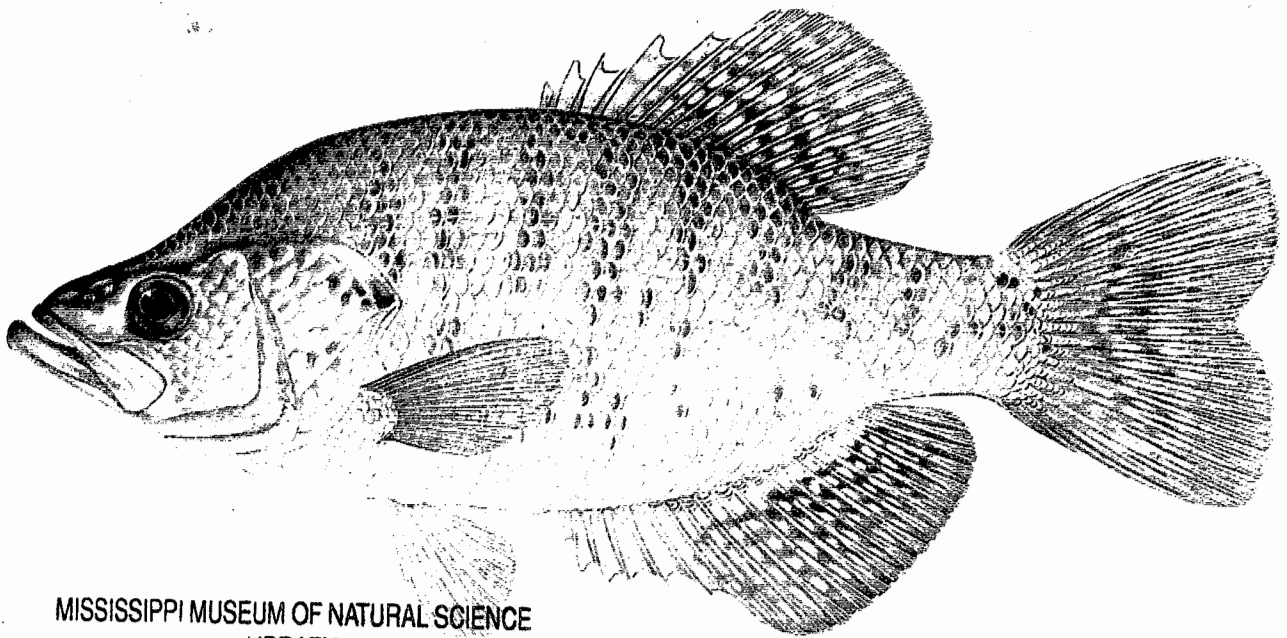

*Meeting of the American Fisheries
Society, Mississippi Chapter*



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*Mississippi State University
3-5 February, 1999*

PROGRAM AND ABSTRACTS

**1999 Meeting of the American Fisheries
Society, Mississippi Chapter
Mississippi State University
3-5 February, 1999**



Eric Dibble, *President*

Glenn Parsons, *President Elect*

Larry Bull and Dennis Reicke, *Secretary Treasurer*

Michael Eggleton and Sherry Harrell, *Newsletter Editors*

Local Committee and Registration:

Eric Dibble, *Mississippi State University*

Glenn Parsons, *University of Mississippi*

Student Fisheries Club, *Mississippi State University*

Biology Students, *University of Mississippi*

Student Awards:

Mick Porter, *Mississippi Valley State*

MEETING AGENDA

(slide, overhead, and computer projectors will be available at Tully Auditorium)

Wednesday, 3 February.

5:30-8:00 PM, **Registration at the Starkville Holiday Inn**
6:30 PM **Social at the Starkville Holiday Inn.**

Thursday, 4 February.

7:30-8:00 AM **Registration in the Tully Auditorium of Thompson Hall,**
 MSU, College of Forestry

8:00-8:15 AM **WELCOME ADDRESS BY DR. WARREN THOMPSON,**
 Dean of Mississippi State University College of Forestry

FISH ECOLOGY SYMPOSIUM (Tully Auditorium)

MODERATOR, ANGIE HAGGARD, *Student - University of Mississippi*

(*indicates participation in the best student paper competition)

8:15-8:30 **POPULATION RESPONSE OF TRIPLOID GRASS CARP TO DECLINING
LEVELS OF HYDRILLA IN THE SANTEE COOPER RESERVOIRS,
SOUTH CAROLINA. James P. Kirk, J. V. Morrow, Jr., K. J. Killgore, S. J.
de Kozlowski, and J. W. Preacher**

8:30-8:45 **ESTUARINE ARTIFICIAL REEFS TO ENHANCE SEAGRASS PLANTING
AND PROVIDE FISH HABITAT. Ryan J. Heise* and Stephen A. Bortone.**

8:45-9:00 **EVALUATION OF THE ECOLOGICAL ASSESSMENT OF GRASS CARP
IMPACTS ON AQUATIC COMMUNITIES. Eric D. Dibble.**

9:00-9:15 **THE DETERMINISTIC NATURE OF COLONIZATION AND EXTINCTION
PROCESSES IN OUACHITA MOUNTAIN STREAM FISHES. Christopher
M. Taylor and Melvin L. Warren, Jr.**

9:15-9:30 **ENVIRONMENTAL VARIABILITY, HISTORICAL CONTINGENCY, AND
THE STRUCTURE OF REGIONAL FISH AND MACROINVERTEBRATE
ASSEMBLAGES IN TIMBER MANAGED, OUACHITA MOUNTAIN
STREAM SYSTEMS. Lance R. Williams*, Christopher M. Taylor, Melvin L.
Warren, Jr., and J. Alan Clingenpeel.**

9:30-9:45

EFFECT OF ENDURANCE TRAINING ON SWIMMING PERFORMANCE AND HEMATOLOGICAL CHARACTERISTICS IN THE GRASS CARP (*Ctenopharyngodon idella*). Dalma Martinovic* and Glenn Parsons.

9:45-10:00

FISH ASSEMBLAGES IN FOUR STREAMS OF THE IGUAÇU RIVER BASIN, BRAZIL. Luiz Carlos Gomes*, Angelo Antonio Agostinho, and Luis Mauricio Bini.

10:00-10:15 **COFFEE BREAK**

MODERATOR, ERIC HOFFMAYER, *Student -University of Mississippi*

10:15-10:30

STOCK DYNAMICS OF THE BLUE SUCKER (*Cyprinus elongatus*) IN THE PRINCIPLE TRIBUTARIES OF THE YAZOO RIVER, MISSISSIPPI. G. Robert Hand* and Donald C. Jackson.

10:30-10:45

EFFECT OF STREAM GEOMORPHOLOGY ON PREDATOR ABUNDANCE AND COMMUNITY STRUCTURE. Eric D. Dibble, Sherry L. Harrel, and Erin Forrester.

10:45-11:00

THE "FLOOD-PULSE" CONCEPT IN LARGE TEMPERATE RIVERS: MODIFYING A PARADIGM. Michael A. Eggleton* and H.L. Schramm, Jr.

11:00-11:15

ASSESSMENT OF LOWER MISSISSIPPI RIVER FISH COMMUNITIES USING A MULTIVARIATE ORDINATION TECHNIQUE. Michael A. Eggleton*, H.L. Schramm, Jr., and C.M. Taylor.

11:15-11:30

A MULTI-SAMPLING APPROACH TO ASSESS STRIPED BASS (*Morone saxatilis*) POPULATIONS AND POTENTIAL THERMAL REFUGIA IN A PASCAGOULA RIVER TRIBUTARY, BLACK CREEK, MISSISSIPPI. Sherry L. Harrel* and Eric D. Dibble.

11:30-1:00 **LUNCH**

FISHERIES MANAGEMENT SYMPOSIUM (Tully Auditorium)

MODERATOR, T. O. Smith, *Fisheries Club President, Student -Mississippi State University*

1:00-1:15

USING ANGLER SURVEYS TO PREDICT ANGLER REACTIONS TO PROPOSED FISHERIES MANAGEMENT ACTIONS. Timothy O. Smith* and Harold L. Schramm, Jr.,

1:15-1:30

ENVIRONMENTAL FACTORS AFFECTING CROAKER ABUNDANCE IN THE NORTHERN GULF OF MEXICO. Craig A. Walker*, Robert Hand, and John R. Davis.

1:30-1:45

PERSPECTIVES FOR THE PASCAGOULA RIVER STRIPED BASS FISHERY. John F. Mareska* and Donald C. Jackson.

1:45-2:00

STOCK RESPONSES BY SUB-ADULT CATFISHES TO PHYSICAL INSTREAM HABITATS IN THE YALOBUSHA RIVER, MISSISSIPPI. Craig A. Chisam* and Donald C. Jackson.

2:00-2:15

ABIOTIC AND BIOTIC FACTORS EXPLAINING LARVAL FISH COMMUNITY COMPOSITION AT ALICEVILLE LAKE, ALABAMA-MISSISSIPPI. Orlando Jose Ferrer Montano*, and Eric D. Dibble.

2:15-2:30

DEVELOPMENT AND CURRENT STATUS OF THE LEGISLATIVE INITIATIVE TO ESTABLISH A NATURAL AND SCENIC WATERWAYS SYSTEM FOR MISSISSIPPI. Donald C. Jackson and Bill Quisenberry.

2:30-2:45

EXPLORING COMPETITION BETWEEN STRIPED BASS AND SELECTED PREDATORY FISHES IN NORRIS RESERVOIR: INTERSPECIFIC PREDATION. S.W. Raborn*, L.E. Miranda, and M.T. Driscoll.

2:45-3:00

EXPLORING COMPETITION BETWEEN STRIPED BASS AND SELECTED PREDATORY FISHES IN NORRIS RESERVOIR: PREY SUPPLY AND PREDATOR DEMAND. S.W. Raborn*, L.E. Miranda, and M.T. Driscoll,

3:00-3:15

PROGRESS REPORT: IDENTIFICATION AND CHARACTERIZATION OF SHARK NURSERY GROUNDS IN THE NORTHERN GULF OF MEXICO. Glenn R. Parsons.

3:15-3:30

RANGE EXTENSIONS FOR SEVERAL SPECIES OF SHARKS FROM NMFS LONGLINE SURVEY DATA. Lisa M. Jones*

3:30-3:45

PRELIMINARY DETERMINATION OF FACTORS INFLUENCING AQUATIC BIOLOGICAL COMMUNITIES IN THE MISSISSIPPI EMBAYMENT. Billy G. Justus and Barbara A. Kleiss

3:45-4:00

LARGEMOUTH BASS VIRUS IS ASSOCIATED WITH ADULT LARGEMOUTH BASS DEATHS IN MISSISSIPPI. Larry Hanson, Keith Meals, Mary Rudis, and Lora Petrie-Hanson.

AQUACULTURE SYMPOSIUM (Tully Auditorium)

MODERATOR, Dr. ANITA KELLY, *Aquaculture - Mississippi State University*

- 4:00-4:15 **EVALUATION OF A REDUCTION OF DIETARY MENHADEN FISH MEAL IN PRODUCTION DIETS AND FEEDING FREQUENCY FOR PHASE III HYBRID STRIPED BASS (STRIPED BASS MALE X WHITE BASS FEMALE). Louis R. D'Abramo, Cortney L. Ohs, John B. Taylor**
- 4:15-4:30 **ADVANCING CONTROLLED REPRODUCTION IN TILAPIA, Mark Owusu-Frimpong and John A. Hargreaves**
- 4:30-4:45 **AN EVALUATION OF SEINING VERSUS TRAP HARVEST AT DIFFERENT TEMPERATURES AND DIFFERENT TRAPPING EFFORTS IN NON-FORAGE BASED CRAWFISH *Procambarus clarkii* PRODUCTION PONDS. Louis R. D'Abramo, Kathleen C. Elgarico, and Cortney L. Ohs,**
- 4:45-5:00 **EVALUATION AND DEVELOPMENT OF A NUTRITIONALLY COMPLETE EGG ALBUMIN BASED MICROPARTICULATE DIET FOR THE CULTURE OF FISH AND CRUSTACEAN LARVAE. Louis R. D'Abramo, Wan Han Jun, Cortney L. Ohs**
- 5:00-5:15 **THE CULTURE OF CRAPPIE: POSSIBILITIES AS A FOOD FISH INDUSTRY. Jason E. Yarbrough, John A. Hargreaves, Anita M. Kelly, and John Barry Taylor,**
- 5:15-5:30 **INFLUENCES ON DAILY FLUCTUATIONS IN FEEDING ACTIVITY OF POND-RAISED CHANNEL CATFISH. John Barry Taylor, John Hargreaves, Craig Tucker, and Sue Kingsbury**
- 5:30 **Meeting adjourned.**
- 6:30-7:00 **SOCIAL, DINNER AND MUSIC AT OBY'S RESTAURANT**

Friday, 5 February

**8:30 -10:30 AM Mississippi Chapter Business Meeting (Tully Auditorium)
& Presentation of Student Awards**

ABSTRACTS

(In order of appearance)

SYMPOSIUM: Fish Ecology

POPULATION RESPONSE OF TRIPLOID GRASS CARP TO DECLINING LEVELS OF HYDRILLA IN THE SANTEE COOPER RESERVOIRS, SOUTH CAROLINA. James P. Kirk¹, J. V. Morrow, Jr.¹, K. J. Killgore¹, S. J. de Kozłowski², and J. W. Preacher³ ¹ Waterways Experiment Station, ² South Carolina Department of Natural Resources, and ³ U. S Army Corps of Engineers, Charleston District

Approximately 768,500 triploid grass carp (*Ctenopharyngodon idella* Valenciennes) were stocked into the Santee Cooper reservoirs, South Carolina between 1989 and 1996 to control hydrilla (*Hydrilla verticillata* Royale). Hydrilla coverage was reduced from a high of 17,272 ha during 1994 to about 250 ha in 1997. In 1997, we collected 100 triploid grass carp for population monitoring. Age-specific weights ranged from 0.327 kg to 16.448 kg for ages 1 through 9. The weight (W, g) to total length (TL, mm) relation was $W = 0.0000054(TL)^{3.131}$. A von Bertalanffy growth equation was fitted to describe the relation between total length (TL) and age (t, years): $TL_t = 1,101(1 - e^{-0.359(t - 0.00646)})$. Growth in weight was less than reported in 1994 and similar or slightly faster than triploid grass carp in Lake Guntersville, Alabama. The annual mortality increased from about 22% in 1994 to 28% in 1997. We expect this trend of increased mortality and decreased growth to continue as long as hydrilla coverage remains sparse. During 1999, we estimated 79,300 remaining triploid grass carp weighing about 839,000 kg. Population models indicate a substantial decline in total population to less than 8,000 fish by year 2004, assuming no future stockings.

ESTUARINE ARTIFICIAL REEFS TO ENHANCE SEAGRASS PLANTING AND PROVIDE FISH HABITAT. Ryan J. Heise^{1*} and Stephen A. Bortone². Biology Department, University of West Florida. Current affiliation: Department of Biological Sciences, University of Southern Mississippi¹, Florida Center for Environmental Studies².

Small, 25 m², artificial reef sets were deployed 1 m deep in Choctawhatchee Bay, Florida to determine the ability of reefs to aid in the establishment of newly planted *Ruppia maritima* (widgeon grass) while providing habitat for estuarine fishes. Seagrass survival and coverage were examined for reef configurations and compared to control plots. Visual surveys conducted from June 1996 to May 1997 indicated that the artificial reefs had no effect on the survivorship or growth of the planted *R. maritima*. The artificial reefs attracted juvenile and young-adult fishes, and had more species, higher diversity, more individuals, and greater total biomass of fishes per area than did the non-reef controls. The 22 fish species observed at the reefs were typical estuarine residents in the area. Young gray snapper, *Lutjanus griseus* (a recreationally and commercially important species) was abundant at the reefs. Although the artificial reefs did not increase seagrass planting success, these artificial reefs may increase the number of fishes surviving to adulthood by providing protective habitat.

*Student Presentation

EVALUATION OF THE ECOLOGICAL ASSESSMENT OF GRASS CARP IMPACTS ON AQUATIC COMMUNITIES. Eric D. Dibble. Department of Wildlife and Fisheries, Mississippi State University.

A comprehensive review of literature on grass carp research was conducted, and current ecological theory synthesized to assess the ability of the available data to validate ecology of grass carp impacts on freshwater communities. The objective was to evaluate availability of ecological data in previous research on grass carp that attempts to validate community impacts. An attempt to uncover all studies published in both primary and grey literature, and studies unpublished, i.e., government reports, technical bulletins, and conferences was made. Approximately 25 years of literature were searched, from the early to mid 70's to the most current. Most (95%) of the research reviewed emphasized structural response variables, rather than dynamic processes within the community; no investigations directly measured impacts on multi-species interactions or behavior of individual organisms. The two most commonly measured response variables to grass carp impacts were aquatic plant abundances and water quality parameters. Most investigations measured the direct impacts of grass carp, and very few data were available to quantify indirect impacts grass carp have on the community, < 2% of all studies reviewed attempted to validate causal mechanisms for these indirect impacts. Large system scaled investigation (>10 h) was most prevalent, representing > 35% of the studies, and > 35% of the studies were conducted within 2-3 yrs. Previous studies emphasized impacts by adult grass carp and neglecting younger life stages; < 3% of these investigations mentioned post-larval stages, and no data were available on potential impacts of early life stages. This evaluation concludes that ecological data gathered from previous grass carp studies are limited, and to thoroughly evaluate the environmental impacts of grass carp on freshwater communities, future emphasis is needed on investigating hypotheses deduced from ecological theory.

THE DETERMINISTIC NATURE OF COLONIZATION AND EXTINCTION PROCESSES IN OUACHITA MOUNTAIN STREAM FISHES. Christopher M. Taylor¹ and Melvin L. Warren, Jr.²

¹ Dept. of Biological Sciences, Mississippi State University, Mississippi State, MS 39762

² U.S.D.A. Forest Service, Southern Research Station, Forest Hydrology Lab, 1000 Front St, Oxford, MS 38655

We sampled fishes and stream habitat at 12 localities for two years (96 samples) to examine the deterministic nature of colonization and extinction processes in stream fish assemblages. Do species come and go randomly or is there a structured pattern to local colonization and extinction? The formation of nested species subsets is one type of structure that may be exhibited by communities. This pattern may result from two non-random processes: selective extinction, or differential colonization abilities. Significant nested subset patterns in species composition occurred over time for seven of the 12 localities. The strength of the nesting was predictable from mean extinction and colonization rates. Higher extinction rates were associated with stronger nestedness, whereas higher colonization rates corresponded to weaker nestedness. The extinction process in local assemblages can be a highly ordered event, but colonization appears to be more stochastic.

*Are the colonization & extinction processes random or structured?
Nested subset pattern = successivity*

*At high extinction rates (> colonization rates) - high nestedness.
When colonization rates are high immigration was a crap shoot
not pattern at all.*

ENVIRONMENTAL VARIABILITY, HISTORICAL CONTINGENCY, AND THE STRUCTURE OF REGIONAL FISH AND MACROINVERTEBRATE ASSEMBLAGES IN TIMBER MANAGED, OUACHITA MOUNTAIN STREAM SYSTEMS. Lance R.

Williams^{1*}, Christopher M. Taylor¹, Melvin L. Warren, Jr.², and J. Alan Clingenpeel³.

¹Department of Biological Sciences, Mississippi State University, P.O. Drawer GY, Mississippi State, MS 39762. ²USDA Forest Service, Southern Research Station, 1000 Front Street, Oxford, MS 38655. ³USDA Forest Service, Ouachita National Forest, Box 1270, Federal Building, Hot Springs, AR 71902.

In 1990-1992, the USDA Forest Service conducted Basin Area Stream Surveys (BASS) in six hydrologically variable Ouachita Mountain streams, paired by management regime within three different watersheds. Fishes, macroinvertebrates, and stream habitat characteristics were collected for each stream. We used canonical correspondence analysis and variance partitioning techniques to determine how much variability in the biota could be explained by timber harvesting or stream habitat characteristics. Most of the biotic variability in these stream systems was explained by stream habitat characteristics. Because fishes are constrained to their historically defined drainage basins and insects are free to cross basin barriers, we anticipated that both groups would respond differently to the measured environmental variables. Fish assemblages were influenced more by spatially structured habitat features (i.e., environmental variability associated with individual drainage basins). Macroinvertebrate assemblages were more strongly associated with environmental variability that was independent of drainage basin. Overall, these assemblages were influenced by a combination of contemporary and historically influenced habitat parameters.

*** Student Presentation**

EFFECT OF ENDURANCE TRAINING ON SWIMMING PERFORMANCE AND HEMATOLOGICAL CHARACTERISTICS IN THE GRASS CARP (*Ctenopharyngodon idella*). Dalma Martinovic* and Glenn Parsons. Department of Biology, University of Mississippi.

Juvenile grass carp were subjected to endurance training for 90-120 days. Critical swimming speed was 27% higher in the trained individuals and the total cost of transport at the highest speeds was half that of untrained individuals. Lactate concentration reached a peak and recovered to pre-exercise levels faster in trained grass carp. No significant difference was found in hematocrit, total Hb and oxygen bound to Hb among trained and untrained fish. Also, there was no difference in the abundance and number of hemoglobin polymorphs as detected by cellulose acetate electrophoresis. Although thought to be hard to train in the classical sense, we have shown that grass carp were responsive to endurance training. Most of the adaptational changes we measured were related to anaerobic metabolism rather than to improving aerobic capacity by ensuring better oxygen delivery. The metabolic rate did not show the usual exponential increase with speed and we suggest it is the result of the anaerobic contribution to the swimming. These results suggest that critical swimming speed tests may not be considered to be mainly aerobic and that cost of transport should be interpreted with caution in this species and perhaps others in the family *Cyprinidae*.

***Student presentation**

FISH ASSEMBLAGES IN FOUR STREAMS OF THE IGUAÇU RIVER BASIN, BRAZIL.
Luiz Carlos Gomes*^{1,2}, Angelo Antonio Agostinho², and Luis Mauricio Bini². ¹ Mississippi Cooperative Fish and Wildlife Research Unit, Mississippi State University. ² Universidade Estadual de Maringá, DBI - Nupelia. Maringá, Paraná, Brazil.

Fish assemblages in streams have not received attention in Brazil. Studies in streams started in mid 80's, and most of the fish fauna in these systems remains unknown. Four tributaries of Iguaçú River (a left tributary of Paraná River) were sampled every three months from June 1993 to March 1995 with electrofishing. The purposes were to investigate species composition, the influence of regional processes, and influence of abiotic characteristics on fish assemblages structure. During the studied period, 35 species were registered. About 80% of the species were exclusive for Iguaçú River basin. Two genus and some species did not fit in the existing identification keys, and maybe new findings. Correlation was used to assess potential relationships between species data (reduced dimensionality by DCA) and abiotic characteristics (reduced dimensionality by PCA). Axis 1 of the DCA was positive correlated with axis 1 of the PCA applied on the habitat structure data (width, depth, hiding places, velocity, and vegetation). No relationship was observed between axis 1 of the DCA and the axes of the PCA applied on limnological characteristics data (temperature, oxygen, pH, conductivity, and water level). The high endemism observed in that region is determined by regional process (presence of waterfalls), that isolates the fish fauna from that of Paraná River. Habitat structure was an important factor in determining fish assemblages structure, in the four studied streams.

* Student presentation.

STOCK DYNAMICS OF THE BLUE SUCKER (*Cycleptus elongatus*) IN THE PRINCIPLE TRIBUTARIES OF THE YAZOO RIVER, MISSISSIPPI. G. Robert Hand* and Donald C. Jackson. Department of Wildlife and Fisheries, Mississippi State University, Box 9690 Mississippi State, Mississippi 39762.

The blue sucker, a rare species whose home range and numbers have declined steadily since the early 1900's, was studied in the upper Yazoo River basin to determine stock characteristics and relationships between catch rates and habitat characteristics. The Yazoo River, one of the few remaining large tributaries of the lower Mississippi River without obstructive dams, is likely an important spawning and rearing area for many riverine fish including the blue sucker. During ten years (1988, 1990-1998) of sampling, 4093 hoop-nets were set over 468 sampling days. This resulted in the capture of 264 blue suckers. There were no significant differences in catch per unit effort (CPUE, fish/hoopnet-night) between upstream and downstream sections of the rivers or between winter and summer sampling seasons. CPUE has declined steadily in the Yalobusha River, the downstream section of which was dredged beginning in 1988 and completed in 1994. However, the overall CPUE of the other tributaries increased slightly. Common carp (*Cyprinus carpio*) CPUE has also increased. Carp prefer the type of habitat found in modified rivers and have been found to dominate channelized rivers. This river system contains a relict population of blue suckers threatened by habitat changes detrimental to their reproduction and survival.

*Student Presentation

Management recommendations - need more natural flow regimes especially in Yazoo - gravel beds for spawning in upper river.

EFFECT OF STREAM GEOMORPHOLOGY ON PREDATOR ABUNDANCE AND COMMUNITY STRUCTURE. Eric D. Dibble, Sherry L. Harrel, and Erin Forrester. Department of Wildlife and Fisheries, Mississippi State University, MS. 39762.

Geomorphology of streams can influence fish distribution by limiting passage, and changes in abundance of predatory fishes can alter community structure in aquatic systems. We collected the first aquatic data on Mint Springs at Vicksburg National Military Park, and measured for differential impacts fish predators have on the aquatic community. Difference in predator abundance was noted below and above a rock outcrop in the stream and we investigated for top-down effects on the diversity and habitat selection by the stream fishes. We measured predator abundances, invertebrate and smaller fish species abundance, and calculate diversity for above and below the rock outcrop barrier in Mint Springs. Habitat availability and fish distribution was measured to calculate habitat selectivity. Diversity of invertebrates varied between the upper and lower reaches. Fish species diversity and abundance of predatory fishes in the creek were low above the outcrop and significantly higher in the lower reach below. In addition, the dominant fish species (Fathead Minnow, *Pimephales promelas*) appeared to be less specialized relative to habitat use in the upper reach and more of a habitat specialist in the lower reach. Mint Springs provided a natural experiment to investigate predator impacts on stream community, and our data suggested that top-down effects were influencing the community structure. A future predator manipulation is planned to investigate and possibly reject alternative hypotheses presented here.

THE "FLOOD-PULSE" CONCEPT IN LARGE TEMPERATE RIVERS: MODIFYING A PARADIGM. Michael A. Eggleton^{1*} and H.L. Schramm, Jr.². 1 Mississippi State University, Department of Wildlife and Fisheries, Mail Stop 9690, MSU, 39762. 2 Mississippi Cooperative Fish and Wildlife Research Unit, Mail Stop 9691, MSU 39762.

The River Continuum Concept (RCC) of the late 1970's has become widely accepted as a conceptual framework for stream ecosystem processes. However, research in tropical rivers and highly regulated temperate rivers has demonstrated the integral role of seasonal floodplain inundation on the production ecology of riverine fishes. Hence, the "flood pulse" concept adds a lateral dimension to the RCC by emphasizing the importance of floodplains to fisheries production in large unregulated rivers. Unlike tropical rivers, which may flood 4-8 months annually, most large free-flowing temperate rivers such as the Lower Mississippi River are characterized by seasonal climates and at least moderate levels of regulation (levees, dikes) which modify thermal regimes, restrict and control annual flooding duration, and may reduce use of floodplain resources by fishes. Although research in the tropics strongly demonstrates a high dependence of fisheries on seasonal flooding, production ecology of fishes in temperate rivers is mostly unknown. Utilization of floodplain resources by riverine fishes in these systems has been little studied, thus the "ecological benefit" afforded fishes by access to these areas is largely speculative except at local scales in a limited number of studies. Temperate river floodplains may function much differently ecologically than those in tropical rivers, and thus, application of "flood pulse" mechanisms may be misguided without modification or qualification owing to differing physical characteristics as compared to tropical rivers.

*Student presentation

Utilization of Floodplain vs dependence
on floodplain.

ASSESSMENT OF LOWER MISSISSIPPI RIVER FISH COMMUNITIES USING A MULTIVARIATE ORDINATION TECHNIQUE. Michael A. Eggleton^{1*}, H.L. Schramm, Jr.², and C.M. Taylor³. 1 Mississippi State University, Department of Wildlife and Fisheries, Mail Stop 9690, MSU, 39762. 2 Mississippi Cooperative Fish and Wildlife Research Unit, Mail Stop 9691, MSU 39762, 3 Mississippi State University, Department of Biological Sciences, Box 9536, MSU, MS 39762.

Fish communities in the Lower Mississippi River (LMR) are extremely dynamic due, in part, to the highly variable nature of the river environment. This is evidenced in that during 150 years of river regulation, relatively few species extinctions have occurred in the river proper. However, due to the high levels of habitat heterogeneity, fish distributions are extremely patchy in most habitats and estimates of catch-per-unit-effort (CPUE) are usually imprecise given reasonable sampling effort. As a result, standard statistical designs such as analyses of variance (ANOVAs) are usually hindered by factor interaction at some level and low statistical power when using CPUE data. Multivariate ordination techniques have become increasingly used by ecologists since modern computers are now better able to process large multi-dimensional datasets and quickly perform complex matrix algebra computations. Two common multivariate methods were employed on LMR fish community data - one for exploratory analysis and the other for hypothesis testing. Canonical correspondence analysis (CCA) used on one year of LMR data suggested that fish communities were structured primarily around three environmental gradients - current velocity and river kilometer (CCA axes 1 and 2), and mean depth (CCA axis 2). Although CCA axes 1 and 2 together explained only 20% of the variation in fish communities, only six environmental variables were used in the CCA and ANOVA-type designs did not clearly depict this structuring. A further application was to assess the effectiveness of underwater weirs constructed at one LMR location to reduce sediment accretion in a particular bendway as compared to a reference bendway. Detrended correspondence analysis (DCA) indicated that through 4 years of data collection (1 yr pre-construction, 3-yrs post-construction), fish communities shifted along a suspected velocity gradient at the manipulated bendway while no similar shift was observed at the reference location. Community shifts were driven primarily by decreasing abundances of gizzard shad, threadfin shad, and white bass over time concomitant with increasing abundances of flathead and blue catfishes, common carp, river carpsucker, and freshwater drum. ANOVA designs with these data have typically been confounded with factor interaction and conclusions with regard to manipulation effects have been largely speculative. Multivariate ordination techniques such as these show promise as an effective tool in assessing communities responding to several environmental gradients simultaneously - as is the case with most biological systems.

***Student presentation**

**A MULTI-SAMPLING APPROACH TO STRIPED BASS (*Morone saxatilis*) POPULATIONS AND POTENTIAL THERMAL REFUGIA IN A PASCAGOULA RIVER TRIBUTARY, BLACK CREEK, MISSISSIPPI. Sherry L. Harrel* and Eric D. Dibble
Department of Wildlife and Fisheries, Mississippi State University, Box 9690, Mississippi State, Mississippi 39762.**

Striped bass *Morone saxatilis* populations have declined in coastal river systems of the Gulf of Mexico. Timing and location of striped bass spawning is correlated with temperature (19-24°C), flow, and salinity (< 9ppt). After spawning, striped bass may remain in fresh water, seeking cool water refugia (<27°C) with sufficient dissolved oxygen. The location, characterization, and protection of critical spawning habitat, nursery grounds, and summer refugia for striped bass in coastal river ecosystems are essential to the recovery and management of this anadromous species. Investigations into potential spawning and thermal refuge habitat have been ongoing in the Pascagoula River and its tributaries. Adult bass have been previously captured in Black Creek, a tributary of the Pascagoula River located in Southeast Mississippi. Few data are available on the status of striped bass populations in Black Creek. Our objectives were to investigate availability of habitat in Black Creek and use multi-sampling methods such as beach seines, gill nets, drift nets, and hand seines to target adults, juveniles, larvae and pre-larvae. These samples were conducted at 55 sites along a 30-35 mi reach during May 1998 - October 1998. Potential summer refugia was identified in late spring and summer (May-July) with temperatures ranging from 24-31.5 °C. Our sampling efforts yielded 50 species of fish, however, no striped bass were sampled. We present spatial and temporal relationships of the fishes collected to physicochemical variables along the stream continuum. We conclude that there is available habitat in Black Creek that may provide potential spawning sites and seasonal refugia for striped bass, yet the numbers of striped bass using this tributary appear to be low.

***Student presentation**

SYMPOSIUM: Fisheries Management

USING ANGLER SURVEYS TO PREDICT ANGLER REACTIONS TO PROPOSED FISHERIES MANAGEMENT ACTIONS. Timothy O. Smith* and Harold L. Schramm, Jr., Department of Wildlife and Fisheries, Mississippi State University. Duane A. Gill, Social Sciences Research Center, Mississippi State University.

Effective fish and wildlife management agencies incorporate stakeholder preferences into the decision making process. Incorporating all stakeholder preferences is usually impossible, often resulting in the implementation of a management action that does not satisfy some stakeholders. In response, stakeholders may take a range of actions from discussing the practice with others to forming an organization to oppose the management practice. Understanding how to use angler surveys to predict angler reactions and identify angler groups who intend to react in a similar way would allow an agency to more effectively incorporate angler preferences into the decision making process. We conducted a telephone survey of randomly selected licenced Mississippi anglers to measure socio-economic characteristics, attitudes, history of political actions, personal efficacy and intention to take actions against a proposed management practice. We used logistic regression to test a model that measures of attitude, history of political actions and personal efficacy predicted if Mississippi anglers would 1) discuss a management practice with others, 2) attend a public meeting, 3) contact Mississippi Wildlife, Fisheries and Parks (MDWFP), 4) contact a fishing organization, 5) contact an elected official or 6) form an organization to oppose a management practice. Results showed that together, the three independent variables are significant ($p \leq 0.007$) predictors for each angler reaction. Anglers were grouped by socio-economic characteristics and tested for significant differences (Kruskal-Wallis, $\alpha = 0.05$) in their reported intention to take each of the above listed actions. Preliminary results indicate that there are significant differences in the way anglers react based upon MDWFP district, age, years of formal education, level of income, membership in fishing organizations, type of residence in which anglers grew up and fishing frequency. These results indicate that measurements made using angler surveys can be modeled to predict angler reactions to proposed fisheries management practices and that grouping anglers by socio-economic characteristics may be useful for understanding the types of action anglers will take in response to a proposed fisheries management practice they oppose.

***Student Presentation**

ENVIRONMENTAL FACTORS AFFECTING CROAKER ABUNDANCE IN THE NORTHERN GULF OF MEXICO. Craig A. Walker*, Robert Hand, and John R. Davis. Department of Wildlife and Fisheries, Mississippi State University.

Spawning of Atlantic croaker *Micropogonias undulatus* occurs in nearshore areas of the Gulf of Mexico from September through May. We investigated the correlation between spawning Atlantic croaker abundance and eight environmental variables: latitude, longitude, water temperature, dissolved oxygen, salinity, chlorophyll A, barometric pressure, and depth during day (0634 hours to 1623 hours) and night (1623 hours to 0634 hours) periods. Multiple regression modeling showed croaker catch was negatively correlated with longitude and depth ($\alpha = 0.05$) for day periods. Croaker catch was negatively correlated with latitude, longitude and depth and positively correlated with dissolved oxygen ($\alpha = 0.05$) for night periods. Models accounted for 24% and 36% of the variance respectively. This exploratory study was conducted to determine how environmental factors associated with croaker distribution can be defined and analyzed more accurately. Future research will use a larger, temporally diverse data set to examine croaker distribution as it relates to environmental variables by 1) using distance from shore rather than geographic location coordinates in a predictive model, 2) measuring catch rate variation across individual environmental gradients and environmental gradients at homogeneous depths, 3) determining environmental similarities of areas with no catch, and 4) measuring variation in seasonal and annual catch rate trends.

***Student Presentation**

Croaker Comprises 76% of Gulf groundfish harvest

PERSPECTIVES FOR THE PASCAGOULA RIVER STRIPED BASS FISHERY. John F. Mareska* and Donald C. Jackson. Department of Wildlife and Fisheries, Mississippi State University, Box 9690 Mississippi State, Mississippi 39762.

Roving creel surveys were conducted on the Pascagoula River, Mississippi from April through September 1998. One hundred nineteen interviews were granted during the six-month period. The fishery was composed primarily of catfish anglers by number (107 anglers) and effort (1,565 h). Bream (*Lepomis* spp.) anglers were the second most common by number (56) and effort (203 h), and had the highest mean catch rate (2.8 fish/h). No anglers interviewed designated striped bass as their target species. Twenty-six interviews reported incidental catches of striped bass. Despite the fact that large numbers of striped bass could not be accounted for in the creel, it is suggested that passive gear (trotlines, limblines) used in angling catfish contribute to striped bass mortality, especially during the spawning season. Radio telemetry studies of striped bass in the system suggests that thermal refuges are extremely limited. This may be contributing to mortality of larger striped bass in the system. Thermal refuges may exist in tributary streams.

*** Student Presentation**

Creel Survey Data
- Mostly male anglers - bream, bass, catfish
mostly trotline effort target species
- mostly weekday evening hours

STOCK RESPONSES BY SUB-ADULT CATFISHES TO PHYSICAL INSTREAM HABITATS IN THE YALOBUSHA RIVER, MISSISSIPPI. Craig A. Chisam* and Donald C. Jackson. Department of Wildlife and Fisheries, Mississippi State University, Box 9690 Mississippi State, Mississippi 39762.

Sub-adult channel catfish *Ictalurus punctatus*, blue catfish *I. furcatus*, and flathead catfish *Pylodictus olivaris* were studied in the Yalobusha River, Mississippi to ascertain relationships between relative abundances of these fishes and environmental characteristics of dredged and undredged sections of the river. There were 16 weeks of continuous sampling during May-August 1997. Two 600-m stream reaches each in dredged and undredged sections were addressed to determine temporal changes. Additionally, random fish collections were taken in dredged and undredged sections. No significant differences existed between dredged and undredged sections with respect to catch per unit of effort (CPU: fish/hoopnet-night) for these species except that random samples resulted in higher CPUE of larger sub-adult channel catfish in the undredged section. This reflects evolving preferences for habitats attractive to adults of this species. Environmental characteristics of all four fixed stations were similar.

subadult = < 330 mm for channel
< 460 mm for flathead
< 600 mm for blue

***Student presentation**

ABIOTIC AND BIOTIC FACTORS EXPLAINING LARVAL FISH COMMUNITY COMPOSITION AT ALICEVILLE LAKE, ALABAMA-MISSISSIPPI. Orlando Jose Ferrer Montano*, and Eric D. Dibble. Department of Wildlife and Fisheries, Mississippi State University.

Relative little is known about freshwater fish larvae in lakes and riverine backwater habitats. Backwater areas are important for fish production because they contain shallow water habitats and aquatic plants used by spawning adults and by young fish for growth and survival. We investigate abiotic and biotic factors that explain distribution patterns and larval fish composition in a cove at Aliceville Lake. Habitats within the study cove contained different macrophyte species and levels of plant densities. Larval and juvenile stages of fish were collected using floating Plexiglass light traps. A total of 102 trap-nights were conducted during a six month period: March 3 to August 21, 1998. Eight microhabitat parameters were measured at each trap site: temperature, pH, DO, turbidity, depth, distance from shore, plant coverage and biomass.

A total of 988 larval and juvenile fishes, representing ten different families were collected; Centrarchidae, Atherinidae, Elasmobranchidae, and Poeciliidae were most prevalent. Multi-variate analyses were used to explain the relationship among abiotic and biotic factors, and community composition of larval fishes. Results suggest that aquatic plants and physical parameters within microhabitat play an important role in the distribution of these young fishes.

***Student Presentation**

DEVELOPMENT AND CURRENT STATUS OF THE LEGISLATIVE INITIATIVE TO ESTABLISH A NATURAL AND SCENIC WATERWAYS SYSTEM FOR MISSISSIPPI.

Donald C. Jackson¹ and Bill Quisenberry². ¹ Department of Wildlife and Fisheries, Mississippi State University, Box 9690 Mississippi State, Mississippi 39762; ² Mississippi Department of Wildlife, Fisheries and Parks, P.O. Box 451, Jackson, Mississippi 39205.

During the 1998 Regular Session of the Mississippi Legislature, a bill was passed to explore the potential for developing a natural and scenic waterways system for the state. Under the direction of the Mississippi Department of Wildlife, Fisheries and Parks, strategy was developed that incorporated workshops, seminars, field exercises (including a float trip), presentations, public comment and informal social interactions for legislators and the general public. These activities, in conjunction with periodic formal meetings with and reports to the legislative committee responsible for the initiative, resulted in the formation of three work groups commissioned to address (1) voluntary incentives, (2) best management practices and (3) assessment criteria for streams considered as potential candidates for inclusion in the system. Reports from these three work groups were consolidated in December 1998 and presented to senators and representatives in the state legislature along with a briefing document developed by the Mississippi Cooperative Extension Service. As a first step, a pilot program has been proposed that will include a limited number of streams from throughout the state.

EXPLORING COMPETITION BETWEEN STRIPED BASS AND SELECTED PREDATORY FISHES IN NORRIS RESERVOIR: INTERSPECIFIC PREDATION. S.W. Raborn*, L.E. Miranda, and M.T. Driscoll, Mississippi Cooperative Fish and Wildlife Research Unit, P.O. Box 9691, Mississippi State, MS 39762, 601/325-3217, Fax 601/325-8726, smiranda@cfr.msstate.edu or sraborn@cfr.msstate.edu

Introductions of striped bass *Morone saxatilis* into reservoirs have long been questioned, especially the potential for striped bass to prey upon native game fishes. We investigated the possibility of reduced game fish survival in Norris Reservoir due to striped bass predation by estimating the number of game fish consumed and accounting for compensatory mortality responses. Total annual consumption by the striped bass population was estimated using a bioenergetics model. Compensatory mortality was estimated by comparing population abundance in successive years. Striped bass were found to consume only *Lepomis* spp. at a rate of 2.5 kg/ha, representing 6% of the *Lepomis* biomass, and 4% of the striped bass diet. Because mortality of *Lepomis* was highly compensatory, survival was projected to actually increase by 14% as a result of striped bass predation. To simulate the impacts of possible diet shifts by striped bass, other game fishes were modeled to represent increased portions of striped bass consumption. For survival to decrease, we found that *Lepomis* would have to comprise about 50% of striped bass consumption, smallmouth bass *Micropterus dolomieu* 9%; spotted bass *M. punctulatus* 4%; largemouth bass *M. salmoides* 9%; and crappie *Pomoxis* spp. 24%. Our results suggest that predation by striped bass may actually benefit some game fish populations, although we identified predation on *Lepomis* only.

*Student presentation

20.2 striped bass/ha.

Annual prey consump = 65.0 kg/ha

95% clupeids
4% *Lepomis*
2% other.

gamefish mortality was compensatory

Lepomis consumption would have had to be 90% for striped bass to impact the population

EXPLORING COMPETITION BETWEEN STRIPED BASS AND SELECTED PREDATORY FISHES IN NORRIS RESERVOIR: PREY SUPPLY AND PREDATOR DEMAND. S.W. Raborn*, L.E. Miranda, and M.T. Driscoll, Mississippi Cooperative Fish and Wildlife Research Unit, P.O. Box 9691, Mississippi State, MS 39762, 601/325-3217, Fax 601/325-8726, smiranda@cfr.msstate.edu or sraborn@cfr.msstate.edu

striped bass - 2% of predator demand.

Prey deficiency is generally considered the single most important limitation on game fish production in southeastern reservoirs; thus, competition for limited forage is likely. We compared prey supply to predator consumptive demand to assess the degree of feeding competition among major game fishes in Norris Reservoir. Prey supply was defined as the biomass plus production of clupeid and leptomids. Predator demand was estimated with bioenergetics models and was partitioned into size-specific demands based on actual prey sizes eaten. The overall mean supply-demand ratio weighted by the importance of prey to the game fish community was 3.5. Also, we modeled increases and decreases in both supply and demand, to simulate natural fluctuations in prey supply and predator demand. Given fluctuations in both supply and demand from 0.25 to 2 times that of the mean estimates, we observed the supply-demand ratio to range between 0.4 and 28.2. It is difficult at best to associate a supply-demand ratio to competition without additional information on the minimum ratio necessary to sustain predator demand, but given the potential range of supply-demand ratios, it is evident that intensity of competition varies annually. The mean supply-demand ratio, 3.5, may be interpreted as an approximation of what is needed to maintain historical average game fish biomass and production in Norris Reservoir. *Supply demand ratio for clupeids = 3.7*

***Student presentation**

Competition does exist in Norris; Annual variation in supply-demand ratio alters degree of competition.

A PROGRESS REPORT ON THE IDENTIFICATION AND CHARACTERIZATION OF SHARK NURSERY GROUNDS IN THE NORTHERN GULF OF MEXICO. Glenn R. Parsons. Department of Biology, The University of Mississippi.

In an on-going study, monthly gill net sampling of shark populations along the coasts of Alabama and Mississippi during October 1997 and between March and October 1998 provided valuable information regarding nursery grounds, species composition, seasonality, and distribution. A total of 522 sharks representing 8 species were collected during the first year of this three year study, with approximately 400 of those captured being neonates and juveniles. Catch per unit effort was highest during June collections and at the Horn Island site. The results thus far obtained suggest that the shallow waters around Horn, Shipp, Cat and Round Islands in Mississippi, and Dauphin and Sand Islands in Alabama are important nursery grounds for Atlantic sharpnose, *Rhizoprionodon terraenovae*, blacktip, *Carcharhinus limbatus*, finetooth, *C. isodon*, blacknose, *C. acronotus*, bull, *C. leucas*, bonnethead, *Sphyrna tiburo*, and scalloped hammerhead, *Sphyrna lewini* sharks. In addition, three juvenile sandbar sharks, *C. plumbeus*, a species that may be imperiled, were collected in the vicinity of Cat Island.

*Gulf landings peaked to over 12 million lbs - 1989
1994 - 3-4 million lbs.
most sharks caught in June. (Adults & juv.)*

RANGE EXTENSIONS FOR SEVERAL SPECIES OF SHARKS FROM NMFS LONGLINE SURVEY DATA. Lisa M. Jones*. National Marine Fisheries Service Pascagoula Facility, East Tennessee State University.

This study examined shark catch data from NMFS-SEFSC bottom longline surveys conducted between 1973 and 1997 for geographical, depth, temperature and salinity distributions by species of sharks captured. Analyses of geographic distribution using SURFER plots revealed probable range extensions for 11 species of sharks including the night shark (*Carcharhinus signatus*), the bignose shark (*Carcharhinus altimus*), the sharpnose sevengill shark (*Heptranchias perlo*), the bigeye sixgill shark (*Hexanchus vitulus*) the spiny dogfish (*Squalus acanthias*), and 6 additional species of dogfish. Analyses of distribution by depth indicated range extensions for 6 species of benthic sharks: the Caribbean reef shark (*Carcharhinus perezi*), the bignose shark (*Carcharhinus altimus*), the nurse shark (*Ginglymostoma cirratum*), the Cuban dogfish (*Squalus cubensis*), the smooth dogfish (*Mustelus canis*) and the Florida smooth-hound (*Mustelus norrisi*). Temperature range extensions were indicated for the silky shark (*Carcharhinus falciformis*) and the night shark (*Carcharhinus signatus*). In addition, useful information on depth, temperature and salinity distributions were found for species for which little or no information of this type has been published.

***Student Presentation**

PRELIMINARY DETERMINATION OF FACTORS INFLUENCING AQUATIC BIOLOGICAL COMMUNITIES IN THE MISSISSIPPI EMBAYMENT. Billy G. Justus and Barbara A. Kleiss , U.S. Geological Survey, Pearly, Mississippi

The Mississippi Embayment Study Unit of the U.S. Geological Survey's National Water- Quality Assessment (NAWQA) Program encompasses most of the Mississippi Alluvial Plain Ecoregion, and smaller parts of the Mississippi Valley Loess Plains and Southeastern Plains Ecoregions. In 1997, a synoptic study was initiated to relate land-use to water quality and aquatic biological communities in the Mississippi Alluvial Plain Ecoregion. Land-use in this ecoregion is dominated by row-crop agriculture, and there has been little effort to document the effects of non-point source runoff to water quality of receiving streams. Sampling was conducted at 36 stream sites in the ecoregion. Macroinvertebrates were sampled during August and September 1997 and surface-water sampling was done during three phases of the 1997 growing season. Fish communities were sampled at the same sites from June to September 1998.

Twelve macroinvertebrate community metrics and 10 fish community metrics were correlated to 14 physical and chemical constituents using a nonparametric test, the Spearman rank order correlation. Preliminary indications are that macroinvertebrate and fish communities from streams with the highest averages for temperature, turbidity, and nutrients had the fewest taxa and the greatest tolerance to environmental disturbance.

→ Started sampling in 1994, Sampled to end of 1997.

MS sites { Skuna River near Broce
V 200 River to S. of confluence of Steele Bayou
Bogue Bayou - near Leland

LARGEMOUTH BASS VIRUS IS ASSOCIATED WITH ADULT LARGEMOUTH BASS DEATHS IN MISSISSIPPI. Larry Hanson¹, Keith Meals², Mary Rudis¹, and Lora Petrie-Hanson¹.¹College of Veterinary Medicine, Mississippi State University, Mississippi State, MS 32962, ²Mississippi Department of Wildlife, Fisheries and Parks, 116 Shoemaker Hall, University, MS 38677

Largemouth bass (*LMB**Micropterus salmoides*) 1 to 6+ pounds were reported to be dying in September, on Sardis Reservoir, a 32,100 acre reservoir in North Central Mississippi. Field examination on October 9 estimated 3,000 decomposing LMB were present. No diseased fish were found for necropsy. On October 29, 60 LMB were electrofished from the lake and analyzed for the cause of the fish losses. Upon gross examination, 8 of the 60 fish sampled demonstrated pathological change consisting of yellow to brown caseous material coating the air bladder lumen. Combined Gill, airbladder, kidney and spleen tissue samples were pooled in groups of five fish and inoculated onto fathead minnow (FHM), *Epithelioma papillosum cyrprinae* (EPC) and blugill fry (BF-2) cell lines. All 13 FHM cultures and 12 of the EPC and BF2 cultures showed CPE identical to that of the LMB virus (LMBV) reference stock. Electron microscopy demonstrated an iridovirus, identical to LMBV. Most of the LMB appeared healthy and were actively feeding. On November 12, 17 LMB were sampled. Of these, 8 were positive for LMBV. On December 15, 30 fish were sampled, with 17 being positive for LMBV. This represents the second report of LMBV associated mortality in wild LMB populations and is the first case in Mississippi.

SYMPOSIUM: Aquaculture

EVALUATION OF A REDUCTION OF DIETARY MENHADEN FISH MEAL IN PRODUCTION DIETS AND FEEDING FREQUENCY FOR PHASE III HYBRID STRIPED BASS (STRIPED BASS MALE X WHITE BASS FEMALE). Louis R. D'Abramo, Cortney L. Ohs*, John B. Taylor, Mississippi State University, Department Wildlife and Fisheries Box 9690, Mississippi State, MS 39762

Reciprocal cross hybrid striped bass (striped bass male x white bass female) were stocked at a density of 8,500/ha into twelve 0.05-ha earthen ponds between April 24 and 26, 1998. Fish in one treatment were fed a control diet to satiation, once daily at 1400. In the other two treatments fish were fed either a control diet or an experimental diet to satiation twice daily, once at 0900 and 1400. There were four ponds per treatment. The fish meal ingredient in the experimental diet was reduced from 30 % to 15 % and losses in protein and essential fatty acids were compensated for by increases or additions of other ingredients.

Fish were harvested after a 175-d culture period. Ten fish were randomly subsampled from each pond for determination of tissue indices (percent of total weight as interperitoneal fat (IPF), fillet, and carcass): the sex of each fish was also recorded. There were no significant differences in mean harvest weight, total production, survival, percent weight gain, and feed conversion ratios for the two dietary treatments and between the 1 X and 2 X daily feeding treatments for the control diet. These results indicate that the fish meal ingredient can be reduced by 50 % in the diet without any significant reductions in production. These results, translate into a savings of approximately \$ 80 /ton of feed relative to feed ingredients and reduced labor costs associated with feeding practice.

ADVANCING CONTROLLED REPRODUCTION IN TILAPIA, Mark Owusu-Frimpong and John A. Hargreaves, Department of Wildlife and Fisheries, Mississippi State University, Mississippi State, MS 39762-9690

Traditionally, controlled reproduction in fish is achieved by stripping viable ovulated eggs that are then fertilized and incubated artificially. The use of natural spawns for controlled reproduction can prevent stress to females, blood contamination of eggs and possible extrusion of unripe eggs that typify traditional use of stripped eggs. Obtaining viable eggs by natural spawning for the purpose of controlled reproduction, however, is crucial because of the short time between ovulation and spawning: once eggs are spawned, they may be fertilized by a male, or egg hydration restricts viability. We developed a protocol by which tilapia spawn spontaneously, and designed a study to assess the duration of egg viability following natural spawning. Eggs obtained by stripping individually isolated females of blue tilapia (*Oreochromis aureus*) were fertilized following hydration by water immersion at 5-min intervals for 60 minutes. Also naturally spawned eggs were retrieved from the mouths of incubating females within 5-10 min of spawning and fertilized. Fertilized eggs were incubated at 28 C in constantly aerated, UV-sterilized recirculating water. The proportion of eggs developing to unpigmented-eyed embryos following water immersion of eggs up to 20 min was 67% of that resulting from freshly stripped eggs. Egg viability decreased rapidly after 20 min to very low levels. Similar results were obtained from natural spawns, indicating the potential practical application of the technique for controlled reproduction in tilapia species.

AN EVALUATION OF SEINING VERSUS TRAP HARVEST AT DIFFERENT TEMPERATURES AND DIFFERENT TRAPPING EFFORTS IN NON-FORAGE BASED CRAWFISH *Procambarus clarkii* PRODUCTION PONDS. Louis R. D'Abramo, Kathleen C. Elgarico*, and Cortney L. Ohs, Department of Wildlife and Fisheries, Mississippi State University, Box 9690, Mississippi State, MS 39762

Different harvest schemes including seine versus trap harvest at water temperatures less than 20 C and an increase in trap density from 80 to 120 /ha were evaluated in non-forage based crawfish *Procambarus clarkii* earthen production ponds (0.05 ha). There was a total of 105 days within 10 months when harvest using baited and unbaited traps occurred. Crayfish were fed a sinking 32 % crude protein sinking catfish feed at rates dependent upon estimated pond biomass and water temperature. Trap harvest occurred at water temperatures greater than or equal to 20 C. At temperatures less than 20 C either a trap or seine harvest was conducted. Trap harvest was suspended for at least one week if the mean daily harvest for a week was less than 20 kg/ha.

Mean total yields ranged from 2173 to 2606 kg/ha. When harvests from baited versus non-baited traps were compared, baited traps yield 75 % of the total harvest. Harvest by either trap or seine (8 seines) at temperatures below 20 C comprised 25.0 % and 26.2 % of the total harvest weight. The mean weights of crayfish trap harvested from ponds with water temperatures less than 20 C for the 80 and 120 /ha trap densities were 19.5 g and 16.9 g, respectively. A 50% increase in trapping effort resulted in a 11.3% mean increase in the total number of crayfish harvested. However, the mean weight of harvested crayfish in ponds where an increase in trapping effort occurred was lower (17.8 g versus 16.6 g), resulting in similar annual harvest yields for both trap densities. Feed conversion ratios ranged from 1.2 to 3.1 ($x=2.0$) for all treatments. Increases in annual harvest yields at ponds temperatures less than 20 C will require a more effective bait to increase the passive harvest by trap or cost effective methods to increase yield after a seine harvest.

EVALUATION AND DEVELOPMENT OF A NUTRITIONALLY COMPLETE EGG ALBUMIN BASED MICROPARTICULATE DIET FOR THE CULTURE OF FISH AND CRUSTACEAN LARVAE. Louis R. D'Abramo, Wan Han Jun, Cortney L. Ohs, Mississippi State University, Department Wildlife and Fisheries, Box 9690, Mississippi State, MS 39762

A newly developed microparticulate diet for the culture of larval fish and crustaceans has been developed and undergone preliminary evaluation. The principal ingredient of the diet is a lipophilic egg albumin to which other nutrients are physically bound. Striped bass larvae were stocked at a density of 30/L in 3L culture containers (2.33 L culture volume) that were part of several similar recirculating systems. There were five dietary treatments, 4 replicates per treatment. The experiment was terminated after 28 days post hatch. Results of an initial evaluation showed that the striped bass larvae fed a diet containing 10% *Artemia* nauplii and 90% artificial diet (dry weight) was 85.1% of that achieved with a control diet consisting of live *Artemia* nauplii exclusively. Mean survival of the control group was 56.1%, while that of the larvae fed the combination diet was 51.4%. Growth of the larvae weaned to the artificial diet exclusively after 4 and 10 days exclusive feeding of live *Artemia* nauplii was 55.2 and 62.6%, respectively, of the control. Survival of larvae in those dietary treatments in which artificial diet was fed exclusively after 4 and 7 days of feeding live food was 37.5% and 50.4%, respectively.

THE CULTURE OF CRAPPIE: POSSIBILITIES AS A FOOD FISH INDUSTRY. Jason E. Yarbrough, John A. Hargreaves, Anita M. Kelly, and John Barry Taylor, Department of Wildlife and Fisheries, Mississippi State University, Mississippi State, MS 39762

Crappie (*Pomoxis spp.*) are one of the most popular gamefish in the United States, especially in the southeast, and are considered excellent table fare. However, crappie are not available through retail markets because federal and state legislation prohibit commercial trade, except in localized markets in the midwestern US and Canada where prices may be twice those paid for rainbow trout and catfish. These facts have created interest among Mississippi producers in culturing crappie for food fish or pond stocking. As crappie have been cultured by state agencies for stocking to enhance recreational fisheries, some research has been conducted on fingerling production. However, many technical problems must be addressed to ensure economically-viable production of food-sized crappie. Some of these research areas include: controlled reproduction, larval rearing techniques, development of artificial feeds, and optimal growout production methods.

A major non-technical problem with aquaculture production, state legislation banning commercial trade of gamefish, has recently been eliminated through the granting of a limited number of permits for commercial culture and marketing of crappie. Also, this legislative action included a mandate for Mississippi State University to conduct research aimed at assisting permitted crappie producers in their efforts. To meet this mandate the following research objectives will be addressed: (1) Evaluate various methods of maintaining and manipulating spawning cycles in black crappie (*P. nigromaculatus*) and white crappie (*P. annularis*) broodstock, (2) Evaluate hatchability of diploid and triploid hybrid (*P. annularis* x *P. nigromaculatus*) crappie and the reciprocal hybrid fry. (3) Determine the timing and pattern of normal gonadal sex differentiation in black and white crappie. (4) To evaluate the success of sex reversal on black and white crappie fry and to evaluate the growth rates of sex-reversed and normal crappie fry. (5) Determine the growth and survival of larval crappie fed four larval diets. (6) Determine the efficacy of three feed training regimes for weaning juvenile crappie hybrids from natural foods to pelleted rations.

- Black Bass Act of 1926 ended sale of most warmwater fish for food.

INFLUENCES ON DAILY FLUCTUATIONS IN FEEDING ACTIVITY OF POND-RAISED CHANNEL CATFISH. John Barry Taylor, John Hargreaves, Craig Tucker, and Sue Kingsbury, Department of Wildlife and Fisheries, Mississippi State University, Box 9690 Mississippi State, MS 39762

Multiple regression analysis was used to assess the influence of selected meteorological and water quality variables on fluctuations in the daily amount fed to fish (kg/ha/day) in eight 0.4-ha channel catfish culture ponds in Mississippi. Values of these variables were within ranges typical of well-managed ponds; fish were not exposed to severely stressful conditions. Standardized regression coefficients (reflecting the number of standard deviation units amount fed changed with one standard deviation change in each predictor variable) were compared to assess the magnitude of influence each variable had on fluctuations in daily amount fed. To eliminate seasonal effects on amount fed, a standard time series analysis technique known as "differencing" was used to construct a transformed measure of amount fed, calculated as the daily amount fed minus the amount fed one day before.

The resulting multiple regression model explained 45.3% of the variance in the data. The amount fed one day before had the largest standardized regression coefficient (-0.707), followed by afternoon water temperature (0.186), change in dissolved oxygen from morning to afternoon (-0.153), afternoon pH (0.152), cumulative solar radiation (0.126), morning dissolved oxygen (-0.069), and rise in water temperature from one day before (0.051). Differencing of amount fed increased the explained variance of the model and demonstrated that the amount fed one day before can have a negative influence on amount fed. This effect is masked if the analysis is performed on "non-differenced" amount fed data.

These results indicate that the amount fed the previous day can have a strong influence on the feeding activity of catfish. The effect was an inverse relationship: fish ate less if they were fed a large amount on the previous day, and ate more if fed a small amount on the previous day. Although considerably weaker, influences from normal fluctuations of certain water quality and meteorological variables also exert some degree of influence on feeding activity. Warmer water temperatures may have increased metabolic activity, and therefore appetite, of fish. Also, the significant relationship between amount fed and change in dissolved oxygen from morning to afternoon, as well as afternoon pH, probably results from increased phytoplankton production and respiration at warmer water temperatures, rather than a direct cause-effect relationship. Catfish ate more on days with higher amounts of cumulative solar radiation, but feeding activity was not affected by precipitation or windy days. Fish ate less on days with low morning dissolved oxygen. Fluctuations in total ammonia-nitrogen, unionized ammonia, and nitrite (at concentrations below toxic levels) did not influence feeding activity of channel catfish.