42nd Annual Meeting of the Mississippi Chapter of the American Fisheries Society

Tara Wildlife
Vicksburg, MS

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9 – 11 March 2016

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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
Gulf Coast Research Laboratory, Center for Fisheries Research and Development, The University of Southern Mississippi	The University of Southern Mississippi Gulf Coast Research Laboratory Center for Fisheries Research and Development

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 9		
4:00 - 7:00 PM	Check-in and Registration	Dining Room
7:00 - 11:00 PM	Welcome Social	Outside, near Dining Room
Thursday, March 10		
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 11		
6:30 – 8:00 AM	Breakfast	Dining Room
8:15 – 9:30 AM	Presentations	Conference Room
9:30 – 9:45 AM	Break	Conference Room
9:45 – 12:00 PM	Chapter Business Meeting	Conference Room

Banquet Speaker 1: Michael Colvin

Challenges and Potential Solutions to Integrating Fisheries Research, Management, and Monitoring – Emerging Patterns from a National Perspective.

Michael Colvin has a broad national perspective of fisheries. His interest in fisheries began during his youth in upstate New York, chasing bluegill and bass in small farm ponds, spring runs of smelt and bullhead, and graduating to more elusive brown and brook trout. During this period he had aspirations of becoming a fish hatchery manager and attended Unity College, Maine, to pursue a degree in aquaculture and fisheries. He spent a couple of years post-graduation working for Idaho Fish and Game and Utah Department of Natural Resources until attending graduate school at the University of Idaho (UI) to study disease dynamics in trout and salmon. Post-graduation he worked for the USEPA studying Coho Salmon on the Oregon Coast until attending Iowa State University (ISU) for a Ph.D. studying the effects of invasive species in lake ecosystems. Then he returned to Oregon to study prespawning mortality of spring-run Chinook salmon as a postdoctoral researcher at Oregon State University. Recently, Mike joined the faculty at Mississippi State University (MSU) as an assistant professor.

Mike's research program, while still in its infancy at MSU, endeavors to further build and refine the link of research, monitoring, and management. His research interests are broad, ranging from individuals to ecosystems, but linked the common theme of using research to inform management decisions and monitoring to further learning and reduce decision uncertainty. He teaches classes in Fisheries Science and Fisheries Management, as well as an upcoming graduate class in Natural Resource and Conservation Decision Making.

Mike has contributed to the American Fisheries Society at many levels. As a student at UI, he served several positions in the Palouse Student Unit, including President. He provided webmaster services to Oregon and Iowa chapters AFS. While at ISU he served as President of the Student Subsection of the Education Section. Currently, he serves as Western Division representative of the Fisheries Management Section, Southern Division Representative of the Education Section, Southern Division Representative of the Education Section Certification Committed, and chair of the New Initiatives Committee of the Education Section.

Banquet Speaker 2: Dennis Riecke

Uncertainty and Certainty in Mississippi's Instream Flow Program

Dennis received a BS degree in Fishery Biology and Aquatic Science from the University of Southwestern Louisiana in 1982 and a MS degree in Fisheries Management from Mississippi State University in 1985.

Dennis has worked for the Kansas Fish and Game Commission as a District Fisheries Biologist, (January 1985- April 1987), in Louisiana as an Aquaculture Research Associate (May 1987-November 1988) and for the past 26 years as a fisheries biologist and a fisheries coordinator for the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP). His current duties include serving as Environmental Coordinator, representing MDWFP on the Miss. Dept. of Environmental Quality permit board; providing fisheries technical information on farm pond and aquatic plant management; helping communities enroll existing water bodies in an urban fisheries program; and on issues concerning commercial fishing, oxbow lake/public water access, aquatic invasive species, instream flow and drafting or revising state laws and fisheries regulations.

Dennis joined the AFS as a student in 1979 and became a Certified Fisheries Professional in 1996 and was recertified in 2002, 2008 and 2013. He was designated a Certified Public Manager in 2011. He has served on the AFS Membership Concerns (1987-1991) and AFS Continuing Education (1992-1995) committees and has served on the SDAFS Reservoir, Small Impoundments and Warmwater Streams Committees. He has been a member of the Fisheries History, Fisheries Management, Fisheries Administrator, International Fisheries and Introduced Fishes Sections. He served as Secretary-Treasurer of the Mississippi Chapter AFS (1997-1999) and the SDAFS Warmwater Streams Committee (2000-2005). From 2003-2014 he served as Chairman of the SDAFS Resolutions Committee and on the AFS Resolutions Committee. From 2009-2014, he served as Chairman of the AFS Resolutions Committee. He authored resolutions on professional safety (2005); instream flow (2007); federal funding of aquatic nuisance species (2012) which were adopted by the SDAFS and the AFS. He authored resolutions on federal funding for Asian carp control (2013) and Off-Highway vehicle use in streams (2015) which were adopted by the SDAFS. He authored the Defensive and Safe Driving article and coauthored the Chemical Application and Hazardous Waste Safety Use article in the AFS Safety Handbook, published online in December 2008. He was fundraising cochairman for the 2012 SDAFS Midyear Meeting in Biloxi, MS. He served as Secretary of the Instream Flow Council from October 2008 - May 2014.

He has served as a fisheries manuscript reviewer for SEAFWA and the North American Journal of Fisheries Management. He coauthored the third (1997), fourth (2010) and fifth (2015) editions of *Managing Mississippi Ponds and Small Lakes: A Landowner's Guide.*

He has had over 30 poplar articles about fisheries published in hunting and fishing magazines and newspapers and has had 8 photographs published in books and brochures.

He is currently serving as Second Term Co-chairman of the Mississippi River Basin Panel on Aquatic Nuisance Species and as Southern Division AFS President.

President-elect Candidates

Jerry Brown

Jerry Brown is a fisheries biologist with the Mississippi Department of Wildlife, Fisheries, and Parks. Jerry grew up in southwest MS and began his career in 1997 assisting the district biologist while attending Delta State University. He served as a state lake manager from 1999-2004, then as a fisheries biologist in east central MS from 2004-2009. He became the regional biologist and project manager for southwest MS during 2009 where he continues to work. Jerry published a manuscript on the Ross Barnett Reservoir hand grabbing fishery in the 2011 AFS Conservation, Ecology, and Management of Catfish book. He has served as the state representative to the SDAFS catfish management technical committee since 2013 and is currently the chair-elect for 2017-2018. He is active in developing sampling methods for catfish and crappie, and has also worked in conjunction with USFWS since 2011 sampling Pallid Sturgeon on the MS River. Jerry earned his AA from Southwest MS Community College, then his BS in biology and MS in natural sciences from Delta State University. Jerry has been a member of MS AFS since 2005 and has served as secretary/treasurer and representative to the MS Wildlife Federation during that time. In 2006, he was recognized by the chapter and the MS Wildlife Federation by receiving a merit award for assistance to members following Hurricane Katrina. In addition, Jerry is chair of the MDWFP uniform committee and he is an avid outdoorsman that enjoys fishing, hunting, and working with his family on their farm. He is a member of Bear Creek Methodist Protestant Church where he is a lay leader, trustee, and helps teach Sunday school.

Robert Leaf

Robert Leaf received his BA and MS while a student in California. His research there focused on intertidal and sub-tidal fish and invertebrate ecology and management. He became interested in quantitative methods while a doctoral student at Virginia Tech. His research is concerned with understanding and modeling biological systems, primarily with understanding how environmental drivers, fishing, and population characteristics influence the management of harvested fishes and invertebrates. He has most recently investigated the population dynamic response to fishing for red drum, gulf menhaden, and blue crab in the Gulf of Mexico. Leaf is an assistant professor in the department of Coastal Sciences at the University of Southern Mississippi where he teaches Biometry for the Coastal Sciences and Quantitative Fisheries Management. He currently supervises four graduate students.

Secretary / Treasurer Candidates

Lillian Collins

Lillian Collins received her B.S. degree in biological sciences from Mississippi State University in 2009. She began working at the USM Gulf Coast Research Laboratory as a fisheries research technician in 2010. Following the oil spill she worked on NRDA projects involving larval blue crabs and plankton. She assists with field work and data management for blue crab catch per unit effort and larval settlement projects. She is also involved in field sampling for SEAMAP shrimp/groundfish survey. Lillian is working on her Master's degree in coastal sciences at USM. Her project is an assessment of the distribution of eel leptocephali in the Northern Gulf and an examination of environmental effects on the distribution of representative Ophichthidae leptocephali taxa, including a diet study of two of the most commonly caught species. She is a member of the national and Mississippi chapters of the American Fisheries Society, as well as the USM student sub-unit.

Jeremy Higgs

Jeremy Higgs is a technician in the Center for Fisheries Research and Development at the Gulf Coast Research Laboratory. He is currently involved with several fisheries projects including oyster and artificial reef restoration, satellite tracking of bull sharks, and long-term monitoring studies of coastal elasmobranchs and sportfish. In addition to his work as a technician, Jeremy is currently finishing his Master's degree at USM. His graduate research addresses the life history of finetooth sharks in the northern Gulf of Mexico through investigation of age, growth, reproduction and feeding ecology. His research interests include: elasmobranch life history, acoustic and satellite telemetry, fisheries ecology, trophic ecology and fisheries management. He has been an active member with the National, MS Chapter and USM Subunit of AFS since 2011 and has presented at Southern Division and MS Chapter meetings. Additionally, he was elected the 2013-2014 President of the USM subunit and facilitated several successful fundraising and outreach events. In 2015, Jeremy received the Fellowship award from the International Fisheries Section of AFS and served as the IFS-AFS exchange representative to the Fisheries Society of the British Isles. Currently, Jeremy is the Deputy Committee Chair for the IFS-AFS 2016 Fellow and will be serving on the board for another two years. Jeremy is looking forward to becoming more involved with AFS and the State Chapter.

Presentation Schedule

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

Date/Time	Title	First author
Thursday, March 10		
8:00 - 8:15 AM	**Welcome**	
8:15 - 8:30 AM	The Big Sunflower gravel bars: An oasis in the Yazoo River delta	Jack Killgore
8:30 - 8:45 AM	Potential changes in Largemouth Bass, *Micropterus salmoides*, after transitioning from formulated to live diets	Colin Dinken*
8:45 - 9:00 AM	Preliminary results from a study of the reproductive biology of Vermilion Snapper (*Rhomboplites aurorubens*) from the north central Gulf of Mexico	Trevor Moncrief*
9:00 - 9:15 AM	Long-term population changes in relation to harvest regulations at Ross Barnett Reservoir, Mississippi	Andrew Shamaskin*
9:15 - 9:30 AM	Environmentally-driven fluctuations in condition factor of adult Gulf Menhaden (*Breoortia patronus*) in the Northern Gulf of Mexico	Grant Adams*
9:30 - 9:45 AM	Desert or dinner? Discovering the benthos of the Lower Mississippi River delta through the diets of young of year Blue Catfish (*Ictalurus furcatus*).	Audrey Harrison
9:45 - 10:00 AM	Fish passage on a low-grade weir in the Mississippi delta: How much water is enough?	Todd Slack
10:00 - 10:15 AM	**Break**	

10:15 - 10:30 AM	Characterizing the diversity and distribution of bacteria in tissues of the Atlantic Sharpnose Shark (*Rhizoprionodon terraenovae*)	Kaitlin Doucette*
10:30 - 10:45 AM	Age validation and the length-at-age relationship of Mississippi's Southern Flounder stock.	Morgan Corey *
10:45 - 11:00 AM	Effects of Silver Carp introductions on White Crappie and Largemouth Bass in floodplain lakes of the Yazoo River basin, Mississippi	Nathan Aycock
11:00 - 11:15 AM	Effects of carbon dioxide on swimming ability and respiration rates of larval Red Drum (*Sciaenops ocellatus*)	Christopher Cross
11:15 - 11:30 AM	Effects of proposed length limit changes and "5 under rule" on Lake Washington crappie yield	Christian Shirley*
11:30 - 11:45 AM	Analysis of the structure and expression of corticosteroid receptors in the Atlantic Stingray, (*Dasyatis sabina*)	Elizabeth Jones*
11:45 - 12:00 PM	Use of trail cameras for estimating fishing effort on small ponds	Stanley Turner
12:00 - 1:00 PM	**Lunch**	**Dining Room**
1:00 - 1:15 PM	Unmanned aerial vehicle data collection: applications for habitat monitoring and classification	Alan Katzenmeyer
1:15 - 1:30 PM	Development of quality crappie fishing opportunities in Mississippi state lakes	Bryant Haley*
1:30 - 1:45 PM	Influences of environmental conditions on distance moved by Shovelnose Sturgeon in the lower Mississippi River.	Dylan Hann*
1:45 - 2:00 PM	Assessing the status of the Mississippi Spotted Seatrout stock using a statistical catch-at-age model	David Dippold*
2:00 - 2:15 PM	Morphology and swimming performance in young Paddlefish	Jan Jeffrey Hoover
2:15 - 2:30 PM	Using fishes as crayfish samplers: Invitation to collaborate	Susan Adams

2:30 - 2:45 PM	Estimating burst swim speeds and jumping characteristics of Silver Carp (*Hypophthalmichthys molitrix*) using video analysis and projectile physics	Ehlana Stell*
2:45 - 3:15 PM	**Break**	
3:15 - 3:30 PM	A trends analysis of economic impacts of recreational angling at a trophy fishery	Charles Parker*
3:30 - 3:45 PM	Investigating environmental effects on physiological responses in Alligator Gar	Andrew House*
3:45 - 4:00 PM	Sedation as a means to reduce capture stress of shark species	Lauren Fuller*
4:00 - 4:15 PM	The effect of water temperature on the survival of angler and tournament caught Largemouth Bass, *Micropterus salmoides*	Kevin Keretz*
4:15 - 4:30 PM	Behavioral interactions between Speckled Peacock Bass, *Cichla temenis*, and three fish species in Puerto Rico reservoirs.	Madelyn Ruble*
4:30 - 4:45 PM	Evaluation of acute temperature change and thermal acclimation on response of Bighead Carp (*Hypophthalmichthys nobilis*) to electrical exposure	Farland Holliman
4:45 - 5:00 PM	Observations on the life history of a mysid shrimp, *Taphromysis louisianae* (Crustacea: Mysidadacea), including new distribution records in northwest Mississippi.	Steven George
5:00-6:00 PM	**Poster session**	**Conference Room**
6:00 - 11:00 PM	**Banquet**	**Dining Room and Conference Room**

Friday, March 11

8:00 - 8:15 AM	**Morning announcements**	**Conference Room**
8:15 – 8:30 AM	Near shore movements of Gulf Sturgeon in designated critical habitat around and adjacent to a commercial port and a maintained navigation channel within Mississippi Sound	Paul Grammer
8:30 – 8:45 AM	The importance of stakeholder collaboration to marine fisheries research in Mississippi	Jeremy Higgs
8:45 – 9:00 AM	Influencing of fertilizing water pH on the hatching success of stripped Channel Catfish eggs on channel x blue hybrid catfish embryo production in hatcheries	Nagaraj Chatakondi
9:00 – 9:15 AM	Establishing native aquatic vegetation in Southwest Mississippi state lakes	Trevor Knight
9:15 – 9:30 AM	Distribution of the Bonnethead Shark, *Sphyrna tiburo*, in the northern Gulf of Mexico	Eric Hoffmayer
9:30 – 9:45 AM	**Break**	
9:45 – 12:00 PM	**Chapter Business Meeting**	**Conference Room**

Poster Submissions

Poster Number	Poster Title	First author
1	Out-of-season spawning of White Crappie, *Pomoxis annularis*	Shay Allred
2	Stomach contents of Red Drum (*Sciaenops ocellatus)* from the Mississippi Sound and adjacent estuaries.	Rick Burris
3	An Atlantic-wide meta-analysis of Atlantic Bluefin Tuna trophic ecology using a bagged classification tree approach.	Christopher Butler
4	Preliminary assessment of Black Drum (*Pogonias cromis*) age and growth from Mississippi coastal waters.	William Dempster
5	Establishing a universal scale and guide to determine macroscopic gonadal development in marine fishes.	Matthew Donaldson
6	Does pellet feeding alter early-life diets and digestive physiology in Channel Catfish?	Jesse Filbrun
7	When life hands you lemonfish…an ArcGIS database of the GCRL Sportfish Tagging Program catch locations for Cobia (*Rachycentron canadum*) in Mississippi and eastern Louisiana waters.	Dyan Gibson
8	Investigations of larval and juvenile Tarpon (*Megalops atlanticus*) inhabiting Mississippi coastal waters: Overview.	Patrick Graham
9	Induced spawning, larval rearing, and mollusk consumption of Black Buffalo, *Ictobus niger*	Emmet Guy
10	Using natural biogeochemical tags to study elasmobranch habitat use and population connectivity.	Justin Lewis
11	An ecological study on the burrowing and feeding habits of *Coronis scolopendra latreille (*Stomatopoda: Nannosquillidae)	Addison Ochs

12	Use of fishery-independent sampling to estimate catch-per-unit-effort and biological characteristics of Blue Crab in the Mississippi Sound.	Tasheena Powers
13	Fishery independent effort and harvest of Mississippi's recreational Blue Crab fishery	Harron Wise

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 10		
8:15 - 10:00 AM	Bryant Haley	Mississippi State University
10:15 - 12:00 PM	Trevor Moncrief	University of Southern Mississippi
1:00 - 2:45 PM	Chelsea Gilliland	Mississippi State University
3:15 – 5:00 PM	Grant Adams	University of Southern Mississippi
Friday, March 11		
8:15 – 9:45 AM	Morgan Corey	University of Southern Mississippi

Abstracts

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

Grant D Adams, grant.adams@eagles.usm.edu, (847) 922-3530

Environmentally-driven fluctuations in condition factor of adult Gulf Menhaden (*Brevoortia patronus*) in the Northern Gulf of Mexico

Grant D. Adams, Robert T. Leaf

Department of Coastal Sciences, University of Southern Mississippi, Ocean Springs, MS

Understanding the impacts of bottom-up processes on commercially important fishes is a major research focus in fisheries science. We evaluated the effects of a suite of environmental predictors on the individual condition (the relationship between individual weight and length) of adult Gulf Menhaden *Brevoortia patronus* sampled from the commercial fishery, from 1964 to 2011 (n = 47 yrs.). A hierarchical linear model (HLM) was used to examine the association between condition and winter Mississippi River discharge. Generalized Additive Models (GAMs) were constructed to determine the impact of El Niño Southern Oscillation (ENSO) and the spatially-dependent influence of sea surface temperature (SST °C) and chlorophyll *a* concentration (mg/ml). Condition was positively related to Mississippi River discharge (p < 0.001, β = 1.43, SD = 0.28) and exhibited both intra- and inter-annual variability, improving the fit of the model vs base models (X^2 (6) = 8,6471, p < 0.001). Condition was greatest during positive anomalies of ENSO and at locations close to the Mississippi River mouth (p < 2e-16, deviance explained > 9%). Condition exhibited intra-annual variability with a small peak during April and May and increasing condition from August until November, likely due to seasonal life-history strategies related to food availability and winter spawning. Comparison of candidate models indicated that the inclusion of SST and chlorophyll-*a* without a temporal lag provided the best model support. However, while the influence of SST on condition was significant and spatially variable (p < 0.001, deviance explained = 15.4%), chlorophyll *a* concentration was not spatially or temporally significant (p > 0.05). We show that bottom-up processes impact the individual dynamics of Gulf Menhaden in the Northern Gulf of Mexico (NGOM) and these results can be used to predict their impacts on the fisheries and ecology of the NGOM.

Susan B. Adams, sadams01@fs.fed.us, (662) 234-2744 ext. 267

Using fishes as crayfish samplers: invitation to collaborate

Susan B. Adams[1]

[1] USDA Forest Service, Southern Research Station, Center for Bottomland Hardwoods Research, Stream Ecology Lab, Oxford, MS, 38655

Although basic knowledge about crayfishes in the Southeast is improving, crayfishes that are primary burrowers or that live in large water bodies are woefully undersampled, largely because they are the most difficult to capture. Crayfishes are functionally important components of ecosystems, serving as ecosystem engineers, predators, and prey. Invasive crayfishes have caused extirpations and fisheries collapses in other regions, and they may be a bigger issue in Mississippi than we realize. However, without better distributional information and sampling methods for crayfishes in large water bodies, we are unprepared to recognize or respond to crayfish invasions in these habitats. In a recent study in and upstream of Lewis Smith Reservoir, AL, we found seven crayfish species, of which two were new drainage records and three were certainly or probably introduced. Despite extensive sampling effort using multiple techniques, two crayfish species were detected only by examining gut contents of black basses captured in the reservoir. We also examined gut contents of fishes in our collection to assess historical crayfish species assemblages in the rivers. I plan to further explore the effectiveness of using fishes as crayfish samplers and am seeking collaborators who have, or who plan to obtain, fish gut samples from large water bodies in or near Mississippi.

Shay Allred, sa1615@msstate.edu, (480) 208-8019

Out-of-Season Spawning of White Crappie, *Pomoxis annularis*

Allred, S.[1], C. Culpepper[1], E. Guy[1], T. Holman[2], L. Pugh[2], and P. J. Allen[1]

[1]Department of Wildlife, Fisheries and Aquaculture Sciences, Mississippi State University, Starkville, MS 39762
[2]Mississippi Department of Wildlife, Fisheries and Parks, 1505 Eastover Drive, Jackson, MS 39211

The white crappie (*Pomoxis annularis*) is a popular recreational game-fish species in North America, particularly in the southeastern United States. Hatcheries contribute to recreation crappie fisheries and help to reduce interannual population variability but are limited to spawning crappie once annually during the natural spawning period. Out-of-season spawning would provide the ability to utilize hatcheries year round for propagation of crappie. Previous research has suggested that compacted seasonal adjustment periods from winter (10°C, 8 hr light) to spring (22°C, 16 hr light) need to be longer than 6-weeks to successfully induce spawning. Therefore, out-of-season spawning experiments occurred from November to February with 6-wk (1°C increase/4 d, 1hr photoperiod increase/6 d) and 9-wk (1°C increase/6 d, 1hr photoperiod increase/9 d) seasonal adjustment periods. After 15 d at spring conditions, fish were injected with gonadotropin releasing hormone (GnRH; 10% priming dose, 90% resolving dose; 24 hr later) and strip spawned upon ovulation. The 6-wk treatment (9 females: 6 males) induced 7 females to spawn with an average fertilization rate of 20.3%, although only 1 of the 7 spawning females produced a fertilization rate higher than 50%. Data for the 9-wk treatment (10 females: 7 males) are currently being collected. While using GnRH, white crappie out-of-season spawning is possible with a 6-wk seasonal adjustment period, however, longer adjustment periods may be necessary to enhance fertilization and spawning success.

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

Effects of Silver Carp Introductions on White Crappie and Largemouth Bass in Floodplain Lakes of the Yazoo River Basin, MS

Nathan Aycock, Darrin Hardesty, Chad Washington, Donta Reed, and Jerry Brown

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

The invasive silver carp continues to quickly expand its range throughout the United States. Studies have shown the negative effects these fish can have on native planktivores in large river systems, yet their effect on sport fish species is less well known, especially in floodplain lakes connected to large rivers. During the historic flooding of the Mississippi River in 2011, silver carp juveniles gained access to some oxbow lakes in the Yazoo River Basin where they had previously not been present. MDWFP sampling from pre-flood and post-flood indicates substantial changes to the white crappie population at these lakes after silver carp entered the system, including decreased abundance, decreased growth rates, and significantly lower relative weight values. In other nearby floodplain lakes where silver carp are not present, crappie abundance increased after the flooding, and fish condition either stayed the same or improved. Similar trends in abundance and condition was found for largemouth bass in these systems. A decrease in prey species abundance, especially gizzard shad and bluegill sunfish, after silver carp introductions may be driving these trends. Our data shows the dramatic impact silver carp can have on sport fish populations in floodplain lakes.

Rick Burris, rick.burris@dmr.ms.gov, (228) 523-4139

Stomach contents of Red Drum (*Sciaenops ocellatus*) from the Mississippi Sound and adjacent estuaries.

Burris, R. E. and J.Barr

Mississippi Department of Marine Resources, Office of Marine Fisheries 1141 Bayview Ave. Biloxi, MS 39530

The diet of the Red Drum (*Sciaenops ocellatus*) is directly related to the spatial movements of this fish throughout the various stages of its lifecycle. Red Drum are known to occupy the lower saline waters of the estuaries as juveniles and sub-adults, foraging along the marsh edges and around oyster reefs, before maturing and moving into deeper waters where diversity of prey can be further limited. The objective of this study is to determine the importance of major prey items on the different life stages of Red Drum in Mississippi coastal waters relative to specific size ranges. Stomach contents were analyzed from Red Drum (n=172) ranging in size from 290 - 1126 mm total length (TL). Fish were collected through both fishery independent (standardized gill net surveys) and fishery dependent (recreational and for-hire industry) methodologies from various locations throughout the Mississippi Sound and its adjacent estuaries (Pearl River, Bay of St. Louis, Biloxi Back Bay, Pascagoula River, and Grand Bay). Fish were separated into different size categories and classified accordingly: < 450mm TL (juvenile), 450-750mm TL (sub-adult), and > 750 mm TL (adult). Of the 172 stomachs examined, 103 (59.8%) contained prey items which were identified to lowest taxa possible, enumerated, measured volumetrically, and an index of relative importance (IRI) was calculated to determine which prey items dominated each specific size range. Findings indicate that the juveniles and sub-adults collected foraged predominantly on crustaceans (IRI% - 99.2 & 82.3% respectively), where the adult's diets consisted of primarily fishes and fish remains (IRI% - 97.4). The data suggests a significant shift in prey selectivity as juveniles mature and move from the estuaries into the Mississippi Sound.

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

An Atlantic-wide meta-analysis of Atlantic bluefin tuna trophic ecology using a bagged classification tree approach

Christopher M. Butler[1], John M. Logan[2], Michelle D. Staudinger[3,4], and Eric R. Hoffmayer[5]

[1]University of Southern Mississippi, Gulf Coast Research Laboratory, Center for Fisheries Research & Development
[2]Massachusetts Division of Marine Fisheries
[3]Northeast Climate Science Center,
[4]University of Massachusetts Amherst, Department of Environmental Conservation
[5]National Marine Fisheries Service, Southeast Fisheries Science Center, Mississippi Laboratories

Atlantic bluefin tuna (*Thunnus thynnus*) is a pelagic predator found seasonally throughout the Gulf of Mexico, North Atlantic Ocean, and Mediterranean Sea. Bluefin tuna diet and trophic ecology have been characterized for individual feeding areas throughout its range, but a comprehensive foraging analysis is lacking for this highly migratory species. Here, we describe the use of a modified (bagged) classification and regression tree modelling approach to evaluate the influence of a suite of environmental and biological variables on broad-scale spatial and temporal shifts in bluefin tuna foraging habits. Diet data from over 3,400 non-empty bluefin tuna stomachs were compiled from individual datasets spanning the Gulf of Mexico, Atlantic coast of the United States, central North Atlantic Ocean, Iceland, Bay of Biscay, and the Mediterranean Sea over a 30-year time-period (1985 - 2015). Additionally, we evaluated trends in regional predator-prey body size relationships among 18,845 individual prey items using quantile and least squares regression techniques. Results from this study will improve ecosystem-based management of Atlantic bluefin tuna by providing a comprehensive evaluation of food web and climatic factors influencing the migration and foraging patterns of this economically and ecologically valuable predator.

Nagaraj G. Chatakondi, nagaraj.chatakondi@ars.usda.gov

Influence of fertilizing water pH on the hatching success of stripped channel catfish eggs on channel x blue hybrid catfish embryo production in hatcheries

Nagaraj G. Chatakondi

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Variable egg quality is one of the most important constrains to the development of aquaculture. The quality of eggs that are manually stripped from channel catfish are affected by variation in parental genetics, maturity, type and dose of hormone, age and pre-spawning stress of female fish. Further, sub-optimal hatching conditions affect egg quality and often result in varied and lower survival of embryos in hatcheries. Production variables that are part of the hatching process need to be identified and optimized to improve the efficiency of hatchery production. Recent studies established a significant correlation between pH of stripped channel catfish eggs and hatch rate of hybrid catfish eggs, suggesting pH of the strip channel catfish eggs prior to fertilization to be predictive of hatching success of hybrid catfish eggs and considered as a predictor of egg quality. The range of pH of stripped channel catfish eggs vary from 6.5 to 9.0, however the fertilized eggs are incubated in hatchery waters of high pH (pH 7.5 to 9.5). Even though, great care is taken to optimize temperature and calcium hardness of hatchery waters, pH of hatchery water is seldom measured nor acclimated for varying pH of stripped eggs, typically a difference of 1.0 to 3.0 pH units. It is suspected that this range of pH difference between stripped eggs and hatching waters may be responsible for inconsistent and lower hatch of hybrid catfish eggs. The objective of this study was to identify progressive periodic exposure of pH waters during the transition from fertilization to incubation of fertilized eggs in hatching waters to improve hatching success. Stripped eggs from 12 hormone-induced channel catfish females of varying egg quality (pH) in replicated mesh cups were randomly exposed to fertilizing waters of pH: 7.0, 7.5, 8.0 and 9.0 for 30 minutes and progressively moved to the next higher pH level, followed by incubating in hatchery waters of pH 9.3 until hatching. Incubating stripped eggs of lower pH (pH < 7.0) in progressive periodic exposure did not improve the hatching success of hybrid catfish eggs. However, incubating stripped eggs with higher pH (pH >7.5) in progressive periodic exposure resulted in higher hatching success. The results of the study suggest that stripped eggs of lower quality incubated in higher pH fertilizing waters with gradual acclimation did not improve the hatching success of fertilized eggs. Hence, future studies need to be focused on improving genetics, nutrition, and hormonal manipulations of broodfish to produce consistent and higher egg quality of stripped eggs to maximize the hatching success of hybrid catfish eggs.

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Age validation and the length-at-age relationship of Mississippi's Southern Flounder stock

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Southern Flounder (*Paralichthys lethostigma*) is the most commonly harvested flatfish species in the north-central Gulf of Mexico (GOM) and supports a major recreational fishery (about 100,000 kg harvest per year) in Mississippi. Despite the economic value of this species and evidence for population decline in the GOM, critical life-history information is limited. The length-at-age relationship has been shown to vary spatially within the GOM and the growth dynamics of Southern Flounder in Mississippi's state-managed stock have not been previously described. The objective of this research is to determine otolith-derived age estimates and to describe the length-at-age relationship for Southern Flounder in Mississippi. Southern Flounder otoliths and measurements of total length (TL, mm) were collected from fish caught during September 2014 to January 2016. Otoliths (n = 274) were sectioned following standard methods and age estimates were determined from otolith annuli counts and marginal increments. Our methods of age validation using measured marginal increments provided precise, biologically relevant estimates of age. A suite of length-at-age models were fit to the TL and age data and evaluated using Akaike information criteria (AIC). Model parameters were compared to previously reported parameter estimates using 95% confidence intervals (CI). We found that the 3-parameter von Bertalanffy growth model best described the data with the following mean parameter estimates: L_∞ = 509 mm (95% CI 480 to 558), k = 0.70 y^{-1} (95% CI 0.48 to 0.94), and t_i = -0.46 y (95% CI -0.89 to -0.18). We also observed that female-specific parameters did not differ from those published at other locations in the GOM. We anticipate that these results will be useful for informing state-level management of the Southern Flounder stock in Mississippi.

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Effects of carbon dioxide on swimming ability and respiration rates of larval red drum, *Sciaenops ocellatus*

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Ocean acidification (OA) is expected to broadly affect entire ecosystems and have detrimental effects on the organismal level. Specifically, OA can play a critical role in the ecology and distribution of fish assemblages by closely interacting with their physiology. This study determined the effects of OA on the swimming ability and respiration rates of 17-19 day old larval red drum (*Sciaenops ocellatus*) at PCO_2 levels expected in the near future (498 µatm), in the year 2100 (730 µatm) and beyond the year 2100 (1473 µatm). It was hypothesized that as CO_2 levels increase, the swimming ability and respiration rates of larval red drum would decline as a result of the Root and Bohr effects, which limit O_2 delivery within the body of fishes. Larvae reared in each CO_2 treatment were swam in a flume and recovery respiration O_2 consumption (RO_2) was measured in a respirometer immediately after the swimming trial concluded. Swimming performance of fish reared in near future and 2100 scenarios (498 µatm and 730 µatm) showed similar, high swimming performance, however, fish in the extreme scenario (1473 µatm) showed significantly reduced swimming performance. Additionally, O_2 consumption was significantly higher in the 730 µatm treatment fish than the other two treatments. These results suggest red drum larvae have the ability to activate a respiration mechanism to maintain swimming performance at elevated PCO_2 levels, but as OA progresses, PCO_2 levels will surpass this coping ability and swimming performance and oxygen consumption rates of larval red drum will be degraded.

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Preliminary assessment of black drum (*Pogonias cromis*) age and growth from Mississippi coastal waters

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Black drum (*Pogonias cromis*) is an estuarine dependent species that supports recreational and commercial fisheries throughout the northern Gulf of Mexico. Life history traits have been described throughout its geographical range, but regional differences in life history are poorly understood. Fisheries independent data for *P. cromis* in Mississippi coastal waters were collected from 2008–2015. A total of 1314 *P. cromis* were collected during the study period; a length-weight relationship was calculated from 1188 fish. Stretched total lengths (STL) ranged from 145–979 mm, with an average of 307.3 ± 83.9 mm (S.D.); weights ranged from 39.5-18800.0 g ($\bar{x}$ = 501.0 ± 832.0 S.D). Annual abundances did not show a significant relationship to the environmental parameters of salinity, temperature, and dissolved oxygen. Additionally, sagittal otoliths (*n*=605) were removed and examined for age; ages ranged from 0–8 years ($\bar{x}$ = 1.6 ± 1.1 S.D. years). Growth was determined by minimizing the sum of squares of a von Bertalanffy growth curve parameterized at L_{inf}=1250, K=1, and t_0=0. Under these assumptions, predicted growth parameter values were L_{inf}=1250, K=0.120, and t_0=-0.317. Data from this study will provide important information on age and growth of this species to aid in stock assessment, management, and conservation.

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Physiological changes in Largemouth Bass, *Micropterus salmoides*, after transitioning from formulated to live diets

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Management agencies are interested in rearing Largemouth Bass *Micropterus salmoides* to larger sizes via intensive culture and formulated diets to increase survival in the wild. Further, intensive culture of Largemouth Bass may benefit studies that require large numbers of relatively homogenous fish that cannot feasibly be obtained from the wild. Previous studies of Largemouth Bass have shown that fish reared on formulated diets higher in carbohydrates than live diets may develop livers with higher lipid content and potentially differ in both physiological responses and survival compared to wild fish. The objective of this study was to determine the duration of time fish need to be fed live diets before they are physiologically similar to wild fish. Therefore, Largemouth Bass were reared from 50 to 290 mm on a formulated diet and transitioned to a diet of live forage. Liver lipids, glycogen, moisture, color, and hepatosomatic index were measured over time and compared to wild populations. Most physiological metrics approximated wild fish within 4-6 weeks after transition. Liver lipid content and liver glycogen content appeared to be inversely related, likely reflecting tradeoffs in energy storage and utilization. Our results indicate that intensive culture using formulated diets to achieve rapid growth can produce Largemouth Bass physiologically similar to wild fish after a brief period of feeding live forage, providing management and research opportunities.

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Assessing the status of the Mississippi Spotted Seatrout Stock using a statistical catch-at-age model

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Spotted Seatrout (*Cynoscion nebulosus*) are the most popular recreational inshore target in Mississippi's coastal waters. In Mississippi, Spotted Seatrout harvest is regulated by a 13 inch minimum length limit and a 15 fish daily bag limit. Despite the popularity of Spotted Seatrout as a recreational target in Mississippi, no formal stock assessment has been conducted for the Mississippi stock. The goal of this study was to quantitatively assess the Mississippi Spotted Seatrout stock using a statistical catch-at-age (SCA) model. SCA models provide a quantitative understanding of the population and fishery dynamics of stocks because they incorporate fishery-dependent and fishery-independent data as well as information about the life history of individuals. The data used for this assessment were the observed catch-at-age from 1993 to 2014, a fishery-independent index of abundance, a fishery-dependent CPUE time series, and age-specific natural mortality estimates and maturity estimates. Additionally, we conducted a sensitivity analysis to evaluate how a fixed estimate of natural mortality (0.2 y^{-1}), compared to age-specific natural mortality estimates, affected the results of the stock assessment. A retrospective analysis was also conducted to evaluate how the inclusion of recent data affected the model estimates of the current fishing mortality and spawning stock biomass. To do this the terminal year(s) in the assessment were sequentially omitted. The results of the stock assessment suggest that, given the reference points of $F_{30\%SPR}$ = 0.35 $y^{-1}$and $SSB_{30\%MSY}$ = 584 metric tons, the Mississippi Spotted Seatrout stock is overfished (SSB_{2014} = 153, 90 % CI = 110 to 212 metric tons) and is currently experiencing overfishing (F_{2014} = 1.72 y^{-1}, 90% CI = 1.57 to 1.87 y^{-1}). Since 2009, spawning stock biomass has decreased (from 538 metric tons to 153 metric tons) and fishing mortality has increased (from 0.76 y^{-1} to 1.72 y^{-1}). The results of the sensitivity analysis and the retrospective analysis indicate that the trends of decreasing biomass and increasing fishing mortality do not change dramatically with changes in the model inputs or changes in the terminal year of the assessment. The results of this stock assessment indicate that changes in the intensity of fishing and the minimum size limit should be made for continued sustainability of the stock.

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Establishing a Universal Scale and Guide to Determine Macroscopic Gonadal Development in Marine Fishes

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Researchers have faced problems with interpreting and assigning macroscopic gonadal assessments due to the lack of understanding of the true histological level changes that accompany the reproductive phases. The Center for Fisheries Research and Development (CFRD) has developed a visual catalog of gonads in various reproductive phases that corresponds to the histological classification of Brown-Peterson et al. (2011; Marine and Coastal Fisheries 3:52-70) This guide was developed to ensure consistent identification between CFRD and the Mississippi Department of Marine Resources (MDMR) employees such that proper management decisions can be made. The visual catalog focuses on 14 important sport fish species of the Mississippi Gulf Coast that both the CFRD and MDMR catch regularly, including *Cynoscion nebulosus, Scombermorus maculatus,* and *Sciaenops ocellatus*. All of these species exhibit a yearly spawning cycle and display all the phases and sub-phases identified by Brown-Peterson et al. Photographs were taken of ovaries and testes in all phases of development from the focus species. The guide provides both written descriptions of each phase as well as photographs of associated male and female gonads. The phases identified are immature (5), developing (2), spawn capable (3), actively spawning (3a), regressing (4), and regenerating (1). Although the guide effectively relies on both photographs and written descriptions to make an assessment, it is still possible that an improper assessment can be made. For instance, gonads in the regenerating and immature phases are difficult to differentiate from one another even using the guide. Therefore, an understanding of the timing of the reproductive cycle for each species is essential to help determine the correct gonadal phase of the fish. Despite this problem, the newly developed guide will help build consistency between the two agencies, and help improve the management of fish species on the Mississippi Gulf Coast.

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Characterizing the diversity and distribution of bacteria in tissues of the Atlantic sharpnose shark (*Rhizoprionodon terraenovae*)

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As keystone species in many ecosystems, sharks are critical to the health of coastal and oceanic communities that also include many commercially and recreationally viable fish and shellfish species. However, despite the importance of sharks in these ecosystems, significant gaps still remain in our understanding of shark biology. For example, very little is known regarding the role of the microbiome, i.e. resident bacteria in tissues of healthy sharks. Communities of bacteria in vertebrate digestive systems aid in host metabolism; however, the existence of non-pathogenic bacteria in other healthy tissues is unusual. Previous studies suggested that sharks, unique in numerous aspects of physiology, possess endogenous bacteria in tissues that are sterile in other vertebrates such as kidney, liver and blood. Surprisingly, this phenomenon has not been explored since initial publications in the late 1980s, which employed culture-based approaches to microbial characterization. Using modern methods such as 16S rRNA gene sequencing, we identified a diverse array of bacteria present in intestinal, hepatic and renal tissues of the Atlantic sharpnose shark (*Rhizoprionodon terraenovae*) from the Gulf of Mexico. Using this preliminary data, we hope to elucidate the costs and benefits of symbiont bacteria to their shark hosts. The results of this study confirm an unprecedented relationship between microbes and vertebrate hosts and raise compelling questions about the importance of resident bacteria to shark physiology, as well as the possible implications of differences in microbial diversity across individuals.

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Does pellet feeding alter early-life diets and digestive physiology in channel catfish?

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Channel catfish nursery ponds typically receive large additions of high-protein pelleted feeds to increase fish growth and survival. However, recent studies found that zooplankton and insects in ponds supported fish growth, despite continuous supplemental feeding. This surprising result suggests that midday feeding does not coincide with peak foraging activity, and/or fish lack the digestive capability to metabolize the inert feed during early life. To improve feeding methods, a pond experiment was conducted to test the effects of supplemental feeding on fish gut fullness, diet composition, and digestive enzyme expression. Floating, open-topped cages (0.44 m^3) fitted with mesh were constructed to retain the fish but allow zooplankton and insects to enter. The cages were deployed in a pond, stocked with 10 day old fish (1.5 fish/L), and randomly assigned to treatments that received feed once daily at midday, or did not receive any feed (4 cages/ treatment). Once weekly for 4 weeks, fish were collected over 24 hours at 3 hour intervals. Underwater video recordings confirmed that fish in fed cages ingested the feed. However, fish growth in length and weight did not differ between treatments (ANCOVA, $P \geq 0.20$). Using the ratio of observed to predicted weights of fish as a proxy for stomach fullness, the fish foraged most actively at 12pm and 12am in both treatments. Gut content analysis and measurements of digestive enzyme activities (amylase, trypsin, pepsin) are ongoing. Initial results support growing evidence that supplemental feeding is unnecessary during early life in channel catfish.

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Sedation as a means to reduce capture stress of shark species

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Capture stress is a significant problem in fisheries biology and may lead to reduced survivorship of bycaptured species. In some fisheries, sedation may be useful for capture stress reduction. In this study, we provide preliminary data regarding the effect of iso-eugenol (clove oil) sedation on the stress response of sharks via measurement of lactate and respiration rate. Sharks caught by hook-and-line (*Rhizoprionodon terraenovae, Carcharhinus isodon,* and *Carcharhinus limbatus*) were placed into a sealed respiration chamber *in-situ* containing iso-eugenol (treatment) or seawater (control) from which dissolved oxygen was continuously monitored to determine the respiration rate. Blood samples were taken at 0, 10, 20 and 30 minute intervals and later analyzed for lactate. The results indicate that treatment has a significant effect on respiration rate in *R. terraenovae*, $F(3,6)=9.672$, $p=0.0116$. After 15 minutes, there appears to be a near significant difference in lactate between treatments of all species combined, $F(1,7)=5.3952$, $p=0.05318$. These preliminary results suggest that iso-eugenol sedation may be useful for stress reduction in bycaptured sharks, thereby increasing survivorship after release.

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OBSERVATIONS ON THE LIFE HISTORY OF A MYSID SHRIMP, *TAPHROMYSIS LOUISIANAE* (CRUSTACEA: MYSIDADACEA), INCLUDING NEW DISTRIBUTION RECORDS IN NORTHWEST MISSISSIPPI

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The opossum shrimp, *Taphromysis louisianae,* is an important food source for fishes including young-of-year largemouth bass. The opossum shrimp is not true shrimp but is a Crustacean superficially resembling crayfish and shrimp. We collected numerous opossum shrimp during seasonal sampling in two oxbow lakes and five floodplain pools of the Mississippi River near Clarksdale, MS. Previous distribution records of *T. louisianae* have been sporadic and based on only a few individuals (<10) suggesting a limited number of established populations. During this study we collected a total of 9,253 specimens ranging from one individual to 1130 in a single light trap. Each oxbow lake and floodplain pool varied in the number of individuals taken. Of the 180 light traps samples taken from October 2015 to June 2015 over half of them contained opossum shrimp. Light traps were set over night in water depths of 0.46 to 7 meters. Water depth or distance to shore did not show any difference in the overall numbers suggesting that specimens occurred sporadically within the sampled habitat. Opossum shrimp are sexually dimorphic; 69 light traps samples contained a total of 4,845 individuals with females (n=2,638) slightly more abundant than males (n=2,207). During May and June 2015 females were pregnant and young-of-year were present. Our data firmly supports an established population of opossum shrimp in Northwest Mississippi.

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When life hands you lemonfish…an ArcGIS database of the GCRL Sportfish Tagging Program catch locations for cobia (*Rachycentron canadum*) in Mississippi and Eastern Louisiana waters

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The Gulf Coast Research Laboratory Sportfish Tagging Program, established in 1989 and funded by the Mississippi Department of Marine Resources through the Sport Fish Restoration Program, contains within its database several thousand catch location points in the Gulf of Mexico from Texas to the Florida Keys, and in the South Atlantic Ocean from The Florida Keys to Chesapeake Bay. Currently, location data are grouped into 10 "tag zones" for quantifying regional participation in the program. The purpose of the study reported here is to utilize the more detailed location information provided by volunteer anglers participating in the program for tagged cobia (*Rachycentron canadum*), aka lemonfish, including catch-release coordinates, landmarks, reefs, and rigs, to tentatively define structural areas favored by anglers, and to create a location database for future website and phone app reference points. Attribute tables detailing the locations of structures (i.e., oil and gas rigs, offshore reefs including the Rigs to Reefs Program areas, buoys, inshore reefs, wrecks and bottom obstructions) were imported into ArcGIS and joined with catch location attribute tables for tag zones 2 and 3, which range from the South Pass of the Mississippi River in the west to the Mississippi/Alabama border in the east, and extends from the coastline southward to 28.325 degrees latitude. Proximities between tagging locations and known structures were determined, and the tagging success per use of the structures were ranked by the numbers of cobia tagged-released. Overall, structures associated with barrier islands and their associated passes yielded the most tagged cobia, followed by offshore oil and gas rigs, shipping channel buoys, and offshore artificial reefs. A future sportfish tagging phone app or website would make the structure locations referenced for this study immediately available, and would allow participating anglers to log each successful tagging event.

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Investigations of larval and juvenile Tarpon (*Megalops atlanticus*) inhabiting Mississippi coastal waters: Overview

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Tarpon, *Megalops atlanticus*, are large, migratory fish that frequent coastal and inshore waters of the tropical and subtropical western Atlantic Ocean, including the Gulf of Mexico and Caribbean Sea. During the late 1800's and early to mid-1900's, schools of adult tarpon reportedly occurred in coastal Mississippi waters during summer months, supporting well publicized tarpon tournaments and fishing clubs. As a result of historic over-fishing throughout its Gulf and South Atlantic range, coupled with loss of nursery habitat from coastal development, regional Tarpon abundance declined considerably since the 1950's. The occurrence of adult Tarpon in Mississippi offshore waters during summer months is believed linked to their annual Gulf migratory pattern and presumed spawning in the northern Gulf. Tarpon larvae (leptocephali) collected from Mississippi shoreline waters (n=42, 16.0 - 28.7 mm FL) during 2013 and 2015 using a beam plankton trawl were examined to determine stage of larval development and estimate age by microstructure analysis of sagittal otoliths. The majority of leptocephali were pre-metamorphic and ranged in age from 28 to 34 days. During 2007-2013, small juvenile tarpon (n=279, 50 - 285 mm FL) were collected during fall/winter months from tidal sloughs and stagnant pools in marsh habitat using cast nets. These collections included 33 'cold-stunned/killed' specimens taken from 9^{o}C water (below the documented temperature threshold for young tarpon survival) in November 2013. The age of juveniles (n = 34, 74 – 245mm FL) selected from the total collection ranged between 51 - 132 days old. Our findings to date have prompted numerous research needs for young tarpon in Mississippi waters, including additional collections for biological research, coupling of leptocephalus ages with ocean current models to estimate their origin (spawned locations), and use of pop-off satellite tags (PSAT) to document movements of adult tarpon along the Mississippi coast.

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Nearshore movements of Gulf Sturgeon in designated critical habitat around and adjacent to a commercial port and a maintained navigation channel within Mississippi Sound

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Traditional dogma concerning the western Gulf Sturgeon population indicates large subadults/adults migrate from rivers in fall to feed in shallow areas around barrier islands whereas small subadults/juveniles remain either in the estuary or nearshore habitats; up river immigration follows in spring. To test this, we used a two-year data set (2012-14) from an acoustic network around the Port of Gulfport (Port footprint, east and west gates) positioned between the Pearl and Pascagoula Rivers. During sampling period 1 (September 2012 – May 2013), we documented between 3 and 6 fish on each receiver totaling 12,285 raw detections among 19 receivers were detected; 5 adult and 1 juvenile (east gate), 3 adult and 2 subadult (west gate), and 5 adult, 1 subadult, and 1 juvenile (Port footprint). Only 30% of tagged Gulf Sturgeon had both a high number of days and high number of detections. During sampling period 2 (October 2013 – May 2014), between 3 and 9 fish were detected on each receiver but only 2,371 raw detections; 6 adult, 1 subadult, and 2 juvenile (east gate), 8 adult, 1 subadult, and 1 juvenile (west gate), and 9 adult, 3 subadult and 2 juvenile in the Port footprint. Five (29.4%) tagged fish had a relatively high numbers of days compared to the rest of the fish; however, all fish exhibited a transient presence pattern. Three adult Pearl and two adult Pascagoula drainage fishes were detected in both periods. Two adult Gulf Sturgeon originally captured/tagged in the Escambia and Choctawhatchee/Blackwater drainages, Florida, on 9 April 2014 totaled 105 detections. Adults, unexpectedly, had the greatest number of detections in these shallow, non-island designated critical habitats. Our data suggests repeatable regional-scale movements into habitats not associated with barrier islands that likely serve as corridors between other habitat types, drainages, feeding zones, or are used as a pre-/post-migratory acclimation zones.

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Induced spawning, larval rearing, and mollusk consumption of Black Buffalo, *Ictiobus niger*

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The Black Buffalo, *Ictiobus niger,* is an important species due to its potential use for trematode control in catfish ponds as a molluscivore, and may be a conservation concern due to diminishing population sizes. Snails may be found in Channel Catfish, *Ictalurus punctatus*, culture ponds, and are an intermediary host in the life cycle of parasitic trematode worms. Trematodes are known to cause reduced growth in Channel Catfish or result in mortality in extreme infections. Black Buffalo present a possible biological control option for catfish farmers because they are believed to be molluscivorous although this has not been well documented. Therefore, a literature review was conducted to gain further insight into Black Buffalo feeding ecology and determine the extent of information regarding Buffalo culture. Topics researched include feeding, spawning, and general culture practices. The results of the literature review helped determine areas where further research is needed to effectively evaluate the potential use of Black Buffalo as a biological control in catfish ponds. The objectives of this study are to examine controlled spawning techniques for Black Buffalo, early rearing techniques, and evaluate mollusk consumption.

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Development of Quality Crappie Fishing Opportunities in Mississippi State Lakes

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Mississippi's large flood control reservoirs are well recognized as being home to some of the best crappie fishing in the world. In fact, much of the fishing effort for crappie in Mississippi is supported by these reservoirs. Lying in their shadow, smaller reservoirs in the state, many of which may have potential to produce quality crappie fishing, have remained relatively underutilized and understudied. Management of these systems often includes supplemental stocking of hatchery-reared fish, but survival and contribution of stocked crappie is not known. Further, while water level and associated habitat have been implicated as major contributors to quality of crappie populations in large reservoirs, factors influencing crappie population quality in smaller reservoirs have not been determined. In this presentation, we describe an ongoing research project designed to assess 1) efficacy of supplemental stocking of crappie in state lakes, and 2) factors which contribute to rapid crappie growth in smaller reservoirs. For objective 1, we will determine post-stocking survival and contribution to the age-1 cohort of chemically-marked hatchery fingerlings. For objective 2, we will use a multiple regression approach to compare crappie growth rates to reservoir morphometry, geology, habitat, water quality and biological communities. We anticipate that this model will identify key characteristics that contribute to quality crappie fisheries in state lakes so that management can be tailored to maximize these characteristics.

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Influences of environmental conditions on distance moved by 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 described as both highly migratory and sedentary by previous studies, though these behaviors are not well documented in the lower Mississippi River. Distance between weekly time steps along with environmental variables were recorded for 32 individual Shovelnose Sturgeon throughout a 27-km reach of the lower Mississippi River. We recorded 221 locations of Shovelnose Sturgeon during a 6-month period over a wide range of river stages and water temperatures. More than 75% of the fish traveled at least 150 m and 25% of the fish traveled more than 1 km between weekly relocations suggesting limited movement. We used a linear mixed model with individual as a fixed effect to determine influences on distance moved by fish. Distance traveled was influenced by river stage and surface current velocity but not change in river stage, water temperature, or depth. Distance traveled increased with surface current velocities and declining river stage. Decrease in habitat availability at low river stages and therefore searching for suitable habitat, along with high energy expenditure in high surface current velocities may cause Shovelnose Sturgeon to move greater distances. This type of analysis can support a greater understanding of habitat selection cues that Shovelnose Sturgeon use when changing locations.

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Desert or dinner? Discovering the benthos of the Lower Mississippi River delta through the diets of young of year Blue Catfish (*Ictalurus furcatus*).

Harrison, A.B., and W.T. Slack

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Coastal restoration projects targeting the Mississippi Birdsfoot Delta propose to dredge underwater sandbars in the Mississippi River and pipe sediment to the coastal marshes to build land in an effort to combat subsidence. This reach of the Mississippi River is notoriously difficult to sample for fish and other aquatic life and few studies have analyzed the resident biological communities. This paucity of information has led to the assumption that this region of the River is an ecological desert and little consideration has been given to the effects of removing the substrata. In 2014, sampling began to characterize the habitats and fauna of this region in an effort to determine the ecological value of these sandbars. Our objective for this study was to explore the benthic community of this stretch of the Lower Mississippi River by investigating the diets of young of year Blue Catfish (*Ictalurus furcatus*) obtained as part of the original sampling efforts. This species is ideal for an exploratory analysis into benthic community composition because of its opportunistic feeding strategy and the sheer numbers in which it can be found in the region. Additionally, this study contributes to the knowledge of the early life history of this recreationally and commercially important species, which is poorly studied. Our results suggest young of year Blue Catfish feed heavily on a variety of available insect and crustacean taxa and begin preying on fish earlier than previously documented.

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The Importance of Stakeholder Collaboration to Marine Fisheries Research in Mississippi

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Collaboration between fisheries scientists and community stakeholders is an emerging practice in the collection of data critical to the assessment and management of fishery resources. Scientists at The University of Southern Mississippi's Gulf Coast Research Laboratory (GCRL) have been working closely with local and regional fishing communities for over 40 years. This relationship has proved to be critical to the collection of data on many sought-after recreational sport fish, as well as commercially valuable species in Mississippi waters and the Gulf of Mexico, Atlantic Ocean off the southeastern United States (U.S.) and Caribbean. Early collaborative efforts began with angler based tag/release programs which were developed to investigate seasonal movements of popular sport fish species (cobia, sheepshead, spotted seatrout, tripletail). These programs included anglers from all U.S. Gulf and south Atlantic states, resulting in knowledge of both regional and broad scale movements. Continuing on the success of the tagging programs, collaborations were expanded to include investigations of life history parameters for multiple species (including cobia, yellowfin tuna, blacknose shark, finetooth shark) and more recently have served to augment post-catch mortality projects on red snapper and blacktip sharks. These collaborations with our stakeholders are either volunteer or contractual in nature, and are instrumental in targeting needs not being met by our routine sampling. The data generated are provided to stock assessment panels in support of sustainable resource management. Our data have been used in cobia and spotted seatrout stock assessments and are slated for use in the upcoming blacknose shark and finetooth shark SEDAR assessments. The highly valued collaborations with knowledgeable and invested stakeholders will continue to be indispensable to the success of GCRL fisheries research.

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Distribution of the bonnethead shark, *Sphyrna tiburo*, in the northern Gulf of Mexico

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The bonnethead, *Sphyrna tiburo*, is a small coastal shark species known to inhabit coastal waters of the northern Gulf of Mexico during spring, summer and fall. Despite showing a clear preference for shallow waters (10-25 m) during warm months, bonnetheads migrate to offshore deeper waters during winter; however, little is known about these seasonal movements or utilization of neritic waters. The objective of this study was to use fishery-independent bottom trawl data to describe the spatial distribution of bonnetheads in the northern Gulf of Mexico. From 1987-2014, 645 bonnetheads (274–1220 mm STL) were captured at 362 stations, with the majority of individuals collected (47%) being young-of-the-year. Catch rates of bonnetheads were higher in the western Gulf of Mexico and their occurrence was relatively rare in neritic waters east of Mobile Bay. Sharks were captured in depths ranging from 5 to 71 m, with the majority of the sharks captured between 10 and 30 m. Despite their reported preference for shallow waters, 40% of bonnetheads were captured in waters deeper than 25 m. Furthermore, the use of deeper waters (25-55 m) by 44.2% of the young-of-the-year sharks suggests that nursery areas may not be as discrete as previously thought. It is widely stated that blue crabs are the primary prey of bonnetheads; however, stomach content analysis of 25 young-of-the-year individuals collected during the 2015 fall trawl survey indicated that mantis shrimp (*Squilla sp.*) was their primary prey and spatial analysis revealed that the distribution of the two species were highly correlated.

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Evaluation of acute temperature change and thermal acclimation on response of bighead *carp (Hypophthalmichthys nobilis)* to electrical exposure

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Temperate fishes, such as the extremely invasive bighead carp, have adapted mechanisms to tolerate a wide range of water temperature. Water temperature at locations, such as the Chicago Sanitary and Ship Canal, where Electric Dispersal Barriers are used to deter dispersal of nuisance fishes, varies markedly, seasonally. We examined the effect of temperature on various responses of juvenile bighead carp to a pulsed DC electrical exposure. Metrics of swimming performance (distance moved, mean and maximum velocity) and time spent in various states of mobility differed significantly ($P < 0.05$) among fish acclimated to 20^{o} C and receiving electrical stimulation during acute exposure to 10, 15, 20, 25, or 30^{o} C. Threshold field strength for behavioral endpoints such as first response, hyperactivity, loss-of-posture, and immobility and metrics of swimming performance and mobility states differed significantly between fish thermally acclimated to 10 and 27^{o} C ($P < 0.05$). Physiological modifications allow high performance by fish across temperatures. Nonetheless fish passed more quickly to graded states of electroshock-induced immobilization in water of low temperature and less quickly in water of higher temperature. Water temperature may significantly influence performance and reliability of electric field-based fish guidance and deterrence systems.

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Morphology and Swimming Performance in Young Paddlefish

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Variation in fish shape affects hydraulic forces such as lift, drag reduction, and thrust, which ultimately influence swimming performance. Relative contributions of specific anatomical features, although difficult to assess empirically, can be readily inferred from correlations between morphological indices and performance metrics. Young Paddlefish are excellent test subjects for such studies because they combine extreme morphological variation (i.e., allometric growth) with consistent locomotor behavior (i.e., free-swimming). We characterized shape and size of the rostrum, body, and caudal fin of 82 juvenile and yearling Paddlefish, for which we had measured 5-min critical swim speeds in laboratory swim tunnels. Standardized surface area of the rostrum (mm^2/body mass) corresponded to relative swim speed of fish; juveniles 50-96 mm EFL had larger rostra (> 77 mm^2 /g) and higher swim speeds (~ 5 body lengths/sec) than yearlings 216-282 mm EFL with smaller rostra (< 42 mm^2/g) and slower swim speeds (~ 2.5 body lengths/sec). Similar pattern was not observed with other morphological correlates including rostral expansion, body fineness, condition, caudal asymmetry, and caudal edge. Results suggest that rostra provide significant hydrodynamic benefits to Paddlefish and could serve as bio-inspirational models for submerged structures and vessels.

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Investigating Environmental Effects on Physiological Responses in Alligator Gar

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The alligator gar (*Atractosteus spatula*) is a freshwater fish species distributed primarily in the Mississippi River drainage basin in the southern US. This species is able to tolerate a vast range of oxygen and salinity concentrations, and possesses an air breathing organ (ABO) facilitating air breathing in poorly oxygenated water. The breadth in environmental tolerances and use of an ABO allows for unique opportunities to link physiological changes to functional and evolutionary genomics by using the alligator gar as model species. The aim of this study was to investigate alligator gar coping mechanisms presented by environmental challenges of oxygen and salinity. To do so, physiological changes in blood were measured in fish exposed to different environmental conditions. Forty-eight juvenile gar were separated into one of four environmental treatments (normoxic freshwater, hypoxic freshwater, normoxic brackish water, and hypoxic brackish water) with four fish per tank, four tanks per treatment and sixteen tanks total. Fish were exposed to environmental conditions for 19 days and then blood was sampled. Blood was analyzed for protein, lactate, glucose, cortisol, hemoglobin, hematocrit, pH and osmolality. Results will be discussed in the context of fish health and conservation in river ecosystems. The long-term goal of this project is to link phenotypic changes to the genomic level in alligator gar.

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Analysis of the structure and expression of corticosteroid receptors in the Atlantic stingray, *Dasyatis sabina*

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Elasmobranchs often act as keystone species that maintain balance within their ecosystems, and therefore management of these taxa is important to ecosystem health. Development of effective management plans requires an understanding of stressors that impact life history parameters such as growth, reproduction, and survivorship. In elasmobranchs, the physiological response to short-term stress has been characterized in several taxa, however, initiation of the endocrine stress axis via production of corticosteroid hormones is poorly understood. Elasmobranchs possess a unique corticosteroid called 1α-hydroxycorticosterone, or 1α-B, which is thought to affect energy availability during stress (as a glucocorticoid hormone) and sodium availability during osmoregulation (as a mineralocorticoid hormone). However, the novel molecular structure of 1α-B poses an impediment to its study, and therefore detailed information regarding the physiological effects of 1α-B is lacking. To investigate the putative dual role of 1α-B, we examined the sequence and predicted structure of its receptors. In most vertebrates, glucocorticoid and mineralocorticoid actions are mediated through two different intracellular receptors, the glucocorticoid receptor (GR) and the mineralocorticoid receptor (MR). We isolated mRNAs encoding both the GR and MR in the Atlantic stingray, *Dasyatis sabina*. Alignments of *D. sabina* GR and MR protein sequences with those of other vertebrate taxa revealed a high level of conservation in both the DNA binding domain of the receptors and in amino acid residues involved in binding the steroid ligand (1α-B). Additionally, we examined the mRNA expression of these receptors in a variety of tissues and found co-expression of both receptors in muscle, heart, brain, liver, gonad, spiral valve, kidney, rectal gland and interrenal gland. These results indicate that the elasmobranch MR and GR function similarly to other vertebrate corticosteroid receptors through alteration of gene transcription, and further suggest that 1α-B plays a central role in mediating stress and osmoregulatory physiology in elasmobranchs.

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Unmanned aerial vehicle data collection: applications for habitat monitoring and classification.

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Unmanned Aerial Vehicle (UAV) data collection platforms have become relatively low cost, high resolution tools for habitat monitoring and classification. The applications of this new technology are not well understood and the cost of operation compared to traditional surveying techniques are not well documented. Island 62 located near Clarksdale, Mississippi was chosen as a test area for mapping. Year one mapping, conducted 21-27April 2015, used a SenseFly eBee UAV with multiple cameras flown over several flights per test area. Temporary bench markers were placed before flights to determine elevation. Digital surface models at 6.6 cm z-axis resolution were generated. Point cloud imagery was generated to show hydraulic patterns throughout the island, which are dependent upon water elevation of the Mississippi River. A high resolution RGB orthomosaic image was collected with both 2.2. cm/ pixel and 6.6 cm/ pixel resolution. A near infrared camera collected vegetation imagery and was used to generate a normalized density vegetation index. Year two mapping (Scheduled April 2015) will re-fly Year 1 areas to determine geomorphological changes in surface elevation and vegetation coverage due to the Spring 2015 flood and the Winter 2015-2016 flood. The future use of UAV platforms, technological advancements, data limitations, legal issues, and ethical use will be presented.

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The Effect of Water Temperature on the Survival of Angler- and Tournament-Caught Largemouth Bass, *Micropterus salmoides*

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Largemouth Bass *Micropterus salmoides* are a frequently sought after fish species by recreational anglers in the United States, and information about the mortality of angler- and tournament-caught Largemouth Bass is critical to their effective management. Mortality of tournament-caught fish varies widely and is positively related to water temperature. The mortality of caught-and-immediately-released largemouth bass is considered to be low, but temperature effects have not been considered. We measured the survival of Largemouth Bass subjected to simulated angling followed by immediate release and simulated tournament conditions across a range of temperatures at which recreational fishing occurs (17, 21, 25, 29 and 33°C),. At each temperature, we also tested the effect of live well (LW) temperature manipulations (ΔT) of −4, 0 and +4°C. LW dissolved oxygen concentration was maintained above 5 mg/L in all trials. No fish subjected to simulated angler capture and immediate release died during 5-day retention at any temperature. In contrast, none of the Largemouth Bass acclimated to 33°C and subjected to simulated tournament handling survived following the ΔT = + 4°C LW treatment; survival was 60% for fish subjected to the ΔT = -4°C LW treatment and 70% for fish subjected to the 0°C LW treatment. Five-day survival of fish subjected to simulated tournament procedures was >80% at acclimation temperatures of ≤29°C. Results suggest that the survival of caught and immediately released largemouth bass is high across a range of water temperatures at which angling occurs; however, decreased survival can be expected in Largemouth Bass subjected to tournament handling as ambient temperatures approach 33°C.

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The Big Sunflower Gravel Bars: An Oasis in the Yazoo River Delta

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We have sampled fish assemblages and characterized aquatic habitat in the lower Mississippi River Valley (LMV) for over 25 years. Most streams and rivers in the LMV have been altered for flood control to protect agricultural lands and urban areas. River engineering features consist of clearing along the banks, enlargement of the channel, bendway cutoffs, and construction of weirs to pool water. Consequently, streamflow is often intermittent due to depletion of groundwater, littoral areas are comprised of soft, unconsolidated substrates, high turbidities prevail during flood flows, and agriculture land occupies most of the floodplain. The Big Sunflower River in the Yazoo Delta is no exception. However, we recently discovered a 15-mile reach near Sunflower, MS mostly intact with perennial flows, forested buffer zones, and gravel substrate. Over the past two years we have sampled these gravel bars documenting the biodiversity that otherwise is absent throughout the most of the Yazoo Delta and LMV. Based on seining data, impaired streams in the LMV are characterized by disproportionally high numbers of habitat tolerant species primarily Mosquitofish (*Gambusia affinis*) and Orangespotted Sunfish (*Lepomis humilis*) with low numbers of intolerant species including darters and rheophilic minnows. However, the assemblage of the Big Sunflower Gravel bars is comprised of up to 75% minnows, and species richness (mean=13.3) is similar to reference sites in the LMV (mean=14.6) compared to other locations in the Big Sunflower River watershed (mean=11.1). We have also collected the endangered Rabbitsfoot mussel (*Quadrula cylindrica cylindrica*) throughout the gravel bars along with a diverse mussel community. This reach of the Big Sunflower River characterizes a minimally disturbed site relative to the LMV and should be considered as a conservation area.

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Establishing native aquatic vegetation in Southwest Mississippi lakes

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Most of Mississippi's state lakes lack habitat complexity. Aquatic vegetation coverage is minimal, and invasive species are more prevalent than native species. Aquatic vegetation provides fish and wildlife with valuable habitat, reduces shoreline erosion, and improves water quality. Native species of vegetation can also help prevent the establishment and spread of invasive aquatic plants. MDWFP fisheries biologists began a program to establish native aquatic vegetation, in southwest Mississippi lakes, during 2015. American Pondweed, *Potamogeton nodosus*, and White Water Lily, *Nymphaea odorata*, were transplanted at Lake Lincoln. Spatterdock, *Nuphar advena*, was transplanted at Lake Mike Conner. Small exclosures, constructed of PVC-coated welded wire, were placed around transplanted vegetation to protect the founder colonies from herbivory. Grass carp are present in both lakes. Founder colonies were monitored throughout the 2015 growing season. All three American pondweed colonies expanded within the exclosures, but did not expand outside of the exclosures. Nine of the twelve white water lily colonies grew within the exclosures, but did not expand outside of the exclosures. Nine of the ten spatterdock colonies expanded within the exclosures, and two colonies had growth outside of the exclosures. MDWFP will continue to monitor the colonies in 2016.

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Using natural biogeochemical tags to study elasmobranch habitat use and population connectivity

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Calcified structures that are metabolically inert and incorporate elements from the environment often provide information used to make ecological inferences difficult to produce using conventional methods. Focusing on the vertebral centra of multiple coastal elasmobranchs, we explore the potential of vertebral chemistry to study habitat use and population connectivity. We used laser ablation ICP-MS to see if changes in vertebral chemistry correspond to known ontogenetic shifts in habitat. We then compared vertebral chemistry among four nursery regions of the blacktip shark (*Carcharhinus limbatus*) to determine whether vertebral chemistry can be used to infer natal origin. Taken together, our results provide evidence that vertebral chemistry is influenced by environmental factors, and the resulting variability may be used to address specific ecological questions.

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Preliminary results from a study of the reproductive biology of Vermilion Snapper (*Rhomboplites aurorubens)* from the north central Gulf of Mexico

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Vermilion Snapper are a commercially and recreationally valuable resource in the Gulf of Mexico (GOM). Despite the value and popularity of the Vermilion Snapper, information about their basic life-history, including reproductive biology, in the north central GOM is scarce. This region of the GOM contains many high-relief artificial structures required by Vermilion Snapper but lacks natural limestone and hard rock outcrops found in the eastern GOM, which may lead to differences in life-history characteristics of offshore species. The goal of this study is to describe the reproductive biology of Vermilion Snapper along with accurately estimating key life-history characteristics. Specifically, we will 1) delineate the spawning season based on histological evidence and measurements of spawning preparedness (Gonadosomatic Index (GSI)) in both males and females, and 2) describe the reproductive strategy utilized by this species. Fish were collected monthly from May through November 2015 using hook and line techniques along with collection from headboats and charter vessels. Both male and female Vermilion Snapper have a spawning season that lasts from at least May through September, based on the presence of fish in the spawning capable and actively spawning phases during this time. Peak mean female GSI values (± SEM) occurred in May (2.93 ± 0.39) and male GSI values (3.24 ± 0.52) occurred in June, and GSI values declined by September for both males and females. Histological evidence demonstrated that Vermilion Snapper are batch-spawners with asynchronous oocyte development. Spawning interval was calculated to be every 2.2 days based on the hydrated oocyte method. Future endeavors will include analysis of the age and growth of Vermilion Snapper along with estimates of fecundity-at-age/length and length/age-at-maturity. Results from this study will aid in future stock assessments and allow for a region-specific overview of life-history of Vermilion Snapper.

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AN ECOLOGICAL STUDY ON THE BURROWING AND FEEDING HABITS OF *CORONIS SCOLOPENDRA* LATREILLE (STOMATOPODA: NANNOSQUILLIDAE)

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On 27 May 2015, specimens of the lysiosquilloid stomatopod *Coronis scolopendra* Latreille, 1828, were collected using yabby pumps on the north shore of Horn Island, Mississippi. The nine specimens were divided and placed into two separate five gallon aquaria. The stomatopods were observed for twenty-six days. Burrowing habits including width and shape of each burrow were recorded. Feeding habits including prey preferences and striking radii were closely monitored. The stomatopods were exposed to a variety of prey which included: *palaemonetes pugio*, artemia, amphipods, isopods, and multiple species of larval and juvenile fish. The feeding behavior of the stomatopods varied between prey type and with variations in depth of the burrow entrances. The stomatopod *Coronis scolopendra* remains a fundamental species regarding the health of the barrier island ecosystem; therefore we feel it would be useful to present an account of the ecology for the species, *Coronis scolopendra*.

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A trends analysis of economic impacts of recreational angling at a trophy fishery

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A mail survey of recreational anglers (n=961) at Lake Fork Reservoir in Texas was conducted from June 2014 to May 2015 to collect information regarding fishing trip characteristics and expenditures. An estimated total of 116,919 one-person, one-day trips were made to the reservoir throughout the year. Expenditures made in the local area by non-local-resident anglers totaled $12,039,570. Using the IMPLAN software, it was found that these direct expenditures generated a total economic impact of $14,718,739. Overall, anglers were willing to pay an additional $19,556,881. This study was a replication of a study conducted twenty years earlier. During the first study (n=848), anglers were estimated to have taken 348,181 one-person, one-day fishing trips to the fishery. Anglers residing outside the local area were found to have spent $14,540,000 which generated $18,559,871 in total economic output in 1995. Anglers were willing to pay an additional $10,679,095 for their trips. The observed two-thirds reduction in angling effort and more than 50% reduction in the real value of expenditures between the two studies were indicative of an economically aging reservoir. Expenditure profiles were generated for each year between the two studies by extrapolating collected expenditure data using the producer price index, and economic impacts were calculated for each year using multiple IMPLAN models. Results from this study sought to improve the utility of economic impact studies by providing a cost effective methodology to annually estimate economic impacts and potentially enhance managerial decision making processes.

Keywords: economic impacts; IMPLAN; recreational fishing; trophy fishery

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Use of fishery-independent sampling to estimate catch-per-unit-effort and biological characteristics of Blue Crab in the Mississippi Sound

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The Gulf of Mexico Blue Crab (*Callinectes sapidus*) stock is assessed using a modified catch-survey analysis (CSA) that uses catch data and relative abundance data to derive reference points and provide advice to managers. The CSA model output is sensitive to the index of abundance used and the Mississippi index of abundance is poorly developed. Specifically, the abundance index from Mississippi is negatively correlated to population trends in Louisiana, Alabama, and Texas. Although the total landings of Blue Crab in Mississippi comprise only about 1% of total landings in the Gulf of Mexico, it continues to be a recreationally, commercially, and culturally important stock for the state. The goals of this project were to provide high-precision catch-per-unit-effort (CPUE) data for Mississippi by determining the characteristics of sampling that can cause variations in this metric. In this study, we estimated CPUE and considered environmental, temporal, and spatial factors that may influence CPUE for the Blue Crab stock in the Mississippi Sound. We deployed crab traps (n = 3) at three sites in the Mississippi Sound equipped with temperature loggers and a dissolved oxygen meter. We found that mean CPUE varied significantly as a function of soak time (ranging from 0.25 to 8 days) and site location. Temperature profiles among sites were positively correlated but exhibited variance (Pearson r = 0.15 to 0.30), indicating abiotic differences among sites separated over small distances. The results of this study provide sufficient information to inform a spatially and temporally extended fishery-independent survey. Given the intra-site variability, more traps at each station must be deployed and a standard soak time must be employed. It is intended the causes in variance of CPUE identified in this study will aid in future stock assessment of Blue Crab in Mississippi.

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Behavioral interactions between Speckled Peacock Bass *Cichla temensis* and three fish species from Puerto Rico reservoirs.

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Introductions of invasive cichlid species from the aquarium trade have been implicated in the decline of Largemouth Bass *Micropterus salmoides* and other centrarchids in several reservoirs in Puerto Rico. These introductions include extremely aggressive species such as Red Devil Cichlid *Amphilophus labiatus.* Since these species quickly outgrow the gape width of established piscivores, researchers and managers have discussed the possible introduction of Speckled Peacock Bass *Cichla temensis* to control expanding populations of damaging cichlid species. One concern with the proposed introduction is the potential for negative impacts on populations of desirable fish species due to agonistic behavior of *C. temensis*. In this study, we recorded behavioral interactions between *C. temensis* and several key reservoir species in Puerto Rico (Largemouth Bass, Butterfly Peacock Bass *Cichla ocellaris,* and Red Devil Cichlids) in 302-L tanks using GoPro® video recorders. Behaviors were categorized from least aggressive (0) to most aggressive (5). Levels of aggression were greatest between *C. temensis* and Largemouth Bass. However, aggressivity of interactions did not vary over time when *C. temensis* were paired with Largemouth Bass, Red Devil Cichlids, or other *C. temensis*, but declined over time when paired with *C. ocellaris*. A greater percentage of time was spent being inactive ("0"- level interaction) during *C. temensis* vs. *C. temensis* trials (74.1 ± 16.3%; mean ± SE) than trials where *C. temensis* were paired with Red Devil Cichlids (58.4 ± 12.6%), *C. ocellaris* (20 ± 7.6%) and Largemouth Bass (36.2 ± 10%) trials. Preliminary results indicate that *C. temensis* are highly aggressive towards other species when held in close proximity. Additional research at greater scale and habitat complexity is required to understand potential interactions of these species under reservoir conditions.

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Long-term population changes in relation to harvest regulations at Ross Barnett Reservoir, Mississippi

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Despite the widespread use of harvest regulations in recreational fisheries, there is a paucity of information regarding the nature of population responses to such decisions. To examine these responses, we compiled electrofishing data for Largemouth Bass (*Micropterus salmoides*) and Bluegill (*Lepomis macrochirus*) collected at the Ross Barnett Reservoir by the Mississippi Department of Wildlife, Fisheries and Parks since 1989, and examined trends in size structure, catch rates, and condition. The data span over three periods of distinct harvest limits for largemouth bass: a protected-slot of 13”-16” (1986-1997), a 15” minimum-length limit (1998-2008), and a 12” minimum-length limit (2009-present). Analyses indicate that population characteristics differ significantly among regulation periods. Many of the differences could be explicated by the regulation changes, and the effects appeared more evident on the largemouth bass than the bluegill populations. These results suggest that regulations on largemouth bass harvest were associated with shifts in population metrics. We discuss whether these shifts achieved desired objectives.

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Effects of Proposed Length Limit Changes and "5 under rule" on Lake Washington Crappie Yield

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Lake Washington is a popular Black and White Crappie fishery. Because of a perceived decrease in harvest rates and average weight, 595 anglers signed a petition stating that they wanted an increase in the minimum length limit from 10 inches to 12 inches last year. An additional component of this fishery is a "5 under rule" that allows anglers to harvest up to 5 fish under the minimum length limit. Harvest occurring below a minimum length limit (MLL) precludes the use of a traditional Beverton Holt yield per recruit (YPR) analysis; therefore we developed a modification to the YPR model that accounts for harvest below the MLL to evaluate minimum length limit changes. The model requires the same information as a traditional YPR analysis: length-age relationship, weight-length relationship, and natural mortality rates. We estimated parameters for the length-weight relationship (a=5.80436E-07, b=3.6) and we used otoliths to estimate age and fit a von Bertalanffy growth function ($L_{infinity}$= 344, k= 0.4, t_0 =-1.03) to size and age structure data from crappie captured in Lake Washington. Then we evaluated yield per recruit for varying conditional fishing mortality levels (0, 0.01, 0.05, 0.1, 0.2) occurring under a MLL of 10, 11, and 12 inches. Analyses indicated that that growth overfishing was not occurring in this crappie population even with high levels of harvest occurring under MLL. These results support creel survey estimates of catch rate and mean length that indicate the population has remained stable over the past 20 years and the potential for growth overfishing is low.

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Fish passage on a low-grade weir in the Mississippi delta: How much water is enough?

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Declining alluvial aquifer levels in the Mississippi Delta in combination with reduced base level stream flows has been the subject of much debate among agriculture, commercial and residential interests. These concerns have prompted discussions regarding interbasin transfer of water as a possible remedy to supplement base level stream flows and improve aquifer recharge capabilities. Guiding these approaches are the concerns over the amount of water that is needed to maintain biotic sustainability of the associated stream fauna (i.e., environmental flows) while also considering the need for weirs to pool water at different locations within the watershed to accommodate surface water withdrawal. We conducted an acoustic based telemetry project in Black Bayou (Leroy Percy State Park, 5 mi. W of Hollandale, MS) to address fish passage over a low-grade weir as a baseline effort to address environmental stream flows in the Mississippi Delta. An acoustic array consisting of six (6) VEMCO VR2W receivers was deployed upstream (n=3) and downstream (n=3) of the weir with a distance of 480 m from the weir to the most upstream receiver and 300 m from the weir to the most downstream receiver. In addition, a YSI 6600 V2 Datasonde (C, NTU, mg/L, pH and *u*S) was deployed upstream and downstream of telemetry array boundary. The deployment period for the array was 15 October 2013-29 May 2014. Fourteen smallmouth buffalo (344-491 mm TL) and one 1 bigmouth buffalo (523 mm TL) were equipped with internal VEMCO V7 acoustic tags (168 day battery life) on 16 October 2013 and released above (n=8) and below (n=7) the weir. We documented 309,539 total detections during the deployment period with 11 passage events for 5 tagged fish. Passage events occurred during periods of elevated stage and varied with both upstream and downstream passage.

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Estimating Burst Swim Speeds and Jumping Characteristics of Silver Carp (*Hypophthalmichthys molitrix*) Using Video Analyses and Projectile Physics

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Invasive fish species management has long been an issue for consideration in all wildlife and fishery industries. Without management control, invasive species such as the Asian silver carp (*Hypophthalmichthys molitrix*) will continue to exploit already vulnerable habitats disrupting native fisheries and inflicting unknown ecological damage. In this study we used on-line videography to estimate burst swim speeds, horizontal and vertical distance traveled, and angle of exit of silver carp during leaps. Additionally, we tested the hypothesis that carp exit the water at an angle that maximizes distance traveled. Our data show that silver carp reach speeds near 10 body lengths per second which is much higher than previously believed. Carp reach mean heights of 1.93 body lengths and travel a mean distance of 4.76 per leap. Maximum height and distance traveled were 4.58 and 11.5, respectively. Our results, while preliminary, suggest the leaping abilities of silver carp may be greater than previously documented. These data may be valuable in the development of control methods to halt or slow the spread of Asian carp. Further investigation is needed particularly regarding the effects of environment on leaping characteristics in this fish.

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Use of trail cameras for estimating fishing effort on small ponds

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Small, public waters rarely justify the manpower required to conduct a traditional onsite angler creel survey. Trail cameras (TCs) could provide an estimate of angler usage with less effort than a traditional creel survey. One TC was placed near each of three urban park ponds enrolled in the MDWFP Community Fishing Assistance Program by the City of Olive Branch. TCs were programmed to take 1 picture/hour, 12 hours/day, April - December. The average number of anglers/hr was calculated from randomly chosen days/month. Hourly averages were expanded to daily and monthly fishing effort. Monthly effort was adjusted by the proportion of each pond visible in the TC picture (shorelines measured). Fishing effort varied monthly and between ponds. An onsite roving creel survey (bank anglers) was done April – June, 2015. Estimates of fishing effort from the TC and roving creel surveys (April – June) did not agree, likely due to inadequate TC picture resolution, making it difficult to identify distant anglers. However, both surveys showed extremely high fishing effort and pressure (hours/acre).

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Fishery Independent Effort and Harvest of Mississippi's Recreational Blue Crab Fishery

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The essential information available to assess the overall condition of the Blue Crab (*Callinectes sapidus*) fishery is limited in the northern Gulf of Mexico. Although data are available through landings and long term catch-per-unit-effort (CPUE) studies within the commercial fishery, a data set for the recreational harvest does not exist, and additional analysis on recreational effort and harvest is much needed to provide an accurate estimation of the complete stock. The Mississippi Department of Marine Resources Office of Marine Fisheries is conducting a fishery independent survey to gather data on the recreational Blue Crab fishery in Mississippi's three major bay systems; which by state statute are inaccessible to the commercial sector. The objectives of this study are 1) to determine CPUE and size/sex characteristics based on spatial location and seasonality, 2) compare and contrast the catch rates of Blue Crabs caught in traps equipped with terrapin excluder devices to those without, and 3) to provide an overall stock assessment by adding the recreational component to the existing commercial data. Our preliminary data from September 2014 through September 2015 demonstrates CPUE is highest in the Pascagoula River system with an average CPUE of 3.54, compared to Back Bay Biloxi at 1.42 and the Bay of St. Louis at 1.25. The sex ratio consisted primarily of male crabs (60%) across the sample area. Preliminary results suggest that crab density is affected by spatial location, habitat, hydrological parameters, and seasonality, and the salinity changes due to fresh water fluctuation influences the number of females caught at all sites.