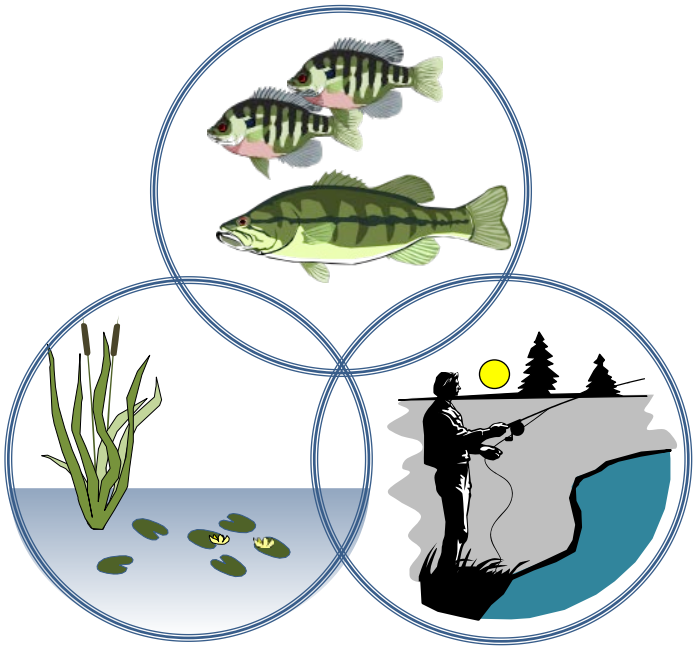
2015 Annual Meeting of the Mississippi Chapter of the American Fisheries Society

Tara Wildlife
Vicksburg, MS



25-27 March 2015

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The organizers from the Mississippi Chapter would like to recognize the following groups for financial support of the meeting.

College of Forest Resources, Department of Wildlife, Fisheries & Aquaculture, Mississippi State University	College of Forest Resources Forest and Wildlife Research Center
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We also thank the Mississippi Department of Wildlife, Fisheries & Parks for the in-kind donation of printing these programs.

Program at a Glance

Date/Time	Event	Location
Wednesday, March 25		
4:00 - 7:00 PM	Check-in and Registration	Dining Room
7:00 - 11:00 PM	Welcome Social	Outside, near Dining Room
Thursday, March 26		
6:30 - 7:45 AM	Breakfast	Dining Room
7:45 – 10:00 AM	Registration	Conference Room
8:00 - 8:15 AM	Welcome	Conference Room
8:15- 10:00 AM	Presentations	Conference Room
10:00 - 10:15 AM	Break	Conference Room
10:15 - 12:00 PM	Presentations	Conference Room
12:00 - 1:00 PM	Lunch	Dining Room
1:00 - 2:45 PM	Presentations	Conference Room
2:45 - 3:15 PM	Break	Conference Room
3:15 - 5:00 PM	Presentations	Conference Room
5:00 - 6:00 PM	Poster Session	Conference Room
6:00 - 11:00 PM	Banquet	Dining Room and Conference Room
Friday, March 27		
6:30 - 7:45 AM	Breakfast	Dining Room
8:00 - 11:00 AM	Chapter Business Meeting	Conference Room

Banquet Speaker: Mark Peterson

Fish habitat conservation at extremes: linkages and wanderings in Mississippi aquatic sciences!

Mark Peterson has been a Professor since 2002 in the Department of Coastal Sciences at The University of Southern Mississippi Gulf Coast Research Laboratory (USM/GCRL). Prior to coming to USM he was faculty at Mississippi State University for 5.5 years and a Post-Doctoral fellow at the Harbor Branch Oceanographic Institution, Florida for 2 years. Mark has been Coordinator of Graduate Studies, a member/head of the Summer Field Teaching Program, and acting Department Chair in Coastal Sciences during his almost 21 years at USM/GCRL.

Mark has developed a research program on resource ecology and conservation where he and his students have studied fish-habitat relationships, eco-physiology of fishes, urbanization impacts on coastal ecosystems, acoustic tracking of threatened Gulf Sturgeon, invasive species, and life-history of fishes. Mark, his students, and colleagues have published extensively on these topics with almost 120 publications to date. Mark has been at the forefront of training future leaders through his courses at USM/GCRL, MSU and internationally in subjects ranging from Fish Ecology and Biology, Ichthyology, Animal Behavior, Statistical Methods and Coastal Processes.

Mark has led through service, including roles as President of the Mississippi Chapter of the American Fisheries Society, Overall Chair of the 2012 Southern Division AFS Spring meeting in Biloxi, Mississipi, and Co-Program Chair of the 1994 Mid-Year SDAFS Meeting in Little Rock, Arkansas. He has also served as President and member of the Board of Governors for the American Society of Ichthyologists and Herpetologists, and was a member of the Science and Data Team for the National Fish Habitat Initiative. He was the Editor-in-Chief for 19 years of the marine science journal *Gulf and Caribbean Research* (http://www.usm.edu/gcrl/gulf_caribbean_research/index.php) through 2013; he and Nancy Brown-Peterson have recently re-initiated the *Gulf and Caribbean Research* as an online journal starting in 2015.

President-elect Candidates

Nagaraj Chatakondi, Ph.D.

Nagaraj received his Ph. D in 1995 from the Department of Fisheries and Allied aquacultures, Auburn University, Auburn, AL. He is presently working as Research Geneticist with USDA ARS Warmwater Aquaculture Research Unit, Stoneville, MS. His research projects include independent and cooperative studies on methods to improve efficiency of catfish reproduction with special interest on the production of channel x blue hybrid catfish. Other projects include: genetic improvement of performance traits, hatchery management, broodfish nutrition, and stress reduction strategies to improve performance of channel catfish.

Previously, he worked with Eagle Aquaculture, Pike Road, AL to commercialize the channel x blue hybrid catfish production in hatcheries. He also worked with Gold Kist breeding program at Inverness, MS to develop genetically improved channel catfish for the US farm –raised catfish industry.

Nagaraj has over 50 peer-reviewed publications, meeting abstracts and presented in regional and national meetings. He has trained farmers, hatchery managers, extension personnel and researchers in various aspects of catfish reproduction.

Notable Accomplishments:

2014	Federal Laboratory Consortium Excellence in Technology Transfer Award
2013	USDA Agricultural Research Service, MSA Technology Transfer Award
2008	Performance Award – recognized by Auburn University, Auburn, AL for producing the highest number of hybrid catfish fry for the years: 2006 – 2008.
2006	Affiliate Professor, Department of Fisheries and Allied Aquacultures, Auburn University, Auburn, AL 36849
2006	Catfish Industry Representative at NRSP-8 Aquaculture Genomics
2005	Adjunct Professor, College of Veterinary Medicine, Mississippi State University, Starkville, MS 39762
1996	Certified Fisheries Scientist, American Fisheries Society, Bethesda, MD
1994	Young Scientist Award, Canadian Agency for International Development.

Tyler Stubbs

Tyler has been the Northeast district project manager in Tupelo for the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) fisheries bureau for the last 3 years. Prior to working with MDWFP he held various positions with the Natural Resource Conservation Service, the Iowa Department of Natural Resources, and the South Dakota Department of Game, Fish, and Parks. He has a broad background in fisheries having worked on various projects from large reservoirs and rivers to small ponds and streams, telemetry studies on walleye, ictalurid stock assessments and sampling protocols, nutrient concentrations in farm ponds, and various age and growth studies. He holds an AA in Biology from Iowa Central Community College, a BS in Wildlife and Fisheries Sciences from South Dakota State University (SDSU), and a MS in Wildlife, Fisheries, and Aquaculture from Mississippi State University (MSU). During his education he received many awards and scholarships including Best Student Poster Award at the Southern Division of the American Fisheries Society (AFS) annual meeting, a travel grant from the Southern Division AFS to attend the 2010 AFS Catfish Symposium, and the David H. Nabi award at MSU, which portrays graduate student leadership and responsibility. Tyler has been very active in AFS over the years, having served on the Southern Division AFS Small Impoundment, Catfish Management, and Warmwater Streams technical committees. He was also a member of the North Central and Southern Division's joint ad-hoc catfish sampling protocol committee. At the society level he currently serves on the Young Professional Committee of the Fish Management Section. As a student he was a member of the SDSU sub-unit, as well as the MSU sub-unit where he held the office of Secretary. As a graduate student at MSU he was elected as the Southern Division's representative to the student subsection of the Education Section. He has also served as a student judge, manuscript reviewer, travel grant committee member, session moderator, and AV volunteer at many division and national meetings. Tyler currently resides in Una, MS with his wife Tia and their daughter Alice Mae.

Presentation Schedule

Students competing for the best student presentation are designated with an asterisk*.

Date/Time	Title	First author
Thursday, March 26		
8:00 - 8:15 AM	**Welcome**	
8:15 - 8:45 AM	The Mississippi River: a place for fish	Hal Schramm
8:45 - 9:00 AM	Environmental determinants of Gulf Menhaden condition	Robert Leaf
9:00 - 9:15 AM	Examining the relationship between water level and crappie year class strength in a Mississippi River oxbow	Nathan Aycock
9:15 - 9:30 AM	Examination of trophic relationships affecting oyster reef restoration success in the Mississippi Sound: a pilot study	Virginia Fleer*
9:30 - 9:45 AM	Effects of egg quality and method of incubation on the hatching success of channel X blue hybrid catfish eggs	Nagaraj Chatakondi
9:45 - 10:00 AM	Effects of Largemouth Bass *Micropterus salmoides* population reduction on home range size and prey species size distribution and abundance	Cynthia Fox*
10:00 - 10:15 AM	**Break**	
10:15 - 10:30 AM	Identifying fish community changes in relation to droughts in South Mississippi	Paul Mickle
10:30 - 10:45 AM	Summary and synthesis of standardized electrofishing efforts from 1986 to present	Michael Colvin

10:45 - 11:00 AM	Growth rates of Pallid Sturgeon and Shovelnose Sturgeon in the Lower Mississippi River and beyond	Robert DeVries*
11:00 - 11:15 AM	Summary of MDWFP lead net sampling on Southwest Mississippi lakes in 2014	Trevor Knight
11:15 - 11:30 AM	Exploring the use of age-based egg- and yield-per-recruit models for the Spotted Seatrout (*Cynoscion nebulosus*) fishery in Mississippi	David Dippold*
11:30 - 11:45 AM	White Crappie (*Pomoxis annularis*) induced spawning and out-of-season spawning in tank aquaculture systems	Charlie Culpepper*
11:45 - 12:00 PM	Baby sea monsters are delicious! First reported occurrence of larval (*Plesiopenaeus armatus*) (aka (*Cerataspis monstrosa*)) in Gulf of Mexico yellowfin tuna diet	Dyan Gibson
12:00 - 1:00 PM	**Lunch**	**Dining Room**
1:00 - 1:15 PM	Investigating the link between temperature and metabolic inertia in largemouth bass (*Micropterus salmoides*)	Shelby Mathieu*
1:15 - 1:30 PM	Range expansion of the Brazilian cownose ray (*Rhinoptera brasiliensis*) into northern Gulf of Mexico waters	Jill Hendon
1:30 - 1:45 PM	Habitat suitability modeling for Shovelnose Sturgeon in the lower Mississippi River	Dylan Hann*
1:45 - 2:00 PM	Fishery effects of quality crappie management	Keith Meals
2:00 - 2:15 PM	Pre-restoration occupancy patterns and connectivity between eastern and western Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) populations on Ship Island, Mississippi Sound, USA: a prospectus	Page Vick

2:15 - 2:30 PM	Influences of riparian shade on reservoir water quality, macroinvertebrates, and fish	Clay Raines*
2:30 - 2:45 PM	Atlantic bluefin tuna (*Thunnus thynnus*) feeding ecology in the northern Gulf of Mexico	Christopher Butler
2:45 - 3:15 PM	**Break**	
3:15 - 3:30 PM	The Ohio River in the Delta	Steve Miranda
3:30 - 3:45 PM	A new technique to evaluate Mississippi State lake usage	Tyler Stubbs
3:45 - 4:00 PM	Movements and habitat preferences of Cobia, *Rachycentron canadum*, in the northern Gulf of Mexico and waters off the southeast U.S. Atlantic coast	Eric Hoffmayer
4:00 - 4:15 PM	Satellite tracking of juvenile bull sharks (*Carcharhinus leucas*) in the northern Gulf of Mexico: a preliminary assessment	Jeremy Higgs*
4:15 - 4:30 PM	Largemouth Bass subspecies composition and growth comparisons in Puerto Rico Reservoirs	Wes Neal
4:30 - 4:45 PM	The physiological effects of temperature, dissolved oxygen content and handling on the recovery of largemouth bass (*Micropterus salmoides*) from simulated angling stress	Colin Dinken*
4:45 - 5:00 PM	Measuring largemouth bass mortality: needs, methods and application	Kevin Keretz*
5:00-6:00 PM	**Poster session**	**Conference Room**
6:00 - 11:00 PM	**Banquet**	**Dining Room and Conference Room**

Friday, March 27

8:00 - 8:15 AM	**Morning announcements**	**Conference Room**
8:15 - 11:00 AM	**Chapter Business Meeting**	**Conference Room**

Poster Submissions

Poster Number	Poster Title	First author
1	Comparison of fixed and random trawl sampling from the Mississippi Sound	John Anderson
2	Habitat-specific growth of hatchery-reared juvenile Spotted Seatrout in a Mississippi Bay system	Read Hendon
3	Evaluation of potential bias caused by insufficient data for particular age classes of Red Drum, *Sciaenops ocellatus*, in Mississippi coastal waters and adjacent federal waters.	Emily Satterfield*
4	Primary and secondary stress responses to handling in Common Carp	Justin Watson*
5	Assessing marginal increment analysis techniques for aging otoliths from Southern Flounder (*Paralichthys lethostigma*) in Mississippi coastal waters	Morgan Corey*
6	Adoption of a folk-fishery technique to harvest pre-molt blue crabs in aquaculture ponds	Greg Crochet

Session Moderators

All moderators in this conference are students. The objective was to give the students greater opportunity for public speaking and improve face recognition with potential employers.

Session	Moderator	Affiliation
Thursday, March 26		
8:30 - 10:00 AM	Charlie Culpepper	Mississippi State University
10:30 - 12:00 PM	Trevor Moncrief	University of Southern Mississippi
1:00 - 2:45 PM	Virginia Fleer	University of Southern Mississippi
3:15 – 5:00 PM	Daniel Sullivan	Mississippi State University

Abstracts

Abstracts are listed in alphabetical order. Presenting author is underlined.

E. John Anderson, evan.anderson@usm.edu, 228-238-3726

Comparison of Fixed and Random Trawl Sampling from the Mississippi Sound

Anderson, E.J. and J.R. Hendon

Center for Fisheries Research & Development, Gulf Coast Research Laboratory, The University of Southern Mississippi, Ocean Springs, MS 39564

Historically, fixed trawl surveys have been used to collect fishery-independent data to describe abundance, distribution, and population dynamics of important fisheries species. Current studies suggest a combination of random and fixed survey designs as the best sampling method, but few of these compared species composition and abundance from fixed and random trawl locations. Our trawl survey covered the central and eastern Mississippi Sound and adjacent waters and included 11 historical fixed trawl stations and eight stations randomly selected from regional sampling grids. Two of the random grids were in channels, the Biloxi and Pascagoula, and the other six grids were located in the Mississippi Sound. Samples were collected with a 16 foot otter trawl towed for ten minutes per station. All species (vertebrates and invertebrates) were sorted from samples, measured, and weighed. Fixed and random trawl stations were compared using nonparametric multivariate analyses of species composition and abundances from the period 2010-2014. Cluster analysis and multidimensional scaling revealed similarities among stations within the same general geographic regions, and diversity metrics were higher for stations in channels from the Biloxi Bay and the Mississippi Sound. To determine ecological factors structuring community assemblages, diversity was assessed relative to primary physical-chemical parameters of salinity, temperature, dissolved oxygen, and water depth.

Nathan Aycock, nathana@mdwfp.state.ms.us, 662-759-6444

Examining the relationship between water level and crappie year class strength in a Mississippi River oxbow

Nathan Aycock, Darrin Hardesty, Chad Washington

Mississippi Department of Wildlife, Fisheries, and Parks, Jackson, Mississippi, 39211

Lake Beulah, a roughly 1,000 acre oxbow lake located in Bolivar County, is influenced heavily by inundations from the Mississippi River, though the extent and duration of these inundations vary annually. We wanted to determine what effect lake water level had on crappie year class strength. To do so, we used residuals associated with a catch-curve regression to index recruitment variability in the crappie population for the 2007-2012 cohorts. We then used linear regression to examine the effect of lake water level, as indexed by seasonal water levels in the Mississippi River, on recruitment success. A significant relationship was found (r^2 = 0.68, $P < 0.05$) between springtime water levels and year class strength. Strong year classes were produced in years with high water during the spring (2008 and 2011), while weak year classes were produced in years with low water (2012). Using the regression equation, we predicted below normal crappie recruitment in 2013 and 2014 based on water levels. Future work is planned to confirm these predictions, examine the persistence of dominant year classes over time, and further refine the model.

Christopher M. Butler, c.m.butler@usm.edu, 228-818-8803

Atlantic bluefin tuna (*Thunnus thynnus*) feeding ecology in the northern Gulf of Mexico

Butler, C. M.[1], J. M. Logan[2], E. R. Hoffmayer[3], M. D. Staudinger[4], J. M. Quattro[5], G. W. Ingram, Jr.[3], and M. E. Lutcavage[6]

[1] Center for Fisheries Research & Development, Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39564

[2] Massachusetts Division of Marine Fisheries, New Bedford, MA 02740

[3] National Oceanic and Atmospheric Administration, Southeast Fisheries Science Center, Mississippi Laboratories, Pascagoula, MS 39567

[4] Department of Environmental Conservation, University of Massachusetts, Amherst, MA 01003

[5] Department of Biological Sciences, Marine Science Program and School of the Environment, University of South Carolina, Columbia, SC 29208

[6] Large Pelagics Research Center, Department of Conservation Biology, University of Massachusetts Amherst, Gloucester, Massachusetts 01930

A preliminary examination of the feeding ecology of bluefin tuna (*Thunnus thynnus*) on the northern Gulf of Mexico spawning grounds is described using a combination of stomach contents, nitrogen stable isotope values, and tissue C:N values. Diet data suggest the importance of teleosts, cephalopods, crustaceans, and a gelatinous zooplankton prey (*Pyrosoma atlanticum*). Stable isotope values from *T. thynnus* collected in the Gulf of Mexico did not indicate nutritional stress (i.e., starvation) and muscle lipid stores were greater than those observed in some northern feeding grounds. This study provides the first evidence that *T. thynnus* are foraging in the Gulf of Mexico and support the classification of this region as both a feeding and spawning ground for the species. Our future work will examine diel feeding patterns and gastric evacuation rates of *T. thynnus* while they are consuming low-lipid prey. We will also examine relationships between gonad and stomach volume to assess whether feeding rates may be limited by a reduction in intracoelomic space for fish in spawning condition. Diet data from this region will be contributed to data from feeding areas throughout the range of this species as part of a classification and regression tree (CART) analysis of *T. thynnus* trophic ecology.

Effects of egg quality and method of incubation on the hatching success of channel X blue hybrid catfish eggs

Nagaraj G. Chatakondi

USDA ARS Warmwater Aquaculture Research Unit, 141 Experiment Station Road,

P. O. Box 38, Stoneville, MS 38776. Email: nagaraj.chatakondi@ars.usda.gov

The objective of this study was to evaluate the effects of egg quality of stripped eggs from channel catfish (*Ictalurus punctatus*) and method of incubation of fertilized hybrid catfish eggs on hatching success.

Stripped eggs from 17 channel catfish females were evaluated in a 2 x 2 factorial study to evaluate the effects of either low quality (pH < 7.5) or high quality (pH > 7.5) stripped channel catfish eggs fertilized with pooled blue catfish (*I.furcatus*) sperm and incubated either in hatching troughs or McDonald jars. Percent fertilization and neuralation of stripped eggs did not differ in this study. The hatching success of high quality eggs incubated in troughs (60.0%) did not differ (P>0.05) with the eggs incubated in jars (61.9%). Average hatching success of hybrid catfish eggs from high quality (60.9%) eggs was higher than low quality (41.4%) eggs. The hatching success of low quality eggs in hatching troughs (46.7%) was higher (P<0.05) than jars (36.1%).

Method of incubation does not affect the hatching success of high quality eggs. Incubating low quality eggs in hatching troughs facilitates the chemical treatment to reduce hatching losses associated with bacterial and fungal infections during incubation. Incubating fertilized eggs in hatching jars need limited labor and care to expand the hatching capacity.

The findings of the study suggest the production of high quality eggs to maximize the production of hybrid catfish embryos in catfish hatcheries regardless of the incubation method.

Summary and synthesis of standardized electrofishing efforts from 1986 to present

M.E. Colvin and L.E. Miranda

Dept. Wildlife, Fisheries and Aquaculture, Mississippi State University

Standardized electrofishing has been in place for Mississippi waterbodies since 1986. Over the 29 years since 1986, 119 fish species were captured in 161 waterbodies. The objectives of this study are to summarize and synthesize existing long term standardized electrofishing data and evaluate temporal and spatial patterns of size structure, catch per effort, and condition. Individual fish captures exceed 450,000. Data associated with electrofishing sampling include values quantifying effort, fish length and fish weight. Waterbodies sampled for a single year, 2-10 years, and 10 or more years were 36, 113, and 12 respectively. The most sampled waterbodies were Aberdeen Lake and Tenn Tom Divide Cut, surveyed in 23 and 19 years respectively. Waterbody specific temporal coverage over the 29 year period varied from 3 to 80%. Single sampling events on a waterbody during an annual period comprised 85% of the sampling events. Repeated sampling events within an annual period on the same waterbody represented 15% of the samples. Size structure, catch per effort, and condition varied across time and space. Varying spatial and temporal resolution and coverage of this long term electrofishing dataset is a unique opportunity but analytical challenge to further understanding fish populations and dynamics.

Assessing marginal increment analysis techniques for aging otoliths from Southern Flounder (*Paralichthys lethostigma*) in Mississippi coastal waters

Corey, M.C.[1], R. Leaf[1], S. Clardy[2] and G. Gray[3]

[1]*The University of Southern Mississippi, Gulf Coast Research Laboratory, Department of Coastal Sciences, 703 East Beach Drive, Ocean Springs, MS 39564*

[2]*The University of Southern Misssissippi, Marine Education Center, Gulf Coast Research Laboratory, 703 East Beach Drive, Ocean Springs, MS 39564*

[3]*Center for Fisheries Research and Development, The University of Southern Mississippi, Gulf Coast Research Laboratory, 703 East Beach Drive, Ocean Springs, MS 39564*

Natural variation in growth ring (annuli) deposition contributes to uncertainty in otolith-based age estimates. Age validation techniques, such as marginal increment analysis (MIA), are used to determine the frequency of annuli formation. After validation of yearly annuli deposition is performed, the number of annuli and the proportion of increment formation can be used to estimate the age of individual fish. The objective of this research is to develop a high-precision MIA technique which will involve using measured margin increments rather than using categorical margin codes. Southern Flounder otoliths collected in 2006 to 2013 were obtained from the Mississippi Department of Marine Resources for analysis. Annual growth increments were measured using IMT i-Solution Lite imaging software with a precision of 0.001 µm. The margin edge was defined as the distance from the most recently-formed annuli to the edge of the otolith. The percentage of translucent area on the margin edge was also coded using standard techniques (category one = 0%, category two = 33%, category three = 66%, category four = 99%), where category one indicates the opaque zone. The temporal pattern of marginal increment formation was analyzed to determine the date of annuli deposition. We hypothesize that age estimates obtained using measurements of marginal increments rather than margin categories will provide precise, and biologically-relevant age estimates.

Gregory Crochet, gregory.crochet@usm.edu, (228)234-1267

Adoption of a folk-fishery technique to harvest pre-molt blue crabs in aquaculture ponds

Crochet, G.1, H. Perry1, and D. Rose2

1The University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564
2The Mississippi Department of Marine Resources, Lyman Fish Hatchery, Gulfport, MS 39503

Bushlining for blue crabs (*Callinectes sapidus*) began in the Barataria Region of Louisiana and was historically practiced only in lakes Salvador and Cataouatche; shallow water bodies with high turbidity. This unique folk-fishery uses bushlines constructed by tying together bundles of the wax myrtle shrub, *Myrica cerifera*, to harvest shedding crabs. Pre-molt (peelers) and shedding blue crabs are attracted to the "bushes" because they resemble natural molting habitat. Crabs are especially vulnerable to predation at molting and they seek refuge in the vegetation to escape predators. This technique has now been applied to blue crab aquaculture to harvest pre-molt or peeler crabs from ponds. The ponds are non-vegetated so that the bushlines provide the only vegetated shelter. The lines are made with wax myrtle bundles attached at 3.04 m intervals along the line and are set in the pond in a linear fashion. Multiple lines are spaced ~ 4.8 m apart. The bushlines rest just above the bottom of the pond. Pre-molt crabs are attracted to the bushes for shelter and protection during molting. Bushlines are checked daily by wading in the pond. Each bush is lifted and shaken into a dip net. The crabs captured in the net are checked individually to see if they show signs of molting. Peelers removed from the pond are placed in a moist, burlap-filled container and transferred to standard re-circulating seawater systems until they molt. The wax myrtle bushes are replaced once the leaves begin to disintegrate, which is typically every three to four weeks

Charlie M. Culpepper III, cmc985@msstate.edu, 229.251.8826

White Crappie *Pomoxis annularis* Induced Spawning and Out-of-Season Spawning in Tank Aquaculture Systems

Charlie M. Culpepper III and Peter J. Allen

Dept. of Wildlife, Fisheries and Aquaculture, Mississippi State University, Mississippi State, MS 39762

In order to enhance hatchery productivity in white crappie *Pomoxis annularis,* we evaluated the viability of induced and out-of-season spawning reproduction methods in tank aquaculture systems. Three commonly utilized spawning induction hormones were investigated: luteinizing hormone releasing hormone analogue (LHRHa), human chorionic gonadotropin (HCG) and salmonid gonadotropin releasing hormone analogue (GnRHa). White crappie, collected during the pre-spawning season from Enid Lake, MS, were stocked into flow-through rectangular tanks. Fish were injected with LHRHa, HCG, GnRHa or not injected as a control (10% priming dose (PD), 90% resolving dose (RD) 12-hr later). Fish were strip spawned upon ovulation (~30hr post-RD). Fertilization success was based upon %-fertilization for each spawning pair at 24-hr post-fertilization. Spawning occurred in all three hormone treatments (spawning success: LHRHa = 65%; GnRHa = 50%; HCG = 25%), but none of the control crappie spawned. GnRHa produced the highest fertilization rates (68.33 ± 8.78%), while LHRHa had the lowest fertilization rates (12.36 ± 4.79%). The HCG treatment was associated with mortalities prior to spawning (54.17%) and highly variable fertilization (28.64 ±12.06%). These results indicate that crappie can be held and spawned in tank systems, and that GnRHa is the preferred spawning hormone to induce spawning.

Out-of-season spawning experiments were conducted from November-February in two recirculating tank systems. Following a 2-wk winter period (10°C, 8-hr light), 3-wk and 6-wk seasonal shift treatments, where photoperiod and temperature changed from winter to summer (22°C, 16-hr light) were investigated. Fish were injected with GnRHa (100%-PD, 100%-RD 24-hr and 48-hr later) and were strip-spawned upon ovulation. The 3-wk treatment (11F:10M) induced 1 female to spawn with 11% fertilization rate. The 6-wk treatment (12F:10M) induced 2 females to spawn with fertilization rates of 31.5% and 79.2%. While these experiments confirm that white crappie out-of-season spawning is possible, mean gonadosomatic index (GSI) from un-spawned females (3-wk=0.02±0.01, 6-wk=0.03±0.02) compared with wild females sampled during December (0.02±0.00) and April (0.04±0.01) indicates that a longer seasonal shift regime is needed to enhance spawning success.

Growth Rates of Pallid Sturgeon and Shovelnose Sturgeon in the Lower Mississippi River and Beyond

Robert J. DeVries[1*], Jared Porter[1], Kevin R. Keretz[1] , and Harold L. Schramm, Jr[2]

[1] Mississippi State University, Department of Wildlife, Fisheries, and Aquaculture, Mail Stop 9690, Mississippi State, Mississippi, USA 39762

[2] U.S. Geological Survey, Mississippi Cooperative Fish and Wildlife Research Unit, Mississippi State, Mississippi, USA 39762

Pallid Sturgeon (PLS) display a latitudinal counter gradient growth pattern in the Missouri River however, no latitudinal growth pattern for Shovelnose Sturgeon (SNS) has been reported. The objective of this study was to assess growth rates for both sturgeon species in the lower Mississippi River (LMR). Ages were determined from 168 PLS (range: 2 to 26 years) and 216 SNS (range: 3 to 21 years) pectoral spine sections, and annual growth increments were back calculated by direct proportion. The back-calculated length-at-age data were used to fit von Bertalanffy growth equations, and the curves were compared to previous studies within the LMR and other locations throughout their ranges. Growth rates for both species were similar in the LMR over the period of this study but were slightly lower than previously reported studies in the LMR. PLS growth rates slowed with decreasing latitude, but SNS growth rates were similar to sites in the middle Mississippi River and Yellowstone River. These results support the latitudinal counter gradient hypothesis for PLS. Further, growth rates in the LMR have changed little over the preceding decade indicating that restoration efforts and engineering activities have had little effect on sturgeon growth in the LMR.

Colin Dinken, cpd47@msstate.edu, (205) 240-0135

The physiological effects of temperature, dissolved oxygen content and handling on the recovery of largemouth bass, *Micropterus salmoides*, from simulated angling stress

Dinken, C.[1], H. Schramm[2], and P. Allen[1]

[1]Department of Wildlife, Fisheries and Aquaculture Sciences, Mississippi State University, Starkville; MS 39762
[2] U.S. Geological Survey, Mississippi Cooperative Fish and Wildlife Research Unit, Mississippi State, MS 39762

Most black bass *Micropterus* spp. tournaments require the live release of fish after weigh-in. However, subsequent survival may vary due to cumulative physiological effects of multiple, sub-lethal stressors, such as exercise from angling, ambient water temperature and live-well water temperature and dissolved oxygen content. Examination of these stressors has been important for understanding the stress response in a number of species, albeit with limited research on black bass; however, the linkage between secondary stress responses and mortality has not been established. Further, given the prevalence of live-release bass tournaments, species-specific guidelines for fish care are needed to minimize sub-lethal effects and mortality. Therefore, the objectives of this study are to examine the physiological responses to stress and post-stress recovery in Largemouth Bass *Micropterus salmoides* subjected to (1) the effects of acute temperature change (-4, 0, +4 °C) and handling stress over a range of acclimation temperatures (17, 21, 25, 29, 33 °C) and (2) the effects of a range of dissolved oxygen concentrations (3, 5, 12 mg/L) and handling stress on physiological responses to stress and post-stress recovery in largemouth bass. Currently, fish are being raised in tanks and raceways in an indoor aquaculture facility and are being fed a formulated diet until they reach experimental size (30.5-35.5 cm). A preliminary study will be performed to compare the stress responses of captive-reared Largemouth Bass used in this study to wild Largemouth Bass. Results from these studies will provide guidelines to reduce sub-lethal effects of stress and mortality in largemouth bass due to angling and tournament conditions.

David Dippold, david.dippold@eagles.usm.edu, (228) 818 8816

Exploring the use of age-based egg- and yield-per-recruit models for the Spotted Seatrout (*Cynoscion nebulosus*) fishery in Mississippi

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Egg-per-recruit (EPR) and yield-per-recruit (YPR) models are used to understand the dynamics of fishing on a cohort and to determine appropriate fisheries reference points. We constructed age-based egg- and yield-per-recruit models to explore potential management strategies for Mississippi's Spotted Seatrout (*Cynoscion nebulosus*) stock. We examined how the use of four different slot limits and four different minimum lengths of entry into the fishery affected the expected yield and egg-production. The selected minimum length limits were 12", 13", 14", and 15" which are the current minimum length limits in the five Gulf of Mexico states. The slot limits used were 12" to 18", 13" to 18", 14" to 20", and 15" to 20". Both Florida and Texas currently regulate their Spotted Seatrout fisheries using slot limits, specifically 15" to 20" and 15" to 25" respectively. We performed two sensitivity analyses to investigate how fisheries reference points (Y_{MAX} and $F_{0.10}$) were affected by variations in estimates of length-specific egg production and individual growth. The sensitivity analyses that we present here are useful for understanding the fishery dynamics of Mississippi's Spotted Seatrout because length-at-age and length-specific egg production are variable. The results of this study can help fisheries managers identify target fishing mortality ($F\ y^{-1}$) benchmarks and size and slot limits by evaluating the trade-off between maximizing the reproductive output (egg production) and expectations of yield under different management scenarios.

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Examination of trophic relationships affecting oyster reef restoration success in the Mississippi Sound: a pilot study

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Over recent years, natural and anthropogenic changes due to altered hydrology, hurricanes, variable precipitation, and the DwH oil spill have taken their toll on existing oyster reefs in Mississippi. In response, extensive oyster reef restoration efforts have ensued or are planned within this region. Oyster reef restoration espouses the overall goal of enhancing the production of commercially and recreationally important oysters and fishes, but assessments of restoration success are generally lacking. Therefore, a five-month pilot study was conducted to make an initial intensive assessment of faunal variability as a means to characterize trophic relationships at ten artificial reefs along the Mississippi coast. Selected reefs included a historic site as well as limestone/concrete and oyster shell artificial reef-sites representing various depths, water flow conditions, and distances from shore. Substrate condition at reef sites was characterized on a scale of one to five, with one being predominantly soft-bottom and five predominantly hard-bottom. Sample trays were deployed at half of these reefs to document species occurrences and obtain specimens of key members of the trophic web for trophic interaction experiments. A clear difference in suitability for spat settlement and growth was evident among the sites, with spat settlement at three of the five sites throughout the fall season. The historic, undisturbed oyster reef supported the highest abundances of organisms, while the deeper offshore reef had the lowest abundances. Experiments confirmed adult stone crabs are capable of consuming oyster drills with no apparent size selectivity, and that larger oyster drills can cannibalize smaller drills. Information gleaned from this pilot study will be instrumental for the overall project goal to examine trophic relationships in the context of oyster reef restoration in the Mississippi Sound using a three-fold approach of individual-based modeling, field studies, and manipulative lab experiments.

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Effects of Largemouth Bass removal on home range size and prey availability

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Predator-prey relationships can greatly impact size structure and abundance of fish communities. Prey abundance can influence movement habits of predators, often resulting in smaller home range sizes with increasing prey availability. Conversely, predator abundance can influence size structure and abundance of prey populations. In Cerrillos Reservoir, Puerto Rico, about 20% of the Largemouth Bass *Micropterus salmoides* biomass was removed annually in 2012 and 2013 in an attempt to restructure the fishery. Following this experimental reduction in predator abundance we examined prey populations to determine 1) if prey populations would respond with increased abundance or changes in size structure, and 2) if changes in prey abundance influenced predator home range size. Mean annual catch rates of all primary prey species (Threadfin Shad *Dorosoma petenense*, sunfish *Lepomis* spp., and tilapia *Tilapia* and *Oreochromis* spp) increased following the removal. Concurrently, mean total length of prey species decreased for all species except lepomids. Largemouth Bass home range size was not significantly impacted following the removal and increased prey availability, suggesting that Largemouth Bass home range in Cerrillos Reservoir is not driven by prey availability.

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Baby sea monsters are delicious! First reported occurrence of larval *Plesiopenaeus armatus* (aka *Cerataspis monstrosa*) in Gulf of Mexico yellowfin tuna diet

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Plesiopenaeus armatus, an oceanic penaeoid shrimp in the family Aristeidae, is globally distributed at depths ≥ 2500 meters. In 2012, *P. armatus* was linked genetically with its previously unknown larval form, *Ceretaspis monstrosa*, which for almost 200 years had been described as a rare and mysterious epipelagic crustacean larva with no known adult stage. The first report of *Cerataspis monstrosa* from the Gulf of Mexico (GOM) described a single specimen collected from a plankton sample in 2004 and two specimens removed from the digestive tract of a wahoo (*Acanthocybium solandri*) in 1998. Assessments of stomach contents of 1321 yellowfin tuna, *Thunnus albacares*, (YFT) caught from the northcentral GOM between 2012 – 2014, identified 575 larval *P. armatus* (now informally described as the 'cerataspis' form of the species) from 83 of the tuna (6.9-76.3kg TW, 75-165cm CFL), the first such account of the species in GOM YFT diet. The larval *P. armatus*, identified as mysis stages III, IV and V, were found in stomachs of YFT caught only between April - July and ranged 50-452mg in weight and 7-14mm in carapace length. The number of larvae found in individual YFT stomachs ranged from 1 to 87 (avg. 7 per stomach). Most YFT prey that co-occurred with larval *P. armatus* in our samples could be considered as preferring in one or both of two ephemeral habitats: 1) nutrient-rich water masses associated with upwelling events or frontal zones, and 2) pelagic *Sargassum*. We offer a hypothetical life-history and larval transport strategy for *P. armatus* in the GOM based on historic global collection data, timing and correlation of oceanographic events with the occurrence of larval *P. armatus* in the epipelagic zone off the Louisiana coast, species associated with larval *P. armatus* found in GOM YFT diet, and reported life history patterns of Mediterranean aristeids.

Habitat suitability modeling for Shovelnose Sturgeon in the lower Mississippi River

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Shovelnose Sturgeon *Scaphirhynchus platorynchus* are native to the large rivers of the Mississippi River basin and have been found to select particular habitat types, and these selected habitats vary seasonally. Ecological niche factor analysis (ENFA) is a presence-only multivariate technique for modeling habitat suitability. We used ENFA to evaluate how Shovelnose Sturgeon telemetry locations relate to habitat types common in the lower Mississippi River (main channel, sandbar, island tip, revetted bank, wing dike field, natural bank, and secondary channel) along with depth and slope of the river bottom. We recorded 338 locations of Shovelnose Sturgeon over a six month period that included both high (July - September 2013) and low (September – December 2013) river stages. ENFA produced factor scores based on the above variables and used those scores to build habitat suitability maps of the study site. Shovelnose Sturgeon occupied deep water at all river stages. Telemetered individuals were located in and near the main channel and avoided secondary channels and wing dike fields during low river stages; fish were located near downstream island tips and areas with steep bottom slope during high river stages. This type of spatial or distributional analysis can be used to guide conservation and restoration of habitat to benefit Shovelnose Sturgeon in the lower Mississippi River and possibly other large rivers.

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Range expansion of the Brazilian cownose ray, *Rhinoptera brasiliensis*, into northern Gulf of Mexico waters

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Of the eight valid species of cownose rays (Rhinopteridae), only one species, the cownose ray, *Rhinoptera bonsasus*, is currently considered common to the Gulf of Mexico. In 2007, three cownose rays were brought into the Mississippi Deepsea Fishing Rodeo bearing dentition similar to the Brazilian cownose ray, *Rhinoptera brasiliensis*, a species considered to be indigenous to the waters off Brazil. Phylogenetic analyses of the mitochondrial COI locus revealed the rodeo specimens to be genetically distinct from *R. bonasus*. To investigate this further, cownose rays were collected from the northern Gulf of Mexico (nGOM) and western North Atlantic (wNA) from 2007-2012, a suite of morphological and meristic characters were described, and tissue samples were collected for genetic analyses. Additional tissue samples were collected from cownose rays caught in the waters of Suriname (n=7; 2010) and Brazil (n=15; 2012-2013), and for comparison, from golden cownose rays, *R. steindachneri,* in the waters off Mazatlán, Mexico (n=34; 2013). Genetic analyses revealed two distinct clades: *R. bonasus* and *R. brasiliensis*. The nGOM, wNA, and Mexican specimens were represented in both clades, Suriname specimens grouped with *R. bonasus*, and Brazilian specimens grouped with *R. brasiliensis*. Discriminant analyses retained several morphologic and meristic characters, but as the value ranges overlapped, use of the identified characters is not ideal. Of the 207 specimens collected from the wNA and nGOM identified as either *R. bonasus* or *R. cf. brasiliensis* based on tooth plate counts, 186 individuals were genetically assigned consistent identifications resulting in an 89.9% rate of agreement. The ratio of *R. cf. brasiliensis* to *R. bonasus* in nGOM collections increased from east to west, with the percentage of occurrence being lowest off Florida (2%), and highest off Louisiana and Texas (69%). These data indicate that *R. brasiliensis* is present in the nGOM and could be undergoing range expansion.

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Habitat-Specific Growth of Hatchery-Reared Juvenile Spotted Seatrout in a Mississippi Bay System

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Spotted seatrout (*Cynoscion nebulosus*) is the most harvested recreational species in Mississippi coastal waters. Concerns about the sustainability of the fishery prompted fishery managers to develop a stock enhancement program to establish methodologies for rearing fish in captivity for subsequent release into the wild to supplement wild stocks. The success of such enhancement programs, however, is predicated on the ability of hatchery-reared fish to survive in the natural environment, transition to feeding on wild prey, and successfully avoid predation, all while not displacing wild fish. Experimental research is also necessary to identify release habitats which optimize survival and growth. The purpose of this research was to evaluate habitat-specific growth of hatchery-reared spotted seatrout among three habitats in a shallow bay system: submerged aquatic vegetation (SAV), non-vegetated shoreline, and non-vegetated open water. After a one-month cage enclosure study, growth was found to be significantly greater (less negative) for fish held in SAV and non-vegetated shoreline compared to deeper, non-vegetated open water. A comparison of stomach content analyses also revealed that hatchery-reared fish had successfully transitioned to wild prey, and general diet categories were similar to that for wild fish in similar size ranges. Research findings indicate that habitats within or in close proximity to SAV or marsh shoreline offer more favorable environments for growth of hatchery-reared spotted seatrout, and that those fish have the capacity to adapt to natural environmental conditions, in the absence of predation, and transition to feeding on wild prey items.

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Satellite tracking of juvenile bull sharks, *Carcharhinus leucas*, in the northern Gulf of Mexico: a preliminary assessment

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Understanding migratory and residency behavior of marine fishes is crucial for proper management and conservation. In the case of highly migratory sharks this task can be vast. Bull shark, *Carcharhinus leucas*, movement patterns and habitat use have been investigated in the northern Gulf of Mexico (nGOM), but primarily within limited geographic areas. To expand this, the current study is using satellite telemetry to investigate movements of juvenile bull sharks within a wider region of the nGOM. Ten bull sharks (six female, four male; 810 - 1676 mm fork length) were captured by routine bottom longline and gillnet surveys conducted by the Gulf Coast Research Laboratory between April and October 2014. Specimens suitable for tagging were fitted with a fin mounted Smart Position or Temperature Transmitting (SPOT) tag that records geographic position and binned temperature data that is transmitted to satellites when the shark surfaces. Calculation of straight-line distance showed the minimum distance traveled by a tagged juvenile bull shark was 127 nautical miles, whereas the maximum distance travelled was 2709 nautical miles. Transmitted temperature data indicates preferred temperatures to be between 27.5 and 32.5 °C. This temperature preference may explain the decrease in transmissions occurring in fall and winter when sea surface temperatures are lower. To date, tagged sharks have been tracked in the waters adjacent to: Texas, Alabama, Mississippi and Louisiana. Preliminary detection data indicates tagged sharks are spending the majority of their time within coastal waters, with the greatest number of locations occurring at the mouth of the Mississippi river. The results of this study will be beneficial for future assessments and management of bull sharks in the nGOM.

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Movements and habitat preferences of Cobia, *Rachycentron canadum*, in the northern Gulf of Mexico and waters off the southeast U.S. Atlantic coast.

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The cobia, *Rachycentron canadum*, is a migratory pelagic fish that occurs worldwide in tropical to warm temperate seas and supports valuable fisheries throughout its range. Gulf Coast Research Laboratory tag and recapture data reveal that cobia undergo an annual spring migration from south Florida wintering grounds northward along both coasts of the Florida peninsula to spring-summer feeding and spawning grounds in the northern Gulf of Mexico (nGOM) and U.S. Atlantic waters (SA), with a return migration to south Florida in late fall. During spring and summer 2002-2007, popup satellite archival tags (PSAT) were deployed on 10 cobia (seven in the northcentral GOM; three in the SA off South Carolina) to identify fine-scale movements and habitat use patterns. Tagged cobia ranged in size from 112 - 132 cm fork length; however, sex was not recorded. Mean tag retention was 90 $\pm$ 17 days (7-188 days), mean distance traveled was 377.9 $\pm$ 164.0 km (48-1,339 km), and mean daily distance was 3.8 $\pm$ 1.0 km/day (1.2-9.0 km/day). Five of the seven cobia remained relatively close to the tagging region; however, two cobia made large migratory movements from the nGOM to the sGOM and from the nGOM to the SA. Both of these movements occurred outside the known spring and fall migratory periods. Cobia spent 95.7% of their time between the surface and 50m, which corresponded to a temperature range of 21 - 28°C. A significant seasonal effect on depth utilization was evident with cobia using shallow waters during spring and increasingly deeper waters during summer and fall. A significant seasonal effect was also evident with temperature as cobia utilized cooler waters during spring, compared to summer and fall. Data obtained in the study revealed movement and habitat use patterns previously undocumented for cobia.

Measuring Largemouth Bass Mortality: Needs, Methods and Applications

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Largemouth Bass *Micropterus salmoides* are the most frequently sought fish species by recreational anglers in the United States, and information about the mortality of angler-caught largemouth bass is critical to their effective management. Considerable attention has been given to the effects of angling on largemouth bass mortality; however, with the exception of several hooking mortality studies and population modeling analyses, research has focused on the survival of tournament-caught fish. The mortality of caught-and-immediately-released largemouth bass is considered to be low; however, research conducted on Walleye *Sander vitreus* indicates mortality in caught-and-immediately-released walleyes can be high, even at temperatures near their optimum. We describe a study to measure the survival of angler-caught Largemouth Bass subjected to immediate release and to simulated tournament conditions across a range of ambient temperatures at which recreational fishing occurs. Further, this research evaluates the effectiveness of livewell temperature manipulation to improve survival of angler-caught Largemouth Bass. This research incorporates a novel approach to estimating survival from tournament-related stressors that may have broad application to operation of water withdrawal facilities.

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Summary of MDWFP lead net sampling on Southwest Mississippi lakes in 2014

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Collecting sufficient numbers of crappie, in order to characterize crappie stocks, has proven difficult with most sampling techniques. As one of the most popular game fish in Mississippi, effective sampling is vital to conduct long-term management and monitoring of crappie populations. MDWFP fisheries biologists conducted lead net sampling on three lakes in southwest Mississippi, during 2014, including Eagle Lake, Lake Mike Conner, and Lake Lincoln. Our results indicate that lead nets are effective at collecting both White Crappie, *Pomoxis annularis* and Black Crappie, *P. nigromaculatus*, as well as, Bluegill, *Lepomis macrochirus*, Yellow Bass, *Morone mississippiensis*, and Channel Catfish, *Ictalurus punctatus*. A total of 68 net nights were sampled between the three lakes with 855 crappie, 655 bluegill, 1371 yellow bass, and 103 channel catfish collected. Crappie ranged in size from 92 to 380 mm in length. Two other states (LA and AR) are currently using lead nets, for sampling crappie populations, with positive results. MDWFP plans to continue evaluating this sampling method.

Environmental determinants of Gulf Menhaden condition

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Gulf Menhaden (*Brevoortia patronus*) is an economically and ecologically important harvested species in the northern Gulf of Mexico (NGOM). Recent interest in the trophic role of this stock as "forage" for predators has resulted in an increased focus on its population and fishery dynamics. In this study we describe and investigate the inter-annual variation in condition of the *B. patronus* stock in the NGOM (estimated as oil density, liters/kg). The population dynamics and condition of Gulf Menhaden are correlated to environmental conditions, including the magnitude of rainfall and the relative size of the Mississippi River and Atchafalaya River discharge plume. We hypothesize that the contrasts in inter-annual condition are controlled by similar abiotic conditions. We examined the relationship of potential predictor variables: chlorophyll *a* phenology and magnitude, the temporal and spatial patterns of sea surface temperature, the magnitude of river discharge, the strength and direction of wind and the spatial characteristics of freshwater intrusion in the NGOM. We show that there exists, in the NGOM, an ecoregion that exhibits coherent productivity dynamics, that the time-series of observed and modeled condition is characterized by marked inter-annual variability, and that environmental conditions in the NGOM have explanatory power to predict annual oil content in the stock. This work is relevant to managers, industry, and other stakeholders because if Gulf Menhaden are a critical link to the productivity of higher trophic levels and their condition is indicative of large-scale changes in ecosystem productivity, then the continued monitoring of menhaden oil content can provide information about the expected status of stocks that prey on Gulf Menhaden.

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Investigating the link between temperature and metabolic inertia in largemouth bass, *Micropterus salmoides*

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Fish are ectotherms, meaning water temperature has a direct effect on their metabolic rate. Rapid temperature changes in their environment may require time for the metabolic rate to readjust to a new level of homeostasis, with this time duration referred to as metabolic inertia. Metabolic inertia may be related to the temperature differential or whether the temperature is increasing or decreasing. In order to determine the influence of temperature on metabolic inertia, largemouth bass *Micropterus salmoides* were studied during and after a sudden temperature change. Largemouth bass were chosen for this study as they are commonly subjected to rapid temperature changes during recreational angling and placement in boat livewells, and the implications of these changes on recovery are not well known. Largemouth bass (n=62) were acclimated to either 20 °C or 30 °C for ≥ 2 weeks. During experiments fish were transferred to a separate tank at the same temperature, held overnight, and individually placed into a 4-L respirometer for 1 hour to acclimate. Tailbeat frequency measurements were recorded to characterize stress levels after 5, 30 and 55 minutes. The respirometer was then transferred to a separate experimental tank either set 4 °C colder, 4 °C warmer, or at the same temperature as the acclimation temperature. Aerobic metabolic rate, or oxygen consumption (MO_2), was measured at 5.5 min intervals for 1.5 hours using a fiber optic automated respirometry system. Three additional measurements were made at 12.5 minute intervals for an additional 0.5 hour. Metabolic inertia varied across the 6 treatment groups with all but one reaching a new homeostasis within the 2 hour time period of the study. This research is beneficial for understanding largemouth bass physiological plasticity, guiding holding practices in boat livewells, and for providing a basis for future research on temperature changes in other sportfishes.

FISHERY EFFECTS OF QUALITY CRAPPIE MANAGEMENT

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Mississippi's flood control reservoirs (FCRs) have been an experiment since 2005 on quality crappie management. Anglers, fishing-related businesses, governmental representatives, and others initially feared stricter crappie regulations would result in reduced harvest, stunting of crappie, and, more importantly, lower angler participation and economic impacts. MDWFP sampling since 2005 has shown stable crappie growth rates, stable or rising fishing effort and harvest, larger fish in the creel, an influx of nonresident anglers, and greater financial benefits of these fisheries to MDWFP and local economies. Although not a goal of quality management, crappie fisheries with trophy size fish have developed, with resultant increased fishing effort, tournament participation, and national recognition of Mississippi's crappie fishing. Future challenges include maintaining the present quality of fishing with greater fishing pressure in aging reservoirs with declining habitat.

Identifying Fish Community Changes in Relation to Droughts in South Mississippi

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The Mississippi coastal region has two major rivers and four smaller rivers influencing the estuaries that make up the Mississippi Sound. The islands off of the state act as a barrier creating an expansive estuary and making the area a highly productive fishery. With such a dependence on input from the drainages, it is important to understand the effect of salinity regimes on the fish community. Drought conditions in other regions have been shown to dramatically change the fish community and biomass structures. We used the long running Interjurisdicional Fisheries Program (IJ) database (2006-2013) within Mississippi and compared yearly fish communities between drought and non-drought years. Multiple Response Permutation Procedure (MRPP) and indicator species analysis were completed to compare drought and non-drought conditions in the Mississippi Sound. During 2006 and 2007, which were identified as drought years, significant differences in fish community structure were identified (Sig. < 0.001) compared to non-drought years (2008-2009 and 2011-2013). Decreased presence of *Archosargus probatocephalus*, *Lagodon rhomboides*, and *Sciaenops ocellatus* during drought conditions identified these as possible indicator species. With the increasing human population in central and south Mississippi, fresh water demand will most certainly increase. Understanding the influence of decreased river discharges will assist managers in determining the impacts of freshwater withdrawals during base flow periods.

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The Ohio River in the Delta

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The Delta region in western Mississippi includes hundreds of oxbow lakes. These lakes were once channels of recent and not so recent river systems. The Ohio River flowed mostly through the eastern part of the Delta along the hill line, before joining the Mississippi south of Natchez. I briefly review the geological history of the region to discern remaining oxbow lakes that might previously have been part of the Ohio River and other prehistoric river systems that once flowed through the region. Current fish assemblages in these lakes vary greatly, but include mostly tolerant species able to persist in shallow hyper-eutrophic environments.

Largemouth bass subspecies composition and growth comparisons in Puerto Rico reservoirs

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Largemouth bass *Micropterus salmoides* in Puerto Rico are the result of a few introductions from mainland North America over the last century. Initial introductions came from populations within the native range of the northern subspecies *M. s. salmoides*, while more recent introductions came from populations within the native range of the Florida subspecies *M. s. floridanus*. We determined the subspecies composition of largemouth bass populations among reservoir and hatchery populations in Puerto Rico and evaluated the relationship between subspecies composition and population metrics (length-frequency distributions, proportional size distribution [PSD], and mean total length) to provide recommendations for future broodstock collections for the Maricao Hatchery. Largemouth bass (n=418) were sampled from 12 reservoir populations and the contemporary hatchery stock on the island, and were genotyped at 6 diagnostic microsatellite loci. Among the reservoir populations, the proportion of Florida subspecific alleles ranged from 0.77 to 0.95 (mean 0.85, SD 0.07). Florida subspecific genotypes ranged from 0.03 to 0.64 (mean 0.29, SD 0.22) and no northern subspecific genotypes were recovered. All populations showed lower levels of Florida subspecific alleles and genotypes than the hatchery stock (alleles 0.98, genotypes 0.80), which could be a result of artificial selection of larger individuals during broodstock collections from Cerrillos Reservoir. Length-frequency distributions differed between Florida largemouth bass and intergrades (Florida x northern; P=0.026), as populations frequently contained proportionally more large Florida largemouth bass. The prevalence of the Florida subspecies and hybrids in all populations on the island could be a derivative of genetic signatures from founding populations, represent the effects of natural selection, or be due to recent hatchery releases, although further research is needed to discriminate between these mechanisms. Since Florida largemouth bass displayed a more dispersed size distribution and more fish attaining larger sizes among populations, we recommend that future introductions should consist of only verified Florida largemouth bass.

Influences of Riparian Shade on Reservoir Water Quality, Macroinvertebrates, and Fish

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Shade, defined as the coolness and darkness caused by shelter from solar radiation, can potentially have significant impacts on water quality, macroinvertebrates, and fish assemblages. Shading can come from a variety of environmental sources such as free floating macrophytes, floating objects, turbidity, but most commonly is provided by riparian vegetation. Riparian shade can affect water quality through its effects on temperature and light availability which directly or indirectly affect various other water quality variables. Shade can also impact macroinvertebrate assemblages, primarily by shifting functional feeding groups by changing periphyton composition. Fish community makeup can be modified in the presence of shade, by altering choice of habitat, prey behavior and predator success. The purpose of this proposed research is to explore if and how riparian shade influences (1) water quality changes, (2) macroinvertebrate composition, and (3) fish distribution along reservoir near-shore areas.

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Evaluation of potential bias caused by insufficient data for particular age classes of Red Drum, *Sciaenops ocellatus,* in Mississippi coastal waters and adjacent federal waters.

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Fisheries managers frequently use spawning stock biomass per-recruit models (SSBPR) to predict expected impacts to a cohort due to changes in management practices. We hypothesize that insufficient data for particular age classes of fish can result in erroneous estimates of growth and that this will bias model predictions. The current age-length model to describe Mississippi's Red Drum growth is characterized by a paucity of data for some age classes. The scarcity of data for ages three to five (maturity is generally accepted to occur at three to five years) could bias the estimates of SSBPR predictions. In this project we evaluate how inclusion of new data serves to alter the age-at-length key (ALK) for Red Drum and determine the sensitivity of estimates from the revised SSBPR model with those from previous efforts. Total length measurements and ages of Red Drum (n = 1144) were used to inform a three-parameter von Bertalanffy growth function (VBGF). The expected mean growth and two alternative scenarios; a "high" (mean + 95% CI) and "low" (mean - 95% CI) were evaluated in sensitivity runs. There was 10.02% increase in SSPPR for the "high" growth scenario and a 9.53% reduction in SSBPR when the "low" growth scenario was used.

The Mississippi River: A place for fish

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The Mississippi River flows 3,760 km from its source at Lake Itasca, Minnesota to its outlet at the Gulf of Mexico. Along its course, it collects water from portions of two Canadian provinces and 41% of the conterminous United States. Although greatly altered for navigation and flood control throughout much of its length, the Mississippi River remains an important fishery resource that supports a diverse fish assemblage and provides abundant recreational and commercial fishing opportunities. This presentation describes the contemporary fisheries habitat throughout the Mississippi River, identifies how management to achieve human benefits influences the fishes and their habitats, and summarizes efforts to conserve and enhance fish habitat. The 824 km headwater reach is entirely in Minnesota and remains largely unaltered. The 1,069 km from St. Anthony Falls, Minnesota to above the confluence with the Missouri River near St. Louis, Missouri have been altered by 29 locks and dams that have affected floodplain function, increased sedimentation of backwaters, and homogenized the formerly diverse habitat. After receiving the flows the of the Missouri River, the Mississippi River flows without interruption for 1,884 km to the Gulf of Mexico; neck cutoffs and levees have altered ecological function of this free-flowing reach. Although adversely impacting the river-floodplain ecosystem, engineering features to improve commercial navigation have also added habitat and, when wisely manipulated, can be used to restore habitat. Water quality has been improved but legacy chemicals and nutrient-laden inflows remain problems. The future value of the Mississippi River as a fisheries resource will depend on maintaining diverse and accessible aquatic habitats and water quality suitable to support fishes.

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A New Technique to Evaluate Mississippi State Lake Usage

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In 2013 the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) deployed traffic counters at three state lakes (1 per region) to try to evaluate overall lake usage. Previous methods such as trailer counts, permit sales, creel surveys, and vehicle cards have been used to evaluate lake usage by anglers, boaters, and campers; however, no effort has been made to evaluate lake usage by all patrons. Although the study is still ongoing, preliminary data suggests that large numbers of non-paying users frequent our state lakes. At Tippah County Lake for instance, 18,639 vehicles entered the lake and non-paying users made up approximately 76 % of the total visitors for the year. However, the permit data only estimated 3,537 total users. When the two methods are compared to estimate usage, permit sales only accounted for approximately 19% of the total lake usage estimation. Results from these data could be used to change permit fee structure, or as leverage for more equipment and seasonal help at our state lakes to handle the wear and tear on facilities from the number of non paying users in the day use areas.

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Pre-restoration occupancy patterns and connectivity between eastern and western Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) populations on Ship Island, Mississippi Sound, USA: a prospectus

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Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) are members of one of the most threatened fish families worldwide, in part, because of their contact with developed coastal landscapes. Life history characteristics combined with anthropogenic effects such as habitat loss, dams, overfishing and repetitive storm events, such as hurricanes, appear to have played a role in declining population size. Gulf Sturgeon occur within seven major river systems ranging from the Suwannee River (FL) to the Pearl River (LA/MS) with eastern and western groups separated by Mobile Bay. Interaction between these two major populations has been observed in the riverine and marine environment with exchanges among some drainages. The Mississippi Coastal Improvement Project (MsCIP) Barrier Island Restoration Plan is scheduled to restore Camille Cut on Ship Island starting in March 2016. Previous telemetry work with large sub-adult and adult Gulf Sturgeon from the western population (Pearl and Pascagoula drainages) found fish inhabited the areas near the barrier islands of the Mississippi Sound. Since 2011, an acoustic array has been deployed annually to monitor acoustically-tagged Gulf Sturgeon within the passes and cuts of the island; Gulf Sturgeon have been detected from mid-October to mid-April. These detections support previous work indicating Gulf Sturgeon overwinter near Ship Island, but also indicate the presence of Gulf Sturgeon from multiple eastern populations. Preliminary analysis has shown individuals from the Pearl and Pascagoula systems as well as individuals from five eastern drainages co-occur annually around Ship Island. Currently, we are quantifying these detections used to generate pre-fill occupancy patterns of Gulf Sturgeon within the array as well as describing the connectivity among populations. These data will aid management to preserve critical habitat, which is key to protecting this state-endangered and federally-threatened species.

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Primary and Secondary Stress Responses to Handling in Common Carp

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The domesticated common carp (koi), *Cyprinus carpio,* is an economically valuable, ornamental, aquaculture species. Common carp are frequently exposed to handling and aerial emersion during culture practices or in aquaria. However, the metabolic and biochemical responses to these stressors are not fully understood. Therefore, common carp were subjected to stressors of 5 minutes of chasing in a circular tank followed by 30 seconds of aerial emersion, and afterwards blood was collected to measure stress effects on oxygen transport, acid-base balance, metabolites and ion regulation. Blood samples were analyzed for cortisol, hematocrit, red blood cell count, partial pressure of oxygen, total oxygen content, oxygen saturation, partial pressure of carbon dioxide, pH, hemoglobin, bicarbonate (HCO_3^-), sodium (Na^+), potassium (K^+), calcium (Ca^{2+},), chloride (Cl^-), glucose and lactate. Handling resulted in increased plasma cortisol, hematocrit, red blood cell count, hemoglobin, glucose, and lactate and decreased oxygen content, blood pH, HCO_3^-, Na^+, K^+, and Cl^-. These results indicate that subjecting common carp to handling elicits primary and secondary stress responses. The characterization of these responses is beneficial for a better understanding of this species.