47th Annual Meeting of the

Mississippi Chapter

of the American Fisheries Society

Virtual

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24 – 26 March 2021

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Program-at-a-Glance

Date & Time	Event	Location
Wednesday, March 24		
2:00 - 3:00 pm	**Keynote Speaker**	**Click here to join the webinar**
3:00 – 3:45 pm	**Poster Breakout Sessions**	**See Page 5 for Links to Poster Breakouts**
Thursday, March 25		
8:15	**Welcome and Housekeeping**	**Click here to join the webinar**
8:30 - 10:00 am	**Oral Presentations**	**Click here to join the webinar**
10:00 - 10:15 am	**Break**	
10:15 - 11:30 am	**Oral Presentations**	**Click here to join the webinar**
11:45 - 1:00 pm	**Lunch**	
1:00 - 2:30 pm	**Oral Presentations**	**Click here to join the webinar**
2:30 - 2:45 pm	**Break**	
2:45 - 4:15 pm	**Oral Presentations**	**Click here to join the webinar**
Friday, March 26		
8:00	**Welcome and House Keeping**	**Click here to join the webinar**
8:15 -9:45 am	**Oral Presentations**	**Click here to join the webinar**
9:45 - 10:00 am	**Break**	
10:00 - 12:00 pm	**Chapter Business Meeting**	**Click here to join the webinar**
12:00 pm	**Adjourn**	

Keynote Speaker

Nancy J. Brown-Peterson

Everything Comes Back to Reproduction

Nancy J. Brown-Peterson is a Research Scientist with the Center for Fisheries Research and Development at the University of Southern Mississippi in Ocean Springs, MS. Although she 'retired' in 2016, Nancy still works at the Center part time leading fish reproduction projects. Nancy received her B.A. in Biological Sciences from the University of Delaware in 1978 and her M.A. in Marine Science from the Virginia Institute of Marine Science, College of William and Mary in 1981. She held research associate positions in various institutions throughout the southeast (University of Texas Marine Science Institute, USM Department of Biology, Florida Department of Environmental Protection Aquatic Preserves Division, Mississippi State University Departments of Forestry and Biochemistry and Molecular Biology) before moving to Ocean Springs and starting at the USM Gulf Coast Research Laboratory in 1995. Although much of her work at USM was with the Toxicology group, she has focused on fish histology and reproduction during her time there. Nancy has published over 100 papers, including 84 in peer-reviewed journals and 5 book chapters. She and her husband, Mark S. Peterson, founded their consulting company, EcoFish Consulting, LLC in 2010 and are co-editors of the journal *Gulf and Caribbean Research*, published by USM. Although Nancy and Mark have co-authored 27 papers during their careers, their most successful collaboration has been their son Christopher, currently a Ph.D. candidate in Ecology and Evolutionary Biology at the University of Texas-Austin.

President-elect Candidates

Mike Andres

Dr. Mike Andres is currently an Assistant Research Professor in the Division of Coastal Sciences at the University of Southern Mississippi. His research is largely focused around diadromous fish conservation, ecology, and their parasites. Mike received his PhD from the University of Southern Mississippi in 2015 and has since worked on various aspects of the ecology of marine and estuarine fish. He currently teaches Marine Ichthyology at USM and has also taught Marine Fisheries Field and Lab Techniques. His current research focusses on Gulf Sturgeon conservation and management, using parasites as biological tags for trophic interactions and movements of migratory fish, and the ecology of estuarine fish in relation to habitat restoration projects. Mike has been a national AFS member since 2011 and has helped with various aspects of MSAFS meeting activities since that time.

Robert Leaf

Dr. Robert Leaf is an Associate Professor in the Division of Coastal Sciences at the University of Southern Mississippi. He has been a member of the American Fisheries Society and has participated in leadership and committee service in various roles in Mississippi's and Virginia Tech's chapters since 2005. He is a passionate advocate of AFS' mission to improve the conservation and sustainability of living resources, advancing fisheries science and promoting the development of fisheries professionals. His and his student's activity in our chapter is a testament to this commitment. Leaf received a PhD in Fisheries and Wildlife Science from Virginia Polytechnic Institute and State University where he was a NMFS/Sea Grant Graduate Fellow in Population Dynamics. He received a BA and MS in Biology and Marine Science respectively. His current work is primarily concerned with understanding biological systems at the individual and population level. A theme in his work is to understand the impacts and resulting dynamics of stocks that are subject to harvest and to understand strategies for effective management. His recent work includes investigations on the biology and assessment of Spotted Seatrout, Red Drum, Southern Flounder, Gulf Menhaden, Red Snapper, Cobia, Blue Crab, and other living marine resources. He also has ongoing work in the mid-Atlantic.

Poster Break Out Session

Students competing for the best student poster are designated with a superscript numeral. The poster abstracts are arranged alphabetically by the last name of the first author**. Please click on the link provided in the title to access the session(s)**.

Poster Number	Title	First author
1	Crayfishes of Mississippi: Diversity and Challenges	Susan B. Adams
2	Bryozoans as an estuarine rafting habitat for mobile benthic invertebrates and young finfish in the north-central Gulf of Mexico	E. John Anderson
3	A framework for evaluating Silver Carp movement in a floodplain system	Jordan Besson[1]
4	Patterns of shark CPUE and environmental variability from ten years of bottom longline data	Angie Hoover
5	Using Local Ecological Knowledge to determine fish distribution in coastal rivers of the Gulf of Mexico	Nicholas I. Stewart[1]
6	Ensuing invasion of bigheaded carps and the imperilment of the Tennessee – Tombigbee Waterway	Spencer VanderBloemen[1]

Presentation Schedule – Thursday, March 25

Students competing for the best student presentation are designated with a superscript numeral. The oral abstracts are arranged alphabetically by the last name of the first author.

Time	Presentation Title	First author
8:30 am	Habitat Partitioning Among Native Cyprinids in the Yazoo Basin	Taylor Banks[1]
8:45 am	Distribution and detection of American eels *Anguilla rostrata* in Mississippi	Haley Blische[1]
9:00 am	Evaluation of long-term effects of erosion control structures on stream conditions and fish assemblages	Nicky M. Faucheux[1]
9:15 am	Understanding ecological niches of invasive cichlids in Puerto Rico reservoir systems	Jacob A. Moreland[1]
9:30 am	Investigating ecological links between floodplain forests and aquatic communities	Conner Owens
9:45 am	Ecology of nekton along natural, altered, and living shorelines in coastal Mississippi	Glenn T. Schumacher[1]
10:00 am	**BREAK**	
10:15 am	Do Sedimentary Processes Have Nonlocal Consequences for Metapopulation and Metacommunity Dynamics?	Loren W. Stearman[1]
10:30 am	The effects of bigheaded carps on a Clupeid species in the Tennessee River	Spencer VanderBloemen[1]
10:45 am	Determining Feeding Habitat of Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) Size Classes Using Multi-Tissue Stable Isotope Analysis	Alfonso Cohuo[1]
11:00 am	The environmentally adaptive gills of the alligator gar	Brandon P. Sorrell[1]
11:15 am	Understanding Influence of Temperature and Dissolved Oxygen, and Improving Culture Methods of Speckled Peacock Bass *Cichla temensis*	Manuel Coffill-Rivera[1]
11:30 pm	Investigation into the Pathogenesis of Blue Catfish Alloherpesvirus (BCAHV)	Vandana Dharan[1]
11:45 pm	**LUNCH**	
1:00 pm	Effects of temperature on metabolic scope and swimming performance in juvenile blue, channel, and hybrid catfish (*Ictalurus* spp.)	Brandon Gerhart[1]
1:15 pm	Production economic relationships in intensive catfish production systems	Shraddha Hegde[1]

1:30 pm	Phenotypic and Genotypic Characterization and Comparison of *Edwardsiella ictaluri* Isolates Derived from Catfish and Ornamental Fish Species	Divya Johnson[1]
1:45 pm	Factors Triggering Disease Outbreaks in Aquaculture Production Systems	Ashmita Poudel[1]
2:00 pm	Metabolic Rate and Activity of Channel, Blue, and Hybrid Catfish (*Ictalurus spp.*)	Abby J. Vaughn[1]
2:15 pm	Towards standardized fisheries management plans	Caleb A. Aldridge
2:30 pm	**BREAK**	
2:45 pm	Use of trace element and isotopic analyses to assess movement of juvenile Gulf sturgeon *Acipenser oxyrinchus desotoi* in the Pascagoula and Pearl River systems	Joshua Neary[1]
3:00 pm	Fecundity of the *Argulus flavescens* Ectoparasite on Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) in the Pascagoula River	Katherine Wright
3:15 pm	Pascagoula River Gulf Sturgeon, *Acipenser oxyrinchus desotoi*, use of St. Louis Bay and the surround waters of Mississippi Sound.	Paul O. Grammer
3:30 pm	Gulf Sturgeon fall outmigration and travel patterns in the lower Pascagoula River	Kasea L. Price
3:45 pm	Swimming against the flow – environmental DNA can detect bull sharks (*Carcharhinus leucas*) across a dynamic deltaic interface	Marcus Drymon
4:00 pm	Preliminary estimates of larval bluefin dispersal in the Gulf of Mexico using octapy, a Python-based particle tracking program	Jason Tilley
4:15 pm	**ADJOURN**	

Presentation Schedule – Friday, March 26.

Time	Presentation Title	First author
8:15 am	Larval and juvenile otolith microstructure reveals age, growth rate, and hatch dates of Atlantic Tarpon, *Megalops atlanticus*, in the north-central Gulf of Mexico	Patrick Graham
8:30 am	Stress response and recovery of tarpon to catch-and-release angling	Laura Horowitz
8:45 am	Documentation of Atlantic tarpon (*Megalops atlanticus*) space use and move persistence in the northern Gulf of Mexico facilitated by angler advocates	Matthew Jargowsky
9:00 am	Understanding and enhancing angler satisfaction with fisheries management: insights from the "Great Red Snapper Count"	Amanda E Jefferson
9:15 am	Identifying movement patterns and stock connectivity of *Lobotes surinamensis*, Atlantic Tripletail, in the Gulf of Mexico using passive acoustic telemetry	Christopher M. Lapniewski
9:30 am	Evaluation of the factors that describe contrast in catch-per-unit effort of Red Snapper in Mississippi's coastal zone	Robert Leaf
9:45 am	**BREAK**	
10:00 am	Chapter Business Meeting	
12:00 pm	**ADJOURN**	

ABSTRACTS

ORAL PRESENTATIONS

Caleb A. Aldridge, caa134@msstate.edu, 662-292-1707

Towards standardized fisheries management plans

Aldridge, C.A[1], L. E. Miranda[2], and M. E. Colvin[3]

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[3]Department of Wildlife, Fisheries & Aquaculture, Mississippi State University, Mississippi State, MS 39762–9690

Organizing and planning are among the most demanding tasks fisheries professionals routinely face. This process can be overwhelming and explicit links between fishery objectives (OBJs), monitoring metrics (METs), and management actions (ACTs) can be uncertain or not explicitly specified. However, when OBJs, METs, and ACTs are made explicit in fisheries management plans (FMPs) tend to be similar throughout an agency and reflect agency-wide goals. Thus, an opportunity to streamline and regiment FMPs is made apparent. We propose a framework that links OBJs and ACTs to standardized METs shared among fisheries and revises the pool of OBJs, METs, and ACTs and their linkages through an iterative process between the agency and a technical support team. Working with the Mississippi Fisheries Bureau, we have begun synthesizing common BOJs and ACTs from existing FMPs and making links to METs (phase I). We developed a prototype web application that provides users with a retrospective summary of system- and species-specific METs and corresponding agency target ranges to identify where OBJs may not have been reached and ACTs may be triggered. The tool guides users from retrospective summaries to selection of OBJs and then to selection of ACTs specific to OBJs. User selections are summarized in a downloadable table that makes explicit the linkages between OBJs, METs, and ACTs. The alpha version of the application is set to be deployed fall 2021. In phase II, the accumulation of FMPs can be used to identify gaps in OBJs and ACTs, and better understand how ACTs influence one or more METs and fulfill OBJs. The framework provides fisheries professionals an efficient and effective way organize and plan ACTs in the context of OBJs and paves the way for improved future decision making.

ORAL PRESENTATIONS

Taylor Banks, wb640@msstate.edu, **Student Paper**

Habitat Partitioning Among Native Cyprinids in the Yazoo Basin

Banks, T.[1], N. M. Faucheux[2], and L. E. Miranda[3]

[1]Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University, Mississippi State, MS 39762

[2] Mississippi Cooperative Fish and Wildlife Research Unit, Mississippi State, MS

[3] U.S. Geological Survey, Mississippi Cooperative Fish and Wildlife Research Unit, Mississippi State, MS

The Southeastern United States is one of the most biodiverse areas for aquatic species in the nation; however, many streams in the Southeast experience a wildly dynamic hydrologic regime, which, combined with major changes in land use, often leads to homogenization in stream habitat. Habitat homogenization can lead to an increase in exploitative competition as the diversity in habitat and diet items become restricted, resulting in multiple species competing for limited resources. The Yazoo Basin in Northern MS is a Southeastern watershed that is currently experiencing stream degradation due to the combined latent effects of deforestation and a dynamic hydraulic regime. We will determine whether niche partitioning is occurring among native cyprinid species including the Yazoo Shiner, *Notropis rafinesquei*, which is endemic to the Yazoo basin. We will analyze diets from multiple species caught across a gradient of environmental factors to look for evidence of diet partitioning in different stream types. Habitat preferences of each species could indicate competition avoidance, if partitioning is occurring.

ORAL PRESENTATIONS

Haley Blische hab284@msstate.edu, 662-325-3579, **Student Paper**

Distribution and detection of American eels *Anguilla rostrata* in Mississippi

Blische, H[1], M.E. Colvin[1], and C.G. Dunn[2]

[1] Department of Wildlife Fisheries and Aquaculture, Mississippi State University, Mississippi State, MS 39762

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

The American eel, *Anguilla rostrata*, is listed as Endangered by IUCN. It is a catadromous species whose migration is an important indicator of stream connectivity. American eels are difficult to capture especially in non-wadeable streams and therefore distributional status may be underestimated. Understanding the current distribution and capture methods is important to evaluate population distribution. The objectives of this project was to evaluate American eel distribution in interior Mississippi Rivers and evaluate passive capture methods for non-wadeable streams. Historic detections of American eels were evaluated from distributional databases. American eels have been detected throughout in the state with the highest number of current and historical detections in rivers draining to the Gulf of Mexico. Detections occurred in 259 out of 22256 sampling efforts withing Mississippi. The Noxubee River is a non-wadeable river in the Mobile basin that is representative of interior Mississippi Rivers. American eel was not commonly detected in the Noxubee River, with detections occurring in 2 out of the 363 samples conducted between 1880 and 2018. The last American eel detection in the Noxubee River was in 1983. Few detections in the Noxubee River despite over 300 sampling efforts suggest that American eels are rare and possibly declining or difficult to capture using conventional stream fish sampling gears. We evaluated several passive capture gears were in the Noxubee River at an American ell historical locality. Net traps, wire box traps, tube traps, and modified limb lines all with varying baits were evaluated for American eel catch. A single American eel was captured in a net trap. This preliminary result indicates that historical locality remains occupied by American eels and suggests that capture and detection is difficult.

ORAL PRESENTATIONS

Manuel E. Coffill-Rivera, manuelcoffill@gmail.com, 407-432-0666, **Student Paper**

Understanding Influence of Temperature and Dissolved Oxygen, and Improving Culture Methods of Speckled Peacock Bass *Cichla temensis*

Coffill-Rivera, M.E., J. W. Neal, and P. J. Allen

Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University, Mississippi State, MS 39762

Over the last several decades, unauthorized introductions of New World cichlids to reservoirs in Puerto Rico have negatively affected sport fisheries. Invasive cichlids displace popular sport fish species due to their aggressive behaviors, competition for space, and lack of effective predatory control. The Puerto Rico Department of Natural and Environmental Resources is considering the introduction of Speckled Peacock Bass *Cichla temensis* to control expansion of invasive cichlid populations. Speckled Peacock Bass may provide greater predatory control than current reservoir species due to their large gape width and similar habitat requirements as invasive cichlids. In addition to providing biological control, Speckled Peacock Bass would serve as a new, larger sport fish in Puerto Rico reservoirs. However, introductory stocking of Speckled Peacock Bass will require appropriate hatchery protocols for handling, spawning, and grow-out. Previous studies suggested that this species is particularly susceptible to stress associated with handling and water quality, making husbandry a challenge. In this proposed research, we will 1) estimate metabolic rate of Speckled Peacock Bass across their thermal range; 2) determine dissolved oxygen requirements at a range of temperatures; and 3) establish a length-weight relationship with hatchery-reared fish. These data will help determine optimal husbandry conditions for Speckled Peacock, which will advance efforts to potentially introduce this species into Puerto Rico reservoirs.

ORAL PRESENTATIONS

Alfonso Cohuo, Alfonso.Cohuo@usm.edu, 972-922-4190, **Student Paper**

Determining Feeding Habitat of Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) Size Classes Using Multi-Tissue Stable Isotope Analysis

Cohuo, A., K.S. Dillon, M.J. Andres, and M.S. Peterson

Division of Coastal Sciences, School of Ocean Science and Engineering, The University of Southern Mississippi, Ocean Springs, MS

Gulf Sturgeon (GS), *Acipenser oxyrinchus desotoi*, are a federally threatened, anadromous species in the northern Gulf of Mexico. They exhibit a ratcheting feeding behavior where individuals feed in estuarine/marine waters in winter and fast once they migrate into rivers during spring–fall. GS of different size classes feed in different habitats: juveniles in estuaries, adults in marine waters, and subadults in both. Confirming this behavior is difficult using gut content analysis; however, stable isotope analysis provides a minimally invasive alternative. Our project aims to determine the feeding habitat of GS in the Pascagoula River (PR) using muscle and blood components. Muscle has a slower tissue turnover, reflecting the integrated isotope values of a consumer's prey over months while RBC and plasma have faster turnover rates (days to weeks). Sampling occurred in the PR from April–October in 2018–2020 with prey sampling in 2020 and 2021. GS were captured, fork lengths recorded, muscle biopsies taken, and blood was collected, then centrifuged into red blood cells (RBC) and plasma. The $\delta^{13}C$ values of all tissues were consistent with current literature: juvenile samples in the riverine $\delta^{13}C$ range ($\leq$ 26.3 ‰) were taken from young-of-year individuals while all other individuals had $\delta^{13}C$ values reflective of estuarine and marine habitats (-22.5‰ to -17‰). $\delta^{15}N$ values for these young of the year were also ~3‰ lower adult values. We found $\delta^{13}C$ and $\delta^{15}N$ values differed between subadults and juveniles for RBC (PERMANOVA; p=0.003) and plasma (P=0.003) but not for muscle. Juveniles appear to be the only size class that significantly feeds in the river, while all others feed in estuarine/marine waters. Stable isotope values of potential prey items will help explain if elevated $\delta^{15}N$ values in the PR population are due to higher baseline values or feeding differences compared to other river systems.

ORAL PRESENTATIONS

Vandana Dharan, vd302@msstate.edu, 662-588-0420, **Student Paper**

Investigation into the Pathogenesis of Blue Catfish Alloherpesvirus (BCAHV)

Dharan, V.[1], N. Phelps[2], L. Khoo[3], G. Kumar[1], and S. Aarattuthodi[1]

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[2] Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota, MN 55108

[3] College of Veterinary Medicine, Mississippi State University, Stoneville, MS 38776

Infectious disease outbreaks are a major and frequent threat in intensive aquaculture practices resulting in mass fish mortalities and associated economic losses. Blue catfish alloherpesvirus (BCAHV) is a strain of Ictalurid herpesvirus 1. Limited information on the pathogenicity of this catfish virus necessitated a detailed study to help in developing comprehensive management strategies including vaccination. To determine the host-specificity and potential host range of BCAHV, the virus was inoculated onto established warmwater fish cell lines belonging to families Ictaluridae, Cyprinidae, Centrarchidae, and Clariidae. The virus replication and exhibition of cytopathic effects (CPEs) were found to be restricted to cell lines from family Ictaluridae indicating the host preference of BCAHV. In a subsequent challenge study, channel, blue, and hybrid catfish fingerlings were exposed to $10^{3.5}$ $TCID_{50}$/mL (50% tissue culture infectious dose) BCAHV. Mortality due to BCAHV infection was significantly higher in blue and hybrid catfish when compared to channel catfish further specifying the host preference of the virus among ictalurid catfish. Since BCAHV is a herpesvirus, which exhibits latency, sub-optimal culture conditions could trigger the latent virus resulting in active infection. In another challenge simulating crowding, mortality was found to be significantly higher in densely-stocked tanks, indicating the importance of horizontal transmission and crowding in BCAHV pathogenesis. Water temperature also had a profound influence on the activation and pathogenesis of BCAHV. Fish exposed to BCAHV at sustained high temperature (32ºC) had no mortality suggesting the likelihood of virus attenuation. Catfish at different days of post-hatch were challenged with BCAHV to determine the age-dependency of BCAHV infection which revealed that host susceptibility to BCAHV differed with age. The heightened pathogenicity of BCAHV towards blue and hybrid catfish as observed in this study points to the potential of this virus to cause significant concern in intensive catfish production.

ORAL PRESENTATIONS

Marcus Drymon, marcus.drymon@msstate.edu, 662-769-2264

Swimming against the flow – environmental DNA can detect bull sharks (Carcharhinus leucas) across a dynamic deltaic interface

Drymon, J.M.[12] and N.M. Phillips[3]

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[3]School of Biological, Environmental, and Earth Sciences, The University of Southern Mississippi Hattiesburg, MS

Human activities in coastal areas are accelerating ecosystem changes at an unprecedented pace, resulting in habitat loss, hydrology modifications, and predatory species declines. Understanding how these changes potentially cascade across marine and freshwater ecosystems requires knowing how mobile euryhaline species link these seemingly-disparate systems. As upper trophic level predators, bull sharks (*Carcharhinus leucas*) play a crucial role in marine and freshwater ecosystem health. Telemetry studies in Mobile Bay, Alabama suggest that bull sharks extensively use the northern portions of the bay, an estuarine-freshwater interface known as the Mobile-Tensaw Delta. To assess whether bull sharks use freshwater habitats in this region, environmental DNA surveys were conducted during the dry summer and wet winter seasons in 2018. In each season, 5 X 1 L water samples were collected at each of 21 sites: five sites in Mobile Bay, six sites in the Mobile-Tensaw Delta, and ten sites throughout the Mobile-Tombigbee and Tensaw-Alabama Rivers. Water samples were vacuum-filtered, DNA extractions were performed on the particulate, and DNA extracts were analyzed with Droplet Digital™ Polymerase Chain Reaction using species-specific primers and an internal probe to amplify a 237-base pair fragment of the mitochondrial NADH dehydrogenase subunit 2 gene in bull sharks. One water sample collected during the summer in the Alabama River met the criteria for a positive detection, thereby confirming the presence of bull shark DNA. While preliminary, this finding suggests that bull sharks use less urbanized, riverine habitats up to 120 km upriver during Alabama's dry summer season.

ORAL PRESENTATIONS

Nicky M. Faucheux, nmh94@msstate.edu, **Student Paper**

Evaluation of long-term effects of erosion control structures on stream conditions and fish assemblages

Faucheux N. M.[1] and L. E. Miranda[2]

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[2] U.S. Geological Survey, Mississippi Cooperative Fish and Wildlife Research Unit, P.O. Box 9691, Mississippi State, MS

Stream erosion is a mechanism of channel evolution which dictates channel morphology and available habitat types for stream organisms. Although erosion is a natural process, it can be accelerated due to anthropogenic landscape-scale changes in the watershed. The Yazoo Basin in North Mississippi has a long history of stream erosion due to widespread deforestation and conversion to agriculture in the 1800s. Although large portions of the basin have been reforested, the legacy of erosion remains as the streams, faced with an increase in sediment transport capacity, became incised. In response to channel incision, the Demonstration Erosion Control program began in the 1980s, and instream erosion control structures, such as box-culverts and low-drop control structures, were installed throughout the basin. We investigated the effects of low-drop control structures on stream conditions 30 years post-installation and report on how the fish assemblage has responded. Upstream and downstream sites were paired in 15 streams located across five subbasins in the hills of the Yazoo Basin. Five streams had two to three structures located between the paired sites, five streams had greater than four structures located between the paired sites, and five streams with no structures between the sites were included as reference streams. We collected 8,784 fish representing 58 species from the 30 sites.

ORAL PRESENTATIONS

Brandon Gerhart, bjg287@msstate.edu, 662-325-4768, **Student Paper**

Effects of temperature on metabolic scope and swimming performance in juvenile blue, channel, and hybrid catfish (*Ictalurus* spp.)

Gerhart, B. and P.J. Allen

Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University, Mississippi State, MS 39762

Water temperature is a key physiological regulator of ectothermic aquatic organisms. Temperature is closely related to aerobic capacity, metabolic scope and swimming performance. Because little is known about the aerobic capacity of juvenile blue, channel, and hybrid catfish related to high seasonal temperatures in production ponds, we evaluated the effects of water temperature on standard and active metabolic rate and swimming performance in these species. Fish were acclimated to either 23 or 33°C, and standard metabolic rate (MO_2, min) was measured using intermittent respirometry and active metabolic rate (MO_2, max) was measured using a modified swim flume. Following these measurements, the metabolic scope was calculated at both temperatures for all three fish types. At both 23 and 33°C, channel catfish had the lowest standard metabolic rate, followed by hybrid, and blue catfish. At 23°C, hybrid catfish had the highest metabolic scope at 559.5 mg O_2/kg/hr, followed by channel (431.5 mg O_2/kg/hr), and blue (369.1 mg O_2/kg/hr) catfish. At 33°C, hybrid catfish had the highest metabolic scope at 764.0 mg O_2/kg/hr, followed by channel (622.4 mg O_2/kg/hr), and blue (606.8 mg O_2/kg/hr) catfish. At both temperatures hybrid catfish had the largest metabolic scope and in addition, the highest critical swimming velocity, suggesting they are a better performing fish. These findings may relate to the rapid growth rates observed in hybrid catfish in production ponds and provide an improved understanding of the aerobic capacity of Ictalurid catfishes.

ORAL PRESENTATIONS

Patrick Graham, Patrick.m.graham@usm.edu

Larval and juvenile otolith microstructure reveals age, growth rate, and hatch dates of Atlantic Tarpon, *Megalops atlanticus*, in the north-central Gulf of Mexico

Graham, P.M.[1,2], J.S. Franks[1], E.J. Anderson[1], R.T. Leaf[2], and J.D. Tilley[1,2]

[1]Center for Fisheries Research and Development, School of Ocean Science and Engineering, The University of Southern Mississippi, Ocean Springs, MS

[2]Division of Coastal Sciences, School of Ocean Science and Engineering, The University of Southern Mississippi, Ocean Springs, MS

Age and growth of early life stage Atlantic Tarpon, *Megalops atlanticus*, collected from Mississippi coastal waters in the northcentral Gulf of Mexico were described using otolith microstructure analysis. Tarpon leptocephali (n = 95, 16.0–27.8 mm standard length; *SL*) collected from June through October, 2013–2018 ranged in age from 22–43 days (mean = 30.9 ± 0.5 days). Leptocephalus somatic growth rates ranged 0.46–1.24 mm day^{-1} (mean = 0.76 ± 0.02 mm day^{-1}), and leptocephalus otolith growth rates ranged 1.78–3.97 µm day^{-1} (mean = 2.58 ± 0.04 µm day^{-1}). Growth rates were inversely correlated to leptocephalus age, indicative of the shrinkage phase associated with leptocephalus metamorphosis. Juvenile tarpon (n = 358, 50–359 mm fork length; *FL*) were collected from August through December, 2007–2018. Juveniles exhibited a positive allometric relationship (adjusted R^2 = 0.99, P < 0.001) between length and weight (g). The age of 100 juveniles (71–277 mm *FL*) ranged from 76–174 days. Juvenile growth rate was estimated as 1.56 ± 0.11 mm day^{-1}. Evaluation of the back-calculated hatch dates suggests that specimens in the collection hatched from late May through mid-September with slight peaks during July and August. A Rao's Spacing Test of Uniformity indicated the presence of significant lunar periodicity in leptocephalus hatch dates (n = 95, U = 250.1, P < 0.05), with 50% of the leptocephali hatched within five days of the full moon. This study fills critical gaps in the scientific knowledge of tarpon and provides estimates of early life history metrics for an iconic game fish at the northernmost extent of its Gulf of Mexico range.

ORAL PRESENTATIONS

Paul O. Grammer, paul.grammer@usm.edu

Pascagoula River Gulf Sturgeon, *Acipenser oxyrinchus desotoi*, use of St. Louis Bay and the surround waters of Mississippi Sound.

Grammer, P.O.[1], M.J. Andres[2], A. Draper[2], C. Lapniewski[1], M.S. Peterson[2], J.M. Hendon[1]

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Gulf Sturgeon (GS) are anadromous with all sizes leaving freshwater during the fall and remaining in estuarine/marine waters until spring. However, the marine and estuarine habitat use of Gulf Sturgeon (GS) is poorly understood relative to their use of riverine habitats. In Mississippi waters, adults are thought to occupy higher salinity, barrier island habitats during fall/winter feeding periods whereas juveniles tend to stay in estuarine waters closer to shore. Unfortunately, we know little about GS use of Mississippi's bay systems that are currently outside federally designated critical habitat. Our study aims to describe GS use of St. Louis Bay and its surrounding waters using acoustic telemetry. We focus on the timing of movements into and out of the array by three GS size classes: juvenile, subadult, and adult; the directionality associated with movement; and the duration of use within St. Louis Bay. From 2017–2020, the number of GS in the array ranged from 14–20, with not more than one juvenile in any year. Entrance into the array was variable with all size classes arriving close in time and generally by mid-December; however, arrival for the 2018–2019 overwintering period was much later (March). Egress from the array normally occurred by May. Sturgeon generally recruited into the array following what appears to be a nearshore movement from east to west and back again. Only 3 GS (all adults) were detected within the Bay proper and time spent in the Bay was short (< 37.4 hrs). Our data demonstrates that GS use habitat outside of their federally designated critical habitat, albeit briefly. The expansion of long-term telemetry data to further document GS use of these systems is necessary so that restoration and species management plans can be accurately informed.

ORAL PRESENTATIONS

Shraddha Hegde, sgh234@msstate.edu, 662-588-7126, **Student paper**

Production economic relationships in intensive catfish production systems

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US catfish industry is evolving by adopting intensive farming practices such as intensively aerated pond and split-pond systems. Functional relationship between fish yield and key production inputs in these intensive systems were separately analyzed employing commercial catfish production data from over 143 pond observations. Production functions such as Cobb-Douglas, translog, and modified translog production functions were employed to define functional relationships between key inputs and fish yield in these two intensive catfish production systems. Choice of appropriate model was made after considering the measures of fitness (R^2, adjusted R^2, root mean square error, Akaike Information Criterion, and Bayesian Information Criterion) as well as minimizing econometric issues such as heteroskedasticity and multicollinearity. A Cobb-Douglas production function recognized size of fingerlings at stocking, aeration rate, survival, and feeding rate as statistically significant variables influencing fish production in intensively aerated pond systems. A modified-translog function identified variables such as initial fingerling stocking biomass, feed conversion ratio, feeding rate, and pond size as important variables influencing production in split-pond systems. Although the later model had weak heteroskedasticity, such occurrences are common given the high variance in input usage on commercial farms. Nevertheless, the high predictive power of this modified translog function provides meaningful estimates of the functional production relationship. Quantity of feed used in the ponds was found as an important variable in both models. Both production functions identified the existence of increasing returns to scale, indicating further room for improvement in input use to increase production. The study also provides insights into input elasticities in the intensive catfish production systems.

ORAL PRESENTATIONS

Laura Horowitz, lbh270@msstate.edu, 570-228-6488

Stress response and recovery of tarpon to catch-and-release angling

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Atlantic Tarpon *Megalops atlanticus* is a popular sport fish and in Puerto Rico, an important component of the ecotourism economy. Historically, tarpon in Puerto Rico experienced considerable fishing pressure and harvest, but in February 2004 the Puerto Rico Department of Natural and Environmental Resources imposed a catch-and-release harvest restriction on tarpon, with the objective of protecting stocks for local and tourist sport fishing. The goal of catch-and-release angling is for captured fish to survive and be caught again. Yet, negative effects of catch-and-release fishing can occur, including acute stress and physical damage that lead to both lethal and sub-lethal consequences. Catch-and-release angling of tarpon in warm tropical waters results in an unknown level of hooking mortality and exerts a measurable stress on all fish angled. Therefore, I propose to examine the physiological response of this species to angling stress and to determine post-release survival. The research will occur in the field and laboratory, with field research located in the San Juan lagoon system and associated canals. Mortality of angled tarpon will be determined *in situ* using acoustic telemetry and manual tracking and will be compared to angling techniques and observed water quality parameters to elucidate key factors influencing stress and mortality. Simulated angling will be performed with tarpon held in the laboratory to generate stress response and recovery curves for key physiological variables. Blood chemistry parameters (e.g., cortisol, glucose, and osmolality) indicative of stress will be monitored during pre-angling (baseline), 15 minutes post-angling, and at 1, 4, 8 and 24 hours post angling. Response curves will be calibrated using field angled fish to allow determination of primary periods of stress. Based on these results, outreach materials will be developed and distributed to help reduce catch-and-release mortality.

ORAL PRESENTATIONS

Matthew Jargowsky, matthew.jargowsky@msstate.edu, 609-602-7922

Documentation of Atlantic tarpon (*Megalops atlanticus*) space use and move persistence in the northern Gulf of Mexico facilitated by angler advocates

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Atlantic tarpon (*Megalops atlanticus*) are a popular sportfish that make long coastal migrations from the southern Gulf of Mexico to the northern Gulf in the late spring. The species is long lived and slow maturing, which makes them susceptible to the synergistic effects of overfishing and climate change and, as a result, they are currently listed as Vulnerable by the IUCN. Yet, significant gaps remain in our understanding of tarpon space use, movement, and biology, particularly in the northern Gulf of Mexico, which hinders our ability to properly manage the species. From 2018-2019, citizen scientists facilitated the tagging of 23 tarpon with towed SPOT tags in Alabama and Louisiana waters to examine space use and movement across the northern Gulf of Mexico. Specifically, space use was examined using movement-based kernel densities to estimate simplified biased random bridge-based utilization distributions and movement was examined using a joint move persistence model to estimate a behavioral index for each tarpon. Utilization distributions were highest at the southwest portion of the Mississippi River Delta, an area previously predicted as a potential spawning habitat for the species. Tarpon move persistence was highest off the Mississippi and Alabama coasts and lowest in Louisiana waters. Our examination of tarpon space use and movement indicates that the Mississippi River Delta is a critical, yet understudied, part of their range.

ORAL PRESENTATIONS

Amanda E Jefferson, amanda.jefferson@msstate.edu, (228) 546-1031

Understanding and enhancing angler satisfaction with fisheries management: insights from the "Great Red Snapper Count"

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Gulf of Mexico Red Snapper (*Lutjanus campechanus*) management has been a topic of much scientific debate and intensive public scrutiny. In response to political, public, and management desires for more robust data on Red Snapper populations, a Gulf-wide initiative commonly referred to as the "Great Red Snapper Count" (GRSC) was funded to estimate the absolute abundance of Red Snapper in the US Gulf of Mexico. Here, we describe the results of an online survey designed to: a) characterize the social dimensions of Red Snapper anglers, b) measure satisfaction with current Red Snapper populations and regulations, c) assess overall patterns of awareness of the GRSC, and d) evaluate the potential benefits of GRSC stakeholder engagement videos. A key finding of our survey was that awareness of the GRSC was associated with up to 3 times higher satisfaction with fisheries management. Among the core GRSC components, awareness was greatest of the tagging program; however, satisfaction was greatest among anglers aware of the habitat characterization component. Through an in-survey experiment, we found that anglers presented a video on specific GRSC project components reported slightly higher management satisfaction than those presented an overview video or no video. Collectively, our results indicate that angler awareness, when underpinned by effective engagement and outreach activities, can enhance angler satisfaction.

ORAL PRESENTATIONS

Divya Johnson, dj1371@msstate.edu, 662-588-7139, **Student Paper**

Johnson, D.[1], M. Griffin[2], L. Khoo[2], G. Waldbieser[3], and S. Aarattuthodi[1]

Phenotypic and Genotypic Characterization and Comparison of *Edwardsiella ictaluri* Isolates Derived from Catfish and Ornamental Fish Species

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Enteric Septicemia of Catfish (ESC) caused by *Edwardsiella ictaluri* results in significant economic losses to the US catfish industry. Generally regarded as host-specific to catfish, *E. ictaluri* outbreaks have recently been reported in other aquacultured species, including zebrafish raised in the southeastern US. The expanding host range necessitated a comprehensive phenotypic and genotypic characterization of *E. ictaluri* isolates from catfish (n=50) and ornamental (n=42) aquaculture. Morphological, biochemical, and antigenic profiles of these isolates were largely comparable. While the ornamental *E. ictaluri* isolates autoaggregated in broth, settling at the bottom of the culture tube, catfish derived isolates displayed a more turbid growth. Variable susceptibility against approved antibiotics for use in catfish aquaculture (Aquaflor®, Terramycin®, and Romet®) were observed for these isolates. Ornamental fish-derived isolates were susceptible to all three antibiotics tested, indicating a lack of acquired resistance. Comparably, several catfish-derived isolates revealed antimicrobial resistance correlating with the presence of multi-drug resistant (MDR) plasmids. Antibiotic sensitivity of *E. ictaluri* isolates to 18 antimicrobial agents indicated differential susceptibility. A comparative analysis of the genomes using Comprehensive Antibiotic Resistance Database's (CARD) Resistance Gene Identifier (RGI) revealed antibiotic resistance in catfish derived isolates was plasmid- and genome-mediated. Plasmid profiles of *E. ictaluri* from both host groups were mostly homogeneous except for the presence of the MDR plasmids from catfish isolates. Genome analysis of isolates indicated marked differences among host groups, including a Type 4 secretion system and putative phage elements present in ornamental derived isolates. An optimal MLST scheme consisting of eight reference genes has been identified revealing two discrete phyletic lineages for catfish and ornamental fish-derived isolates. Clonality of these bacteria indicates a high degree of genetic stability among *E. ictaluri* isolates within respective industries. Study results provides important baseline data to develop effective management strategies against this pathogenic bacteria affecting diverse aquaculture industries.

ORAL PRESENTATIONS

Christopher M. Lapniewski, christopher.lapniewski@usm.edu, (228) 313-3732

Identifying movement patterns and stock connectivity of *Lobotes surinamensis*, Atlantic Tripletail, in the Gulf of Mexico using passive acoustic telemetry

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In recent years, Atlantic Tripletail have become highly sought after in the recreational and commercial fisheries throughout their geographic range. Tripletail have also been identified as a data limited species, which has initiated several recent collaborative efforts to study their life history. As such, a biological profile of the species was published in 2017 (Gulf States Marine Fisheries Commission (GSMFC) Publication 258), a multi-agency population genetics study is in progress, and two extensive, long-term conventional tagging projects are ongoing in the Gulf of Mexico (Gulf) and South Atlantic Ocean (USM/GCRL and Georgia DNR, respectively). To add to these collaborative efforts, GSMFC and USM/GCRL began investigating northern Gulf-wide movements of Tripletail using passive acoustic telemetry. In October 2019, we implanted 31 INNOVASEA V13 acoustic transmitters in Tripletail (11–21 inches total length, TL) caught and released in Mississippi coastal waters. Twenty-nine of those fish were detected (8,826 total raw detections) within our acoustic receiver array located in western Mississippi Sound, with no fish being detected after 31 October 2019. In an effort to better understand the migration patterns of Tripletail as they leave their presumed Gulf overwintering grounds, an additional 19 acoustic transmitters were implanted in Tripletail (12 - 27 inches TL) caught/released in the southeastern Gulf in Florida Bay and off the Florida Keys in December 2019. Five of those fish logged 658 detections within Florida Bay, and thus far 6,008 total raw Tripletail detections have been recorded by iTAG/FACT members ranging from Florida Bay to Galveston Bay, Texas. Through our collaborative efforts, especially via integrated detection data sharing facilitated by iTAG and FACT telemetry networks, we hope to better understand potential stock connectivity between northern and southern Gulf populations of Tripletail and their migratory patterns in the Gulf.

ORAL PRESENTATIONS

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Evaluation of the factors that describe contrast in catch-per-unit effort of Red Snapper in Mississippi's coastal zone.

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In this work we evaluate the distribution of Red Snapper on habitats within Mississippi's coastal zone over the continental shelf in the northern Gulf of Mexico. We leveraged data collected from a vertical bottom longline survey conducted in from 2016 through 2019. Each year, a total of 54 to 77 stations were sampled, following a stratified random sampling protocol prioritizing Artificial Reefs (n = 103) and Oil and Gas Platform habitats (n = 133). We used these data to construct two random forest (RF) models to understand the habitat characteristics that describe contrast in catch per-unit-effort (CPUE). The first RF model evaluated the number of fish collected at each sampling effort and the second evaluated the weight (g) of fish collected at each sampling effort. Candidate predictor variables included the depth of the station (m), the location (latitude and longitude) of the sampled station, the month of collection, and the hook size on the vertical bottom longline. The evaluation of contrast in Number of Fish CPUE resulted in a model with 39.65% of the variance explained and the mean square of the residual at 0.025. The evaluation of contrast in Weight of Fish CPUE resulted in a model with 24.76% of the variance explained and the mean square of the residual at 0.42. The explanatory predictors that best determined contrast in both CPUE metrics included Depth, Month, and the Location of Station. Our results demonstrate that contrasts in CPUE are generally poorly predicted by habitat variables evaluated in our models, indicating that the characteristics of habitat that determine CPUE need further exploration.

ORAL PRESENTATIONS

Jacob A. Moreland, jam2081@msstate.edu, 864-506-5518, **Student Paper**

Understanding ecological niches of invasive cichlids in Puerto Rico reservoir systems

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Reservoirs in Puerto Rico contain purposefully introduced sport fish species and an increasing number of invasive fish species, including many New World cichlids. The majority of the invasive species were introduced via unauthorized aquarium species. Two of the primary invasive fishes in these reservoirs are the Jaguar Guapote (*Parachromis managuensis*) and *Amphilophus* spp., consisting of the Red Devil Cichlid (*Amphilophus labiatus*), Midas Cichlid (*A. citrinellus*) or a hybrid of both. These species are thought to compete with established sport fish species, although this has not been confirmed. Therefore, to better understand their range of physiological performance within different potential reservoir conditions, their invasivity, and how they may impact established sport fish species, the following objectives will be explored: 1) measure standard aerobic metabolic rate and pO_2 crit at temperatures of 22ºC, 28ºC and 34°C; 2) compare gastric lavage and destructive sampling techniques between species for accuracy and efficiency; and 3) compare diet of non-native cichlids and sport fish within reservoirs. Diet analysis will consist of seasonal and diel sampling, with fish collected via electroshocking to determine dietary overlap between invasive cichlids and established sport fish species. Comparing both physiological differences and diet between species will inform management actions in Puerto Rico and other tropical climates.

ORAL PRESENTATIONS

Joshua Neary, jjn130@msstate.edu, (708)-606-4725, **Student Paper**

Use of trace element and isotopic analyses to assess movement of juvenile Gulf sturgeon *Acipenser oxyrinchus desotoi* in the Pascagoula and Pearl River systems

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The Gulf sturgeon, *Acipenser oxyrinchus desotoi*, is a federally threatened subspecies of Atlantic sturgeon, *A. oxyrinchus*. This species is native to the northern Gulf of Mexico, where individuals occupy estuarine and coastal habitats in the winter and freshwater habitats in the spring and summer. Current population sizes are low in the western portion of its range, particularly in the Pascagoula and Pearl River systems. Because Gulf sturgeon is a slow-maturing, long-lived species, recovery times following population depletions are slow. In order to guide recovery, basic life history information on adult spawning locations and juvenile habitat use is needed. This information can be inferred by microchemistry analysis of pectoral fin spines to reconstruct life history-based movements. However, the relationship between water chemistry, diet, and fin spine chemistry is not fully understood. Therefore, to help interpret chemical patterns observed in wild Gulf sturgeon, hatchery-reared Atlantic sturgeon will be used to test which environmental factor (water or diet) is more influential for microchemistry signatures in the fin rays. Further, the duration of time necessary to occupy a certain habitat or eat a certain diet to produce a chemical signature measurable in the fin ray will also be evaluated. For field-based analyses, trace element and strontium isotope water chemistry maps of the Pearl and Pascagoula River systems will be developed. The third portion of the study will analyze chemical signatures in pectoral fin spines of wild Gulf sturgeon to predict early life history habitat use. Microchemistry of water and fin spine samples will be analyzed using Laser Ablation -Inductively Coupled Plasma -Mass Spectrometry (LA-ICP-MS). The results from the lab and field experiments will provide an understanding of life history-based movements: information necessary for resource managers to guide recovery practices.

ORAL PRESENTATIONS

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Investigating ecological links between floodplain forests and aquatic communities

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Forested floodplains are a complex mosaic of periodically flooded aquatic habitats with variable levels of connectivity. While there is a clear link between riparian forests and freshwater organisms, floodplain forests are seldom investigated due to difficulties in sampling structurally complex and periodically inundated habitat. Therefore, we aimed to determine how bottomland hardwood forests influence fish taxonomic and functional diversity. To accomplish this goal, we: (1) assessed species taxonomic diversity (i.e., species richness and composition) and functional diversity (i.e., standard length and body shape), and (2) quantified habitat complexity. we hypothesized that fish taxonomic and functional diversity are driven by forest complexity. Overall, a total of 51 fish species (1,487 individuals) were captured. Ordination analyses per hydrological period revealed consistently different assemblages in floodplain forest sites compared to river channel sites, yet periodic connectivity facilitated longitudinal movement of fishes across the floodplain during the annual flood. Floodplain forests also contained a higher taxonomic diversity and functional richness than the river channel. Regression models showed that fish standard length was negatively affected by increased water surface temperature in the river channel. However, water surface temperature had no effect on fish standard length in the floodplain forest. Interestingly, the water surface temperature in floodplain forest sites was cooler than in river channel sites, even in the warmer months of the year, which suggests that floodplain forests act as a thermal refugia for fish. By linking floodplain forests to greater fish taxonomic and functional diversity, this research further emphasizes the importance of floodplain forests to inland fisheries conservation.

ORAL PRESENTATIONS

Ashmita Poudel, ap2751@msstate.edu, 502-319-4941, **Student paper**

Factors Triggering Disease Outbreaks in Aquaculture Production Systems

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In recent years, the adoption and implementation of intensive production practices have tremendously increased aquaculture production. However, there has also been a significant increase in the occurrence of infectious disease outbreaks in production facilities. The pathogens causing infectious diseases in intensive aquaculture production systems are primarily categorized as bacteria, viruses, fungi, and parasites. The dynamic interactions of the elements constituting the epidemiologic triad namely host, pathogen, and the environment are key to disease outbreaks in any system. This retrospective study explores the subfactors in each key element and how the complex interplay among them contribute towards disease outbreaks in production systems citing reported cases. Factors discussed here include pathogen virulence, host-specificity, mutations, transmission routes, mechanisms of infection, methods of interaction, vectors, co-infections, stress, and sub-optimal environmental parameters off-balancing the epidemiologic triad. Proactive methods to enhance the health of the aquaculture species and safety measures to prevent the spread of infectious diseases are also mentioned. In nutshell, this review covers the triad elements and their associated factors, which directly or indirectly culminate in disease outbreaks along with potential management aspects such as vaccination and biosecurity measures to minimize the disease incidences, thus enhancing aquaculture production.

ORAL PRESENTATIONS

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Gulf Sturgeon fall outmigration and travel patterns in the lower Pascagoula River

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Gulf Sturgeon, *Acipenser oxyrinchus desotoi*, is an anadromous species found in the northern Gulf of Mexico and is federally listed as threatened. Sturgeon comprising the western population units (those natal to the Pearl and Pascagoula rivers) have smaller population sizes than those comprising the eastern population units (river systems East of Mobile Bay). One such reason for this could be habitat alteration although no river impediment is located along the main stem of the Pascagoula River. However, the eastern distributary of the lower Pascagoula River is partially altered and maintenance dredged, which may impact the species. Objectives for this research are to 1) determine patterns of migration in the lower Pascagoula River, and 2) determine if rate of travel varies between size classes in the two distributaries. Additionally, this study aims to document if smaller tributaries/bayous are used during fall outmigration. We tracked sturgeon movement using telemetry receivers placed along both major distributaries and smaller tributaries (Bluff Creek in the West and the Escatawpa River in the East) in fall of 2020. One juvenile, six subadults, and nine adults used the eastern distributary traveling at rates of 0.18 km/h, 0.28 km/h, and 0.38 km/h; respectively whereas 9 subadults, and 3 adults used the western distributary traveling at rates of 0.38 km/h and 0.18 km/h; respectively. Eleven individuals were detected in the mouth of Escatawpa River, including one individual that traveled further upstream in that system. Five sturgeon were detected within Bluff Creek during fall outmigration, but this system was used variability by eight additional sturgeon during earlier months. Fall outmigration was not as linear as expected with multiple fish running into the mouth of the estuary then returning further upstream. Our preliminary data demonstrates more variable use of the lower Pascagoula River and its tributaries than previously demonstrated.

ORAL PRESENTATIONS

Glenn T. Schumacher, Glenn.Schumacher@usm.edu, 262-305-4990, **Student Paper**

Ecology of nekton along natural, altered, and living shorelines in coastal Mississippi

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Coastal salt marshes support a diversity of nekton and facilitate critical ecosystem functions but are threatened by shoreline development and hardening. Managers in coastal Mississippi have begun incentivizing the construction and use of alternative bulkhead designs, erosion control structures incorporating native plantings akin to living shorelines (LS), to mitigate ecological consequences of marsh loss. Although LS replicate some natural marsh ecosystem functions, the differential use of different shoreline types by coastal nekton in the northern Gulf of Mexico is poorly understood. Therefore, we are evaluating the ecology of nekton adjacent to LS, natural marshes, and hardened and greyed shorelines along a salinity gradient in Biloxi Bay, Mississippi. We aim to determine if nekton communities off LS resemble natural marsh habitats by addressing in terms of species richness, diversity, and relative abundance. Three LS were paired with nearby natural marsh, hardened, and rip-rapped stations of similar salinity. Sampling with fyke nets and beam plankton trawls (BPL) occurs in spring, summer, and fall. Species richness (S), Shannon-Weaver diversity (H'), and species-specific catch per unit effort (CPUE) will be compared for each station and habitat type. Fall 2020 richness was highest at LS in freshwater (<0.5; S=35) and mesohaline (5.0–18.0; S=20) stations but not oligohaline (0.5–5.0) stations, where natural marsh and hardened shorelines (S=27) were higher. Fyke net diversity was highest at the LS (H'=2.43) at oligohaline stations, but not at freshwater and mesohaline stations. CPUE for fykes (catch per hour) and BPLs (catch per m^3) was variable but highest for notable species such as *Sciaenops ocellatus* and *Callinectes sapidus* at LS. Overall, LS appear to support a greater diversity of marsh resident and benthic feeding nekton than hardened and greyed shorelines. The results of this study will help managers to further understand the role of living shorelines in ecosystem management.

ORAL PRESENTATIONS

Brandon P. Sorrell, bs2215@msstate.edu, **Student paper**

The environmentally adaptive gills of the alligator gar

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The alligator gar, *Atractosteus spatula*, is a bimodal breather, absorbing environmental oxygen through the swim bladder as an air-breathing organ and the gills. These adaptations allow them to inhabit low dissolved oxygen environments. In addition, the gill physiology allows them to live in environments ranging from freshwater to saltwater. The gill is a multifunctional organ, with primary functions of gas exchange, ionic regulation, acid-base regulation, and osmoregulation. Although the alligator gar can occupy a wide range of habitats, there is little understanding of the role of environmentally adaptive gills. Therefore, the main goal of this research study was to gain an understanding of how the gills of the alligator gar adapt to a variety of environments and the anatomical structures that play a role in this phenomenon. To gain this understanding, alligator gar were acclimated to fresh water (0 ppt) or saline water (20 ppt) for over 4 weeks. Fish from both groups were euthanized and gills were extracted via dissection. Multiple filament and lamellae samples were placed in aldehyde-based fixatives and washed in a series of chemical buffers for preparation for scanning or transmission electron microscopy (SEM or TEM, respectively). Using SEM, the external surfaces of the gill filament and lamellae were examined. Using TEM, internal cellular structures of epithelial cells were examined. Images were taken to characterize the diversity of structures and to understand their function. In freshwater gar, there were chloride cells with numerous microvilli extending outwards, generally located on the gill filaments near the insertion of the lamellae. In saltwater gar, chloride cells were recessed, with apical pits and button cells present over the filament surface. In both cases, these cells are important for maintaining internal osmotic, ionic, and acid-base levels. These findings elucidate the plasticity of cellular gill responses to external salinity change in alligator gar, and provide adaptive comparisons with ancestral, teleost, and bimodal breathing fishes.

ORAL PRESENTATIONS

Loren W. Stearman, Loren.Stearman@usm.edu, **Student Paper**

Do Sedimentary Processes Have Nonlocal Consequences for Metapopulation and Metacommunity Dynamics?

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Altered sediment regimes in riverine ecosystems have clear effects on fish population and community dynamics. However, demonstrating clear mechanisms in field studies has proved difficult. Geomorphic models of riverine sedimentary processes suggest that the simple direct linkages between land use change and sediment introduction employed by ecologists may be overly simplified, and that sedimentary processes may themselves link across space and time in a river basin, potentially disrupting metapopulation and metacommunity dynamics. In this paper we explore whether sedimentary processes in alluvial river systems may have nonlocal effects on fish communities using preliminary data from river systems in south Mississippi. We employed geospatial data from digital elevation models and aerial imagery to determine sedimentary processes in mainstem rivers and sampled multiple headwater streams per basin for fishes and habitat data. Analyses of channel profiles and channel cross-sections at the basin scale suggest many of these systems are either actively experiencing episodes of erosion from headcutting or recovering from these processes. Multivariate analyses of habitat data demonstrate characteristics in local channel morphology consistent with a gradient between stable (deep, narrow, sediment retention) and erosional (shallow, wide, bedrock exposure) processes. Multivariate analyses of fish communities suggest that beta diversity is higher in systems recovering from erosional processes than those currently experiencing them. We explore the implications of these preliminary data for the recovery of river basins affected by human alterations and discuss next steps with metapopulation dynamics through genetics analyses.

ORAL PRESENTATIONS

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Preliminary estimates of larval bluefin dispersal in the Gulf of Mexico using octapy, a Python-based particle tracking program

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Larval Atlantic bluefin tuna *Thunnus thynnus* were collected from the Gulf of Mexico to address uncertainties in assessments of the stock. To improve understanding of environmental drivers of recruitment, a particle tracking package, octapy (Ocean Connectivity and Tracking Algorithms in Python), was developed in the Python programming language to estimate larval dispersal and adult spawning locations. The model used 1\25° Hybrid Coordinate Ocean Model (HYCOM) data as inputs with diffusion following a Lagrangian stochastic model. Model performance was validated using skill scores calculated against satellite-tracked mixed-layer drifter trajectories. Skill scores varied by region with an average 3-day skill (s_3) of 0.29 (min, 0.0; max 0.92). Using previously aged bluefin larvae (2008, n=25; 2009, n=14; 2010, n=45; 2012, n=138), three hindcast modeling scenarios were run with each particle having 50 replicates: a 2D model at 5 m, a passive 3D model, and a diurnal vertical migration model. Predicted spawning locations were similar among model scenarios, but mean larval dispersal velocities were highly variable among years (5-m surface model: 2008, 41.3 km day^{-1}; 2009, 29.4 km day^{-1}; 2010, 24.1 km day^{-1}; 2012, 20.5 km day^{-1}). Results suggest that spawned larvae may be retained in distinct hydrodynamic regimes that vary interannually and that adult spawning site selection has a greater effect on larval dispersal than larval vertical migration behavior.

ORAL PRESENTATIONS

Spencer VanderBloemen, sv579@msstate.edu, **Student Paper**

The effects of bigheaded carps on a Clupeid species in the Tennessee River

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The Tennessee River basin and its' cascade of reservoirs are home to some of the most diverse assemblages of fishes in the world. This unique system is being threatened by the ongoing invasion of Silver Carp (*Hypophthalmichthys molitrix*) and Bighead Carp (*H. nobilis*), collectively referred to as the bigheaded carps. Bigheaded carps directly compete for food resources with native Clupeid species such as the Gizzard Shad (*Dorosoma cepedianum)*, and this potential interaction could have devastating ecological and even economic consequences. Large abundances of Gizzard Shad are crucial to the Tennessee River fisheries due to their role as a forage base for carnivorous species of this system. Gizzard Shad also serve an important ecosystem function as indicator species for the condition of water quality within this system. We analyzed an extensive dataset of annual gillnetting and electrofishing data between 1990 and 2017 to assess how Gizzard Shad abundances might have changed in the Tennessee River reservoirs since the invasion of bigheaded carps began. We used a BACI design to test the changes in overall Gizzard Shad abundance before and after the arrival of bigheaded carps using an ANOVA and an ANCOVA. A Change-Point Regression was applied to test for potential pivotal changes in Gizzard Shad abundances before and after the arrival of bigheaded carps. We report shifts in abundances since the invasion of bigheaded carps, but more research is needed to connect these changes to bigheaded carps directly.

ORAL PRESENTATIONS

Abby J. Vaughn, ajv180@msstate.edu, 502-517-1060, **Student Paper**

Metabolic Rate and Activity of Channel, Blue, and Hybrid Catfish (*Ictalurus spp.)*

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Catfish aquaculture is an important part of the regional and US economy with annual sales totaling $386 million in 2016. Originally, catfish aquaculture focused on the propagation of channel catfish (*Ictalurus punctatus*), but more recent efforts have included the production of hybrid catfish (*I. furcatus* x *I. punctatus*) due to favorable characteristics such as high growth rates, better feed conversion, high tolerance to low dissolved oxygen concentrations, higher tolerances to fluctuating temperatures, and higher resistance to common aquaculture diseases. The overall well-being and behavior of a fish is directly influenced by its environment, with temperature considered a controlling factor of metabolic rate and dissolved oxygen concentration considered a limiting factor. To better understand the challenges catfish face under various aquaculture conditions, examination of physiological parameters such as standard and active metabolic rates, and associated blood metabolites is needed. Additionally, there is a need to understand how these factors influence activity in aquaculture ponds, as large fluctuations in both temperature and dissolved oxygen occur regularly. Recent studies have focused on the comparison of channel and hybrid metabolic rates at high temperatures, but little is known about the metabolic processes at low temperatures for each species. Therefore, we propose to determine the metabolic scope of catfish at low temperatures (10 and 20°C), and how blood pO2 and metabolites such as pH, lactate, and glucose change between resting and exercised fish to facilitate active metabolism. Lastly, we propose comparing the seasonal activity of catfish in aquaculture ponds. Determining these physiological and behavioral characteristics will promote better management production practices and increase fish welfare.

ORAL PRESENTATIONS

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Fecundity of the *Argulus flavescens* Ectoparasite on Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) in the Pascagoula River

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Gulf Sturgeon (GS), *Acipenser oxyrinchus desotoi*, are a federally protected species of anadromous fish that feed in estuarine/marine waters during the winter and reside in rivers at holding/resting sites during late Spring through early Fall. Although not generally considered a large threat to species recovery, parasites can tax a host's immune system and deplete its energy reserves. Unfortunately, the parasite community of GS is poorly documented. *Argulus* (Branchiura) are common ectoparasites of fishes, with most of their diversity occurring in freshwater rather than estuarine/marine. *Argulus flavescens* have been found on GS, where the infestation was concentrated around hosts mouths. The purpose of this study is to examine the ecology, sex ratio, and fecundity of *A. flavescens* on GS in the Pascagoula River, Mississippi from 2016 to 2019. GS were captured in gill nets and ectoparasites were removed while handling the fish for tagging studies. *A. flavescens* were more abundant on larger GS (nbglm, $p < 0.001$) and in freshwater holding areas as compared to estuarine/coastal locations ($p = 0.004$). The overall sex ratio of *A. flavescens* was skewed female ($X^2 = 12.366$, $p < 0.001$) but did not vary by holding location or month sampled. Our results show that *A. flavescens* fecundity is highly correlated to carapace length, but that fecundity did not vary by holding location, month sampled, or the size class of the host. The skewed sex ratio is potentially an interaction between sampling bias (females are larger than males) and ecology (males might be motile when searching for mates). Although non-significant, *A. flavescens* fecundity peaked in September with a drop in October, which can potentially be explained by dropping water temperatures in October and fish beginning to emigrate from their riverine habitats. No *A. flavescens* infestation was at a level that would suggest harm to GS.

ORAL PRESENTATIONS

POSTER PRESENTATIONS

Susan B. Adams, susan.adams@usda.gov

Crayfishes of Mississippi: Diversity and Challenges

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We compiled an updated crayfish species list for Mississippi, along with species lists by county and hydrologic units (Adams and Jones 2021). We documented 65 species and possibly 5 subspecies. Over half of the species are endemic or occur in only 1 other state. We estimated that only 18% of counties were well sampled for crayfishes. Here, we highlight priority sampling needs for crayfishes in the state and suggest some high priority research needs related to unresolved taxonomic issues.

POSTER PRESENTATIONS

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

Bryozoans as an estuarine rafting habitat for mobile benthic invertebrates and young finfish in the north-central Gulf of Mexico

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Bryozoans are sessile suspension-feeders that primarily prey on plankton and some species are considered ephemeral habitats. Beyond drift algae, there are relatively few studies describing the fauna associated with other ephemeral habitats and the functions these habitats maintain in estuarine systems. This study will determine if the presence of bryozoans in nearshore waters of the north-central GOM will provide additional temporally- and spatially-ephemeral habitat for early life-stages of ecologically, commercially, or recreationally important invertebrates and fishes. We used a 7.5 m seine and a 4.9 m flat otter trawl at fixed and random sites from 2012–2017 to collect samples. Most of the samples with bryozoans present were collected between September and November, so all analyses focused on data during these months. Species richness (SR) and Shannon Diversity (SD) for each sample collection were calculated, samples were categorized as bryozoans present or absent, and compared by group including gear, area, season, year, and habitat type. We used a non-parametric Kruskal-Wallis (KW) test or pairwise Mann Whitney U-tests for SR and SD to determine differences between groups. *Amanthia verticillata* was the only species of bryozoans collected with seines and was the most dominant in trawls with lesser amounts of *A. convoluta* and *Bugula neritina.* During this study, 71 invertebrate taxa were collected in seines and 86 species in trawls, with 39 taxa in common. In contrast, 87 vertebrate taxa in seines and 74 species in trawls, with 54 taxa in common. On average, SR and SD were higher when bryozoan volumes were large during all trawl data pooled by year or in November trawl or seine collections only. Species richness generally decreased over the fall months whereas SD tended to stay the same. Shannon diversity for pooled seine data was significantly different among fall months when bryozoans were not collected. Our results indicate bryozoan mats serve as a dispersal mechanism and refugia for estuarine nekton species. These drifting bryozoan species likely serve a nursery habitat function, similar to other fixed or mobile habitat types like *Sargassum*, seagrass, drift algae, or combination seagrass and drift algae.

POSTER PRESENTATIONS

Jordan Besson, jb5161@msstate.edu, (408) 310-9252, **Student Poster**

A framework for evaluating Silver Carp movement in a floodplain system

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Silver Carp (*Hypophthalmichthys molitrix*) are a highly mobile, invasive species that represent a potential threat to native biodiversity, resources used by native species, recreational opportunities, and economies supported by water bodies. It is crucial managers reduce Silver Carp movements, and the subsequent expansion of populations, to prevent intrusion into uninvaded systems. Barriers can be used to minimize movement, but efficiency depends on the understanding of movement patterns. The objectives of this research are to 1) analyze potential factors associated with Silver Carp movements in and out of Moon Lake through space and time and 2) create a framework to inform barrier options, placement, and operations. Eighty-five Silver Carp from Moon Lake were implanted with acoustic tags and translocated to adjacent waters. We will actively and passively monitor movement of fish in and out of Moon Lake with acoustic receivers, and environmental factors like lake stage, hydrologic connectivity, and temperature will be continuously collected to analyze associations with movement. A multi-state mark-recapture model will be used to estimate Silver Carp movement probability through space and time and evaluate associations with environmental factors and fish specific covariates. When mark-recapture techniques are used in movement studies, we can expand evaluated movement probabilities from tagged fish to a broader population to inform barrier options, installation, and operation to optimize movement limitation of Silver Carp.

POSTER PRESENTATIONS

Angie Hoover, angie.hoover@usm.edu

Patterns of shark CPUE and environmental variability from ten years of bottom longline data

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Monitoring fishery stocks is paramount to ensuring sustainability and conservation of species. This is particularly important for fish, such as elasmobranchs, that exhibit k-selected life history traits. In the early 1990's a fishery management plan was developed to better maintain shark populations in U.S. Waters. The National Marine Fisheries Service has been monitoring the populations through data collected from recreational and commercial landings, offshore fishery independent surveys, and the onboard observer program. In 2008 Mississippi began a directed fishery independent bottom longline survey to provide inshore data for stock assessments and management. From 2008 to the present, scientists from USM's Center for Fisheries Research and Development have conducted this survey off Mississippi and eastern Louisiana with a monthly sampling (March to October) regime implemented from 2008-2014 and seasonal sampling regime (spring, summer, fall) implemented from 2015-2020. For each station, environmental data were collected, and caught sharks were identified to species, weighed, measured, and the sex was determined. Data from each year was compiled into seasons to allow comparability across the breadth of the project. Ten years (2009-2019) of catch per unit effort (CPUE) and environmental data were analyzed by year and season. Analysis across all years indicated mostly statistically similar CPUEs, with the only differences being exhibited in the spring season. Seasonal differences in CPUE were only exhibited in 2013 and 2014, with all other years having statistically similar CPUEs across seasons. The spring showed the highest variability in temperature, while variation in salinity occurred primarily in the fall. Additionally, the highest level of variability in dissolved oxygen occurred in the summer. Examination of this ongoing fishery independent survey has provided insight into seasonal trends throughout Mississippi and Louisiana waters for sharks and ultimately will provide meaningful data for future management considerations.

POSTER PRESENTATIONS

Nicholas I. Stewart, ns1029@msstate.edu, (228) 990-7216, **Student Poster**

Using Local Ecological Knowledge to determine fish distribution in coastal rivers of the Gulf of Mexico

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With mean global sea levels increasing by upwards of 16 cm since the 1990's, there is increasing tide movements into coastal rivers. Given their lower elevation, rivers along the northern Gulf of Mexico have a high risk of being affected by saltwater intrusion. This movement of saltwater could expand the distribution of saltwater-dependent species and lessen the available environment for freshwater-dependent species. Other changes include cascading affects such as increased competition and shifting food webs and habitat use. Changes in water chemistry and hydrology usually require expensive monitoring over long periods of time to determine the severity of the situation. In most cases long-term data is not available. However, the use of the local ecological knowledge (LEK) of commercial fishers and recreational anglers could supplement for this missing data. This is because many fishers and anglers limit their fishing to relatively small geographical areas over their lifetime. It then allows for these individuals to gain in-depth knowledge of the common species in the area, as well as the habitats and ecosystems that these fish occupy and any potential changes that may have occurred. The goal of this research was to capitalize on LEK of users along coastal rivers of the Gulf of Mexico to assess change in fish distributions, as well as other environmental impacts of saltwater intrusion. I conducted interviews with commercial fishers and recreational angler along access points to the Pascagoula and the Pearl River in Mississippi (N = 19.) This was however amended to phone interviews (N = 7) due to constraints imposed by COVID-19. Survey questions attempted to assess perception of change in species distribution, and predictor variable that can influence the perception of change included participant demographics and age. Despite the limited sample size, this effort shown that some anglers have perceived change of some saltwater fishes moving further upstream than in the past. The survey also showed trends in our predictor variable with older, more experienced anglers being more likely to perceive change.

POSTER PRESENTATIONS

Spencer VanderBloemen, sv579@msstate.edu, **Student Poster**

Ensuing invasion of bigheaded carps and the imperilment of the Tennessee – Tombigbee Waterway.

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The Tennessee – Tombigbee Waterway was the largest earth moving project in history in order to create a water-based route from Mobile Bay in Alabama to the Tennessee River in Mississippi. This system is now in danger of being invaded by Silver Carp (*Hypophthalmichthys molitrix*) and Bighead Carp (*H. nobilis*) collectively referred to as the bigheaded carps. These fishes are potentially moving from the Tennessee River through the Yellow Creek Embayment of Pickwick Lake, into Bay Springs Lake which is the northernmost reservoir in the Tennessee – Tombigbee Waterway. This invasion could potentially be detrimental to the various recreational and commercial opportunities this waterway provides. The objectives of this study where to 1) document the capture of any bigheaded carps that have moved into Yellow Creek or Bay Springs Lake, and 2) document the CPE to show relative abundance of fish coming into this system. So far, the capture rates of bigheaded carps have been extremely low within the headwaters of the Tennessee – Tombigbee Waterway. The implications of capturing such low numbers within this system means that the invasion of the Tennessee – Tombigbee waterway is just in its early stages. Bay Springs may potentially act as a natural barrier to these fishes due to its oligotrophic nature and thus, it may not be able to provide enough of a food source for these fishes.

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