

*Annual Meeting of the Arkansas Chapter  
of the American Fisheries Society  
DeGray Lake Resort State Park  
February 1-3, 2006*



# Meeting Program

## Wednesday, February 23

- 10:00 a.m. – 4:00 p.m.** Meeting Registration (Lobby)
- 1:00 p.m. – 5:00 p.m.** Aquatic Plant Workshop Presented by Dr. Staria Vanderpool, Arkansas State University (Caddo Room)
- 3:00 p.m. – 3:30 p.m.** Break (Atrium)
- 5:15 p.m. - 6:30 p.m.** Load Presentations on Computer (Lobby: Sandy Clark)
- 630 p.m. - Midnight** Social with Plenty to Eat and Drink (Eagle, DeGray, and Ouachita Rooms)  
Carving Station Sponsor: Fisheries Answers By AC

## Thursday, February 2

**Breakfast on your own (Buffet Available in Restaurant)**

**8:00 a.m. – Noon** Meeting Registration (Lobby)

**Session 1 (Caddo Room)**

**8:20** Moderator/Opening Remarks: Joseph Stoeckel

**8:30** Lang, Thomas J. (G), J. Wesley Neal, and Clifford P. Hutt  
Evaluation of monthly versus biweekly stocking of channel catfish in the Arkansas urban fishing program

**8:45** Donabauer, Steve B. (G), Joseph N. Stoeckel, and Jeff W. Quinn  
Reproduction and habitat use of paddlefish in Ozark Lake, Arkansas River, Arkansas

**9:00** Leone, Frank J. (G), Joseph N. Stoeckel, and Jeff W. Quinn  
Population characteristics of paddlefish in the Arkansas River, Arkansas: implications on the management of an exploited fishery

**9:15** Cushing, A. W. (G), and Dan. D. Magoulick  
The effects of catch and release areas on movement and mortality of rainbow trout in Bull Shoals and Norfolk tailwaters

**9:30** Bullock, V. (U), A. J. Cline, and Steve E. Lochmann  
Responses of brook and brown trout to stream rehabilitation in a Michigan forest stream

- 9:45**            **Break (Atrium)**
- Session 2**      **(Caddo Room) Moderator: Wes Neal**
- 10:15**            Batten, Ben G. (G), Mike A. Eggleton, Steve E. Lochmann, and Harold L. Schramm  
Largemouth bass population characteristics in the lower 11 pools of the Arkansas River
- 10:30**            Wilberding, Matthew C. (G), and John R. Jackson.  
The effects of increased minimum base flow on black bass populations in the Ouachita River, Arkansas
- 10:45**            Wentz, Tate (U), and John R. Jackson  
Comparison of otoliths and branchiostegal rays for age and growth analysis in spotted gar
- 11:00**            Schroeder Matt D. (G), Robert L. Clark, Bradley S. Williams, and Reid Adams  
Fish community structure in floodplain wetlands of the Arkansas River: A preliminary analysis
- 11:15**            Clark, Sandra J. (G), John R. Jackson, and Steve E. Lochmann.  
Relation between floodplain lake fish communities and river connectivity in the lower White River, Arkansas
- 11:30**            Mondragon, S. (U), R. Hines, and S.E. Lochmann  
Ichthyofauna of Maddox Bay runnout on the White River National Wildlife Refuge
- 11:45**            **Lunch on your own (Buffet Available in Restaurant)**
- Session 3**      **(Caddo Room) Moderator: Sandra Clark**
- 1:15**            Miller, Grace (U), Andrew J. Peck, and Alan D. Christian  
Spatial and temporal distribution of organic and inorganic material within total sediment load samples in the lower White River, Arkansas
- 1:30**            McCord, S.B. (G), and Richard S. Grippio  
The effectiveness of silviculture best management practices logging on protecting stream ecosystems in Arkansas
- 1:45**            Medlin, Elizabeth C. (G), Stephen M. Coghlan, Jr., and Robyn Hannigan  
Discrimination between walleye stock of the South Fork, Middle Fork, and Devil's Fork of the Little Red River using otolith microchemistry
- 2:00**            Matthews, Mickey W. (G), Faron D. Usrey, Shawn Hodges, Sara E. Seagraves, and Alan D. Christian  
Assessment and evaluation of native freshwater mussel assemblages of Buffalo National River

- 2:15 Break (Atrium)**  
**Session 4 (Caddo Room) Moderator: Jim Wise**
- 2:45** Lawson, Raven L. (U), Mickey W. Matthews, Faron D. Usrey, Shawn Hodges, and Allen D. Christian  
 Species and size selective predation on Buffalo National River, Arkansas freshwater mussels
- 3:00** Seagraves, Sara E. (G), Jerry L. Farris, John L. Harris, and Alan D. Christian  
 Conservation of the ouachita creekshell: reproduction and host fish suitability
- 3:15** Smith, Allison M. (U), Jeannette Loutsch, Emy Monroe, and Alan D. Christian  
 The use of micro-satellite analysis to determine paternity in freshwater mussels
- 3:30** Peck, Andrew J. (G), John L. Harris, Jerry L. Farris, and Alan D. Christian  
 Movement patterns of freshwater mussels following relocation: a case study of *Potamilus capax* and *Quadrula quadrula* in an Arkansas drainage ditch
- 3:45** Martin, Holly C. (G), Raven L. Lawson, John L. Harris, and Alan D. Christian  
 Richness, densities, population and community numerical standing crop, and habitat characterization of Spring River drainage freshwater mussels
- 4:30 Business Meetings (Caddo Room)**
- 7:00 Banquet: Catfish and Rib Buffet (Eagle, DeGray, and Ouachita Rooms)**

### Friday, February 3

**Breakfast on your own (Buffet Available in Restaurant)**

- Session 5 (Caddo Room) Moderator: Chris Racey**
- 8:30** Justus, Billy  
 Water quality of eleven lakes in eastern and southern Arkansas
- 8:45** Wagner, Brian K., and Mark D. Kottmyer  
 Status and distribution of the Arkansas darter (*Etheostoma cragini*) in Arkansas
- 9:00** Hutt, Clifford P., Thomas J. Lang, and J. Wesley Neal  
 A fishing derby program's influence on effort and harvest at derby locations

- 9:15** Lochmann, Steve E.  
An examination of different stocking densities of sunshine bass larvae reared in tanks
- 9:30** Lochmann, Steve E., Kelly J. Goodwin, and Chris L. Racey  
Environmental and genetic influences of the percent of hatch and size at hatch of sunshine bass
- 9:45** Hobbs, Melissa S., Richard S. Grippo, Jerry L. Farris, Billy R. Griffin, Gerald M. Ludwig, and Lora L. Harding  
Environmental fate and effects of the aquaculture therapeutant potassium permanganate: summer of tier III (mesocosm) studies
- 10:00** **Break (Atrium) and Meeting adjourned**

**G = Graduate student**

**U = Undergraduate student**

# *Meeting Abstracts*

## **Largemouth Bass Population Characteristics in the Lower 11 Pools of the Arkansas River**

B.G. Batten<sup>1</sup>, M.A. Eggleton<sup>1</sup>, S.E. Lochmann<sup>1</sup>, and H.L. Schramm, Jr.<sup>2</sup>

<sup>1</sup>University of Arkansas at Pine Bluff

<sup>2</sup>Mississippi Cooperative Fish and Wildlife Research Unit,  
Mississippi State University

Following completion of the McClellan-Kerr Navigation System in 1973, the Arkansas River's fisheries have been exposed to many of the same impacts as other river systems, such as sedimentation, altered hydrology, and loss of off-channel or backwater habitats. A 380-mm (15-in) minimum length limit was implemented on largemouth bass in 1998. However, recent concerns have been expressed suggesting the quality of largemouth bass population in the Arkansas portion of the river has been diminishing. Historical fisheries data for the river are scarce and not representative of the entire river. Thus, the primary objective of this study was to provide detailed characterization of the largemouth bass populations in the lower 11 pools (500 km) of the Arkansas River. Population age structures were skewed towards younger fish with very few individuals older than age 3. Population size structures, expressed as proportional stock density (PSD), were greatest in the lower pools of the river. PSD values averaged 57 ( $\pm 4$ ) and 45 ( $\pm 8$ ) in the lower and upper pools, respectively, with Lake Dardanelle averaging 47 ( $\pm 5$ ). Similarly, relative stock densities using 380-mm total length averaged 20 ( $\pm 4$ ) and 18 ( $\pm 6$ ) in the lower and upper pools, respectively, with Lake Dardanelle averaging 14 ( $\pm 4$ ). Bass condition was generally good throughout the river, though a slight inverse relationship existed with river mile. Results of this study do not suggest that the quality of largemouth bass populations in the lower Arkansas River is poor.

## Responses of Brook and Brown Trout to Stream Rehabilitation in a Michigan Forest Stream

V. Bullock<sup>1</sup>, A.J. Cline<sup>2</sup>, and S.E. Lochmann<sup>1</sup>

<sup>1</sup>Aquaculture/Fisheries Center, University of Arkansas at Pine Bluff

<sup>2</sup>Huron-Manistee National Forests, Baldwin Ranger District, MI

The White River is located in west central Michigan, partially within the Huron-Manistee National Forests. The White River is one of the “Blue Ribbon” trout streams in the Lake Michigan drainage. It is wadeable, and the bottom consists of a combination of cobble, gravel, and sand. Developments, road construction, and crossings generally increase the amount of sand in the river and can negatively effect trout reproduction. Fisheries biologists with the Huron-Manistee National Forest undertook a stream rehabilitation project to minimize sand accumulation. Instream features were added to provide habitat, capture sand, increase pool depth and frequency, and minimize sand accumulation in the stream channel. Chapman’s mark/recapture estimates of population abundance were calculated in 2001 for brown *Salmo trutta* and brook *Salvelinus fontinalis* trout, prior to construction of instream structures, in two reaches of the river. Trout were collected with a barge electroshocker, identified, measured for total length, fin-clipped to mark the fish, and released downstream of the area being sampled. Subsequently, instream features (lunkers, deflectors, brush bundles, and platform structures) were put in place in the White River. In 2005, the two reaches were again sampled with the barge electro-fisher. Species were identified, measured, and fin-clipped as before. Chapman’s mark/recapture estimates of abundance were calculated for both trout species. We compared the size distributions prior to, and following the instream work using chi-square tests ( $\alpha=0.05$ ). We also compared the abundance of both trout species prior to and following the rehabilitation work. Abundance of brown trout increased 1.5 to 2.5 times following instream work. Abundance of brook trout remained the same in one reach and increase 1.4 times in the second reach. Brown trout size distributions significantly increased in both stream reaches. Brook trout size distribution increased in the reach that did not exhibit a significant increase in abundance, but did not change in the reach that exhibited a significant increase in abundance. Trout populations exhibited improvements in either abundance or size structure, or both, following the instream work. This stream habitat management strategy may be a model for improvement of habitat in other Michigan trout streams.

## **Relation Between Floodplain Lake Fish Communities and River Connectivity in the Lower White River, Arkansas**

Sandra J. Clark<sup>1</sup>, John R. Jackson<sup>1</sup>, and Steve E. Lochmann<sup>2</sup>

<sup>1</sup>Fisheries and Wildlife Program, Arkansas Tech University

<sup>2</sup>Aquaculture and Fisheries Center, University of Arkansas at Pine Bluff

The goal of our research was to provide an understanding of how river-floodplain linkages affect fish communities in floodplain lakes. Our study was conducted within the White River National Wildlife Refuge, AR. We sampled 41 floodplain lake fish communities with boat electrofishing, gill nets, and mini-fyke nets. Nearly 41,000 fish comprising 72 species and 18 families were collected. Average richness was 31 species/lake (ranged from 13 to 42 species) and average Shannon diversity was 1.90 (ranged from 1.15 to 2.42). Canonical correspondence analysis was used to evaluate relationships between species, families, and reproductive mode relative abundances with lake physical/environmental and hydrological variables. Length/width ratio, water temperature, type of connection (prior to overbank flooding or overbank flooding), and average start date of connection were found to be important influences on fish communities. Lakes with a greater length/width ratio, surface area, and average depth tended to be connected by sloughs prior to overbank flooding. Start date of flooding tended to increase as distance to the river increased. Three general lake types and associated fish communities were evident. Type 1 lakes had higher length/width ratio, larger surface area, higher average depth, and connected prior to overbank flooding. Type 3 lakes had lower length/width ratio, lower surface area, lower average depth, and connected via overbank flooding. Type 2 lakes were intermediate with moderate length/width ratio, surface area, average depth, and connected just prior to overbank flooding.

## **The Effects of Catch and Release Areas on Movement and Mortality of Rainbow Trout in Bull Shoals and Norfolk Tailwaters**

A.W. Cushing, and D. D. Magoulick  
Arkansas Cooperative Fish and Wildlife Research Unit  
University of Arkansas at Fayetteville

Catch-and-release areas were developed in the mid 1990's on the tailwater systems of the White and Norfolk Rivers, Arkansas, with the goal of improving survival and residence time of rainbow trout *Oncorhynchus mykiss* in areas normally under put-and-take management. In a paired study design, rainbow trout were implanted with radio-transmitters from within and below each catch-and-release (CR) area to investigate the assumptions that, 1) trout stay within CR areas and 2) mortality is reduced within CR areas. Current velocity, substrate type, temperature, and dissolved oxygen were recorded at fish locations. Preliminary results showed greater summer and fall residence times in CR than non-CR areas. Summer movements in all areas were limited (0-10 meters) with fish maintaining positions in single pools or riffles. In autumn, several fish made upstream migrations covering distances ranging 6-40 kilometers. Knowledge of movement patterns and home ranges will allow managers to more effectively establish the size and location of special regulation areas.

## **Adult Paddlefish Survival in Ozark Lake, Arkansas River, Arkansas**

Steve B. Donabauer<sup>1</sup>, J. N. Stoeckel<sup>1</sup>, and J. W. Quinn<sup>2</sup>

<sup>1</sup>Fisheries and Wildlife Program, Arkansas Tech University

<sup>2</sup>Arkansas Game and Fish Commission

The levels of fishing and natural mortality on paddlefish populations in the Arkansas River, Arkansas are unknown. Data regarding these important facets of paddlefish population dynamics are needed to enable managers to design, implement, and support regulations that promote sustainability. The purpose of this study was to estimate survivorship of harvestable-size (> 914 mm) paddlefish in the Arkansas River, Arkansas. We implanted 50 adult paddlefish in Ozark Lake with ultrasonic transmitters and conducted monthly searches for telemetered fish from January 2004 to December 2005. Average minimum and maximum relocation probabilities ranged from 0.649 to 0.867. Commercial and recreational fishing harvest on telemetered fish was 25% and 10%, respectively. We modeled natural mortality using a Kaplan-Meier staggered design procedure where survival was estimated to be  $0.854 \pm 0.143$  ( $\hat{S} \pm 95\%$  CI). In addition, recent regulations have assumed paddlefish in the Arkansas River to be closed populations, however telemetered fish infrequently moved between pools. Regulations that recognize the efficiency of commercial and recreational angler harvest relative to paddlefish longevity are recommended.

## **Reproduction and Habitat Use of Paddlefish in Ozark Lake, Arkansas River, Arkansas**

Steve B. Donabauer<sup>1</sup>, J. N. Stoeckel<sup>1</sup>, and J. W. Quinn<sup>2</sup>

<sup>1</sup>Fisheries and Wildlife Program, Arkansas Tech University

<sup>2</sup>Arkansas Game and Fish Commission

The effects of proposed channel modifications on paddlefish reproduction and habitat use in the Arkansas River, Arkansas are unknown. Data regarding these aspects of paddlefish ecology are needed to enable managers to develop an appropriate management plan. The purpose of this study was to identify paddlefish spawning areas and determine seasonal habitat use. We implanted 50 adult paddlefish in Ozark Lake with ultrasonic transmitters and made 1,021 relocations from January 2004 through December 2005. Telemetered fish migrated a median distance of 32.7 km in the spring when water temperatures ranged from 10-20 °C. Gravid females staged for the spawn in the tailwater of James W. Trimble Dam in 2004 and in 2005. We verified reproduction by capturing 23 prolarvae in the upper reach of Ozark Lake at water temperatures between 17-20 °C. Tributary-mouths were the most dominant habitat type selected for in each season and comprised 55.1 % of all relocations. Fish frequently moved between bayous and interpool movement was verified. Water depths that fish occupied were  $6.7 \pm 2.0$  m (mean  $\pm$  SD) and did not differ between seasons. Mean water velocities fish utilized were significantly different between summer-fall and winter-spring seasons, 29.8 and 61.7 cm/s, respectively. Given the proposed channel modifications for Ozark Lake, paddlefish will likely retain access to adequate spawning habitat. However, adult paddlefish use habitat near the Mulberry River confluence year-round, therefore channel modifications between river-kilometer 435.3 and 439.3 may alter important population characteristics pertinent to a successful management plan.

## **Environmental Fate and Effects of Aquaculture Therapeutant Potassium Permanganate: Summary of Tier III (Mesocosm) Studeies**

Melissa S. Hobbs<sup>1,2</sup>, Richard S. Grippo<sup>1,2</sup>, Jerry L. Farris<sup>1,2</sup>, Billy R. Griffin<sup>3</sup>,  
Gerald M. Ludwig<sup>3</sup>, and Lora L. Harding<sup>2</sup>

<sup>1</sup>Program in Environmental Sciences, Arkansas State University

<sup>2</sup>Department of Biological Sciences, Arkansas State University

<sup>3</sup>H.K. Dupree Stuttgart National Aquaculture Research Center/ARS/USDA

Potassium permanganate (KMnO<sub>4</sub>) is a widely used freshwater aquaculture drug for the treatment and prevention of parasitic, bacterial and fungal diseases in fish. However, it is not yet approved by the U.S. Food and Drug Administration (USFDA). The requirements for USFDA approval of a new therapeutant include: demonstration of efficacy, residue chemistry, target animal safety and an ecological risk assessment (ERA). The goal of this research was to generate fate and effects data suitable for use in developing an ERA of potassium permanganate. To achieve this goal, the following objectives were met: 1) determine the acute sediment and water column toxicity of KMnO<sub>4</sub> in controlled laboratory conditions; 2) determine chronic toxicity in controlled laboratory conditions; 3) evaluate fate, toxicity and ecological effects (zooplankton abundance) under recommended dose and worst-case overdose scenarios in simulated warm-water pond (mesocosm) conditions. Acute water-only toxicity test results showed that the observed toxicity to standard testing organisms in treated moderately hard synthetic test water was reduced in pond water. Chronic exposure to the same laboratory conditions showed similar toxicity to acute values. These median lethality values were below the generally recommended KMnO<sub>4</sub> disease treatment. Acute sediment toxicity test results showed that KMnO<sub>4</sub> spiked pond sediment had extremely low toxicity (median lethality = 10.0 – 14.0 g/kg). Testing in mesocosms stocked with channel catfish and dosed at X (recommended dose) 3X and 5X levels, in a 4 x 3 experimental design with control, supported the acute and chronic findings of an ameliorating effect of pond water and sediment on KMnO<sub>4</sub> toxicity. No channel catfish mortalities were observed at the recommended dose while 100% mortality occurred at 3X and 5X the recommended dose within six hours. This toxicity was associated with significant body Na loss. Zooplankton abundances within the mesocosms were significantly reduced 24 hours after dosing in all dosing treatments but were no longer significantly different by 48 hours. Whole effluent and sediment from mesocosms tested one week after the final application of a series of three dosing within a nine month period showed no significant difference in organism survival between the control and dosed mesocosms. Our results suggest that KMNO<sub>4</sub> will pose low environmental risk if treated pond water is not released for at least two days after normal application.

## **A Fishing Derby Program's Influence on Effort and Harvest at Derby Locations**

Clifford P. Hutt, Thomas J. Lang, and J. Wesley Neal  
Aquaculture/Fisheries Center, University of Arkansas at Pine Bluff

Recruiting new anglers is a primary concern of fish and game agencies, and successful recruitment depends on reaching new anglers at a young age. Fishing derbies are a common recruitment technique, yet their effectiveness is rarely evaluated. Arkansas Game and Fish Commission (AGFC) currently supports fishing derbies by stocking catfish into derby ponds prior to derby events. We are evaluating the derby stocking program to determine if derbies increase fishing effort at derby locations following the event, and if derby events recruit new anglers. We are sampling a total of 32 derby events stratified evenly between rural and urban locations, and between derby events that are open or closed to the public. We have currently completed sampling on 13 derby events. Preliminary findings indicate that fishing effort on derby ponds increased significantly the week after a derby event ( $Z = -2.91$ ;  $P = 0.0037$ ). Derby participants were primarily Caucasian (67%), while those fishing on the ponds before and after the derbies were primarily African-American (52%). Finally, the majority (89%) of adults that participated in or accompanied children at derbies reported either currently possessing a fishing license or having possessed one in the past. Although our results are incomplete, it appears that derbies increase angling at derby locations outside of derby events. Also, although many derby participants are not new to fishing, derby events may play an important role in retention of anglers through increased contact with the sport.

# Water Quality of Eleven Lakes in Eastern and Southern Arkansas

Billy Justus

U.S. Geological Survey, Little Rock, Arkansas

From August 2004 - July 2005, the U.S. Geological Survey, in cooperation with the U.S. Environmental Protection Agency, conducted a water-quality study at 11 lakes in eastern and southern Arkansas. The U.S. Environmental Protection Agency suspected that nutrient standards were exceeded at five lakes located in eastern Arkansas—Old Town Lake, Grand Lake, Mallard Lake, Bear Creek Lake, Horseshoe Lake, and at one lake located in southeastern Arkansas—First Old River Lake. Lake Frierson, located on Crowleys Ridge in northeast Arkansas was suspected of exceeding narrative turbidity standards. The U.S. Environmental Protection Agency also suspected the exceedance of chloride standards at two lakes located in south central Arkansas; Lakes Calion and June. In addition to the above nine lakes, monitoring also was conducted at two reference lakes. Upper White Oak Lake, in south central Arkansas, was selected as a reference lake for chlorides, and Stave Lake, in northeastern Arkansas, was selected as a reference lake for nutrients. The study included lake reconnaissance and selection of the two reference lakes, collecting water-quality samples in nine months of a 1-year period, a 48-hour dissolved-oxygen investigation at the seven nutrient lakes, and vertical profiles of specific conductivity, dissolved oxygen, pH, and temperature. Results of nutrient and nutrient-dependent constituent (chlorophyll *a*, pheophytin *a*, and nonpurgeable organic carbon, for example) sampling reveal consistent patterns for the nine lakes monitored for nutrients. Old Town Lake tended to have the highest concentrations for most nutrient and nutrient-dependent constituents, followed by First Old River, Grand (two sites were sampled), and Mallard Lakes. Bear Creek, Horseshoe (two sites were sampled), and Upper White Oak Lakes (the chloride reference lake that also was monitored for nutrients) tended to have lower nutrient concentrations that were comparable to those measured at Stave Lake (the nutrient reference lake). Results of turbidity and turbidity-dependent constituent sampling at Lake Frierson indicated that this lake could be impaired by sediment-induced turbidity. Lake Frierson tended to have the highest turbidity and total suspended-solid concentrations, and the lowest chlorophyll *a*, pheophytin *a*, and secchi depth readings of all lakes sampled. Phosphorus concentrations at Lake Frierson also tended to be higher than the other lakes sampled for nutrients. Samples taken from the two “chloride” lakes—Lake Calion and Lake June—tended to have similar concentrations of chloride, sulfate, and total dissolved solids. However, concentrations for each of these constituents were about two to five times higher than concentrations at the reference lake, Upper White Oak Lake. During the 48-hour dissolved-oxygen investigation, abrupt diurnal fluctuations were apparent at First Old River, Grand, Horseshoe, Mallard, and Old Town Lakes, and dissolved-oxygen concentrations were less than 1.5 milligrams per liter at Mallard and Grand Lakes for short periods. Dissolved-oxygen concentrations never declined below 4 milligrams per liter and fluctuations were less abrupt at Stave Lake (the nutrient reference lake) and at Bear Creek Lake (a lake located on Crowleys Ridge). Lake profile data indicate that most of the lakes were stratified from early summer into early fall but were well mixed from late fall through spring. In late summer, dissolved-oxygen concentrations usually were less than 1 milligram per liter throughout the hypolimnion; however, dissolved-oxygen concentrations in the hypolimnion of Horseshoe Lake typically were higher than dissolved-oxygen concentrations in the hypolimnion of the remaining lakes. Aside from the obvious seasonal pattern, stratification characteristics seemed to be most affected by lake depth. The deepest two lakes, Bear Creek and Horseshoe, were the last lakes stratified and remained stratified longer than shallower lakes. Lakes that were less than 5 feet deep, such as Stave and Old Town Lakes, did not stratify. Observations made as samples were collected may provide some insight for potential sources of nutrients. Cattle usually were grazing along the banks of First Old River Lake and Grand Lake. A small community is located along the edge of Old Town Lake, and given the age of many of the structures, it is possible that untreated sewage is entering the lake.

## **Evaluation of the Use of Personal Digital Assistants (PDAs) For Collecting Angler Survey Data**

Thomas J. Lang, J. Wesley Neal, and Clifford P. Hutt  
Aquaculture/Fisheries Center, University of Arkansas at Pine Bluff

Angler surveys are a common method for sampling recreational fisheries. Typically, survey data are recorded on paper forms and entered into electronic databases for future analyses. Entering survey data is tedious, expensive, and a source of data error. As an alternative to paper forms, we used Palm® Personal Digital Assistants (PDAs) to collect angler survey data. Approximately 950 interviews and 700 instantaneous angler counts were recorded during 2005, and all data were downloaded directly into a PC by connecting the PDA and PC with a USB cable and simply touching the Hot Sync icon. This technique was rapid and accurate, saving time, money, and eliminated another source of data entry error. Surveys were designed and administered through Quickformz software developed by RJB Computers, Inc. Cost for each PDA was about \$100 and Quickformz licensing cost was about \$35. The PDAs proved durable with only one malfunction occurring in approximately 250 trips into the field. Using frequent downloads, we did not have significant data loss when the malfunction occurred. Quickformz Designer allowed for diverse question designs and multiple answer formats, including text, numeric, pull-down lists, signature, checkboxes, yes/no, date/time, and more. We used the PDAs and Quickformz software to record angler demographics, angler satisfaction rates, catch, harvest, effort, and date/time data. Overall we found the use of PDAs for conducting angler surveys to be inexpensive, durable, reliable, and an efficient way of collecting angler survey data.

## **Evaluation of Monthly Versus Biweekly Stocking of Channel Catfish in the Arkansas Urban Fishing Program**

Thomas J. Lang, J. Wesley Neal, and Clifford P. Hutt  
Aquaculture/Fisheries Center, University of Arkansas at Pine Bluff

Declines in recreational fishing participation, under-representation of women and minorities among the angling population, and increasing urban immigration have prompted many state management agencies to start urban fishing programs. Arkansas Game and Fish Commission (AGFC) currently stocks channel catfish biweekly as part of their Urban Fishing Program (UFP), and the transportation costs can be prohibitive because frequent stockings at many locations are required. We evaluated monthly stocking as an alternative to biweekly stocking in the UFP. We conducted a creel study from April 2, 2005 to August 3, 2005 on six ponds stocked with channel catfish by AGFC. Three ponds received the AGFC standard biweekly stocking, and three ponds received monthly stocking at double the biweekly density. Bus-route type roving creel surveys at the study ponds were used to collect data on angler demographics, effort, catch, and attitudes. Urban pond anglers were predominantly African-American (82%). Effort, catch, and harvest of catfish varied greatly between the six ponds with an average catch rate of catfish (CPUE) ranging from 0.34 to 0.61 per pond. The majority (63%) of anglers had not caught any catfish when interviewed, but most anglers (56%) still rated their overall trips as good or excellent. The mean CPUE for the three ponds stocked monthly ( $0.45 \pm 0.08$  catfish/h) was not significantly different than ponds stocked biweekly ( $0.36 \pm 0.02$  catfish/h), nor did angler ratings of fishing success differ significantly between the two groups of ponds.

## Species and Size Selective Predation on Buffalo National River, Arkansas Freshwater Mussels

Raven L. Lawson<sup>1</sup>; M.W. Matthews<sup>1</sup>; F. D. Usrey<sup>2</sup>; S. Hodges<sup>2</sup>, and A.D. Christian<sup>1</sup>;

<sup>1</sup>Arkansas State University, Department of Biological Sciences

<sup>2</sup>Buffalo National River, National Park Service

Predation by muskrats (*Ondatra zibethicus*) on freshwater mussels has been hypothesized to be selective for both species and size. The objective of this study was to determine the relationship between species and sizes of the individuals represented in the middens to those found in the adjacent mussel aggregate. This study was conducted by periodically collecting middens from one mussel aggregate on the Buffalo River, Arkansas near the Calf Creek confluence. Aggregates were quantitatively sampled in June 2005, and middens were collected at the time of quantitative sampling and periodically afterwards. Live and midden mussels were identified and sorted by species and measured for length, width, and depth. Results indicate a species-specific selection for the first two of three sampling periods. Even though the most abundant species in the aggregate was *Ptychobranhis occidentalis*, it was second to *Lampsilis reeviana* in the middens. In fact, *Fusconia ozarkensis* and *Cyclonias tuberculata* also were in higher abundance in the aggregates than *L. reeviana*. Further analysis of data will be conducted to determine if species specific size selection is occurring. By conducting this correlation, we hope to be able to determine if certain species and cohorts are more susceptible to predation in the Buffalo River.

## **Population Characteristics of Paddlefish in the Arkansas River, Arkansas: Implications on the Management of an Exploited Fishery**

Frank J. Leone<sup>1</sup>, Joseph N. Stoeckel<sup>2</sup>, and Jeff Quinn<sup>1</sup>

<sup>1</sup>Arkansas Game and Fish Commission

<sup>2</sup>Fisheries and Wildlife Program, Arkansas Tech University

Paddlefish *Polyodon spathula* (n = 749) were collected from three pools (Pool 13, Ozark Pool, and Lake Dardanelle) of the Arkansas River, Arkansas, with gill nets in the fall and winter of 2003-2004 and 2004-2005 to assess population characteristics and to determine the effects of commercial fishing on the populations. Fish did not fully recruit to the gear until they were 889 millimeters eye-to-fork length (EFL). Catch per unit effort (CPUE) varied by pool and year (range = 0.12 to 3.92, mean = 0.81) and was lowest in Lake Dardanelle. The paddlefish that were aged from dentary bones (n = 537) were 3 to 16 years old. Growth rates were fastest in fish sampled from Lake Dardanelle. Sex ratio varied by pool and year, but overall was skewed toward males (1.2:1.0). The percentage of recruited, gravid females varied between years (2003-2004: 68%, 2004-2005: 49%). Fecundity varied between years and pools (range = 175,871 to 297,225 eggs/gravid female, mean = 240,681 eggs/gravid female), and was highest in Lake Dardanelle (mean = 296,189 eggs/gravid female). Relative weight ( $W_r$ ) varied between sexes, gravid and non-gravid females, years, and pools. Lake Dardanelle consistently had the highest  $W_r$ s in each category. Annual mortality varied among pools (range = 0.40 to 0.68), and was consistently highest in Lake Dardanelle. Yield-per-recruit models completed with the program FAST indicated that flesh yields were highest at the current minimum length limit of 914 mm, and that “growth overfishing” due to commercial fishing would not occur even at an exploitation rate of 85%. Spawning potential ratios (SPRs) never fell below 20%, indicating that “recruitment overfishing” would not occur even at an exploitation rate of 85%. Although models indicate that the current minimum length (914 mm) is adequate to sustain paddlefish populations in all three pools, increased effort by commercial fishermen (up 40% from 2003) will increase by-catch mortality of undersized fish. Therefore, we recommend an increase in the minimum length limit to 940 mm, a shorter season for paddlefish harvest (from 151 to 104 days), and implementation of a minimum gillnet mesh size requirement of 152 mm bar-mesh.

## **An Examination of Different Stocking Densities of Sunshine Bass Larvae Reared in Tanks**

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Sunshine bass fingerling culture in tanks allows easier control of temperature, oxygenation, feeding, enumeration, and monitoring of health and growth. In order to be cost effective, conditions for tank culture must be optimized. This experiment attempted to determine the relationship among stocking density of sunshine bass larvae in tanks and growth and survival. Sunshine bass larvae, 4 days post hatch (dph), were stocked into blue, polyethylene tanks with 100 L of 8 ppt brackish water. Light intensity at the water surface was about 900 lumens. Larvae at 10 densities, ranging from 29 to 118 larvae/L were stocked into 10 tanks. Rotifers, cultured with *Nannochloropsis* and Culture Selco® 3000 were fed 4 times per day at 15 rotifers/ml until 12 dph. From 8-12 dph *Artemia* nauplii were fed 4 nauplii/ml once per day; every four days an additional feeding/day was added until at 22 dph 20 nauplii/ml/day were fed. Six grams of a 55% protein salmon starter meal was fed throughout the day with a belt feeder from 19 dph until 22 dph when the meal was increased to 8 grams/day. Fish were harvested at 26 dph and enumerated gravimetrically. About 30 fish from each tank were photographed and total length and other morphometrics determined. Survival ranged from 18—48%, averaged 35% and increased slightly with the stocking density. Total biomass of fish produced appeared unrelated to stocking rate, Mean individual weight decreased while percent survival, stocking density, and numbers of surviving fish increased. Mean weights of surviving fish averaged 0.12 grams and ranged from 0.036 to 0.33 grams. Lengths and other morphometrics of fish from each tank are being analyzed.

## **Environmental and Genetic Influences on Percent Hatch and Size at Hatch of Sunshine Bass**

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Larval sunshine bass that hatch at larger sizes may have advantages over their smaller counterparts. We re-examined the relation between temperature and egg stage duration, and tested the hypothesis that a longer egg stage would produce a larva that was longer at hatch. Additionally, we examined the relation between temperature and percent hatch to determine if lengthening egg stage had negative consequences for survival to hatch. Finally, we tested the hypothesis that maternal genetic influences were greater than temperature effects on size at hatch and percent hatch. Three or four female white bass were spawned each week for four weeks. Eggs from all the females were fertilized by a single, but different male each week. Approximately 4000 eggs from each female were hatched in McDonald hatching jars at 14, 16, 18, and 20 °C. Hardness, ammonia, pH, and dissolved oxygen were monitored daily and temperature was monitored every 6 h. Eggs were examined every 6 h until the first eggs hatched, and every 3 h thereafter until hatching was complete. Yolk-sac larvae were removed from the jars, photographed individually, and enumerated. Standard and total lengths of larvae were estimated from the photographs. We determined modal hatch and percent hatch for each female at each temperature. Temperature affected egg stage duration, but not in a linear fashion as had been previously reported. Eggs incubated at a cooler temperature took longer to hatch, but larvae were significantly ( $P < 0.05$ ) larger at hatch. Temperature did not have an influence on percent hatch. Length at hatch and percent hatch varied among females. The maternal influence on length at hatch appeared to be greater than the temperature influence on length at hatch. However, there was a significant interaction ( $P < 0.05$ ) between maternal influence and temperature for length at hatch and percent hatch. Larvae from some females exhibited a monotonically decreasing length at hatch as temperature increased. Larvae from other females exhibited a non-linear response to temperature, with larvae significantly larger at hatch at the lowest and highest temperatures and smaller at intermediate temperatures.

## **Richness, Densities, Population and Community Numerical Standing Crop, and Habitat Characterization of Spring River Drainage Freshwater Mussels**

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The Spring River is considered an extraordinary resource waterbody based on its extraordinary physical, chemical, and biological properties. One major component of the extraordinary biological resources is the 41 mussel species reported from the Spring River. The objectives of this project were: 1) to qualitative survey potential mussel aggregates, 2) to delineate and quantitatively sample aggregates, and 3) to characterize associated physical habitat. Aggregates were delineated and sampled to assess mussel population densities, species richness, and size structure. Of the 14 Spring River and 8 Southfork River stations searched, 7 Spring River and 3 Southfork stations qualified to be quantitatively sampled. All 22 stations underwent Basin Area Stream Surveys regardless of their mussel densities. A total of 30 species were recorded from the Spring River with richness ranging from 3 to 24 per station and a total of 24 species were recorded from the Southfork River with richness ranging from 9 to 24 per station. For the current study, 17 Spring River and 18 Southfork River species rank S1, S2, or S3. This study will provide data for future management strategies and information on the many factors that influence mussel population changes including providing information on associated physical habitat.

## Assessment and Evaluation of Native Freshwater Mussel Assemblages of Buffalo National River

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The Buffalo River, of north Arkansas, is a 153-mile river flowing through the Ozarks to the White River. This is America's first National River with the National Park Service owning 11% of the watershed. The objectives of this project are to survey the entire wet length of river, search for endangered and extirpated mussels, and document the mussel assemblages. During 2004 and 2005, 146 miles of the river were qualitatively and quantitatively surveyed. Detrended corresponded analysis revealed 4 distinct community types: 1) *Ptychobranhus occidentalis*, 2) *Villosa iris*, 3) *Cyclonaias tuberculata*, and 4) *Actinonaias ligamentina* that roughly represented species gradients along the river length. Quantitatively sampled mussel aggregates (n=22) resulted in a mean richness of 9.45, ranging from 4-15 and a mean density of 6.85 individuals / m<sup>2</sup>, ranging from 1.33 - 25.64 individuals / m<sup>2</sup>. Time constrained qualitatively sampled aggregates (n= 41) resulted in a mean richness of 7.77 with a range of 2-12. Past work listed a total 26 species for the river however only 23 species were identified in this survey with no T&E species found. Future work includes nutrient recycling based on community types, quantification of exotic bivalve densities, and associating geomorphological characteristics to mussel distribution.

## **The Effectiveness of Silviculture Best Management Practices Logging on Protecting Stream Ecosystems in Arkansas**

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Silviculture is a major land use in Arkansas; over 18 million acres of the state's land are commercial forest. Clear-cut harvesting without implementation of best management practices (BMPs) has been shown to result in impairment of stream ecosystems. The Clean Water Act directed states to develop BMPs to address this problem, and Arkansas has recently (2002) updated their BMP implementation guidelines. In April 2005, we completed a three-year study measuring the effectiveness of silvicultural BMPs in protecting the biological integrity of adjacent streams. We used benthic macroinvertebrate assemblages as indicators of potential habitat and/or water quality degradation. Surveys were conducted upstream and downstream of timber harvests for one year prior to, and two years after, logging at seven locations in four Arkansas ecoregions—the Arkansas Valley, the Ouachita and Ozark Highlands, and the Southern Coastal Plains. Macroinvertebrate samples were collected, and physical and chemical measurements were taken, in winter and spring of each study year. Analysis of variance (ANOVA) revealed very few significant differences in abiotic or biotic variables that could be associated with silviculture impacts. Differences between upstream and downstream sites, when noted, were present before as well as after the timber harvest. However, ANOVA and principal components analyses frequently revealed seasonal variations in macroinvertebrate assemblage structure. Taxa richness was consistently higher in the spring, whereas differences in relative abundance variables (e.g., percent EPT, percent non-insects) were typically location-specific and appeared unrelated to silviculture activities. Annual differences in assemblage characteristics were also noted, particularly in temporary streams. In general, the results indicated that BMPs were effective in protecting water quality and biological integrity at the study streams.

## **Discrimination Between Walleye Stock of the South Fork, Middle Fork, and Devil's Fork of the Little Red River using Otolith Microchemistry**

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Natal homing has been observed in many species of fish, including walleye *Sander vitreus*. Traditional studies of natal homing patterns were difficult and labor-intensive, owing to the reliance on physical or genetic tags. The use of otolith microchemistry to identify stock of various anadromous and freshwater species has become increasingly prevalent, and has much promise in elucidating migration patterns, including those associated with natal homing. We collected otoliths from spawning adult walleye from the three tributaries of the Little Red River above Greers Ferry Lake, AR. Cation concentrations were then quantified with Laser Ablation Inductively Coupled Mass Spectrometer (LA-ICP-MS), which were then used to discriminate between unique stocks based on core signature unique to spawning habitats. Continued research plans include sampling emerging juveniles from each of the tributaries in order to differentiate those walleye from the Arkansas Game & Fish Commission hatchery and those of the three tributaries. We also plan to sample during spawning to determine homing patterns of the hatchery fish which lack natal spawning grounds.

## **Spatial and Temporal Distribution of Organic and Inorganic Material within Total Sediment Load Samples in the Lower White River, Arkansas**

Grace Miller<sup>1</sup>, Andrew J. Peck<sup>2</sup>, and Alan D. Christian<sup>1,2</sup>

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The foundation of food webs is organic material, in all of its various forms. Organic matter is a food source for primary consumers; therefore, organics are significant to the survival of organisms in the river system. Though both organic and inorganic materials are considered to play a significant ecological role in a river reach, the distribution of organic and inorganic suspended load and bedload is not very well understood. For this study, suspended load is defined as that material that is suspended in the water column while bedload is defined as material in motion at the bottom of the stream that was collected by a Helley-Smith bedload sampler. In conjunction with a larger study examining multiple habitat parameters of mussel beds in the lower White River, Arkansas, we examined the spatial and temporal distribution of organic and inorganic suspended and bed load. Organic and inorganic content of suspended load and bedload were examined using standard lab methods. Though this study is in the preliminary stages, we expect to find an uneven distribution of organic material both spatially and temporally. Understanding the distribution of organic material within a reach can be important to understanding the formation and distribution of aquatic habitats.

## **Ichthyofauna of Maddox Bay Runout on the White River National Wildlife Refuge**

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Maddox Bay Runout connects Maddox Bay and Indian Bayou to the main channel of the White River. Concerns about stream crossings of Maddox Bay Runout for logging activities led to a survey of ichthyofauna. We sampled five randomly selected 0.1-mile segments of the 1.5-mile long stream. Ichthyofauna was sampled with one 10-minute backpack electrofishing sample per stream segment. We conducted two seine hauls per segment with a 30 x 6-ft knotless nylon seine with 3/16-inch mesh. We also set one minifyke net overnight in each of the stream segments. In addition to sampling fish fauna, we characterized the stream by measuring width, depth, and current velocity every 1 m, and dissolved oxygen, temperature, and secchi disk depth at the margin and the middle of one cross section per stream segment. All fish were fixed and preserved for inclusion in the ichthyology teaching collection at UAPB. Cross sections varied considerably between the upper and lower portions of Maddox Bay Runout. Lower portions were narrow, deep, and turbid. Upper portions were wide, shallow, and clear. We hypothesized that fish communities would vary between the upper and lower halves of Maddox Bay Runout due to differences in stream characteristics. We compared species composition, richness, and diversity among stream segments. We also compared species abundance of the three most abundant species. There was little evidence of differences in fish communities among stream segments. We also compared the darters found in Maddox Bay Runout to those reported to occur in Indian Bayou and the main Channel of the White River. The darter community in Maddox Bay Runout appears intermediate between the other two habitats.

**Movement Patterns of Freshwater Mussels Following Relocation:  
A Case Study of *Potamilus capax* and *Quadrula quadrula*  
in an Arkansas Drainage Ditch**

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As a component of a larger study examining mussel relocation practices, movement patterns of *Potamilus capax* and *Quadrula quadrula* were followed from October 2005 to January 2006. Resident and relocated mussels were given a unique number, etched on the shell, and a passive integrated transmitter (PIT tag) was attached to each mussel. Subsequently, radio transmitters were attached to the posterior slope of native (n = 16) and relocated (n = 12) *P. capax*. Initial coordinates were established using GPS technology and updated monthly. Movement, measured as differences between coordinates, was analyzed and plotted in GIS. Results indicate little to no movement for *Q. quadrula* and short movements (< 15 m) for *P. capax*. This study will be continued throughout a one year period to determine the potential movement ranges of *P. capax* and *Q. quadrula*. Though this study is ongoing, greater movement is expected in the mid-spring through late summer associated with reproduction and changing micro-habitat conditions. A period of relative dormancy is predicted during late fall and winter due to reduced primary production and water temperature. Information gained from this study will assist in the design of mitigation practices associated with in-stream disturbance activities.

## **Fish Community Structure in Floodplain Wetlands of the Arkansas River: A Preliminary Analysis**

Matt D. Schroeder, Robert L. Clark, Bradley S. Williams, and Reid Adams  
University of Central Arkansas

Large rivers and associated floodplains were historically dynamic, diverse ecosystems, but most have been modified to varying degrees. Lack of data typically hinders conservation/restoration efforts in these regulated systems. We initiated a study of fish communities in floodplain wetlands of the Arkansas River to understand current patterns of diversity and environmental gradients. During summer 2005, we sampled fishes with a seine (3.1-mm mesh), mini-fyke nets (3.1-mm mesh), and experimental monofilament gill nets (3.8-8.9-cm mesh) at 33 sites along a 174-km reach of the Arkansas River (Pool 5 – Pool 9). Sites ranged in size from 0.5 – 390 ha and varied in degree of connectivity to the main channel (contiguous, intermittent, and isolated). We collected 57 taxa in the floodplain and richness ranged from 8-31 species across sites. Samples contained a number of species with few previous records from the Arkansas River system (e.g., *Carpiodes cyprinus*, *Etheostoma fusiforme*, *Lepomis symmetricus*, and *Notropis maculatus*). Nonmetric multidimensional scaling ordination identified structuring of the fish community along a gradient from isolated wetlands characterized by high vegetative cover, low dissolved oxygen, and low pH (*Centrarchus macropterus*, *Elassoma zonatum*, and *Aphredoderus sayanus*) to wetlands having low vegetative cover and relatively high dissolved oxygen and pH (*Dorosoma petenense*, *Menidia beryllina*, *Pimephales vigilax*, *Lepomis megalotis*, *Pomoxis annularis*, and *Lepomis macrochirus*). Preliminary analysis suggests a mosaic of wetlands supporting a diversity of fishes continue to occur along the Arkansas River, and that some of the most unique fish communities within the study reach are found in wetlands outside the levee system.

## **Conservation of the Ouachita Creekshell [*Villosa arkansasensis* (Lea 1852)]: Reproduction and Host Fish Suitability**

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The Ouachita creekshell, *Villosa arkansasensis*, is considered endemic to the Ouachita River drainage and is an Arkansas species of special concern. The objectives of this project were: 1) to determine the period of gravidity for *V. arkansasensis*, 2) to determine suitable host fish. Female *V. arkansasensis* were observed to be gravid beginning in October and continuing through August of the following year. Like other *Villosa* species, *V. arkansasensis* was assumed to be bradyctictic (long term brooders), becoming gravid in late summer, early fall and releasing glochidia in late spring, early summer. Host fish suitability trials for the Saline River resulted in two suitable host fish, shadow bass (*Ambloplites ariommus*) and Creole darter (*Etheostoma collettei*) out of 20 total fish species tested. The most successful suitable host fish was determined to be the shadow bass with 15 of 20 total transformations. Continued monitoring for gravid females will be conducted through 2006 and a host suitability trial for the Ouachita River will be performed in spring 2006. This study can hopefully contribute to better management of this species by determining if distribution and abundance of suitable host fish is of ecological significance to *V. arkansasensis*.

## **The Use of Micro-satellite Analysis to Determine Paternity in Freshwater Mussels**

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Numbers of individuals and species of freshwater mussels have been documented as declining. Research in mussel ecology will provide valuable information for the conservation and management of mussels. Mechanisms of release and intake of sperm in mussels has been documented, but the paternal contribution a male has on offspring of a single female is unknown. The objective of this study is to determine whether a female mussel is fertilized by one or many males. This study uses a three step process which involves: 1) establishing the spatial patterns of male and female population distribution in a stream reach, 2) non-destructively sampling male and female mantle tissue and harvesting glochidia from females, and 3) using micro-satellite loci to determine paternal contribution to broods based on potential males in the population. DNA has been successfully extracted from a glochidium using Quick Extract Epicentre solution. Successful amplification has occurred with two out of 15 previously published micro-satellite primer sets. The amplified DNA has been visualized on an automatic fragment analyzer, but has not been visualized with agarose gels. The results of micro-satellite paternity analysis will provide a better understanding of reproductive events and will be useful for management and conservation planning.

## **Status and Distribution of the Arkansas Darter (*Etheostoma cragini*) in Arkansas**

Brian K. Wagner and Mark D. Kottmyer  
Arkansas Game and Fish Commission

The Arkansas darter, *Etheostoma cragini*, has an extremely limited distribution in Arkansas and is designated as a candidate for listing under the Endangered Species Act. It was first discovered in the state in 1979 in Wilson Spring near Fayetteville, and has since been found in four additional headwater streams in Benton and Washington counties prior to this study. A study in 1997 found the species in three of the five historic streams, with one represented by a single individual. This study sought to reassess the status of the 5 historically known populations and sample additional spring run habitats in the Arkansas River basin in these two counties. Spring branch habitats were identified using USGS topographic maps and available GIS coverages. Surveys targeted for *E. cragini* were conducted at 78 sites combining a broad coverage of the basin and intense searches in the vicinity of historic sites. *E. cragini* were encountered in 15 stream segments, concentrated in four areas within the Illinois River basin. All segments supported numerous *E. cragini* and fell within a 2 km radius of historic sites. Each segment was intensively surveyed to delineate the extent of occupied habitat, which ranged from 10 to 1,645 meters. Based on this survey the total occupied habitat for *E. cragini* in Arkansas was determined to be 5,676 meters. These segments include three historic locations and five disjunct stream reaches. While the presence of *E. cragini* in Arkansas is persisting, rapid urban development in northwest Arkansas raises concern for some populations.

## Comparison of Otoliths and Branchiostegal Rays for Age and Growth Analysis in Spotted Gar

Tate Wentz, and John R. Jackson  
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The objective of our study was to compare otoliths to branchiostegal rays as the preferred structure in age and growth analysis of spotted gar (*Lepisosteus oculatus*). Otoliths often are the preferred structure for aging many fishes. Currently, little published data exists as to the preferred structure for aging gar (*Lepisosteus spp.*). Historically the branchiostegal rays have been used. Fish were collected during May through August 2005 in backwater lakes of the White River National Wildlife Refuge with experimental gill nets and boat electrofishing. Twenty-five fish were collected and sacrificed to remove the otoliths and branchiostegal rays. Otoliths were mounted in Crystalbond, sectioned by sanding, and read using an Olympus SZ61 microscope. Branchiostegal rays were boiled to remove any flesh, and then read whole. Otoliths and branchiostegal rays were digitally imaged for back-calculation. Two readers separately aged each fish and then discussed ages during a concert reading. Annual growth of the structures was measured with USTCHA Image Tool. Initial agreement between readers for branchiostegal rays was 55%, with an additional 25% of ages being within one year. Agreement between the readers for otoliths was 20%, with another 35% agreement within one year. Five fish were removed from the study because the readers could not reach a consensus on age. Branchiostegal ray length compared to total body length showed a direct correlation with a P-value <0.01 and  $R^2=0.85$ . Otolith length compared to total body length showed no direct correlation with a P-value=0.17 and  $R^2=0.29$ . The von Bertalanffy growth equation for the branchiostegal rays was  $L_t=1308(1-e^{-0.069(t+6.07)})$ , where  $L_t$ = length at time t, maximum length=1308 mm, growth parameter=0.069, and  $t_0 = -6.07$ . We believe the branchiostegal rays to be the preferred structure for aging spotted gar.

## **The Effects of Increased Minimum Base Flow on Black Bass Populations in the Ouachita River, Arkansas**

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The goal of our research was to gain an understanding of how the population dynamics of black bass, particularly largemouth bass (*Micropterus salmoides*) and spotted bass (*M. punctulatus*), in the Ouachita River have been influenced five years after an increase in base minimum flow. Boat electrofishing was used to collect fish downstream from Rempel Dam to the confluence of the Caddo River in 2005. Fish were identified to species, measured (total length, mm) and released. A subsample of 10 fish/25mm group per species was kept for sagittae otolith removal and age/growth analysis. Catch per unit effort (CPUE) for the largemouth bass and spotted bass were 7.1 fish/hr (SE=1.8) and 13.7 fish/hr (SE=3.5). Previous studies revealed that in 2000 (pre-minimum flow change) CPUE was 5.8 fish/hr (SE=1.9) and 8.5 fish/hr (SE=1.7) for largemouth bass and spotted bass. In 2001 (one year post-minimum flow change), CPUE for largemouth bass and spotted bass was 4.8 fish/hr (SE=1.2) and 14.1 fish/hr (SE=4.7). Mean length of largemouth bass and spotted bass were 212 mm (SE=16) and 130 mm (SE=7). In 2000 and 2001, largemouth bass mean lengths were 306 mm (SE=16) and 252 mm (SE=17) and spotted bass mean lengths were 197 mm (SE=11) and 150 mm (SE=7). Largemouth bass proportional stock density (PSD) was 78 and relative stock density preferred (RSD-P) was 48. Spotted bass PSD was 56 and a RSD-P was 28. In 2000, PSD and RSD-P for largemouth bass were 62 and 43 and spotted bass PSD and RSD-P were 39 and 18. In 2001, largemouth bass PSD and RSD-P were 73 and 27 and spotted bass were 41 and 14. We still need to complete incremental growth and von Bertalanffy growth equation comparisons among pre- and post-minimum flow change data sets before final conclusions can be determined regarding black bass populations.