

## Arkansas DEQ Data Availability in the 21<sup>st</sup> Century

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The Arkansas Department of Environmental Quality maintains an extensive ambient river and stream, publicly-owned lakes and roving station monitoring programs with the purpose of establishing background levels and baseline water quality, including physical, chemical and biological data, as well as seasonal and chronological variations. Intensive watershed-based projects designed to get a synoptic picture of designated watersheds also are conducted to help determine management needs of a specific watershed. With the advent of the internet, information availability and exchange dramatically improved our ability to provide the public with easily accessible data and/or information. In the last year, ADEQ has added several online searchable databases (OSD's). The ADEQ web site ([www.adeq.state.ar.us](http://www.adeq.state.ar.us)) contains 33 OSD's that span many media (air, water and land). The goal of this presentation is to provide a synopsis of OSD's pertaining to water quality and biological data. These OSD's include the *Water Quality Monitoring Database*, *Fish Community Database* and *Aquatic Macroinvertebrate Database*.

The *Water Quality Monitoring Database* contains all water quality monitoring data including the ambient network, the roving network, the Buffalo River National Park Service Stations, lake stations and other water quality monitoring stations that have data generated more than just once or twice. This database includes water quality data from approximately 500 stations statewide. The database may be searched using any of several criteria such as county, ecoregion, U.S.G.S. Hydrologic Unit Code, ADEQ Planning Segment and dates. The data included in the *Water Quality Monitoring Database* is from our in-house database that we started maintaining in the last quarter of 1990. Data prior to 1990 may be retrieved from the EPA Legacy Data Website.

The *Fish Community Database* and *Aquatic Macroinvertebrate Database* are searchable by many of the same search criteria provided in the *Water Quality Monitoring Database*. In addition to site information such as latitude, longitude, location and watershed size, each of the biological databases include community and habitat assessment data. The *Aquatic Macroinvertebrate Database* also includes biological metrics for each sample. The *Fish Community Database* and *Aquatic Macroinvertebrate Database* contain data for 319 and 445 samples, respectively.

Each of the OSD's provides users with the capability to either print hardcopy reports or export data to Microsoft Excel. The entire Microsoft Access database also may be downloaded.

## CHARACTERISTICS, PREFERENCES, AND MOTIVATIONS OF YOUNG ADULT RECREATIONAL FISHING LICENSE HOLDERS IN ARKANSAS

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We conducted a mail survey to determine the characteristics, preferences, and motivations of young adult fishing license holders in Arkansas as well as factors that contributed to their participation in recreational fishing. During the summer of 2002, we sent questionnaires to 1,500 randomly selected license holders ages 16 to 18. An adjusted response rate of 44% was achieved. Twenty-four percent of respondents were 16-years old, 40% were 17-years old, and 36% were 18-years old. Eighty percent of anglers were male and 20% were female. Caucasians composed 95% of all respondents followed by African-Americans. Preferred species were largemouth bass (*Micropterus salmoides*), channel catfish (*Ictalurus punctatus*), and crappie (*Pomoxis spp.*). Ninety-seven percent of respondents had their first fishing experience before they were 11-years old and 94% purchased their first fishing license at 16. First fishing experiences were often associated with family members, which was in contrast to current fishing participation that is mainly associated with friends. Almost all of the respondents were interested in fishing more often. However, work, school, and interests in other activities are constraining fishing participation. Results from this research will assist management agencies in setting priorities to provide improved and more diverse recreational fishing experiences.

PowerPoint Presentation

Title: Characterization of floodplain lake fish assemblages in the Lower White River, Arkansas.

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Abstract: The lower White River in Arkansas represents one of the least altered river-floodplain ecosystems (RFE) in the United States. This RFE contains approximately 75,880 ha of bottomland hardwood habitat in which over 300 floodplain lakes are scattered throughout public and private land. River regulation including irrigation and navigation channel projects threaten to alter the natural hydrology of the White River RFE. The objectives of this research were to measure fish species diversity and relative abundance in 16 floodplain lakes, and environmental variables (i.e. hydrology, thermal regime, connectivity, size, depth, dissolved oxygen, total dissolved solids, and conductivity) expected to affect fish diversity and abundance. Experimental gill nets, mini-fyke nets, and night electrofishing were used for fish collection during the summer and fall of 2002. Environmental variables were also measured at this time. Fish community similarity among lakes will be assessed by multivariate ordination and cluster analyses that will identify statistically significant environmental gradients within floodplain lake fish assemblages and provide a basis for classifying lakes into groups with similar characteristics and fish assemblages. This project provides the opportunity to define baseline conditions for temperate RFEs and to determine relationships between fish communities and RFE functions before river alterations.

\*Graduate student presentation

**Toxicity of Isopropyl Methylphosphonic Acid to Eggs  
of Golden Shiner and Channel Catfish**

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Abstract.—The Pine Bluff Arsenal has been ordered to incinerate a number of the chemical weapons currently stored at the facility in accordance with the Chemical Weapons Convention Treaty of 1997. Sarin is a nerve agent that acts as an acetylcholinesterase inhibitor. In the event of an accident during incineration, Sarin has the potential to be expelled into the environment. Isopropyl methylphosphonic acid (IMPA) is the main hydrolysis product of Sarin. Golden shiner *Notemigonus crysoleucas* and channel catfish *Ictalurus punctatus* eggs were exposed to IMPA. Fifteen fertilized eggs were placed in 250-mL test tubes containing 200 mL of water with five different concentrations of IMPA ranging from 35 to 75 mg/L for golden shiner and 115 to 175 mg/L for channel catfish. There were four replicates per treatment and a control. Each test tube was aerated with air stones and maintained at a temperature of 25 °C. The LC50 for eggs was determined by estimating the concentration of IMPA in which half of the individuals failed to hatch. The LC50 for golden shiner egg hatchability was 60 mg/L (upper 95% C.I. 68 mg/L, lower 95% C.I. 53 mg/L). The LC50 for channel catfish was 157 mg/L (upper 95% C.I. 179 mg/L, lower 95% C.I. 144 mg/L). These results are critical in understanding the toxicological properties of this potential environmental contaminant. They are also important in conducting risk assessments relative to activities at the PBA.

**Effects of Double-crested Cormorants on Largemouth Bass  
and Crappie in Lake Chicot, Arkansas**

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Abstract.—The mortality of crappie *Pomoxis* spp. and largemouth bass *Micropterus salmoides* populations due to depredation by double-crested cormorants (DCCOs) was quantified and the diet overlap of DCCOs and largemouth bass was evaluated for fall, winter, spring, and all seasons combined in Lake Chicot. The DCCOs consumed between 85 and 863 crappie and between 91 and 1032 largemouth bass per year. The DCCOs consumed an estimate of between 0.002% and 0.02% of the crappie population per year when using rotenone data to estimate population abundance or between 0.01% and 0.32% of the population when using creel survey data to estimate population abundance. The DCCOs consumed between 0.26% and 3.00% of the largemouth bass population using rotenone data to estimate population abundance and between 0.03% and 1.53% using creel survey data to estimate population abundance. Diet overlap was biologically significant (greater than or equal to 60%) in the fall using percentage of total number and weight of prey, and relative importance index values for prey items. However, diet overlap was insignificant for diet measures used in all other seasons and for all seasons combined. Over-wintering DCCOs had little or no negative effects on largemouth bass and crappie populations in Lake Chicot.

**Evaluation of Population Dynamics and Stocking Contribution of Largemouth Bass  
in Two Pools of the Arkansas River**

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Abstract.— Largemouth bass stock characteristics and population dynamics in two pools of the McClellan-Kerr Arkansas River Navigation System were assessed. We evaluated the initial results of a fingerling stocking effort initiated by the Arkansas Game and Fish Commission. Approximately 500,000 fingerling largemouth bass (app. 50 mm) were stocked into 10 pools of the Arkansas River. Largemouth bass were collected SmithRoot 7.5 GPP electrofisher, set at 60 cycles per second and voltage was adjusted between 4 and 5 amps of electricity. For pool 5, proportional stock density (PSD) was 47% and relative stock density preferred (RSD-P) was 16%. For pool 9, PSD was 31% and RSD-P was 11%. Total annual mortality was 57% and 81 % for pools 5 and 9, respectively. Contribution of stocked largemouth bass fingerlings was evaluated by examining oxytetracycline marks.

## **Status of Paddlefish in the Ozark Pool of the Arkansas River.**

Frank Leone, Bob Limbird, Paul Gaulin, and Jeff Quinn. Arkansas Game and Fish Commission, 1266 Lock and Dam Road, Russellville, AR. 72802.

Abstract: The Arkansas River has recently received an increase in commercial fishing pressure for paddlefish (*Polyodon spathula*). During a commercial fishing moratorium, we assessed the population status of paddlefish in the 4,071 hectare Ozark Pool. We used large-mesh gill nets (5, 6, and 8 inch bar mesh) to sample paddlefish. Fish were measured for eye to fork length, and marked with individually numbered jaw tags. Through January 2003, we have 713 marked-fish at large. 393 fish were marked during the November-December sample period. During January, we captured 341 fish and had 20 recaptures. Using a Peterson estimator, a preliminary estimate of the recruited population is roughly 7,000 fish (1.63 fish/hectare). About 50% of the paddlefish captured were greater than the 36-inch minimum length limit, and length frequency distributions were very similar for 5 and 6-inch bar mesh. Paddlefish were found at a variety of depths, and no relationship exists between the size of paddlefish and depth captured. Recaptures indicate that paddlefish move throughout the navigation pool, and tag loss appears to be minimal.

**As if a truck ride is not enough;  
Stocking trout with a raft on Arkansas trout tailwaters**

Jackie Stinnett  
Stocking Raft Technician  
Arkansas Trout Management Program  
Arkansas Game and Fish Commission  
Mountain Home, AR

Arkansas stocks approximately 1,620,370 trout annually into Bull Shoals and Norfolk tailwaters. A stocking raft is utilized whenever possible to distribute trout into areas without stocking access. Primary challenges are to be able to move large numbers of trout in water conditions ranging from 200 to over 30,000 cfs. A stocking raft was developed based on an 18' twin-tube, white-water cataraft equipped with a 4' x 4' x 8' holding net. Trout are taken directly from the distribution truck and carried downstream to the point of release or scattered along the way. The net is equipped with a trap door to allow easy release of fish. The raft is capable of moving up to about 1,800 pounds of trout at a time. During a typical raft trip it will meet 3 trucks, travel about 15 miles, and distribute about 10,000 11" rainbow trout. Rafts are also used on limited basis for stocking trout in Beaver and Greers Ferry Tailwaters. The rafts are highly visible and we receive frequent positive comments from the public.

# EVALUATION OF A NEW IN-POND MECHANICAL FLOATING GRADER FOR FOOD-SIZED CHANNEL CATFISH

Jeremy Trimpey<sup>1</sup>, David Heikes<sup>1</sup>, and Carole Engle<sup>1</sup>

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Grading is a common practice in the culture of many fish species that involves separating a population of various sized fish into groups of similar size classes. While mechanical grading has been attempted for commercial catfish, the industry standard continues to be passive grading in socks (nets). However, it has been reported that the catfish industry loses over \$100 million annually due to inefficient harvesting, grading, and transport. Grading trials are underway to compare the performance and efficiency of the UAPB/Heikes grader with the traditional live car method (nets) at the UAPB Aquaculture Research Station and on commercial catfish ponds at three different water temperatures ( $\geq 27^{\circ}\text{C}$ ,  $12\text{-}26^{\circ}\text{C}$ , and  $\leq 11^{\circ}\text{C}$ ). The UAPB trials will also evaluate three different size ratios (harvestable to sub-harvestable) of fish: 75%/25%, 50%/50%, and 25%/75%. Each trial will be replicated three times at each temperature range (UAPB and commercial farm trials) with each ratio of fish sizes (UAPB trials only).

The  $\geq 27^{\circ}\text{C}$  trials have been completed. For the UAPB trials, fish were seined and moved into a live car from which 454.5 kg of fish were lift-net weighed each into a 4.44-cm live car and a 1.27-cm mesh live car. The same procedure was repeated on commercial farm trials except that 4,545.5 kg of fish were loaded into each live car. The control live car was sampled 14 hr after loading. The UAPB/Heikes grader graded 152 kg/min during the UAPB trials and 413 kg/min on commercial farm trials. Both graders significantly reduced the number and weight of sub-harvestable fish. However, the UAPB/Heikes grader undergraded only 12-31 kg of sub-harvestable fish during UAPB trials and 157-386 kg during commercial trials while the control live car undergraded 24-72 kg during the UAPB trials and 341-797 kg during commercial trials (Figs. 1&2). Both these differences were statistically significant ( $p < 0.05$ ), but size ratios of fish populations had no effect on grading performance. There was no difference in the weight of harvestable-sized fish retained by the graders. Thus, the UAPB/Heikes grader graded out 5-11% more kg of sub-harvestable fish than the control live car in a shorter time at high temperatures. This resulted in a 12.5% increase in average weight of the fish available for transport to a processing plant.

Figure 1. Mean weight of sub-harvestable fish after grading at UAPB trials

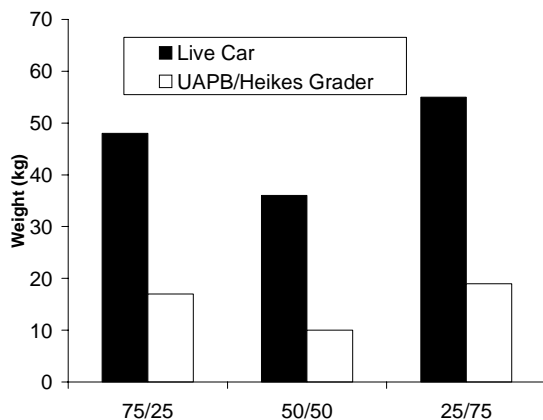
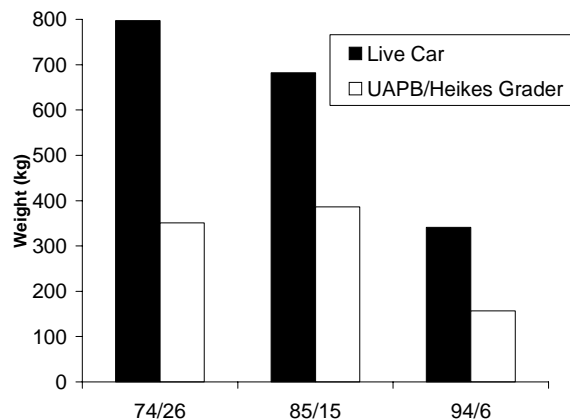


Figure 2. Total weight of sub-harvestable fish after grading at commercial farm trials



**Title:** Angling effort and success during a three-year creel survey of an Ozark tailwater trout fishery.

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**Abstract:**

Between September 1998 and August 2001, an intensive creel survey was conducted on the Beaver Tailwater, a tailwater trout fishery on the White River located in northwest Arkansas. The objectives of this survey were to estimate the amount of angling effort directed at this fishery and to quantify angler success. Angling effort as measured by total angler hours dropped from 106,682 hours the first year of the survey to 65,181 hours the final year, a 39% reduction in effort. Catch rates remained high (mean = 1.6 trout/hour) over the study period. Harvest rates declined steadily (mean = 0.31 trout/hour), but were similar to those observed in a previous study. Total harvest decreased from almost 40,000 trout in 1998 to approximately 16,000 trout in 2000. Concurrent with this decrease in harvest, stocking rates increased during the survey and were higher than historic levels. After adjusting for fish that were protected from harvest by special regulations, mean harvest efficiency was 16%. These results suggest that the Arkansas Game and Fish Commission should evaluate current management and stocking practices to more efficiently manage the trout fishery in the Beaver Tailwater.

**Format:** PowerPoint

# **Influences of local tournaments on the biology of black bass populations**

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*Abstract:* Extensive research has been conducted to determine the effects of fishing tournaments on mortality of black bass. While the research has addressed a wide range of criteria that affect mortality, it has focused primarily on relatively large, sponsored tournaments. Little information exists on small, “local” tournaments. These tournaments, because of their high popularity, may have a significant impact on the biology and subsequent management of black bass populations. Our study will address the mortality rates, recapture rates, and movements of fish following their release from local tournaments. Our primary goal is to determine the impact of smaller tournaments on black bass mortality in Arkansas’ reservoirs. Data from small and large tournaments will be compared to determine if mortality rates differ between the types. Our secondary goals are to document the recapture rates of tournament caught fish, and to determine movement patterns of fish released from these tournaments. Recapture rates will provide information regarding the percentage of black bass that are “recycled” throughout the year. Movement patterns will help determine whether or not fish “stockpile” at release sites.

Effects of Stream bank Stabilization & Reduction of Cattle Access  
as a BMP on the South Fork of the Spring River, Arkansas

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Cattle grazing in riparian zones can be a major source of non-point source pollution (NPS) reducing water quality and critical habitat for fish and benthic macroinvertebrates. Best management practices (BMPs) and bank restoration can be effective and practical methods for preventing and reducing water quality impacts due to erosional NPS. The objectives of this study are to determine if stream physical-chemical and biological variables change after streambank restoration and reduction of cattle access (exclusion fencing) are implemented at one cattle ranch on the South Fork of the Spring River, Arkansas. In a previous study, pool and riffle sites above (reference) and below the ranch were evaluated before implementation (Phase I). At the time, turbidity and total suspended solids were higher below the ranch; small mouth bass (silt-intolerant) and riparian plant diversity were higher above the ranch. Macroinvertebrate abundance in the downstream site was lower than the reference site. Initial results after implementation (Phase II), suggest a similarity in turbidity, total suspended solids and riparian plant diversity between the sites. Macroinvertebrate abundance has increased in the lower site. These results are consistent with improvement in stream conditions from bank restoration and reduced cattle access.

## **Is Phenotypic Variation in Central Stonerollers (*Campostoma anomalum*) Related to Ecological Function?**

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**Abstract:** How environmental factors influence and change individuals within populations can have important implications for population dynamics. I hypothesized that adult and juvenile central stonerollers (*Campostoma anomalum*) would display phenotypic variation along a longitudinal gradient in Bear Creek, Arkansas. Fish were sampled from a downstream and upstream reach and compared using landmark-based geometric morphometrics on scaled photographs. Multivariate analysis of variance on partial warp scores, that describe uniform (parallel) and non-uniform (non-parallel) shape deformations between individuals, was used to determine differences among groups. Analyses showed significant differences in body shape between adults and juveniles within a location, as well as significant differences between locations for each size class. Individuals in the downstream location were more streamlined than in the upstream location and adults were more streamlined than juveniles. The results suggest a link between body form and ecological function that may be related to differences in discharge.

Format: PowerPoint Presentation

\*Best Student Paper Award Candidate

## Environmental Fate and Effects of the Aquaculture Therapeutant Potassium Permanganate.

Melissa S. Hobbs<sup>\*1,2</sup>, Richard S. Grippo<sup>1</sup>, Jerry L. Farris,<sup>1</sup> Billy R. Griffin<sup>2</sup>, and Lora L. Harding<sup>1</sup>, <sup>1</sup>Environmental Sciences Program, Arkansas State University, State University, AR; <sup>2</sup>H.K. Dupree SNARC/ARS/USDA, Stuttgart, AR.

### (To be considered for a poster presentation)

Potassium permanganate (KMnO<sub>4</sub>) is a widely used freshwater aquaculture drug for the treatment and prevention of waterborne parasitic and fungal diseases. However, it is not yet approved by the U.S. Food and Drug Administration (USFDA) for use as a therapeutant. The requirements for USFDA approval of a new therapeutant include, demonstration of efficacy, residue chemistry, target animal safety and an environmental/ecological risk assessment. The USFDA's Center of Veterinary Medicine, responsible for approving new animal drugs, has requested more information concerning its environmental safety. The goal of this research is to generate fate and effects data suitable for use in developing an ecological risk assessment (ERA) of potassium permanganate. The information in this ERA will be used by the USFDA for evaluating whether this chemical should be approved for use in food fish. To meet this goal, the following objectives will be met: 1) determine the acute sediment and water column toxicity of KMnO<sub>4</sub> in controlled laboratory conditions; 2) determine its chronic toxicity in controlled laboratory conditions; 3) evaluate its fate and toxicity in pond water under recommended dose and worst-case overdose scenarios; 4) to determine the fate and toxicity of this chemical in simulated warm-water pond (mesocosm) conditions. To date, acute toxicity test results using treated moderately hard synthetic test water show static 96hr LC<sub>50</sub> values of 0.039 + 0.009 mg/L (*Daphnia magna*), 0.052 + 0.010 mg/L (*Ceriodaphia dubia*) and 1.88 + 0.29 mg/L (*Pimephales promelas*). These values are below the generally recommended KMnO<sub>4</sub> disease treatment. Tests in progress will reveal what ameliorating effect pond water or mesocosm water will have on KMnO<sub>4</sub> toxicity.

Relationship between flow regime, habitat complexity and fish assemblage structure in  
Arkansas Ozark streams

Mandy K. Scott\*  
Daniel M. Magoulick

Variable flow regimes can affect fish assemblage structure by selecting for disturbance-tolerant fish, whereas habitat variability (i.e., habitat complexity) can reduce the effect of this disturbance by providing refugia. Seven Arkansas Ozark streams were sampled by backpack electrofishing and habitat variables were measured at each site to determine the relationship between stream discharge, habitat variability and fish assemblage structure. Flood frequency was negatively related to fish density, but was not related to species richness. Substrate variability was positively related to species richness, but was not related to fish density. The streams in the Boston Mountains ecoregion had higher habitat complexity, flow variability and percentage of piscivorous fish than streams in the Springfield-Salem Plateau ecoregion. Habitat and flow variability in Arkansas Ozark streams impact the fish assemblage structure by affecting species richness, fish density, and trophic structure.

\*Please include this presenter in the judging for best student paper.

# THE ROLE OF MARKET AND PRODUCT CHARACTERISTICS IN CATFISH PRICING AT THE PRODUCER LEVEL

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Catfish producers in the aquaculture industry have been facing difficult economic decisions in recent times. The price of catfish at the processing plant door has fallen from a high of \$1.72 per kg in May 1999 to a low of \$1.28 per kg in December 2001. Prices have been slow to rebound, forcing some farmers to sell below the breakeven price. The objective of this study is to examine the effects of marketing channels and product characteristics on farm price.

Market channels are important in the price discovery mechanism because they determine how aquaculturists move their product from the farm to the consumer.

TABLE 1. Estimated coefficients of market channels

Variable	Avgprice	Size1	Size2	Size3
Proc	-108.41**	23.59**	97.52**	160.06**
Fee	6.57**	0.07**	1.73**	12.36**
Live	53.17**	-6.30*	-16.93**	-28.58**
Retail	34.53**	-4.96**	-15.35*	-26.11**
Other	9.63**	4.78*	-0.84*	-0.33**

\* Significant at 10% level

\*\* Significant at 5% level

The major marketing channels of the catfish industry include: delivery to local processing plants (Proc), fee fishing operations(Fee), live hauling(Live), and retail outlets(Retail). Other channels(Other) include: sales to other producers, specialty restaurants, other outlets and government organizations. Sales to processing plants represent the majority of catfish sold in the U.S., but other marketing channels can be especially important to small and medium sized farm operations

We analyzed 12 years of marketing channel data to determine how each channel effects average price(Avgprice) and size. Size was analyzed in three categories: less than 0.57kg (Size1), 0.57kg to 0.91kg(Size2), and greater than 0.91kg(Size3). The preliminary results suggest that average price negatively affects quantity of fish delivered to processing plants and positively affects quantity of fish delivered to all the other marketing channels (Table 1). This result was expected because processing plants generally handle the largest volume of fish and pay the lowest average price. Size across all three categories had a positive effect on quantity of fish delivered to processing plants and fee fishing operations. It suggests that as fish size increases more fish are marketed through these channels. These preliminary results suggest that the catfish industry may benefit from increased competition at the farm gate. This is especially apparent in some states where the market is not dominated by processing plant sales. In other states that have been traditionally dominated by the processing sector, bargaining associations or farmer cooperatives may increase farm gate prices. This analysis may also provide information related to the size preferences of different marketing channels.

## TRENDS OVER TIME FOR THE ARKANSAS RIVER FISHERY

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### ABSTRACT

Trends in fish standing crop were determined for the Arkansas River at four long-term rotenone-sampling sites from 1970 to 2001. Sample sites were located at Pool 13 (Garrison Creek), Ozark Pool (Lavaca), and Lake Dardanelle (Panther Bay and Arkansas Nuclear One Effluent Bay). Sites ranged from having 24 to 30 years of data. Mean standing crop ranged between 466.3 kg/ha and 1,601.3 kg/ha among sites, and no significant trends were detected for the total standing crop at the sites. Spearman rank correlation was used to detect significant increases in the abundance of paddlefish, spotted gar, redear sunfish, and freshwater drum. Significant declines were observed in the abundance of common carp at all sites. Trends over time were not always consistent among pools, and site-specific factors appeared to influence local abundance. Species abundances were often correlated for the Effluent Bay and Panther Cove although the Effluent Bay was thermally impacted. More species declined in abundance at Lavaca than at other sites, which may have been related to changes in habitat (e.g., loss of woody debris). Declines in sportfish abundance were observed for flathead catfish, green sunfish, warmouth, longear sunfish, largemouth bass, and white crappie at Lavaca. Trends from rotenone sampling were not correlated with those from spring nighttime electrofishing on Lake Dardanelle or with fishing tournament data. Zebra mussel infestation appears to have led to increased abundance of species that prey upon them such as redear sunfish and freshwater drum. We surmise that increased paddlefish abundance may be related to higher primary productivity associated with zebra mussel filtering and increased water clarity. Our results suggested that zebra mussel infestation led to several significant changes in the last thirty years in the fisheries of the Arkansas River.

### Biographical info

Bob Limbird is the District 9 Fisheries Biologist for Western Arkansas 1980-present  
Jeff Quinn is the River/Stream Biologist, performed the statistical work on this data, and wrote the major portion of this paper

Jim Ahlert was the Assistant District 9 Fisheries Biologist 1980-2001 and is now the Regional Stream Team Coordinator for Western Arkansas

Larry Rider was the District 9 Fisheries Biologist for Western Arkansas 1972-1980 and is now the Statewide Aquatic Habitat Coordinator

Mike Bivin is the Fisheries Division Data Analyst All the above are employees of the ARKANSAS GAME AND FISH COMMISSION, FISHERIES DIVISION. **Bob Limbird will present the paper if accepted.**

ONGOING EVALUATION OF WALLEYE STOCKING  
IN ELEVEN POINT RIVER OF MISSOURI & ARKANSAS

by

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*Abstract* – The Eleven Point River is a clear, predominantly springfed stream located in the extreme eastern Ozark mountain region of Southeast Missouri and Northeast Arkansas. The headwaters of the stream originate in Howell County, Missouri and flow approximately 150 miles south before joining the Spring River in Randolph County, Arkansas. Walleye are native to the stream and supplemental stocking of fingerling walleye has been undertaken annually for almost two decades. Over a period of four years (1999 thru 2002) the Arkansas Game and Fish Commission and the Missouri Department of Conservation freeze branded (liquid NO<sub>3</sub>) all walleye stocked within the Eleven Point River. At an annual stocking rate of 1000 fingerling fish per mile, walleye released in prime habitat of Missouri (13 miles) were branded on the left side and those stocked in Arkansas' portion (40 miles) were branded on the right. Subsequent electrofishing surveys are shedding light on the extent of each state's stocking contribution to the river's walleye fishery. Preliminary findings indicate that over 40 percent of the walleye in the river are products of the states' stocking programs. All recaptures of marked fish have occurred in Arkansas. Sixty-eight percent (68%) of the recaptures came from Arkansas stockings and 32 percent came from Missouri stockings. Future work to be completed includes describing the genetic heritage of the walleye population from Arkansas and Missouri and determining age and growth structure of the population.

**ABSTRACT FOR AFS-ARKANSAS CHAPTER MEETING PRESENTATION  
(To be considered for an oral presentation)**

**Assessing the Effects of Silviculture Best Management  
Practices Using Benthic Macroinvertebrates**

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Included in the Clean Water Act is a direction for states to develop best management practices to reduce water pollution from all non-point source categories. One of these categories is silviculture, which is an important land use in Arkansas. Approximately 55 percent of the land cover of Arkansas is commercial forest. Unmanaged timber harvesting can severely impair forest streams, chiefly through canopy removal and increased sedimentation. Consequently, several states have developed protocols, termed best management practices (BMPs), which aim to minimize the negative effects of harvesting. This study will be an attempt to determine whether silviculture BMPs developed for Arkansas are truly effective in protecting aquatic ecosystems.

Study sites consist of streams with adjacent watersheds scheduled to be clear-cut in spring/summer 2003. Study sites are located in the Ouachita Mountain, Ozark Mountain and Southern Coastal Plain ecoregions of Arkansas. Stream quality will be monitored by surveys of benthic macroinvertebrate communities, as well as direct measurement of certain water quality variables. A BACI sampling design will be utilized and will consist of winter and spring surveys prior to the timber harvest, and surveys in each of these periods for two years after the harvest. Additionally, multiple reference (control) sites will be sampled, and three biological samples will be collected at each site. Collections will begin in winter of 2003.

# EFFECT OF STOCKER CATFISH PRODUCTION ON FARM PROFITABILITY.

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Traditionally, farmers understock 9-27 g fingerlings directly into growout ponds in multiple-batch production. However, some use a three-phase strategy, where fingerlings are raised to stocker-size (27-340 g) in single-batch for one growing season, before transfer to growout ponds. Does the use of stockers improve farm productivity and profitability? A series of pond studies were conducted at the University of Arkansas at Pine Bluff on fingerling and stocker production and their respective performance in growout ponds. Enterprise budgets were developed based on three sizes of farm (65, 130, and 260 ha) and eight production strategies. Five strategies involved the production of large-stockers (114, 135, 176, 255, and 361 g) thereafter stocked in growout ponds at 11,250/ha, in single-batch production. The three other strategies involved buying and understocking fingerlings (6, and 12 g) or small-stockers (37 g) directly into growout ponds at 15,000/ha with 1,369 kg/ha of large 580-g catfish to simulate multiple-batch production.

The baseline budget analysis indicated that the 37-g small-stocker strategy was the most profitable strategy for the three sizes of farm. The second most important profit-maximizing strategy was the single-batch 255-g large-stocker strategy for the larger farm sizes. However, it was the 12-g fingerling strategy for the smaller farm. The 361-g and 255-g large-stocker strategies generally resulted in the highest yields (kg of foodfish/farm water-ha), but not in the highest net returns because harvest and fingerling costs were too high. Risk analysis indicated that the small-stocker (37 g) strategy was associated with the lowest levels of economic risk. Sensitivity analysis for the smallest farm size indicated that the results were robust to large variations in production characteristics and prices. However, results were more sensitive for larger farm sizes, varying generally between the 255-g large-stocker and the 37-g small-stocker strategy. The relative profitability of production strategies was also sensitive to variation in pond size because of the difficulty of balancing the number of stockers produced with the number necessary for stocking in growout ponds.

This static analysis indicated the profit-maximizing strategies for a single year. However, the analysis did not consider the effect of each strategy on farm profitability over multiple years, the increased risk of mortalities and off-flavor, nor the logistics of producing and stocking successive batches of stockers throughout the season across the whole farm. Additional research is needed in a dynamic framework to evaluate the effects of these additional factors.

Table 1. Net returns above total costs for three sizes of farm (65, 130, and 260 ha) and five production strategies involving the production of large-stockers (114, 135, 176, 255, and 361 g) in single-batches, and three involving buying and understocking fingerlings (6, and 12 g) or small-stockers (37 g) in multiple-batch.

Strategy	Net Returns Above Total Costs (\$1,000)		
	65-ha	130-ha	260-ha
361-g L-Stocker	-13	-13	-59
255-g L-Stocker	1	<b>108</b>	<b>283</b>
176-g L-Stocker	-43	-73	-34
135-g L-Stocker	22	57	210
114-g L-Stocker	2	15	5
37-g S-Stocker	<b>60</b>	<b>132</b>	<b>297</b>
12-g Fingerling	<b>44</b>	100	232
6-g Fingerling	-41	-69	-113

The Influence of Low-water Bridges on Fishes of the Ouachita  
Mountains of Arkansas

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*Abstract:* In the spring and summer of 1999 and 2000 we studied movements of batch-marked, native fish across low-water bridges in six streams on the Ouachita National Forest. In the summer of 2001, we sampled fish communities in twenty-one streams to assess the influence of low-water bridges on fish diversity and abundance. Each low-water bridge consisted of a concrete slab with 1-4 concrete or corrugated steel culverts. Fish were less than half as likely to move 50-m across reaches with low-water bridges than across 50-m reference reaches without these structures. Fish were twice as likely to move downstream, rather than upstream, through the culverts. Upstream fish passage was only observed for low-water bridges without plunge pools. Mean species richness was significantly lower in upstream reaches (upstream=7.14, downstream=9.38,  $p \leq 0.01$ ) indicating that reduced re-colonization from downstream reaches affected the structure of fish communities. Furthermore, abundance of certain families and species was also significantly lower upstream of the road crossings (e.g. sunfish, sucker, and minnow families; Ouachita madtom and orangebelly darter species,  $p \leq 0.1$ ). Spring baseflow culvert-velocities exceeding 0.6 m/s were consistently associated with lower upstream richness. New designs for low-water bridges may benefit the integrity of forested ecosystems.

\*Graduate student presenter

## EFFECTS OF INCREASED MINIMUM FLOW AND STREAM TEMPERATURE ON FISH COMMUNITY STRUCTURE IN THE OUACHITA RIVER, ARKANSAS

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The Federal Energy Regulatory Commission (FERC) currently monitors hydropower facilities in the U.S. FERC considers fish and wildlife issues as part of the relicensing process. Through relicensing of Rempel Dam, located on the Ouachita River in Arkansas, an increase in instantaneous minimum flow from 40 to 200-cfs and a shallower reservoir release regime were implemented. The goal of the project was to assess fish population structure before (2000) and after (2001-2002) modifications were employed. Riffle habitat was sampled at four permanent sites on the Ouachita River using push-barge electrofishing. A total of 56 species were collected. Riffle habitat was dominated by species in the Percidae and Centrarchidae families. The families Percidae, Catostomidae, and Atherinidae increased in relative proportion from 2000 to 2001. Preliminary analysis using Shannon-Weaver and Simpson's D diversity indices indicated shifts in community structure in riffle habitats. Similar trends were demonstrated using Morisita's index of similarity. Overall diversity increased from 2000 to 2001 and tended to increase downstream. Site-specific diversity decreased from 2000 to 2001 in the site just downstream from the dam. In contrast, downstream sites revealed increased diversity between years. Data for 2002 are currently being analyzed and final results are pending.

PowerPoint Presentation

## **An Economic Analysis of Alternative Bycatch Policies in the Gulf of Mexico**

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In an effort to reduce bycatch of red snapper by shrimp fishermen, in 1998 Amendment 9 to the Fishery Management Plan for the shrimp fishery of the Gulf of Mexico mandated the use of certified bycatch reduction devices (BRDs) on all shrimp trawls. However, BRDs are costly to shrimp fishermen and not as effective as desired in reducing juvenile red snapper bycatch.

The primary goal of this paper is to conduct an economic analysis of two alternative policies aimed at reducing the effort levels of shrimp boats in the Gulf of Mexico: fractional licenses (FL) and fractional gear (FG) that were suggested by Townsend. Under FL and FG programs tradable fractional rights to either a portion of a license or units of gear rather than the full rights are granted to the fishermen.

In our paper we built a theoretical model for FL and FG policies. The theory is developed for an open access fishery with heterogeneous fishermen by extending the graphical representation of Anderson and Staiford.

We develop a simulation model of the FL and FG policies for the joint shrimp/red-snapper fisheries by modifying a General Bioeconomic Fishery Simulation Model (GBFSM) of Grant and Griffin. GBFSM will be used to compare the new policies with traditional policies including BRDs and license buy-back programs. Comparison will be based on both the economic efficiency of the policy, and the policies' relative effectiveness in leading to the recovery of the red snapper population.

# GENETIC RELATIONSHIPS OF THE ROCK BASSES (AMBLOPLITES) AS DETERMINED BY MITOCHONDRIAL DNA ANALYSIS

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The rock basses, *Ambloplites*, are found within the sunfish family (Centrarchidae). The rock bass, *A. rupestris*, has an extensive national range whereas the the shadow bass (*A. ariommus*) and particularly the Ozark bass (*A. constellatus*) have more restrictive ranges. Morphological and protein-level analyses of the three rock bass species have proven inconclusive. The shadow and rock bass exhibit little differentiation whereas the Ozark bass is more diverged. Higher levels of resolution are required to better sort the genetic and historic relationships of these species. Mitochondrial DNA analysis has demonstrated historical isolation of taxa where allozyme analysis has not. Mitochondrial DNA of two of three species, the shadow and Ozark basses were studied by way of restriction fragment length polymorphisms in an effort to determine both genetic diversity and genetic divergence of these two species. Genetic diversity was found to be high for both species. Genetic divergence as measured by mtDNA analysis was consistent with previous morphologic and allozyme analyses.

**Is It Necessary To Identify Diet Items From Hard Parts  
To Accurately Characterize Cormorant Diets?**

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Abstract.—Diets of double-crested cormorants *Phalacrocorax auritus* have been the subject of several studies. Description of the diet from regurgitated pellets and fecal material rely heavily on diagnostic hard parts. Diet characterization from stomach contents of collected birds typically relies on intact prey remains. Analyses of diet based on only one method may bias characterizations. The purpose of this study was to describe the diet of wintering cormorants from intact prey items and diagnostic hard parts and compare this estimate with the diet described using only intact prey items. Approximately 1371 prey items were identified from intact remains or hard parts. In fall, based on intact remains alone, gizzard shad were the most numerous and frequently occurring prey taxa, and had the highest relative importance. In the fall, based on hard parts and intact remains, cyprinids were the most numerous taxa and had the highest relative importance. Gender-based diet differences were not affected by choice of method. Length frequency distributions did not differ. We have determined it is sufficient to use only intact remains for diet characterization of cormorants unless specific seasonal information is required.