



*Natchez '92*

*Mississippi*

*Louisiana*

*Arkansas*

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of the  
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# Gulf Coast Research Laboratory

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## WELCOME TO

the American Fisheries Society 1992 chapter meeting for  
Arkansas, Louisiana and Mississippi.

This meeting will be interesting, informative, and  
entertaining. Forty-seven papers are scheduled for the technical  
sessions in addition to a mini-symposium "**Fisheries Management  
Strategies of the '90s,**" and a workshop "**Lower Mississippi River  
Initiative.**" For your enjoyment a social and a banquet have been  
organized.

**HAVE A GREAT TIME!!**

Wednesday, February 19, 1992

Registration 1:00 - 5:00

Mini-Symposium 1:30 - 5:00 "Fisheries Management Strategies  
in the 90's" - Forrest Payne

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Thursday, February 20, 1992

Registration 8:00 - 5:30

8:00 Workshop - Lower Mississippi River Initiative  
Garry Lucas, Moderator

Technical Session - Thursday, February 20, 1992

**FRESH WATER**

Polyodon spathula

8:00 Bobby Reed p4

Amia calva

8:15 Richard B. Davidson, et. al. p4

Dorosoma spp.

8:30 Galen D. Jons & L. E. Miranda p5

8:45 Therese L. East & Stephen T. Threlkeld p6

9:00 Joanne Cline p6

9:15 Brenda Seuell & Carole Engle p7

Catostomidae

9:30 Jan Jeffrey Hoover, J. V. Morrow, & K. Jack Killgore p7

9:45 J. E. Johnson, M. Pardew, & M. Lyttle p8

10:00 Break

Ictalurus punctatus

10:30 Gary L. Siegwarth p8

Morone spp.

10:45 Louise A. Stanley, C. A. Wilson, & William Wolters p9

11:00 H. R. Robinette, J.B. Taylor, & G. Fornshell p10

11:15 M. O. Frinsko, H. R. Robinette, & E. H. Robinson p10

Lepomis spp

11:30 Keith Sigler p11

11:45 James J. Duffy and Donald C. Jackson p11

12:00 Lunch

1:00 David C. Beckett, B. J. Viskup, & Stephen T. Ross p11

1:15 James L. Sylvester, Jr and Glenn R. Parsons p12

Micropterus salmoides

1:30 Jodee Hunt & Cynthia Annett p13  
1:45 Eric D. Dibble p13  
2:00 Claudia F. Bailey p14  
2:15 Cynthia Annett, et. al. p14  
2:30 Keith O. Meals & L. Esteban Miranda p15  
2:45 Cindy Timmerman p15

3:00 Break

3:30 Cynthia Annett p16

Micropterus dolomieu

3:45 Jody Walters p16  
4:00 Darrell W. Bowman p17  
4:15 Mark Oliver, Steve Filipek & Brian Wagner p17

Micropterus spp

4:30 Shannon Stanger, Cynthia Annett, & Raymond Pierotti p18

Pomoxis spp

4:45 John Stark & Don Turman p18  
5:00 Bubba Hubbard p19

Stizostedion vitreum

5:15 Mark S. Peterson p19

7:00 Banquet - Doug Fruge' U.S. Fish & Wildlife Service  
after dinner speaker

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Friday, February 21, 1992

Registration 8:00 - 12:00

8:00 Business Meetings

9:30 Break

Technical Session - Friday, February 21, 1992

**CONSERVATION**

10:00 Steve Filipek, et. al. p20  
10:15 Guthrie W. Perry, Ted Joanen, & Larry McNease p21  
10:30 Virginia Van Sickle-Burkett p21

**SALT WATER**

10:45 David R. Stanley p22

Seriola dumerili

11:00 Marty L. Beasley & Bruce A. Thompson p22

Lutjanus campechanus

11:15 Ian K. Workman & John J. Watson p23

11:30 Jeffery H. Render & Charles A. Wilson p23

Sciaenops ocellatus

11:45 David L. Nieland & Charles A. Wilson p24

12:00 Lunch

1:00 Andrew Whitehurst, et. al. p25

1:15 Mike Murphy, James W. Warren, & Patricia A. Simm p25

Paralichthys lethostigma

1:30 Bruce A. Thompson p26

**HABITAT**

1:45 Kari E. Benson, et. al. p27

2:00 K. Jack Killgore & Jan Jeffrey Hoover p27

2:15 Mark Oliver & Tom Burnett p28

2:30 Break

2:45 Madeleine Lyttle & Art Brown p29

3:00 Rex Roberg p30

**EDUCATION**

3:15 Charles J. Gagen, Thomas A. Nelson & Buford L. Tatum p30

Louisiana Paddlefish Investigations  
Bobby Reed, Louisiana Department of Wildlife and Fisheries 1213  
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The life history of the paddlefish (Polyodon spathula) was studied over a three year period in several Louisiana waterbodies. A total of 259 net-nights of effort were expended to capture 185 paddlefish for an overall CPUE of 0.71 paddlefish/net-night. The mean total length, body length (eye-tip of tail), and weight of 334 paddlefish were no significant size differences between sexes. The overall sex ratio was 1.7:1 males:females. Sixty-seven (20%) were mature adults, 53 (16%) were males and 14 (4%) were females. Nine of the females were gravid and capable of spawning the spring in which they were collected. Mean lengths for mature male and female paddlefish were 131.8 cm TL and 139.2 cm TL, respectively. Mean weights for mature male and females were 9.9 kg and 11.4 kg, respectively. The fecundity estimates for nine gravid females collected ranged from 7,198 to 13,309 eggs per kilogram of body weight with a mean of 9,484/kg of body weight. Two hundred ninety-nine paddlefish were aged by examination of dentary bone cross sections. Age-classes II - XIV were represented in the sample. No age-class XII was present. Male paddlefish ranged from II-XIII, while females ranged from I-XIV. The median age for males was IV and the median age for females was V. Sexually mature male paddlefish ranged from IV-XIII, while mature females ranged from VII to XIV. Total mortality was estimated to be 18% ( $z = 0.20$ ) for the fully recruited portion of the population (median age = V). Growth determined by back-calculated lengths at annulus formation indicated that Louisiana paddlefish grow relatively fast the first year of life. Age-I paddlefish in Lake Pontchartrain and the Atchafalaya Basin averaged 423 mm and 342 mm in body length, respectively.

Potential Caviar Fishery Impacts on Louisiana Bowfin Populations

Richard B. Davidson

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In recent years, a small scale, bowfin (Amia calva) roe fishery in Louisiana has increased in both volume and value. To initiate an evaluation on the impacts of this fishery on bowfin populations, three study areas were selected to represent various ecosystems

inhabited by bowfin. It was not possible to relate growth, size, and sexual maturity with age based on otolith samples. Length-frequency data suggested that 9 month old fish ranged from 225-400 mm and 21 month old bowfin may grow to 525 mm. Gonadosomatic indices showed a constant increase through February, and all females observed had spawned by early March. Gonadal development and length-frequency data support the conclusion that most bowfin in Louisiana mature during their second winter. It appears that at least some bowfin mature before they become vulnerable to legal mesh (76 mm) gill nets. Other legal gears such as trotlines and hoopnets are capable of capturing bowfin before they mature, but their impact on the population has not been evaluated.

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Spawning of Gizzard Shad in Two Mississippi Reservoirs.  
Galen D. Jons and L.E. Miranda  
Mississippi Cooperative Fish and Wildlife Research Unit

Bay Springs Reservoir in northeast Mississippi is characterized by relatively low standing crops of gamefish, possibly because of a forage fish deficiency. Recruitment of gizzard shad (Dorosoma cepedianum) and threadfin shad (D. petenense), the principal forage of gamefish in southeastern reservoirs, has been unusually low since impoundment in 1983. To determine if limited reproductive ability was affecting low recruitment in Bay Springs Reservoir, we examined the spawning of gizzard shad in Bay Springs and Sardis reservoirs. Sardis Reservoir, a large flood-control reservoir in northwestern Mississippi, served as a control. Adult gizzard shad were collected March - May 1991 in the two reservoirs. Ovarian development followed similar patterns in both reservoirs; however, spawning was seemingly extended at Bay Springs and contracted at Sardis. Average fecundity was 192,000 and 131,000 eggs/female in Bay Springs and Sardis reservoirs, respectively. Percentage of mature eggs (>0.45-mm diameter) averaged 15 and 18% for gizzard shad in Bay Springs and Sardis reservoirs, respectively. The average absolute number of mature eggs was greater in the Bay Springs population. These data suggest that recruitment of age-0 gizzard shad in Bay Springs Reservoir may not be limited by the reproductive ability of the adult population.

A Limnological Comparison between Sardis  
and Bay Springs Reservoirs  
Therese L. East and Stephen T. Threlkeld  
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University of Mississippi, University, MS 38677

We examined the limnological factors affecting recruitment of age-0 gizzard shad (Dorosoma cepedianum) in Bay Springs and Sardis Reservoirs. Phytoplankton primary productivity was measured over a one year period using in situ incubations of light/dark BOD bottles at three depths at an open water, cove, and riverine site on both reservoirs. Primary productivity was always greater in Sardis than in Bay Springs. Initial comparison of the zooplankton composition suggests Sardis has more zooplankton than Bay Springs. Age-0 gizzard shad appear to be more resource limited in Bay Springs than in Sardis Reservoir.

Diet and relative condition of Gizzard shad in Sardis Reservoir  
Joanne Cline  
Freshwater Program, Department of Biology  
University of Mississippi  
University, MS 38677

Gizzard shad were collected seasonally by electrofishing from upper, mid, and lower sites on Sardis Reservoir from March 1990 through June 1991. Benthos, periphyton, plankton, and water samples were collected in August 1990, February 1991, and June 1991. Food substances were extracted from gizzards and pooled by size class/location/season. A subsample was stored in Lugol's solution for microscopic examination and the remaining sample was dried to constant weight and used for diet quality assays. Seasonal water elevation, condition factors, and percent total amino acids (%TAA) followed the same pattern, increased in spring and decreased in winter. Condition was weakly, but positively, correlated with %TAA and percent organic carbon (%OC). Seasonal changes had the most significant effect on all parameters measured, including condition factors as well as percentages of TAA, OC, diatoms, and sand in shad gut contents.



The Effect of Gizzard Shad on Catfish Production in  
Commercial Pond

Brenda Seuell and Carole Engle  
University of Arkansas at Pine Bluff  
Pine Bluff, AR 71601

Catfish farmers have become concerned that the increasing number of gizzard shad (Dorosoma cepedianum) that have appeared in recent years in catfish (Ictalurus punctatus) production ponds may have an adverse effect on catfish production. Six 0.10 - hectare earthen ponds were stocked with 11-17 cm catfish fingerlings at 10,000/hectare. Three of the ponds were stocked with 114 kg/ha of gizzard shad in March, 1991. Growth, yield, dissolved oxygen concentrations and off-flavor occurrences were monitored. Results indicated a significant increase in yield (kg/ha) in catfish ponds stocked with shad compared to ponds without shad. Average weight of catfish stocked with shad was 671 g compared to 600 g in ponds without shad. The pond with the greatest yield (500 kg/ha greater than the next highest) also had a greater shad population (688 kg/ha greater) than the other ponds. The paper further discusses effects of gizzard shad on water quality and incidence of off-flavor in catfish ponds.

Habitat of Juvenile Blue Suckers (Cycleptus elongatus)  
from the Yazoo River System.

Jan Jeffrey Hoover, James V. Morrow, and K. Jack Killgore  
U.S. Army Engineer Waterways Experiment Station

Because juvenile blue suckers are infrequently encountered during fish surveys, their habitat has been rarely documented. In May 1991, we collected more than 150 individuals at White Lake, a contiguous oxbow off the Tallahatchie River, and described their habitat from field and laboratory observations. Suckers were collected during flood stage, in shallow water (<60 cm), in high velocities (>30 cm/s), over substrates of gravel and hard clay. Ten individuals were kept alive for laboratory observations. These were divided between two flumes (244 x 122 x 50 cm), one with eight flat clay tiles (no overhead cover) and the other with eight elevated clay tiles (overhead cover). Water velocities in each flume ranged from 0-30 cm/s and the positions of suckers relative to velocity were recorded 9 times over a 6-day period. In the flume with flat tiles, 18% of observations were in 0 cm/s, 51% in 0.1-10 cm/s, and 31% in 10.1-25 cm/s. In the flume containing elevated tiles, 23% of observations were in 0 cm/s, 17% in 0.1-10 cm/s, and 60% in 10.1-25 cm/s. Suckers were never recorded in velocities > 25 cm/s and were more frequently observed near elevated tiles (22%) than flat tiles (8%). Preference for moderate velocities in the presence of cover, and avoidance of high velocities suggest that the ability of juvenile suckers to exploit

fast flowing water is partially attributable to the utilization of low velocity refugia.

Predator recognition and avoidance by larval razorback sucker  
(Xyrauchen texanus) and northern hog sucker  
(Hypentelium nigricans)

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Arkansas Cooperative Fish and Wildlife Research Unit  
University of Arkansas

Razorback suckers are endemic to mainstream Colorado River that originally supported only one native piscivorous species, Colorado squawfish. Recent attempts to reintroduce razorback suckers into native habitats have not been very successful, perhaps due to predation by non-native fishes. Two hypotheses were tested: (1) larval razorback suckers will not recognize fish predators as rapidly as larvae of a similar species from a predator-rich environment, and (2) groups of larvae will recognize predators more rapidly than individual larvae. Over a period of 2 month after hatching, untested single razorback sucker larvae improved their predator recognition rate from random (50%) to greater than 80%. Similar avoidance patterns were observed in 1990 and 1991. Another catosotmid, northern hog sucker, recognized a predator earlier than did razorback sucker, and improved avoidance to 100% within 30 days after hatching. Five untested larval razorback suckers placed in the test chamber simultaneously, initially demonstrated predator recognition and avoidance similar to single larvae, but failed to improve as rapidly or as extensively as did single larvae. More surprising, groups of 5 previously tested and untested northern hog sucker larvae demonstrated little better predator recognition than did razorback suckers. Management implications are that razorback suckers should be at least 45 days old before stocking into the wild, and should be spread extensively throughout the stocking sites.

Use of larval drift nets to assess channel catfish reproduction  
in four northwest Arkansas streams

Gary L. Siegwarth  
Arkansas Cooperative Fish and Wildlife Research Unit  
University of Arkansas

Larval drift nets were used to assess channel catfish reproduction in the Kings, Mulberry, Illinois, and Buffalo rivers of northwest Arkansas. The sampling scheme consisted of placing four nets at each of two sites located above a riffle section in each stream.

Nets were fished from sun-down to sun-up on four different dates from 15 June to 22 July 1991, with average net catches of larval catfish representing an index of reproduction. Comparisons were also made between upper, middle, and lower sections of the Buffalo River. The Illinois River had the highest average catch per net (56.7 channel catfish/net) of the four rivers, while the Buffalo River had the lowest (1.0 channel catfish/net). Average catch per net (reproduction) in the Buffalo River was significantly lower than similar reaches of the Kings, Mulberry, and Illinois rivers. Catches within the Buffalo River indicated an increase in larval channel catfish drift from upper to lower reaches. Age structure assessment of the adult channel catfish population in the Buffalo River verified low reproductive success observed from drift net catches, as no non-stocked catfish under age 7 were collected. Larval drift nets are recommended as a simple technique to assess natural reproduction of channel catfish, predict year class strength, or assess stocking needs for a particular river.

The Use of Alizarin Complexone in Marking Fish Otoliths  
A. Louise Stanley and Charles A. Wilson  
Coastal Fisheries Institute  
and William Wolters, Forestry, Wildlife and Fisheries  
Louisiana State University  
Baton Rouge, Louisiana, 70803

Thirty day old fingerling red drum (Sciaenops ocellatus) and striped bass (Morone saxatilis) (10 fish per replicate) were immersed in solutions of alizarin complexone at two concentrations (100 ppm and 200 ppm) for varying lengths of time (6, 12 and 24 hours) to determine an optimum marking concentration and immersion time for the chemical. After treatment, fish were held and fed for one week to add otolith growth beyond the time of marking. Excellent marks on otoliths were observed in both species after 12 and 24 hours of immersion in 200 ppm of alizarin complexone. Good marks were observed in the otoliths of both species after 6 hours of immersion at 200 ppm and 12 and 24 hours immersion at 100 ppm. Poor marks were observed after 6 hours immersion at 100 ppm. No mortalities were recorded during these experiments. Mass marking of red drum (350 fish) and striped bass (600 fish) with 100 ppm of alizarin complexone for 12 hours was undertaken for pond trials over an extended period. After immersion, marked and unmarked fish were stocked into replicated ponds and fed artificial diets. Fish were sampled from the ponds at approximately 3 month intervals. Alizarin complexone marks were visible in whole otoliths of striped bass after 16 months, and in sections of red drum otoliths after 6 months.

Production characteristics of phase II and III  
hybrid striped bass culture as affected by density.  
H.R. Robinette, J.B. Taylor, and G. Fornshell  
Mississippi State University

Phase II hybrid striped bass (HSB) were stocked at either 19768/ha, 29652/ha, or 39535/ha into 3 replicate 0.07 ha ponds. Phase III HSB were stocked at either 8648/ha or 11974/ha into three replicate 0.05 ha ponds. Fish were graded and stocked according to size in each study to minimize cannibalism. Biosponge feed was fed to Phase II as a % of body weight, while Phase III fish were fed to satiety. Low density Phase II HSB had significantly ( $P \leq 0.10$ ) greater weight gain (51.1 g) than fish at medium (36.0 g) or high density (30.3 g). There were no significant differences at low, medium, and high densities for yield (551.6 kg/ha, 473.4 kg/ha, and 554.2 kg/ha, respectively), feed conversion ratio (3.75, 6.87, and 6.87, respectively), or survival (57.3 %, 47.7%, and 52.2 %, respectively). There were no significant differences ( $P \leq 0.10$ ) for Phase III HSB at either 8648/ha or 11974/ha densities for average weight gain (601.3 g and 531.7 g, respectively), feed conversion ratio (2.47 and 2.71, respectively), or survival (98.9 % and 98.2 %, respectively). However, yield was significantly less at the low density (6689.1 kg/ha) than at the high density (8326.6 kg/ha).

Evaluation of Lipid Sources for Phase II Hybrid Striped Bass  
(Morone saxatilis x Morone chrysops).

Michael O. Frinsko, H. Randall Robinette, and Edwin H. Robinson  
Mississippi State University

Hybrid striped bass (hsb) averaging 0.59 g were fed similar semi-purified diets, each of which contained one of 5 different lipid sources. Menhaden oil, catfish offal oil, beef tallow, soybean oil, or corn oil was supplied at 10% of the total diet. All diets contained 45% protein and were isocaloric (3.7 Kcal/g). Fish were fed 9% body weight per day divided into two equal feedings. Diets were completely randomized using 5 replications per treatment with 10 fish per 106 L aquarium. Total fish weights were taken on a bi-weekly basis to adjust feed allowance. Results indicated that hsb fed diets containing fish oil grew significantly ( $p < 0.05$ ) faster and more efficiently than those fed other fat sources. Whole body proximate analysis indicated that hsb fed feeds containing the beef tallow, soybean oil or corn oil had significantly less fat, more protein, and greater moisture content than fish fed fish oil. Survival was similar among all test groups.

Aspects of Nesting Behavior and Reproductive Success Between Two  
Reproductive Strategies in Longear Sunfish (*Lepomis megalotis*)  
Keith Sigler  
University of Arkansas

Certain modes of reproductive strategies are known to exist for many fish species. In dealing with certain species of sunfish (Centrarchidae), the major strategies are colonial nesting versus solitary nesting. The success and failure ratio between the two is poorly known in Arkansas' lakes, and needs to be determined. In order to do this, a total of 600 minutes were spent studying 40 different nests in the two coves. Scanning samples on dry land and using snorkel gear were the methods used to examine aspects of behavior concerning the two modes of nesting strategies. Sixty-five percent of the colonial and 85 percent of the solitary nests were successful. Both colonial and solitary nesting strategies are necessary for the success pertaining to each individual strategy.

Population Structure and Relative Abundance of Zooplankton  
and Juvenile Bluegill in Different Aquatic Macrophyte Assemblages  
James J. Duffy and Donald C. Jackson  
Department of Wildlife and Fisheries  
University State University

Zooplankton and fish were collected from three aquatic macrophytes common to southern impoundments. Plankton abundance and biomass were significantly greater in Potamogeton nodosus than in Nymphae odorata or Brasenia schreberi, but not different between Brasenia and Nymphaea. Species composition and size distributions of plankton assemblages did not differ. Plankton resources were significantly more variable in Potamogeton. Fish samples were dominated by juvenile bluegill, Lepomis macrochirus, contributing 73.7%, 72.4%, and 75.9% to the catch by number and 59.6%, 55.4% and 61.7% to the catch by weight of fish samples from Brasenia, Nymphaea, and Potamogeton, respectively. Though significantly more larger bluegill were collected from Potamogeton, condition of bluegill did not differ among macrophyte taxa, indicating that Potamogeton may provide a richer food source for juvenile bluegill than Brasenia or Nymphaea.

Occurrence of Lepomis (Centrarchidae) in Horn Island Ponds.  
David C. Beckett, Barbara J. Viskup, and Stephen T. Ross  
University of Southern Mississippi

The fishes of Horn Island were sampled intensively by Franks in 1965 and 1966. Despite sampling all of the island's ponds and

lagoons he collected "no true freshwater fishes;" no Lepomis were collected in his study. In 1988 and 1990 we sampled 5 permanent ponds of varying salinities on Horn Island and collected 3 species of Lepomis: L. macrochirus (bluegill), L. microlophus (reardear sunfish), and L. punctatus (spotted sunfish). Pond 20, the freshest of our study ponds, contained all three Lepomis spp., with collections from two other ponds including both reardear and spotted sunfish. The large number of small Lepomis (between 21 and 34 mm SL) in our samples indicates that the fish successfully reproduce in these ponds. Lepomis microlophus is able to survive several months of continuously elevated salinities as evidenced by our capture of two individuals in Pond 19 following 3 months of salinities equaling 11-12 ppt. We hypothesize that the presence of Lepomis on Horn Island is characterized by a repeating sequence of colonization and extinction. Lepomis are eliminated from the ponds by saltwater overwash accompanying hurricanes, and then recolonize them over non-hurricane intervals as the ponds freshen.

Swimming Performance and Energetics in Bluegill Sunfish, Lepomis macrochirus, Largemouth Bass, Micropterus salmoides and Channel Catfish, Ictalurus punctatus: A Laboratory and Field Analysis

James L. Sylvester, Jr. and Glenn R. Parsons  
University of Mississippi

There exists a need for knowledge of the average daily energy costs for fish under natural conditions. In this investigation, swimming performance and energetic data were used to estimate energy expenditure, due to activity, in situ. Three species of fish, bluegill sunfish, Lepomis macrochirus, largemouth bass, Micropterus salmoides, and channel catfish, Ictalurus punctatus, were tethered with a small float and their movements recorded with video equipment in the near natural impoundment for 24-hour intervals. The tape was then evaluated in the laboratory as to speed and distance traveled. Representatives of the same species were then forced to swim under controlled conditions, matching those in the field, in a swim tunnel respirometer. From the respirometry experiments, total cost of transport (TCT), net cost of transport (NCT), energetic range (ER), standard metabolic rate, active metabolic rate, critical swimming velocity ( $U_{crit}$ ), metabolic rates for all swimming speeds, and optimum swimming velocities were determined. These data were then correlated with activity data from the field in order to estimate average daily energy costs.

Effects of nest-site selection, timing of reproduction and parental care on nesting success in largemouth bass (Micropterus salmoides).

Jodee Hunt and Cynthia A. Annett  
Arkansas Cooperative Research Unit  
University of Arkansas

Nest-site selection, timing of reproduction and parental care may strongly effect nesting success in species showing parental care, but these factors are largely unexamined for centrarchid fishes under natural conditions. We located 138 nests of largemouth bass using SCUBA and measured depth, water temperature, substrate, associated structure, distance to nearest conspecific nest and presence, age and condition of brood for each nest. Habitat availability was measured for 1000 m of shoreline. Parental behavior of males guarding 12 nests was recorded using onshore focal-animal observations for 20 min per nest. Bass preferentially nested on gravel substrate: 77% of nests were located on gravel, while gravel composed only 20% of available habitat. Cobble, sand/silt and boulder substrates were each selected less than that expected from availability. Structure (logs, boulders, plants and sticks) was associated with 83% of nests; bass preferred logs to other forms of structure and to no structure. Nesting attempts were clustered into early and late spawns; early nests were unsuccessful due to a chilling spring storm system. Parental behavior includes hovering and circling over nests and chasing away potential predators. Individual variation in parental behavior, nest-site selection and timing of nesting all correspond with variable nesting success in largemouth bass.

Differences in Habitat Use between Hatchery-reared and Wild Juvenile Largemouth Bass (Micropterus salmoides).

Eric D. Dibble  
Arkansas Coop Unit  
University of Arkansas  
Fayetteville, AR

Previous studies on fish distribution have emphasized the importance of habitat choice in survival of juvenile fish. The use of specific habitat by fish can determine growth rate, size and predator risk. It has been suggested that experience may play an important role in choosing good habitat. To investigate this relationship between distribution and mortality in fish and how experience may be important, I measured habitat use by juvenile largemouth bass. Habitat preferences were determined by 1) using pop-nets and 2) underwater observations using SCUBA. Field enclosures containing fish and habitat manipulations were used to determine the important differences in habitat use between hatchery-reared and wild juvenile bass. Structural preferences

were noted. Of total fish observed with underwater transects, fifty-four percent were recorded in weeds, 36% in woody debris, 2% next to logs, 8% in leaf litter and no fish were recorded in open areas. Results from the enclosure experiments demonstrated differences in habitat use between hatchery-reared and wild bass. Hatchery-reared fish were observed using woody debris 3% and weeds 7% of the time, whereas, wild bass used woody debris 10% and weeds 32%. Hatchery-reared fish were observed more in open areas without structure (38%) than were the wild fish (3%). These differences in the use of structure suggest hatchery-reared fish may be more vulnerable to predators and lack the experience in choosing protective habitat.

Nutritional Condition of Stocked vs Naturally Spawmed  
Populations of Largemouth Bass.

Claudia F. Bailey  
Department of Biological Sciences  
University of Arkansas  
Fayetteville, AR

Supplemental stocking of largemouth bass (Micropterus salmoides) is carried out on Arkansas sport lakes to enhance the first-year cohort and, thereby, improve future angler catch. Failure of the first-year fish is thought to be due primarily to over-wintering temperature stress and/or to poor condition prior to over-wintering. In addition many larvae fail to survive the critical period in which they switch to a piscivorous diet. Post-release survival of stocked fish are reported to be even less likely. The general histological integrity of tissues, as well as histochemical identification of nutrient reserves, are excellent parameters of physiological condition. Naturally spawned bass have been collected from several Arkansas lakes and compared to hatchery stock reared for spring and fall release. Assessment of glycogen and lipid storage in the liver was made, and normalcy of tissue histology in the gut, muscle and eye was determined.

Survival, size distribution, and diet of supplementally stocked  
spring and fall largemouth bass young-of-year

Cynthia Annett, Claudia Bailey, Eric Dibble, Jodee Hunt,  
Steve Marchant, Keith Sigler, and Cindy Timmerman  
University of Arkansas  
Fayetteville, AR

Young-of-year largemouth bass were supplementally stocked into four small impoundments (100-350 acres) to determine relative survival



of spring vs. fall fingerlings. The size distribution of stocked fish was significantly larger than bass that were naturally spawned in the impoundments. Stocked fingerlings were marked by freeze-branding, then recaptured using seines, rotenone, and electrofishing. Although initial survival was high, the contribution of spring stocked bass to the year-class 6-8 weeks after stocking was low (0.5-5%). 1991 was a low water year in the study impoundments, and the contribution of supplementally stocked bass may have been adversely affected compared with other years. The diet of the stocked fingerlings was examined both before (in hatchery ponds) and after (in lakes) stocking and compared with the diet of naturally spawned fingerlings of similar sizes and ages. The relationship of water level and diet to survival of supplementally stocked largemouth bass will be discussed.

Size-Related Initial Mortality of Tournament-Caught Largemouth Bass, Sardis Reservoir, Mississippi.

Keith O. Meals and L. Esteban Miranda

Mississippi Department of Wildlife, Fisheries, and Parks  
and Mississippi Cooperative Fish and Wildlife Research Unit

Initial mortalities of largemouth bass (Micropterus salmoides) were recorded at a major tournament each spring and fall, 1989 to 1991, on Sardis Reservoir, Mississippi. A slot length limit separated bass into small (12 to 14 inches) and large (over 18 inches) sizes. Initial mortalities of small and large bass averaged 9.2% and 29.2%, respectively, for a total initial mortality of 10.7%. Bass mortality was positively correlated to an interaction of increased water temperature and mean number of bass per boat. Significantly higher ( $p \leq 0.05$ ) initial mortality of large bass could alter population size structure with high tournament fishing pressure.

Larval Largemouth Bass Oral Morphometry and Feeding Behavior

Cindy Timmerman

Arkansas Fish and Wildlife Research Cooperative Unit  
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Largemouth bass (Micropterus salmoides) are gape limited predators. The switch to piscivory is postulated to be a critical point in their development. Bass which are capable of switching to piscivory earlier than others are thought to grow faster and therefore cause the bimodal size distributions commonly found in young of year largemouth bass populations. Laboratory experiments, recorded on video tape, were designed to assess feeding behavior by the larval bass. Bass were presented with different food items, including frozen blood worms, freeze killed minnow larvae or guppy

larvae, and live minnow larvae or guppy larvae. The latency to first feeding was measured. To correlate behavior with mouth measurements, larval largemouth bass were prepared and examined for oral structure. Bass larvae were cleared and stained for dense connective tissue, then examined microscopically. Oral morphology was measured using JAVA, a computer program which digitizes images and performs statistical analysis of measurements collected.

Vision and water quality as determinants of prey choice by largemouth bass (Micropterus salmoides).

Cynthia Annett

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Fish vary in their color vision according to (a) water clarity and transmission properties and (2) method of prey capture. This fit between ecology and physiology has major implications for the management of game species which rely on vision to feed. A model will be presented to demonstrate how color vision impacts prey choice by largemouth bass. The model was tested in the field and in enclosure experiments. Two color morphs of the same species of prey fish were used to remove the effects of differences in prey behavior. In open water, the model predicted that patterned fish were more conspicuous than uniformly colored morphs, and black was more conspicuous than yellow. Experiments confirmed these predictions, with a significantly higher proportion of black/patterned fish being eaten by bass.

Microhabitat use of young-of-the-year smallmouth bass in the Buffalo River, Arkansas

Jody Walters

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Microhabitat use of young-of-the-year fishes is important to determine since this life stage is a critical period due to higher probabilities of predation and possible limited food availability. Underwater observations were used to determine microhabitat use of smallmouth bass in the Buffalo River, Arkansas by recording variables such as depths, substrate types and cover types used by various size groups. Chi square analysis was used to determine differences in microhabitat use between young-of-the-year smallmouth bass and those older than age 1. This information will be important from a management perspective since microhabitat needs of young-of-the-year smallmouth bass should be a first step in

determining the suitability and biotic potential of a particular water body.

Distribution and Abundance of Smallmouth Bass (*Micropterus dolomieu*) in Relation to Water Quality of Beaver Reservoir

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Smallmouth bass have been stocked in Beaver Reservoir since 1981 with limited success. Limnological parameters including temperature, dissolved oxygen, conductivity, turbidity, total dissolved solids, total suspended solids, Ph, nitrates, phosphates, chlorophyll a, and secchi disk were measured monthly to identify preferred smallmouth bass habitat. Electrofishing was used to sample smallmouth bass distribution with catch-per-unit-effort yielding abundance. Preferred smallmouth bass habitat only existed in the lower portion of the reservoir; however, smallmouth bass were most abundant in the middle portion of the reservoir.

A Profile of the Smallmouth Bass Fishery of  
Crooked Creek, Arkansas  
Mark Oliver, Steve Filipek and Brian Wagner  
Arkansas Game and Fish Commission

Crooked Creek, located in north-central Arkansas, is a well-known smallmouth bass fishery. Due to concern by area anglers and fisheries biologists, a complete survey of the physical, chemical, biological, and human dimensions of the fishery was initiated in 1986. Mark and recapture population estimates were conducted annually on three 1-mile sections of the most heavily used segment of the creek. Population estimates ranged as high as 180 smallmouth bass per hectare and PSD's as high as 60. Length frequencies were depressed above 300 mm. These fish were primarily age-3, indicating fast growth and suggesting high levels of angler exploitation. To evaluate exploitation, a creel survey was initiated in 1989. The first year of this survey found fishing pressure of 309 hours/ha and harvest of 51 smallmouth bass per hectare. In response to these high levels of pressure and harvest, more restrictive harvest regulations were proposed for this stream beginning in 1992.

Hybridization and male parental investment: Implications of mate choice for fish management

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Natural hybridization is often regarded as a rare phenomenon of minor evolutionary significance. In some vertebrate lineages, however, intrageneric hybridization appears to occur relatively commonly, and in fact may be an intentional or unintentional consequence of fish management programs. The ability of two species to hybridize may be limited by the mating system of the species involved. We propose that hybridization will occur most readily in lineages where there is considerable male parental investment, with females preferring males which provide more investment in offspring. This may result in hybridization between females of smaller species with males which are larger, provide better territories, or better care for young. We propose that this is a major problem when introducing game or forage fish, for example in black bass where males guard nests and fry the introduction of other Micropterus species into a drainage may cause widespread hybridization.

Impacts of Extended Spring Overflows on Crappie Populations in Felsenthal NWR Reservoir of Southeastern Arkansas.

John Stark and Don Turman  
Arkansas Game and Fish Commission

Black and white crappie were collected over 460 net nights of fall (Oct.-Nov.) trap netting on Felsenthal NWR in southeastern Arkansas during 1988-91, in an effort to assess the effects of extended spring overflows on crappie population dynamics. During this period 3,665 black and white crappie were collected.

Significantly more YOY black crappie were collected during the first extended overflow year (1989) in the study period (1481 vs 20 in 1988). Although both species of crappie produced good year classes during subsequent overflow years, neither species could match the 1989 black crappie year class. Differential specific growth rates were observed during the study period. Growth of white crappie as determined by back calculation and mean length at age datum from otolith annuli was greater than that of black crappie. Extended high water levels may have also resulted in increased mean length at annuli formation. Estimates of total specific mortality were also obtained for Age 1+ or older black and white crappie.

The implications of the study results suggest that fisheries managers with crappie fishing clientele may want to explore ways of artificially simulating spring overflows and selecting for white crappie production if forage and environmental factors are suitable.

Considerations for Crappie Length Limits in Mississippi  
Bubba Hubbard  
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Crappie fisheries in Mississippi are mainly consumptive with most catch and release occurring when fish are considered too small to eat. A large percentage of the total harvest in many lakes is crappie. Length limit regulations have potential to maximize harvest in waters receiving heavy fishing pressure. Mortality after catch and release in shallow water was minimal during the spring but a 67% mortality rate occurred for crappie raised from 10 m. Other factors to consider before implementing a length limit should include growth rate, percent composition of black and white crappie, and year-class strength. Crappie populations are cyclic and length-at-age data are different for black and white crappie in Mississippi lakes. Black crappie length-at-age was consistently lower than white crappie at older ages. Differences in population rate functions in Mississippi lakes indicate that a statewide length limit may be inappropriate in some situations. Management on a lake-to-lake, or regional basis would be most effective.

Preliminary Comparison of Temperature Tolerance of Iowa  
and Mississippi Populations of Walleye.  
Mark S. Peterson  
Mississippi State University

The natural range of walleye Stizostedion vitreum is from northwestern Canada to the southeastern United States. Murphy (1990) documented that walleye in the Tombigbee River System (TRS) are genetically unique compared to eight northern populations. Creation of the Tennessee-Tombigbee Waterway has raised concerns about the interbreeding of the TRS and Mississippi River populations of walleye. It is thought however, that the hot summer temperatures would reduce the probability of northern populations migrating south and interbreeding with the TRS population. With this in mind, I examined temperature tolerance of Iowa and Mississippi groups of walleye acclimated to 23.0 °C using the critical thermal maximum methodology. Results of this study indicate no significant difference in temperature at the "loss of equilibrium" and "opercular spasm" end-points between the Iowa (34.8 & 35.9 °C) and Mississippi (35.0 & 35.8 °C) groups. Hematocrit and plasma osmolality data of control and treatment fishes suggest both groups were stressed. Results indicate that temperature alone would not deter Mississippi River populations from migrating into the TRS, even though empirical data indicates that northern populations do not survive in ponds over the summer. Oxygen is most likely interacting with temperature as the causal agent in the inability of northern populations to survive summer conditions in Mississippi.

The Lower Ouachita River Work Group: Development of an  
Interdisciplinary Scientific Assessment Team.

Steve Filipek, Don Turman and John Stark  
Arkansas Game and Fish Commission

Joe Nix and Tim Knight, Ouachita Baptist University  
John Giese and Bill Keith

Arkansas Department of Pollution Control and Ecology

Tom McChesney, Arkansas Department of Health

John Harris, Arkansas Highway and Transportation Department

Robert Ellis and Jack Lee, U.S. Fish and Wildlife Service

David Johnson, U.S. Corps of Engineers Vicksburg District

Terry Lamb, U.S. Geological Survey, Forest Payne FTN Consultants

Kirk Cormier, Louisiana Department of Environmental Quality

Janice Little, Louisiana Department of Wildlife and Fisheries

The Lower Ouachita River in southern Arkansas and northern Louisiana has been heavily impacted by anthropogenic development in the basin, primarily impoundment and industrialization, including oil field operations, paper mills, mining operations, and metal refining. Because of the extent of industrialization in the river corridor, recent suboptimal sampling results by the Arkansas Game and Fish Commission, Arkansas Pollution Control and Ecology, and Ouachita Baptist University relative to the river's fisheries and water quality have thrown up red flags on possible negative impacts on the system as a whole.

During the summer of 1990, an ad hoc committee, the Lower Ouachita River Work Group was formed by representatives of the Arkansas Game and Fish Commission and Arkansas Department of Pollution Control and Ecology to further investigate the possible causes for apparent low population levels of fish and water quality problems. This group consisted of representatives of Arkansas Game and Fish Commission, Arkansas Department of Pollution Control and Ecology, Ouachita Baptist University, Department of Health, Department of Highway and Transportation, U.S. Corps of Engineers Vicksburg District, U.S. Geological Survey, U.S. Fish and Wildlife Service, FTN Associates ,Ltd. (Consultants), Louisiana Department of Environmental Quality, and the Louisiana Department of Wildlife and Fisheries.

This group has reviewed existing data on the Ouachita River and have developed a scope of work which will provide information needed to help define the problems on the Ouachita River, their magnitude, and source. The status of the group and progress made to date are summarized.

Values Associated With a Proposed Coastal Restoration Project  
in Southwest Louisiana

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Grand Chenier, Louisiana 70643

Although most wildlife/fisheries resources are recognized as having some value, most of us would probably agree that land is our fundamental and most valued resource. We know that the future of our wildlife/fisheries resources depends upon proper stewardship of these lands. Lack of it by landowners and managers results in detrimental effects to these wetlands and associated natural resources. Thus, improving the quantity and quality of habitat on these lands provide more wildlife for recreational and commercial use, potentially increasing their value. Incorporating wildlife/fisheries as an enterprise can provide the impetus by which wetlands conservation can compete economically with traditional agriculture uses. This is an important tool, i.e., providing marshland managers with economic programs of incentive similar in many ways to conservation programs available to upland landowners.

This report includes a discussion of values which could be associated with a restoration plan for a 2,000 marshland area tract in southwest Louisiana. Utilizing, 'real world situation' data from actual observations, values compare what should be achieved through restorative management with no management.

Activities and Status of the National Wetlands Research Center  
U S Fish and Wildlife Service  
Virginia Van Sickle-Burkett, National Wetlands Research Center  
USFWS Chief, Wetlands Ecology Branch  
USL Drawer 4531  
Lafayette, LA 70504-4531

Recognizing the seriousness of wetland problems in the U.S., the Fish and Wildlife Service created the National Wetlands Research Center in Slidell, Louisiana, in 1976. NWRC has established field stations in Baton Rouge, Louisiana, Corpus Christi, Texas, Vicksburg, Mississippi, and is currently constructing a 65,000 square foot laboratory in Lafayette, Louisiana.

The mission of the research center is to provide national leadership in research and development studies that address resource issues related to the protection, management and enhancement of wetlands. An emphasis on coastal wetlands has led NWRC to develop research projects in the East and West coasts and in the Gulf of Mexico region, including Mexico.

Research programs which will be conducted at the new facility address the effects of climate change on coastal ecosystems, the causes of declining waterfowl population and how wintering grounds

influence recruitment and survival, the effects of contaminated sediments on estuarine fish and wildlife resources and restoration techniques which can offset habitat losses from development impacts.

Hydroacoustic Assessment of Abundance and Behavior of Fishes  
Associated with an Oil and Gas Platform off the Louisiana Coast  
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Center for Wetland Resources  
Louisiana State University  
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There are over 4100 oil and gas platforms in the northern Gulf of Mexico which constitute over 28% of the hard substrate in this otherwise soft bottom environment. These defacto artificial reefs have played an important role in the development of the aquatic ecosystem. The abundance of many species was correlated with the development of oil and gas on the continental shelf. However, the exact function of the platforms is poorly understood due to sampling difficulty using standard fisheries sampling methods (e.g., trawls, experimental gill nets, etc.).

Dual beam hydroacoustics was employed to measure fish abundance, size and obtain behavioral information. The size of fish around the platform ranged from 2 cm to over 2 m with an average of 32 cm. The densities of fish around the platform ranged from 0.2 fish/m<sup>3</sup> on the upcurrent side of the platform and 0.05 on the down current sides of the platform which corresponds to approximately 20,000 fishes around the platform. The platform had a field of influence of approximately 30 m. The dominant species of fish near the platform based on visual and underwater video surveys are blue runner (Caranx crysos), spadefish (Chaetodipterus faber), bluefish (Pomatomus saltatrix), sheepshead (Archosargus probatocephalus), grey triggerfish (Balistes capriscus), red snapper (Lutjanus campechanus) and greater amberjack (Seriola dumerili).

Age and Growth of Greater Amberjack off the Louisiana Coast  
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The greater amberjack (Seriola dumerili) is a pelagic reef species that ranges from Nova Scotia to Brazil. Although it has been a popular target of recreational fishermen and has recently been targeted by commercial fishermen, very little is known about its biology. The objectives of an ongoing study at LSU includes determination of growth rate and validation of age estimates for



greater amberjack off the Louisiana coast. Eight hundred and fifty-five greater amberjack have been collected from recreational fishermen, charterboat catches, and commercial fishermen between April 1989 and November 1991. Sagittal otoliths were obtained, sectioned in the transverse plane, and examined for the presence of annual growth features. Invalidated age estimates range from less than one to fifteen years of age with over 90% occupying the age groups one to six. Age validation is being attempted using marginal increment analysis as well as tag and recapture efforts.

Shrimp Trawl Gear Modifications to Reduce Bycatch  
Ian K. Workman and John W. Watson  
National Marine Fisheries Service

A major concern for the shrimp fishing industry in the Southeastern United States is the capture and discard of unwanted bycatch. Fishing gear researchers with the National Marine Fisheries Service (NMFS) have been working on this problem and have developed several gear modifications that effectively exclude parts of the bycatch. Fishery managers recently focused attention on reducing the number of juvenile red snapper (Lutjanus campechanus) caught in shrimp trawls. This species poses a particularly tough problem to resolve because of their small size and required that NMFS researchers study the behavior of juvenile snapper in order to develop techniques to exclude them from shrimp trawls. Development work is still in progress, but preliminary results from the latest testing are very encouraging with reduction rates exceeding 50 percent for juvenile red snapper and most other finfish in the bycatch.

Hook-and-Line Mortality of Red Snapper Around a High  
Profile Artificial Reef: Mobil Production  
Platform - West Cameron 352  
Jeffrey H. Render and Charles A. Wilson  
Coastal Fisheries Institute  
Louisiana State University  
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Due to concerns over the status of red snapper (Lutjanus Campechanus) in the Gulf of Mexico, size and bag limits were enacted for the recreational fishery. As a result of these restrictions, undersized red snapper (<13 in) are released and red snapper of any size are released after a bag limit of 7/person/day is reached.

Red snapper are physoclistus (i.e. closed air bladder system) therefore, understanding mortality rates of released red snapper is

critical to insure proper management. The goal of this study was to determine mortality rates of hook-and-line caught and released red snapper. The study was conducted on a Mobil platform approximately 90 km south of Cameron, Louisiana, in 20 m water depth. Red snapper were caught by hook-and-line, treated (control, air bladder deflation, tagged, and tagged and deflated), and released into vertical holding nets (8 meters deep) for varying lengths of time (24, 30, 36, and 48 hrs). Mortality rate by treatment was recorded at the conclusion of each experiment. Preliminary results indicate a mortality rate of 20% at 70 feet depth, with no significant differences between treatments, time in net, or season. There was a significant difference in mortality between seasons (Summer and Fall) with higher mortality occurring in all treatments during Fall.

Reproductive Biology of Red Drum and Black Drum in the Northern  
Gulf of Mexico: Methodology and Results  
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Louisiana State University  
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Our investigations of red drum and black drum reproductive biology have relied on histological examination of ovarian tissues to determine spawning season, age and size at maturity, spawning frequency, and batch fecundity of each species. Maximum proportions of vitellogenic and hydrated oocytes establish red drum spawning from August to October and black drum spawning from January to April. Fifty percent maturity is achieved at 720 mm FL, 4.2 kg TW, and 4 yr among female red drum; 680 mm, 4.3 kg, and 5 yr among female black drum. The presence of multiple oocyte maturity stages throughout the spawning seasons confirms multiple batch spawning in both species. Spawning frequency, estimated from the proportion of mature females with ovarian postovulatory follicles, exhibits annual variations of 5-12 d for red drum and 2-4 d for black drum. Gravimetric estimates of numbers of hydrated oocytes show both species to be exceptionally fecund. Seasonal mean estimates of batch fecundity range from 1.2 to 2.6 million ova per spawning for red drum and 1.2 to 1.7 million ova per spawning for black drum.

Red Drum Ichthyoplankton Dynamics and Recruitment Implications  
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Ichthyoplankton samples were collected off the LA-MS barrier islands on 23 sampling cruises taken each year during 1986-1990 from August to October, the red drum spawning season in the northern Gulf of Mexico. Collections made during the study provide information on red drum larvae and on the composition, abundance, and seasonality of ichthyoplankton captured during the late summer to early fall months.

A total of 731 surface tows were taken using a 60-cm bongo net yielding approximately 202,500 larval fish representing 41 families and 77 taxa. Engraulidae, Clupeidae, Carangidae, Sciaenidae, Gobiidae, and Cynoglossidae accounted for 79% to 97% of the overall densities (#larvae/100m<sup>3</sup>) over 5 years.

Temporally, species richness and abundance were higher during August and September than in October and November. Total densities were highest in 1989 and lowest in 1987. Collection of many small sized larvae indicated that these inner continental shelf waters were local spawning and nursery grounds. Surface densities were significantly greater at night for two species: Menticirrhus sp. and Brevoortia patronus, however overall larval fish densities were not significantly different due to diel period. Fish larvae were generally patchily distributed with most having Lloyd's index of patchiness (P) values greater than 1.0.

Tagging Dynamics and Fishery Exploitation of Aquaculturally

Reared Red Drum, Sciaenops cellatus, in Mississippi  
Coastal Waters

Michael J. Murphy, James W. Warren and Patricia A. Simm  
Mississippi State University  
Gulf Coast Research Lab and  
U.S. Naval Oceanographic Center

One thousand two hundred ninety one red drum reared at Mississippi State University Coastal Aquaculture Unit were tagged and released into Mississippi coastal waters in 1988 and 1990. The return rate for each year was 6.2% and 0.6% respectively. In comparison to wild drum tagged by Gulf Coast Research Lab during the same period, aquaculturally reared fish grew faster and remained at large longer, but were less likely to be caught by sport fishermen.

These results indicate that with refinements in techniques and handling procedures, release of large (250-300 mm) juvenile red drum appears to be a viable resource enhancement tool. Tag returns will continue to be monitored in the future, and additional fish will be released as they become available.

Big Girls and Little Boys: Some Life History Information on  
Southern Flounder in Louisiana

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The Southern Flounder, Paralichthys lethostigma, a lefteye flounder of the family Bothidae, is one of five members of the genus on the Gulf and Atlantic coasts of the United States. This species is a popular coastal sportfish and, in Louisiana, makes a small contribution to the commercial finfish harvest. There is considerable sexual dimorphism for body size, producing an interesting fishery statistic of both recreational and commercial catch being predominately female. preliminary data show males rarely reaching 1 kilogram and a maximum age of 2 to 3 years; females grow to about 6 kilograms and 5 to 6 years of age. These ages are, at present, invalidated. Data on very large females are scarce. Comparison with published data from Texas flounders show similar length-weight curves for the two areas. The dimorphism in body size results from significant differences in both length-at-age and weight-at-age for southern flounder males and females. Maturity information is incomplete, but some males have developed testes at age 1, while most females are not mature until age 2 or sometimes three. Maximum ovary development is found in mid-December accompanied by offshore movements to spawn. Hydrated females have been taken in the shrimp trawl by-catch in the West Delta area of the Gulf of Mexico. It is interesting to note that some large (over 400 mm SL) Louisiana Southern Flounder are unusual wide-bodied, approaching P. squamilentus, the Broad Flounder, in body depth. Fin ray and gill raker counts distinguish the two species.

Use of Floodplain Habitats by Larval Fishes.

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The University of Mississippi

and

Joel C. Trexler and Thomas F. Turner

Florida International University

We conducted a sampling study to compare the use and abundance of larval fishes in three types of floodplain habitats at the Tallahatchie River, Mississippi. Three characteristic ephemeral floodplain habitats (flooded forests, flooded agricultural fields, and permanent backwater channels) were sampled extensively with light traps during the peak of larval fish abundance in the spring, 1991. The abundance of four major taxa, Dorosoma spp., Cyprinus carpio, Ictiobus spp., and Lepomis spp. contributed to over 85 percent of the overall catch of 5965 specimens. The abundance and diversity of these major taxa in all habitats were compared with MANOVA. Fish abundances in the field habitats were consistently highest, while fish abundances in the forest habitat exceeded that in the channel at only one site. Further, though the sites were closely associated, there were significant differences in site use by larval fishes. On a temporal scale, the abundance of larval fishes decreased consistently for all taxa except Lepomis spp. The flow rates and the temperature regime did not differ among sites. Larval fish abundances within and among specific floodplain habitats displayed consistent variability.

Temporal Habitat Use by an Assemblage of Demersal Fishes  
in the Yazoo River System

K. Jack Killgore and Jan Jeffrey Hoover

U.S. Army Engineer Waterways Experiment Station

Fishes were sampled with hoop nets in the Yazoo River system to determine seasonal habitat use by commercial and sport fishes. A total of 989 hoop nets were fished from fall 1989 through summer 1991 at six different locations. At each hoop net, distance from shore, water depth, water velocity 0.3 m above stream bottom, and type of instream cover were recorded. Seven species of fish accounted for approximately 80% of the total individuals and biomass collected in hoop nets; in decreasing order of abundance they were flathead catfish, blue catfish, channel catfish, smallmouth buffalo, freshwater drum, longnose gar, and common carp. Fish size did not vary substantially among seasons and mean length of most species was greater than 400 mm. The seven common fish species were usually found 3 to 6 m from the shoreline, in depths ranging from 3 to 5 m, and in velocities from 27 to 50 cm/sec in the spring and summer. However, as water temperatures declined in the fall/winter, fishes (particularly the flathead catfish) were found closer to shore in low velocity areas. Utilization of cover

varied by season, but except for catfishes, most species did not show a strong affinity for instream structure. Catfishes associated with wooded banks more in the summer than in other seasons. Revetted banks and sandbars were used by all species during the study.

Development of a Large-Scale Fish Habitat Enhancement Project  
in Bull Shoals and Norfolk Lakes, Arkansas.  
Mark Oliver and Tom Burnett, Fisheries Biologists  
Arkansas Game and Fish Commission

Norfolk and Bull Shoals Reservoirs in north central Arkansas are old U.S. Army Corps of Engineers hydropower and flood control projects. Because of age and construction practices, large woody cover is virtually nonexistent in these lakes. The absence of woody cover and other factors often result in poor fishing conditions after lake stratification in late spring. Aquatic vegetation is limited by severely fluctuating lake levels. A large-scale fish habitat enhancement project was initiated on these lakes in May 1987. Approximately 500 fish attractors composed of 60 to 150 trees, ranging in size from 8 to 40 cm in diameter, have been installed in these lakes and the development stage of the project is 80 percent complete. The trees are cut from the lake shoreline near the fish attractor site according to Corps of Engineers guidelines. A maintenance program, involving the addition of fresh cover to sites on a rotating basis is in place on Norfolk Lake. This federal aid-supported program (Sportfish Restoration Act) has cost approximately \$150,000 to implement to date. Almost the entire local match has been generated by monetary donations. A long-term assessment plan has been developed but only recently begun. Fisherman reports and scuba observation have indicated that the program has been successful in concentrating sportfish. Funding, methods, materials, and evaluation plans are described.

Assessment of Effects of Gravel Mining on Stream Communities  
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and  
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This study was designed to measure potential impacts of gravel mining on stream communities. All mining activities from September 1989 to August 1991 in perennial areas of three stream drainages (Illinois and Kings rivers, and Crooked Creek) have been mapped. Gravel removed from within stream beds or from point bars change the hydrology of the stream. These changes influence flow, substrate type, and abiotic factors. In this study we measured stream width, depth, pool/riffle ratios, substrate type, available habitat, organic/inorganic ratios, and canopy cover at locations above (reference site [C]), on (disturbance site [DS]) and below (downstream site [DW]) mining sites in the three river drainages. We also measured width and depths in 10 extensive sites in the three rivers. Most field collections and measurements have been taken and data analysis is in progress. All fish collected have been identified, weighed, and measured and 166 benthic samples have been sorted, identified, and weighed. Fish and invertebrate species assemblages will be compounded and separately correlated with the coexisting abiotic conditions. Trends observed indicate a change in the trophic structure of fish communities. In the intensive site riffles of Crooked Creek there was a loss in numbers of silt sensitive species from the upstream reference to the disturbance and/or downstream sites (i.e., Notropis boops C=9, DS=3, DW=0, N. nubilus C=104, DS=20, DW=101. N. rubellus C=79, DS=18, DW=19, Etheostoma blennioides C=48, DS=4, DW=52). Kings River intensive site riffles showed similar patterns (i.e., N. nubilus C=103, DS=25, DW=0, N. rubellus C=71, DS=0, DW=0, E. blennioides C=32, DS=11, DW=21, Micropterus dolomieu C=11, DS=7, DW=0). Percent game fish (GF) were higher in the control pool of the Kings River and lowest in the disturbance pool (i.e., C=30%, DS=13%, DW=26%). The mean weight (MW) of GF are also larger in the reference pool (i.e., C=44 g, DS=25 g, DW=16 g). Similar trends were observed in Crooked Creek (i.e., C=42% GF with MW=71 g, DS=37% GF with MW=40 g, DW=65% GF with MW=49 g).

Status of Aquatic Endangered Species in Arkansas and  
Potential Threats to Continued Existence

Rex Roberg

Arkansas Game and Fish Commission

Little Rock, AR

Population status, current studies and threats to continued existence are discussed as pertains to six mussels, one crayfish and three fish listed as federally endangered in Arkansas. Aquatic species listed as "special concern" in the state are identified, and those in greatest need of further study are discussed in greater depth.

Proposal for a Non-traditional Master of Science Degree in  
Fisheries and Wildlife Biology.

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Fisheries and Wildlife Program

Arkansas Tech University

Russellville, AR 72801

The M.S. degree has recently become an educational requirement for employment and advancement of biologists and resource managers. Unfortunately, many professionals in these fields do not have M.S. degrees and cannot fit traditional class meeting times into their working schedules. We are assessing the need for a non-traditional graduate program leading to the Master of Science degree in Fisheries and Wildlife Biology. We could offer most courses as three consecutive 50-minute periods and would meet one night each week or on the weekend. Three seminar credits and 3 courses will be required (tentatively, Biometrics and Population Ecology, Biostatistics and Experimental Design, and Environmental Law). The remainder of the curriculum would be determined by the graduate committee based on one's goals and experiences. A student completing one course each semester and attending fall, spring, and summer semesters would finish 24 hours in less than 3 years. Up to 6 additional credit hours could be associated with thesis preparation. Because this program will be geared toward professionals, we anticipate that thesis research would be applied to questions pertinent to a student's area of employment. We also expect that most data will be collected on-the-job. At the meeting we will outline the program in detail, distribute a written survey, and solicit oral comments on the implementation and need for such a program.