2017 Proposal to AGFC SWG Program – Eggleton et al.

Project Title: Distribution and Status of Alabama Shad *Alosa alabamae* in Arkansas Rivers

Project Summary: The Alabama shad *Alosa alabamae* is an anadromous clupeid species native to the northern Gulf of Mexico. During spring, this species migrates into freshwater rivers along the U.S. southern coast for spawning. The species' historical spawning range included the Mississippi River basin eastward to the Suwannee River in Florida (Ely et al. 2008). In recent decades, the species has become rare throughout much of this range. Declines in abundance have been attributed largely to the widespread construction of navigational lock-and-dam systems (Barkuloo et al. 1993). Although dams and other obstructions tend to congregate adults, it is generally believed that they have probably reduced population sizes through time and eliminated the use of some river systems (Ely et al. 2008). In Arkansas, the species is very rare. There are only about 20 accounts of the species being collected since 1879, though most have been concentrated in the Ouachita River system since the 1990s. At present, there are no reports of Alabama shad being collected in the Arkansas reach of the Mississippi River or the Arkansas River basin in more than a century. Given that the Alabama shad has been assigned a species of greatest conservation need (SGCN) ranking of 52, and is the fourth highest ranked fish on the list of 377 species, information concerning its current distribution and status is warranted.

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Project Budget: The total project cost is **$39,546**; this project requests **$25,350** from the SWG program over a 2-year (fiscal year) period. Non-federal matching funds totaling **$14,197** (36% of total cost) is being provided from AGFC biologist time, AGFC equipment use, and UAPB unrecovered indirect costs. UAPB will be providing the time of an M.S.-level Research Associate towards this work. UAPB also will be providing vehicles, gasoline, boats, nets, meters, and other field and lab equipment to be used towards this project. *(University reporting guidelines prohibit this support from being classified as "match" towards SWG grants)*

Project Statement

Project Need: The Alabama shad *Alosa alabamae* is an anadromous clupeid native to the northern Gulf of Mexico. During spring, this species migrates into freshwater rivers along the U.S. southern coast for spawning. The species' historical spawning range included the Mississippi River basin eastward to the Suwannee River in Florida (Ely et al. 2008). In recent decades, the species has become rare throughout much of this range. Declines in abundance

have been attributed largely to the widespread construction of navigational lock-and-dam systems (Barkuloo et al. 1993). Although dams and other obstructions tend to congregate adults, it is generally believed that they have probably reduced population sizes through time (Ely et al. 2008). Lock-and-dam construction has likely eliminated Alabama shad use of some river systems; the species has been viewed as "much reduced" and "vulnerable to extinction" (Mickle et al. 2010).

In Arkansas, the Alabama shad has been observed only intermittently through time despite that it is considered a native species. Robison and Buchanan (1988) report scattered, isolated catches throughout the state before 1960. Pfleiger (1997) reported catches from the Mississippi and Missouri river mainstems and some of their tributaries. Buchanan et al. (2012) reported about 20 separate accounts of Alabama shad being collected in Arkansas since 1879. Most historical collections of the species have been made in the Ouachita River and one of its larger tributaries – the Little Missouri River. There has been one account of the species in the Saline River (a more downstream tributary in the Ouachita River system) from 1972. However, Layher et al. (1999) reported collecting no Alabama shad from 80 sites in the Saline River in the late 1990s. Most of the Ouachita River reports have occurred since the 1990s, with one report as recent as 2014 (J. Quinn, personal communication). Recent reports in this river system are somewhat surprising given the completion of the U.S. Army Corps of Engineers' Ouachita-Black River Navigation Project in the 1980s (Olive et al. 2010). This navigation system includes four lock-and-dam systems downstream in Louisiana and Arkansas (Felsenthal Reservoir) that could potentially impede upstream migrations of Alabama shad. Otherwise in Arkansas, there was one account reported (three specimens) from the White River near Newport in 2006; another report was from the Mulberry River, which is an Arkansas River tributary in western Arkansas, but this account is from 1892. At present, there are no known reports of Alabama shad being collected in the Arkansas reach of the Mississippi River or the Arkansas River basin in more than a century. Given that the Alabama shad has been given a species of greatest conservation need (SGCN) ranking of 52, and is the fourth highest ranked fish on a list of 377 species, information concerning its current distribution is warranted.

Purpose and Objectives: UAPB working in concert with the Arkansas Game and Fish Commission (AGFC) proposes to conduct fish sampling effort to locate and index Alabama shad populations in Arkansas. Sampling will include spring (March-May) boat-mounted electrofishing to target spawning adults, and summer (June-September) seining and boat-mounted electrofishing (as feasible or possible) to index juvenile Alabama shad (i.e., age-0) from the 2018 and 2019 year classes. The specific objectives of this project are to 1) characterize Alabama shad spawning adult populations in selected Arkansas river systems using spring boat-mounted electrofishing, and 2) characterize juvenile Alabama shad cohorts using seining and boat-mounted electrofishing (as feasible or possible).

Location: Specific river systems, tributaries, and reaches within systems to be sampled will be determined following consultation with the appropriate AGFC, U.S. Fish and Wildlife Service (USFWS), U.S. Geological Survey (USGS), and/or U.S. Army Corps of Engineers (USACE) personnel. However, it is highly likely that spring adult sampling will occur throughout the Ouachita River mainstem and several of its main tributaries, including the Little Missouri, Saline, and Caddo rivers, and Moro Creek. Additional spring adult sampling will likely target the lower Arkansas River below Dam No. 2 (i.e., free-flowing reach), and reaches below selected Arkansas River dams in central and western Arkansas. We will seek advice from USACE

biologists and sample selected secondary channel habitats in the Arkansas reach of the lower Mississippi River (LMR). We will additionally sample selected reaches of the lower White River upstream to the Batesville/Newport reach. Other potential sampling areas will be considered as recommended by the agencies listed above. Summer juvenile sampling will occur in these same areas, especially if congregations of spawning adults were located in that system during the previous spring sampling.

Timeline: Upon being awarded this grant, it is expected that preliminary pilot sampling, site reconnaissance and selection, and equipment and supply purchases will be completed during fall 2017 and winter 2018. The entire field schedule will be completed during 2018 and 2019, with spring adult sampling occurring each year during March-May, and juvenile sampling occurring each year during June-July and September-October. The grant would be initiated on October 1, 2017 and end on September 30, 2019. Tentatively, we anticipate that sampling will commence in Ouachita and Arkansas river systems during 2018, with the White and Mississippi rivers sampled in 2019. Any additional study areas that are recommended by the agencies would be incorporated into either the 2018 or 2019 field schedules as possible.

Objective 1. Characterize Alabama shad spawning adult populations in selected Arkansas river systems using spring boat-mounted electrofishing. Boat-mounted electrofishing will be conducted bi-weekly from March through May in the river systems and reaches selected for each year. This time period coincides with Alabama shad adults migrating into freshwater systems for spawning. During this period, adults are very active and observable, but typically do not feed despite their long migrations from the sea. Adults congregate for spawning below dams and in selected reaches of rivers that typically contain large gravel bars. Following spawning, adults out-migrate from the system and return to the sea, being completely gone by early summer.

Sampling locations used will not be random; rather they will be selected from reaches downstream of dams that have historically served as known spawning grounds. Ten 10-min electrofishing samples will be taken in a downstream direction within each reach. Electrofishing output settings will be standardized based on water temperature and conductivity to achieve a standard power output of approximately 3,000 W at all locations (Burkhardt and Gutreuter 1995). Samples will be obtained using two dip-netters on the bow of the boat at all times. Boat-mounted electrofishing appears to be the gear of choice for this species (Ely et al. 2008) as Alabama shad are generally believed to be more net-shy than other clupeids (A. Kern, personal communication).

Objective 2. Characterize juvenile Alabama shad cohorts using seining and boat-mounted electrofishing (as feasible or possible). Seining and boat-mounted electrofishing will be conducted approximately twice during June-July, and August-September in 2018 and 2019 (different river systems will be done each year). Boat-mounted electrofishing will be done as feasible given seasonal low water levels in some systems, but may be needed as juvenile Alabama shad have been documented as exhibiting distinct ontogenetic shifts in habitat preference during their first years of life (NOAA 2007). In particular, juveniles tend to occupy shallow sandbars during early summer following hatching, but shift to deeper main channel, channel border, and steep-bank habitats during late summer (Mickle et al. 2010). By late summer and fall, juveniles typically begin their downstream migrations to the sea.

Environmental data: During all sampling, environmental variables will be measured within each reach. For each individual sample, longitude, latitude, and total depth will be recorded using an onboard depth finder/GPS unit. Using a multiprobe field meter (Hydrolab Datasonde 4a, Hach Hydromet, Loveland, Colorado), turbidity (as NTU), dissolved oxygen (as mg/L), total dissolved solids (as mg/L), conductivity (as µS/cm), pH (standard units), and water temperature (as ^{o}C) will be measured at four random locations within each river reach. Depending on channel dimensions, river discharge will be estimated for each reach either by the using the nearest USGS or NOAA-National Weather Service river gage, or by computation using the midsection method of Hauer and Lamberti (2007). All of these environmental variables will be used to examine correlation relationships between environmental variables and Alabama shad indices (juvenile and adult).

Expected Results and Outcomes: This 2-year sampling regime will primarily serve to update distribution and status of Alabama shad, which is an Arkansas species of greatest conservation need. Our hope is that the intensive sampling outlined, which targets both spawning adults in spring and juveniles during summer and fall also will identify additional reaches in Arkansas rivers currently being utilized by Alabama shad. Furthermore, this study would be a logical first step preceding future studies of Alabama shad, which may lead to the development of a state management plan and protection of critical areas known to be important for spawning or rearing.

Budget: A total of **$25,350** is being requested from SWG, with an additional **$14,197** (36%) being provided as non-federal matching support by UAPB and AGFC. UAPB match is provided in the form of unrecovered indirect costs. AGFC matching support will be provided by the prorated time for two AGFC biologists and AGFC equipment usage.

A. Requested Funds – Travel, Supplies, Contractors, etc.	Year 1	Year 2	Total
1. Part-time technician salary (1000 hrs @ $9.50/hr)	$4,750	$4,750	$9,500
2. UAPB fringe benefits (31%)	$1,473	$1,473	$2,945
3. Travel	$2,000	$2,000	$4,000
4. Equipment (sampling gear maintenance/replacement)	$2,000	$2,000	$4,000
5. Field/sampling supplies*	$800	$800	$1,600
6. Lab supplies*	$500	$500	$1,000
7. Project Total Direct Costs (TDC)	$11,523	$11,523	$23,045
8. Recovered Indirect Cost (10% of TDC)**	$1,152	$1,152	$2,305
TOTAL FUNDS REQUESTED	$12,675	$12,675	**$25,350**
B. Matching Support Provided	**Year 1**	**Year 2**	**Total**
1. State Biologist Time - Jeff Quinn (20 h/yr x $36/h)***	$1,089	$1,089	$2,178
2. State Biologist Time - Aaron Kern (20 h/yr x $28/h)***	$840	$840	$1,680
4. AGFC Transportation (2 weeks rental x 2 trucks)	$600	$600	$1,200
5. AGFC Electrofishing / Airboat (1 month rental)	$600	$600	$1,200
6. AGFC travel (2 weeks x 2 people)	$800	$800	$1,600
7. Miscellaneous supplies (net repair/replacement)	$2,000	$1,000	$3,000
8. Unrecovered UAPB Indirect Cost****	$1,669	$1,669	$3,338
TOTAL MATCH PROVIDED	$7,598	$6,598	**$14,197**

* Field and lab supplies include preservative, containers/bags, net repair/replacement

** 10% of total direct costs - this is only amount SWG will allow

*** Based on AGFC salaries prorated by hour + 40% benefits.

**** Equivalent to 59.4% of technician salaries minus recovered indirect costs in line A7

Total Cost of Project = $39,546 which includes 36% match

Project Personnel Qualifications:

Dr. Michael Eggleton is an Associate Professor in the Aquaculture/Fisheries Center at UAPB. He earned graduate degrees at Tennessee Tech University and Mississippi State University. He has been employed with UAPB since 2003, and has worked on a variety of sportfish-oriented projects for the Arkansas Game and Fish Commission. He was involved in a prior study of White River floodplain lakes, and has worked extensively in the lower Mississippi and Arkansas rivers. These projects produced several graduate students and publications.

Aaron Kern is a fisheries biologist with the AGFC District 6 office in Camden. He received a M.S. degree in Fisheries Management from Auburn University in 2016. His thesis research was centered on habitat use and movement patterns of Alabama shad during spawning migrations. Previously, Aaron worked as a Fisheries Researcher for both Auburn University and Southern Illinois University, and was a Fisheries Biologist for the Arizona Game and Fish Department and Wyoming Game and Fish Department.

Jeff Quinn is a Stream Fisheries Biologist with AGFC. He received his M.S. degree from the University of Arkansas, and has been employed with AGFC since 1998. He has published 13 peer-reviewed papers in scientific journals and books, and is an American Fisheries Society Certified Fisheries Professional.

Appendix A. Literature Cited

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