience has included propagating endangered mussel species, monitoring mussels using field surveys, caged deployments of mussels and Asian clams, and laboratory toxicity assays of glochidia and juveniles.
4. William R. Posey. Conducted graduate research on freshwater mussels and is the State Malacologist and Fisheries Biologist.