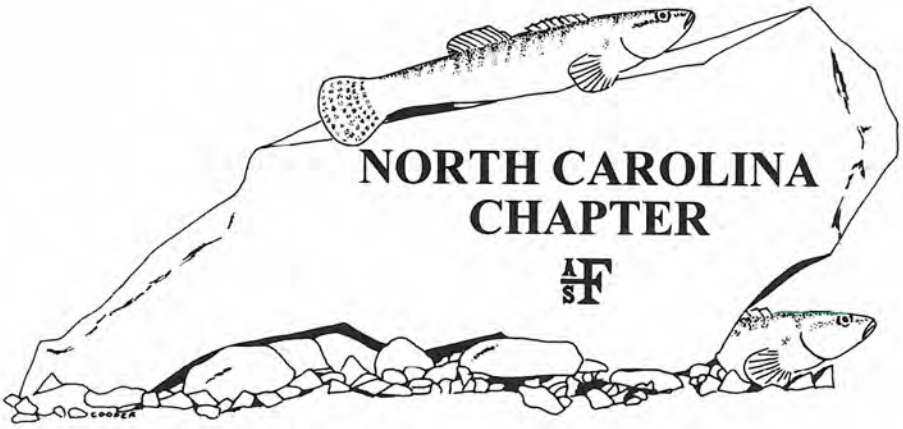
22nd Annual Meeting

of the

North Carolina Chapter

American Fisheries Society



2011 Program

February 22 – 23, 2011

Drury Inn and Suites Northlake

Charlotte, North Carolina

Meeting Support Provided By:

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2011 Annual Meeting – North Carolina American Fisheries Society
Drury Inn and Suites Northlake, Charlotte, North Carolina
February 22 -23, 2011

Tuesday, February 22, 2011

9:00 – 2:00 Registration (Main Lobby)

9:00 – 11:00 **Continuing Education Short Course**: Introduction to the Use of R for Statistics and Graphics (instructor - Dr. Thomas H. Martin, Western Carolina University)

11:00 – 11:30 Lunch (pizza provided for Continuing Education Course participants)

11:30 – 1:30 **Continuing Education Short Course** (continued): Introduction to the Use of R for Statistics and Graphics (instructor - Dr. Thomas H. Martin, Western Carolina University)

1:30 – 2:00 Break (30 min)

2:00 – 2:10 **Welcome and introductions** - Kevin Dockendorf, President, NCAFS

Technical Session 1: Reservoir Fisheries Management and an Evaluation of *Wildlife in North Carolina* Magazine
(Moderator: Kevin Dockendorf)

2:10 - 2:30 Consistent Trophic Position and Generalist Niche of White Perch across Stages of Invasion in Large North Carolina Reservoirs
Zachary S. Feiner*, James A. Rice, and D. Derek Aday – *NC State University*

2:30 – 2:50 The Reservoir Fisheries Habitat Partnership
Brian J. McRae – *NC Wildlife Resources Commission*, Jeff Boxrucker – *Reservoir Fisheries Habitat Partnership*

2:50 – 3:10 Competition Between Black Crappie and White Perch in Two North Carolina Reservoirs
Caroline N. Andrews*, Marybeth K. Brey, Zachary S. Feiner, and D. Derek Aday - *NC State University*

3:10 – 3:30 Evaluation of Supplemental Stocking of Black Crappies in Lake Hickory: An Attempt to Improve Crappy Crappies
Kevin J. Hining – *Wildlife Resources Commission*

3:30 – 3:50 *Wildlife in North Carolina* Magazine Evaluation: Magazine Preferences of Anglers and Hunters and Current and Former Subscribers
Kerry Linehan, Greg Jenkins, and Dain Palmer – *NC Wildlife Resources Commission*

3:50 – 4:00 Break (10 min)

* **Student Presentation**

Technical Session 2: Riverine Fisheries Management
(Moderator: Jessica Baumann)

4:00 – 4:20 Behavior of Migratory Fishes in a North Carolina River Following Dam Removals
Joshua K. Raabe* and Joe E. Hightower – *NC State University*

4:20 – 4:40 Sampling Coastal Crappie: What's Good for the Goose Isn't Always Good for the Gander
Ben Ricks, Jeremy McCargo, and Kevin Dockendorf – *NC Wildlife Resources Commission*

4:40 – 5:00 Recovery of Shortnose Sturgeon and American Shad in the Roanoke River: Water Quality Implications
Gregory W. Cope and Thomas J. Kwak – *NC State University*, Corey N. Oakley – *NC Wildlife Resources Commission*, Michael F. Holliman – *Smith-Root, Inc.*, Robert B. Bringolf – *University of Georgia*, and Kevin J. Dockendorf – *NC Wildlife Resources Commission*

5:00 – 5:20 Developing Hydroacoustic Methods for the Study of Sturgeons and Other Large-Bodied Fishes
Jared H. Flowers* and Joe E. Hightower - *NC State University*

5:20 – 5:40 Assessment of Two American Shad Stocking Locations in the Roanoke River Basin
Kevin J. Dockendorf, Jeremy McCargo, and Bennett Wynne – *NC Wildlife Resources Commission*

5:40 – 7:00 Break (ballroom conversion for dinner/social setup)

7:00 – 10:30 **Evening Social** (with the following events)

- Fred A. Harris Conservation Award presentation
- NCAFS Distinguished Service Award presentation
- NC State University Student Raffle

* **Student Presentation**

Wednesday, February 23, 2011

Technical Session 3: Nongame Species Management: Fish, Crayfish, and Mussels
(Moderator: Jim Rice)

8:00 – 8:20 Cryptic Introductions of Hog Suckers, *Hypentelium* in the Pee Dee Drainage in North Carolina
Bryn H. Tracy – *NC Division of Water Quality*, Wayne C. Starnes – *NC Museum of Natural Sciences*, and Robert E. Jenkins – *Roanoke College*

8:20 – 8:40 The Return of Darters (Percidae) to Mecklenburg County Streams
Anthony J. Roux – *Mecklenburg County Water Quality Program*

8:40 – 9:00 Habitat Use of Stream-Dwelling Crayfish During Reproductive Seclusion
Tyler R. Black – *NC Wildlife Resources Commission*, Hayden T. Mattingly and David D. Smith - *Tennessee Technological University*

9:00 – 9:20 Annuli Verification and Comparison of Growth-Measurement Techniques for *Villosa vibex* and *Villosa lienosa*, in the Lower Flint River Basin, Georgia
Justin Dycus* and James T. Peterson – *University of Georgia*

9:20 – 9:40 Update on Survival and Growth of the Wavy-Rayed Lamp Mussel (*Lampsilis fasciola*) in the Pigeon River, NC: Second Year of Growth
Thomas H. Martin and Caroline E. Rooney - *Western Carolina University*, Stephen J. Fraley and William T. Russ – *NC Wildlife Resources Commission*, and Galen T. Martin – *Smoky Mountain High School*

9:40 - 10:00 Research and Relicensing on the Pee Dee River, North Carolina
Ryan J. Heise and Brena K. Jones – *NC Wildlife Resources Commission*, J. Michael Fisk II and Thomas J. Kwak - *NC State University*, and Todd D. Ewing – *NC Wildlife Resources Commission*

10:00 – 10:20 Break (20 min.)

* **Student Presentation**

Technical Session 4: Caribbean Fisheries Research and Management of NC's Coastal Aquatic Species
(Moderator: Bob Curry)

10:20 – 10:40 Influence of Dams, Big and Small, on Tropical Diadromous Fishes
Patrick B. Cooney and Thomas J. Kwak - *NC State University*

10:40 – 11:00 Population Modeling to Guide Caribbean Freshwater Riverine Fishery Management
William E. Smith* and Thomas J. Kwak - *NC State University*

11:00 – 11:20 Contaminants and Food Web Dynamics in Puerto Rico Stream Ecosystems
Elissa N. Buttermore*, Thomas J. Kwak, Gregory W. Cope, Patrick B. Cooney, Damian Shea, and Peter R. Lazaro - *NC State University*

11:20 – 11:40 Preliminary Results for an Assessment of Mercury in Economically Important Fishes Commonly Landed off the Coast of North Carolina
Sally Petre*, Dana K. Sackett, and D. Derek Aday - *NC State University*

11:40 – 12:00 Spatial and Temporal Variation in Fish Assemblages on Four Artificial Oyster Reefs in Pamlico Sound, NC
Katherine Pierson* and D. Eggleston - *NC State University*

12:00 – 12:20 A Status Survey for Rare Fishes of the NC Coastal Plain
Brena K. Jones and Ryan Heise – *NC Wildlife Resources Commission*

12:20 – 1:20 Lunch (on your own)

1:30 – 3:00 **NCAFS Business Meeting**

3:00 Adjourn

* **Student Presentation**

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2011 Abstracts

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Technical Session 1

Consistent trophic position and generalist niche of white perch across stages of invasion in large North Carolina reservoirs

Zachary S. Feiner*, James A. Rice, and D. Derek Aday, North Carolina State University, Department of Biology, Box 7617, Raleigh, NC 27695, 919-884-6295, zsfeiner@ncsu.edu

* Student Presentation

The trophic dynamics of an invasive species can yield important insights into the mechanisms of invasion success, and can aid predictions about negative impacts on established species. To determine whether invasive white perch (*Morone americana*) shift trophic positions as they progress through different stages of invasion, we examined white perch populations in three North Carolina reservoirs that ranged from the early establishment to late integration phases of invasion. Using stable isotope and diet overlap analyses, we evaluated the trophic position and niche of each population relative to three established species: a littoral omnivore (bluegill *Lepomis macrochirus*), littoral piscivore (largemouth bass *Micropterus salmoides*), and a pelagic piscivore (striped bass *Morone saxatilis* or walleye *Sander vitreus*). Small (<120 mm TL), medium (121-180 mm TL), and large (>181 mm TL) white perch occupied different trophic positions across size, and these positions were consistent among reservoirs. Small and medium white perch had the largest total niche areas and strong diet overlap with bluegill, while large white perch had moderate diet overlap with striped bass. White perch appear to occupy a wide trophic niche that may be advantageous in establishing new invasive populations. However, they are not invading an empty niche; instead they are using resources shared by other species, which may negatively impact established populations if these resources are limiting.

The Reservoir Fisheries Habitat Partnership

Brian J. McRae[1] and Jeff Boxrucker[2], [1]North Carolina Wildlife Resources Commission, 2312 Summit Drive, Hillsborough, NC 27278, 919-732-9429, brian.mcrae@ncwildlife.org, [2]Reservoir Fisheries Habitat Partnership, 9321 E. State Highway 9, Norman, OK 73026, jboxrucker@sbcglobal.net

The Reservoir Fisheries Habitat Partnership (RFHP) is one of 17 partnerships recognized by the National Fish Habitat Action Plan (NFHAP). RFHP is a national collaborative partnership established to promote the protection, restoration and enhancement of habitat for fish and other aquatic species through collaborative actions that contribute to: 1) the ecological health and function of reservoirs and their associated waters and watersheds; 2) the sustainability and enhancement of reservoir fisheries; 3) the well-being of fish and other aquatic species and communities, therein; 4) public awareness of the conservation issues and challenges facing reservoir and associated waters and watershed management in the 21st Century; and 5) the quality of life of the American people. RFHP has focused on developing an assessment of habitat impairments in reservoirs nationwide and developing a set of physical metrics that would serve to classify reservoirs. The assessment and classification system will be merged to identify least impaired reservoirs, most impaired reservoirs, and reservoirs that are moderately impaired but can be improved. Such a system will help reservoir managers direct enhancement efforts on a large geographic scale and help develop best-management practices for impairment groups. RFHP also hopes to enlist local stakeholders for implementing fisheries habitat enhancement. Therefore, RFHP created the non-profit foundation Friends of Reservoirs (FOR). Stakeholders can create local Chapters and utilize FOR's non-profit status to obtain tax-deductible donations for local habitat enhancement projects. In addition to projects initiated by local FOR Chapters, RFHP intends to partially fund 3-4 large-scale reservoir projects per year.

Competition between black crappie and white perch in two North Carolina reservoirs

Caroline N. Andrews*, Marybeth K. Brey, Zach S. Feiner, and Dr. D. Derek Aday,
Department of Biology, North Carolina State University, Raleigh, NC 27695

* Student presentation

Introduced species pose an ecological threat to established populations, especially in freshwater systems where invasions are a leading cause of biodiversity loss, fish extinctions, and habitat alteration. In North Carolina reservoirs, introduced white perch have become a large component of the aquatic community and are thought to contribute to declining populations of sportfish such as black crappie. Our objective was to determine the potential for competition between black crappie and white perch in two North Carolina reservoirs, Lake Norman and Jordan Lake. We used stomach content analysis and stable isotope analysis (SIA) to determine the amount of diet and trophic position overlap between black crappie and white perch in both systems. White perch and black crappie of two size classes (<150 mm and >150 mm) were collected from each lake using gillnets, electrofishing and trapnets in July of 2009 and 2010. Nonparametric multidimensional scaling (MDS) based on index of relative importance (IRI) values from diet data revealed differences in diet composition between and within species and size classes. In particular, we found high diet overlap for large black crappie and large white perch in Lake Norman. This was confirmed with SIA, which revealed nearly identical trophic positions and carbon (δ13C) isotopic signatures of large black crappie and white perch, suggesting high potential for resource competition in Lake Norman. Jordan Lake fish showed moderate potential for competition between small and medium white perch and small black crappie; larger fish did not overlap. These results confirm the notion that invasive species can impact native populations in reservoir systems.

Evaluation of supplemental stocking of black crappies in Lake Hickory: An attempt to improve crappy crappies.

Hining, K. J., North Carolina Wildlife Resources Commission, Fleetwood, NC, 336-877-1087,
kevin.hining@ncwildlife.org

Catch rates of black crappies *Pomoxis nigromaculatus* collected during fall trapnet surveys in Lake Hickory have declined dramatically since stock assessments were first conducted in the late 1990s. Black crappie catch rates in 1999 were >8 fish/net night, but steadily declined to <1 fish/net night by 2006. Concerns and complaints from crappie anglers at Lake Hickory also increased during this time period. While the reason for the decline of black crappies in Lake Hickory is unknown, it is possible that changes in the lake's fish community affected crappie recruitment. White perch *Morone americana* and alewife *Alosa psuedoharengus*, both of which are known to interfere with the recruitment of other fishes, became established in Lake Hickory during the period in which the crappie population was declining. To determine at which life stage the recruitment bottleneck was occurring and to evaluate potential management options to augment the fishery, an experimental stocking program of black crappies marked with oxytetracycline (OTC) was initiated in 2007. The proportionate contribution of these stockings to each year class is being evaluated by examining the presence of OTC marks. The total contribution of OTC marked crappies in fall trapnet surveys increased from 4% in 2008 to 43% in 2010. Furthermore, catch rates improved to 3 fish/net night in 2010, which is the highest recorded since 1999. As a result of these preliminary findings, continued annual stocking of OTC marked black crappies in conjunction with fall trapnet surveys are recommended.

Wildlife in North Carolina magazine evaluation: Magazine preferences of anglers and hunters and current and former subscribers

Kerry Linehan[1], Greg Jenkins[2], and Dain Palmer[3], North Carolina Wildlife Resources Commission,1751 Varsity Drive, Raleigh, NC 27606, [1] kerry.linehan@ncwildlife.org, 919-707-0339, [2] greg.jenkins@ncwildlife.org, 919-707-0175, and [3] dain.palmer@ncwildlife.org, 919-707-0057

Wildlife in North Carolina magazine (*WINC*) is the official educational publication of the North Carolina Wildlife Resources Commission (Commission). In 2009, the Commission evaluated *WINC* to plan for magazine marketing and editorial content and to describe magazine preferences of current and former subscribers and anglers and hunters who were not recent subscribers. We included holders of North Carolina fishing or hunting licenses in the evaluation because the Commission identified them as potential subscribers. We conducted focus groups and surveys of the three populations and we identified and compared their magazine preferences and subscription behaviors. Seventy-five percent of current subscribers were licensed anglers and/or hunters, 93% approved of fishing, and 89% approved of hunting. We asked respondents to rate their interest in 27 magazine topics. Anglers' and hunters' highest-rated topics included places to fish, freshwater fishing, and threats to fish and wildlife. Current and former subscribers' highest rated topics included threats to fish and wildlife, threatened and endangered species, and coexisting with wildlife. Eighty percent of anglers and hunters had heard of *WINC* and 24% have subscribed to *WINC*. Twenty-seven percent of anglers and hunters planned to subscribe to *WINC* in the future. The most frequently indicated reasons anglers and hunters did not plan to subscribe were that they generally did not subscribe to magazines, they subscribed to other magazines, and they did not have time to read the magazine. Results from this project have helped to inform magazine content, and aid in renewal and marketing strategies.

Technical Session 2

Behavior of migratory fishes in a North Carolina river following dam removals

Raabe, J. K.[1]* and J. E. Hightower[2], [1]North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University, Department of Biology, Raleigh, NC 27695, 919-513-2469, jkraabe@ncsu.edu, [2]U. S. Geological Survey, North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University, Department of Biology, Raleigh, NC 27695, 919-515-8836, jhightower@ncsu.edu

* Student presentation

Dam removals are contentious processes that are increasing for both economic and ecological reasons. Migratory fish species may benefit most from eliminating barriers and restoring access to upstream habitat, but limited evaluations exist. We conducted a study from 2007-2010 on the Little River, North Carolina, a tributary to the Neuse River, to assess migratory fish responses to removal of three dams since 1998. We used a resistance board weir near the river mouth to tag migratory fishes with passive integrated transponders (PIT). PIT antennas were installed upstream, including at former dam sites, to determine the extent of migrations, identify migratory timing and cues, and to evaluate passage efficiency of a notched dam. Extensive migrations occurred during freshets that also aided in notched dam passage. Overall, we found that a relatively high percentage of fish migrated past former dam sites. For example, 24-31% of anadromous American shad *Alossa sapidissima* and 45-49% of resident gizzard shad *Dorosoma cepedianum* migrated past the most recently removed dam located at river kilometer (rkm) 56. In addition, 8-15% of American shad and 31-43% of gizzard shad utilized restored habitat to the farthest upstream extent, an impassable dam at rkm 82. Cases of predation on American shad by invasive flathead catfish *Pylodictis olivaris* were concerning, especially since flathead catfish abundance and migrations increased substantially over the study period. Nevertheless, the results provide strong support for further efforts to restore currently inaccessible habitat through removal of derelict dams.

Sampling coastal crappie: What's good for the goose isn't always good for the gander.

Ben Ricks[1], Jeremy McCargo[2], and Kevin Dockendorf[3], [1]463 Sawmill Rd., Elizabeth City, NC 27909, 252-330-8024, ben.ricks@ncwildlife.org, [2]1003 Consolidated Rd., Elizabeth City, NC 27909, 252-330-4063, jermery.mccargo@ncwildlife.org, [3]106 Cayuse Way, Elizabeth City, NC 27909, 252-335-9878, kevin.dockendorf@ncwildlife.org

Crappie are a popular recreational sportfish. Traditionally, trap nets have been the primary gear used to assess crappie populations. However, some aquatic systems do not lend themselves to be effectively sampled with trap nets. North Carolina's northeastern coastal rivers are examples of aquatic systems where trap nets are not a viable sampling gear to access black crappie populations. To overcome this problem biologist have used hoop nets, gillnets, and hook and line sampling with mixed results. The purpose of this presentation is to outline an efficient electrofishing method for collecting crappie. This method is not without its own limitations and best analysis techniques are being developed. However, this method can be used to access crappie populations relatively easily where traditional methods are inefficient or impractical.

Recovery of Shortnose Sturgeon and American Shad in the Roanoke River: Water Quality Implications

W. Gregory Cope[1], Thomas J. Kwak[2], N. Corey Oakley[3], F. Michael Holliman[4], Robert B. Bringolf[5], and Kevin J. Dockendorf[6], [1]North Carolina State University, Department of Environmental and Molecular Toxicology, Raleigh, NC 27695-7633, [2]U.S. Geological Survey, North Carolina Cooperative Fish and Wildlife Research Unit, Department of Biology, North Carolina State University, Raleigh, NC 27695-7617, [3]North Carolina Wildlife Resources Commission, Mebane, NC, [4]Smith-Root, Inc., Vancouver, WA, [5]University of Georgia, Warnell School of Forestry and Natural Resources, Athens, GA, [6]North Carolina Wildlife Resources Commission, Elizabeth City, NC

In a 28-d in situ toxicity test, we determined the suitability of water quality in the Roanoke River of North Carolina for supporting shortnose sturgeon *Acipenser brevirostrum*, an endangered species in the United States. Fathead minnows *Pimephales promelas*, were also evaluated alongside the sturgeon to measure potential differences in fish survival, growth, contaminant accumulation, and histopathology. Caged fish outcomes were compared to simultaneous measurements of water quality and contaminant chemistry in river water and sediment. Adult American shad *Alosa sapidissima* were also collected at the riverine sites and analyzed for a suite of contaminants. Survival of caged shortnose sturgeon among the 8 riverine sites averaged 9% (range 1.7-25%) on day 22 of the 28-d study, whereas sturgeon survival at the 3 non-riverine control sites averaged 64% (range 33-98%. In contrast, only one riverine deployed fathead minnow died (average 99.4% survival) over the 28-d test period and none of the control fathead minnows died. Chemical analyses revealed the presence of retene, a pulp and paper mill derived compound with known dioxin-like toxicity to early life stages of fish, in significant quantities in water, sediment, and adult shad at several river sites, but no correlation was detected between adverse water quality conditions or measured contaminant concentrations and the poor survival of sturgeon at riverine test sites. Given the poor survival of shortnose sturgeon (9%) and high survival of fathead minnows (99.4%) at the riverine test sites, our study indicates that conditions in the Roanoke River are incongruous with the needs of juvenile shortnose sturgeon and that fathead minnows, commonly used standard toxicity test organisms, do not adequately predict the sensitivity of shortnose sturgeon. Therefore, additional research is needed to help identify specific limiting factors and management actions for the enhancement and recovery of the imperiled sturgeon and shad species in this river system.

Developing Hydroacoustic Methods for the Study of Sturgeons and Other Large-Bodied Fishes

Flowers, H. J.[1]*, and J. E. Hightower [2], [1]North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University, Department of Biology, Raleigh, NC 27695, hjflower@ncsu.edu, [2]U. S. Geological Survey, North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University, Department of Biology, Raleigh, NC 27695, 919-515-8836, jhightower@ncsu.edu

* Student presentation

Hydroacoustic technologies are being used increasingly in fisheries research and management. Perhaps the fastest growth has been in the use of side-scan sonar. While often used to survey substrate and bottom characteristics, it is possible to detect fish using this technology. The goal of our study is to develop methodologies to study sturgeon *Acipenser* spp. populations using side-scan sonar to replace or supplement traditional sturgeon sampling and surveying methods that require the use of gill nets. Detrimental effects of netting and associated handling is an issue for species of concern, such as Atlantic sturgeon *A. oxyrhinchus* and shortnose sturgeon *A. brevirostrum*. Results of our preliminary trials demonstrate that we can detect fish and can possibly identify larger individuals to genus. Future work will consist of developing detection probability estimates for side-scan sonar and creating a standardized survey methodology, likely based on an occupancy framework.

Assessment of two American shad stocking locations in the Roanoke River basin

Kevin J. Dockendorf[1], Jeremy McCargo[2], and Bennett Wynne[3], [1]NC Wildlife Resources Commission, 106 Cayuse Way, Elizabeth City, NC 27909, 252-335-9898, kevin.dockendorf@ncwildlife.org, [2]NC Wildlife Resources Commission, 1003 Consolidated Rd., Elizabeth City, NC 27909, 252-330-4063, jeremy.mccargo@ncwildlife.org, [3]NC Wildlife Resources Commission, 901 Laroque Ave., Kinston, NC 28501, 252-522-9736, bennett.wynne@ncwildlife.org

Since 1998, American shad *Alosa sapidissima* fry were stocked in the Roanoke River basin as the primary strategy of an American shad restoration project. From 2003 to 2009, American shad fry were stocked in two locations in similar numbers each year with OTC marks unique to each location; one above John H. Kerr Reservoir and one downstream of the Roanoke Rapids Dam at Weldon, NC. Juvenile American shad were recovered with boat electrofishing from the lower Roanoke River between September and November each year and in and above reservoirs in 2009. River discharge data was obtained from USGS gauges in the Roanoke River basin for each year. Mean contribution of American shad of hatchery origin to the juvenile American shad emigration was 10.3% for the Weldon stocking location and 0.9% for the stocking location above John H. Kerr reservoir at the lower river collection site. Yet, American shad from the 2007, 2008 and 2009 year classes were collected in and above reservoirs during sampling in 2009. River discharge may influence American shad emigration and needs to be considered when selecting the above reservoir stocking location each year.

Technical Session 3

Cryptic Introductions of Hog Suckers, *Hypentelium* in the Pee Dee Drainage in North Carolina.

Bryn H. Tracy[1], Wayne C. Starnes[2], and Robert E. Jenkins[3], [1]NC Division of Water Quality, Raleigh, NC, bryn.tracy@ncdenr.gov, [2]NC State Museum of Natural Sciences, Raleigh, NC, wayne.starnes@ncdenr.gov, [3]Roanoke College, Salem, VA, jenkins@roanoke.edu

A cryptic introduction is an undocumented introduction of a species to a drainage in which it is not believed to be native. In North Carolina, two species of the morphologically distinctive catostomid genus *Hypentelium* occur—*H. nigricans*, Northern Hog Sucker, widespread in eastern and central USA and having a native distribution on the south Atlantic slope in the Roanoke, Neuse, Tar and Santee river drainages; and *H. roanokense*, Roanoke Hog Sucker, endemic to the Roanoke River drainage including its Dan River system in NC. Blotchy-sided age-0 and -1 specimens may easily be confused with similar-age *Catostomus commersonii*, White Sucker, or *Moxostoma rupiscartes*, Striped Jumprock. After re-examining vouchered specimens and reviewing agency gray literature, we have concluded that, during the past 50 years, Northern Hog Sucker has been cryptically introduced into probably three areas of the Yadkin River system of the Pee Dee River drainage—North Fork Reddies River watershed; mainstem upper Yadkin River between W. K. Scott Reservoir and Donnaha; and the middle Ararat River subsystem. In April 2009, Roanoke Hog Sucker was discovered by DWQ staff in Pauls Creek, a tributary to Stewarts Creek of the upper Ararat subsystem, the first record of the species outside the Roanoke drainage. Ranging from 41 to 109 mm TL, the 101 specimens represented age 1–3 fish based on length frequency. Further surveys in April and September 2009 documented its occurrence in the middle and upper Stewarts Creek watershed in Surry County northwest of Mount Airy. Future dispersal of both species may be limited by dams and inhospitable lacustrine environments. The primary avenue of these cryptic introductions is speculated as bait bucket releases by fishermen seeking trout and Smallmouth Bass.

The Return of Darters (Percidae) to Mecklenburg County Streams

Anthony J. Roux, Mecklenburg County Water Quality Program, 700 N. Tryon Street, Charlotte, NC 28202, 704-336-5447; Tony.Roux@MecklenburgCountyNC.gov

Mecklenburg County's Water Quality Program (MCWQP) sampled the fish community of the County's streams at 96 sites between 1995 and 1999. The majority of these sites are being resampled on a 5-year rotation. Five species of darters are found in Mecklenburg County Streams, including the Carolina darter (*Etheostoma collis*), a Federal and North Carolina Special Concern Species, the Fantail darter (*Etheostoma flabellare*), the Swamp darter (*Etheostoma fusiforme*), the Tessellated darter (*Etheostoma olmstedi*) and, the Piedmont Darter (*Percina crassa*). The current distribution of these darters in Mecklenburg County streams was compared to historical data presented in Don Cloutman and Larry Olmsted's 1979 publication *The Fishes of Mecklenburg County, N.C.* Two of the darters, the Swamp darter and the Piedmont darter were not reported to have been found in Mecklenburg County streams prior to 1980, although the Swamp darter was commonly found in the coves of Lakes Wylie and Norman and Mountain Island Lake, reservoirs in the Catawba River adjacent to Mecklenburg County. Recent samples taken show that the distribution of several of the species are increasing with the Tessellated darter being found in both Sugar and Little Sugar Creeks, urban streams that had not supported darters since the 1950s. The fish data collected by MCWQP shows that the water quality of Mecklenburg County streams has improved over the past 40 years. The species richness in Mecklenburg County streams has generally increased, especially in Sugar and Little Sugar Creeks.

Habitat Use of Stream Dwelling Crayfish during Reproductive Seclusion

Tyler R. Black[1], Hayden T. Mattingly[2], and David D. Smith[3], [1]NC Wildlife Resources Commission, Aquatic Wildlife Diversity Program, 1142 I-85 Service Rd., Creedmoor, NC 27522, Tyler.black@ncwildlife.org, (919) 528-9886, [2]Department of Biology, TennesseeTechnological University, Cookeville, TN 38505, HMattingly@tntech.edu, 931-372-3134, [3]Department of Mathematics, TennesseeTechnological University, Cookeville, TN 38505, DDSmith@tntech.edu, 931-372-3529

Stream habitat use of female crayfish during brooding of eggs and hatchlings represents a poorly studied aspect of crayfish life history and ecology. Therefore, the goal of this study was to use passive integrated transponder (PIT) technology to identify the habitat use of two species of crayfish during reproductive seclusion. PIT tags (12.5-mm long, 2.1-mm diameter) were externally attached to female Hairy Crayfish, *Cambarus friaufi* (15.0—20.4 mm carapace length (CL)) in Pine Creek, Dekalb County, Tennessee during February of 2008, and Meek's Crayfish, *Orconectes meeki meeki* (16.0—33.7 mm CL) in Rock Creek, Barry County, Missouri during November 2008. Crayfish were tracked via a portable detector and habitat use assessed during March — June 2008 for *C. friaufi* and during February — May 2009 for *O. m. meeki*. PIT tags proved to be a highly effective tool for relocating crayfish, with ≥85% of tagged individuals being located at least once. Substrate roughness was identified as the most important variable for brooding *C. friaufi* and *O. m. meeki*, followed by additional substrate related variables, water velocity, and water depth for the respective species. Habitat use specificity was quite different between the two species. *C. friaufi* was more of a generalist and utilized microhabitat variables in close proportion to availability while *O. m. meeki* specialized in its habitat use during reproductive seclusion. The results of this study suggest that loss of heterogeneous substrate could substantially alter crayfish reproductive capacity, thus impacting biodiversity and productivity of lotic environments.

Annuli verification and comparison of growth-measurement techniques for *Villosa vibex* and *Villosa lienosa*, in the lower Flint River Basin, Georgia

Justin Dycus* and James T. Peterson, Georgia Cooperative Fish and Wildlife Research Unit, Warnell School of Forestry and Natural Resources, Athens, GA 30602, 706-542-1041, dycusj@warnell.uga.edu

* Student presentation

Southeastern United States is home to the most diverse freshwater mussel assemblages in the world. Unfortunately, many of these species have experienced substantial population declines in recent decades that have been attributed to a variety of factors ranging from naturally occurring disturbances (e.g., periodic drought) to anthropogenic alterations of the environment. Freshwater mussels are long-lived, limited-mobility, aquatic species that are often useful biological indicators that reflect the integrity of their environment. Thin-sectioning mussels for age and growth studies paired with historic biological and environmental data can potentially be used to identify the factors responsible for species declines. The process of thin-sectioning exposes internal annuli that are used to age individuals and estimate growth. A fundamental assumption of thin sectioning is that the distance between annuli represents annual growth. To evaluate this assumption, two species, *Villosa vibex* and *Villosa lienosa*, were collected, tagged, notched, and returned to two stream sites in the lower Flint River Basin, Georgia. After one year, these specimens were collected, thin-sectioned, and annuli were counted. Results indicated that the distance between annuli represented growth over a single year. We also compared two growth measurement techniques using multiple observers and identified the method that provided the most consistent measure of annual growth. Age and growth techniques from this study will be used to identify the factors likely responsible for freshwater mussel population declines in the lower Flint River Basin.

Update on survival and growth of the wavy-rayed lamp mussel (*Lampsilis fasciola*) in the Pigeon River, NC: second year of growth.

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Historically the wavy-rayed lamp mussel, *Lampsilis fasciola*, was present in areas of suitable habitat throughout the North Carolina portion of the Pigeon River. It currently only persists upstream of Canton, NC. In December of 2008 we placed individually marked mussels caged in concrete enclosures at 2 sites upstream of Canton and 3 sites downstream of Canton at increasing distances from the paper mill located there. The initial purpose of the study was to test for differential mortality of mussels at the different sites, with the expectation that we would see higher mortality in downstream sites near the paper mill. We were surprised to find generally high survival at all sites with no discernable effect of location. But, mean growth rates differed significantly among sites. The study continues with the goal of examining long-term location effects on growth and maturation. Growth rates continued to be significantly higher for mussels at downstream sites during the second year of the experiment. Also, other macroinvertebrates colonizing the enclosures were found to be more diverse and far more abundant at downstream sites, suggesting that the downstream sites experience generally higher productivity. Increased temperatures associated with the heated effluent of the paper mill and elevated nutrient availability from sewage treatment plant effluent and agricultural run-off are likely explanations for the increased productivity at the downstream sites.

Research and relicensing on the Pee Dee River, North Carolina

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There are six hydroelectric dams on the Yadkin-Pee Dee River, and in 2008, Progress Energy completed the Federal Energy Regulatory Commission (FERC) relicensing process for the Tillery and Blewett Falls facilities. As part of the proposed operating license, they will provide higher minimum flows downstream from each of their dams and maintain dissolved oxygen concentrations above the state standard. Currently, the water quality certification for these facilities is under litigation and implementation is delayed indefinitely. In 2009, we conducted freshwater mussel surveys downstream of Tillery Dam and Blewett Falls Dam to document potential changes in mussel diversity and abundance due to the improvements in water quality and minimum flows. During our pre-minimum flow surveys, we collected 13 species at each study site with densities ranged from 0.018 to 6.8 mussels/m^2. The robust redhorse is a rare fish that occurs downstream of the Blewett Falls Dam. In a collaborative effort, NCWRC, NCSU, Progress Energy, and others identified three spawning shoals and have described habitat use for this species under the current flow conditions. Spawning habitat consists of shallow, fast-moving water with gravel and cobble substrate. Non-spawning habitat consists of deep pools, with slow-moving water and bedrock and sand substrates. Microhabitat suitability analysis and flow modeling suggest that proposed augmented flows will increase suitable habitat during spawning and non-spawning periods. These results are playing an essential role in defining our management strategy for rare fish and mussel species in the Pee Dee River.

Technical Session 4

Influence of dams, big and small, on tropical diadromous fishes

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Recent research demonstrated impacts of large dams on migrations and life cycles of native amphidromous fishes in Puerto Rico. However, little is known on impacts of other artificial barriers to fish passage (small dams and road crossing) in tropical island river and stream corridors. With no available database of artificial stream barriers, we set out to find and document these impediments to assess their influence on distribution and abundance of native fishes. We surveyed a total of 311 manmade barriers, 36 reaching heights of at least 17 m above the downstream water surface (height for fish to traverse), and 80 that were greater than 2.4 m. In total, 74% (6,773 river km) of riverine habitat is impeded by artificial barriers in Puerto Rico, creating a disconnect of upstream habitat from the ocean. The remaining 26% (2,414 river km) of riverine habitat is almost exclusively at lower elevations, limiting higher altitude stream habitat availability. We sampled fish across the island from 123 locations, incorporating all 46 major river drainages in Puerto Rico. From these samples, we confirmed that while high dams completely exclude all native fish species from accessing upstream habitat, some low barriers appear to allow passage of several native fish species. Understanding the influence of all artificial stream barriers on native fish passage will aid in increasing stream habitat availability and enhancing freshwater fish communities in Puerto Rico.

Population Modeling to Guide Caribbean Freshwater Riverine Fishery Management

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* Student presentation

The management of Caribbean freshwater riverine fisheries is limited by a lack of ecological information. The bigmouth sleeper, *Gobiomorus dormitor*, is a native Caribbean amphidromous species with sport fish potential, but little is known of its life history, population dynamics, and habitat requirements. To date, parameters required to develop a basic Leslie matrix population model for bigmouth sleeper populations are generally unavailable. Thus, we studied population dynamics and estimated important life history parameters, size at maturity, growth rates, and survival rates for bigmouth sleeper in Rio Mameyes, Puerto Rico. The results of fishery simulations and sensitivity analyses indicate that bigmouth sleeper populations may be highly productive and robust to high rates of angling and exploitation. Mark-recapture sampling of PIT-tagged bigmouth sleeper indicated that this species is sedentary. Although bigmouth sleeper populations may be able to sustain high rates of fishing mortality, low rates of individual movement suggest that public river access points could become locally depleted. Furthermore, they may be most sensitive to factors affecting age-0 survival, a result that emphasizes the importance of flow regulation during critical periods when amphidromous larvae drift downstream to the ocean. Our findings indicate that factors affecting recruitment, such as larval survival, recruitment timing, and metapopulation dynamics are critical influences on the viability of amphidromous populations. These findings represent important first steps in understanding the ecology of the species and a basis for future strategic management planning toward riverine sport fishery development.

Contaminants and Food Web Dynamics in Puerto Rico Stream Ecosystems

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* Student presentation

Puerto Rico is a densely populated Caribbean island with a history of anthropogenic chemical usage. Few contaminant studies have been conducted on the island, and none have examined stream ecosystems. The objective of our study was to quantify occurrences and patterns of aquatic contaminants (PAHs, PCBs, pesticides, and heavy metals) as related to watershed land-use characteristics and trophic relationships. We used stable isotope analyses of carbon, nitrogen, and sulfur to elucidate contaminant and trophic dynamics. We sampled reaches within 12 rivers spanning broad watershed land-use patterns (e.g., urban, agricultural, industrial, and forested). Additional intensive studies were conducted at four of these sites, involving stable isotope analyses of all food web components and contaminant analyses of native fish and shrimp species. Overall, stream ecosystems in Puerto Rico were not severely polluted, with the exception of PCBs and mercury in some fish species. Trophic level and contaminant concentrations were poorly correlated in these highly dynamic ecosystems that are characterized by frequent hydrologic disturbances, nutrient pulses, and marine influences. Calculation of food web biomagnification factors was complicated, by low levels of contaminants found in these systems, biased estimates of trophic level due to $\delta^{15}N$ enrichment from nutrient pollution, and short food chains. Lipid content was a better predictor of contaminant concentration than trophic level. These results will provide natural resource managers with scientific information needed to guide ecosystem and fisheries management and human health risk assessment.

Preliminary Results for an assessment of mercury in economically important fishes commonly landed off the coast of North Carolina

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* Student presentation

Though mercury is a naturally occurring element, most atmospheric mercury is the result of anthropogenic activity. In aquatic systems, the conversion of mercury to methylmecury (MeHg) is problematic because MeHg is a neurotoxin that bioaccumulates in fish. Marine fish are an important dietary component because they contain protein and essential nutrients, are low in saturated fats, and tend to be good sources of omega 3 fatty acids. However, fish (principally marine fish) are the main source of MeHg exposure to humans. Though fish harvest and consumption is an important part of North Carolina's heritage and economy, little is known about MeHg concentrations in marine fish commonly caught and consumed by our residents. The goal of this study was to examine mercury levels in six commonly caught and consumed marine species in North Carolina, and compare our results to published guidelines on fish consumption. We (1)quantified and compared MeHg levels of mahi mahi, *Coryphaena hippurus;* king mackerel, *Scomberomorus cavalla*; and wahoo, *Acanthocyblum solandri* caught recreationally, and pink snapper, *Pagrus pagrus;* red grouper, *Epinephelus morio*; and triggerfish *Balistes capriscus*, caught commercially and sold to local seafood markets, and (2) compared MeHg levels of these species with mercury consumption recommendations established by the Environmental Protection Agency (EPA), Food and Drug Administration (FDA), and the Seafood Watch list. Results of our study will provide location-specific information needed by consumers as they decide which species to harvest and consume, and by policy makers as they develop strategies to reduce mercury consumption risk for NC citizens.

Spatial and temporal variation in fish assemblages on four artificial oyster reefs in Pamlico Sound, NC

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In response to historic low population sizes of eastern oysters, the NC Division of Marine Fisheries created a network of no-take, oyster broodstock reserves in an effort to enhance the oyster metapopulation in Pamlico Sound. In addition to oyster enhancement, restored oyster reefs provide increased structural refuge and feeding opportunities for fish. Using gill nets and fish traps, we quantified transient and reef fish, respectively, inhabiting oyster reserves and nearby unstructured estuarine bottom. In general, significant differences in catch per unit effort between unstructured bottom and oyster reserves were found. In most cases, species per unit effort were higher on unstructured bottom, compared to the oyster reefs. Currently, we are looking to see whether there are differences in fish species composition. Significant peaks in catch during the month of September, followed by rapid declines in October, may signify that estuarine fish are using restored reefs as a staging area before migrating to offshore wintering grounds. Evidence was found of seasonal habitat use of reefs by key species of juvenile sharks and recreationally important fish. These results have the potential to impact management and sanctuary placement as they provide information regarding specific temporal and spatial trends in fish assemblages between reef locations as well as, the timescale of habitat colonization by finfish.

A Status Survey for Rare Fishes of the NC Coastal Plain

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In North Carolina, approximately 12% of our fishes are listed by the state or federal government as endangered, threatened, or meriting special concern. In addition to these lists, the NC Wildlife Action Plan identifies a number of priority species that are found in the coastal plain region of the state. The objectives of this study are to sample for priority fishes in the Lumber, lower Cape Fear, and White Oak drainages, grouped near the southeastern coast of NC. Targeted species include the bluefin killifish, thinlip chub, broadtail madtom, banded sunfish, golden topminnow, Everglades pygmy sunfish, blackbanded sunfish, spotted sunfish, ironcolor shiner, and taillight shiner. Distribution records for these species are sparse and most are over ten years old, so in 2010, 32 sites were sampled to update these records. The bluefin killifish and banded sunfish were not found at any of the sampling sites. The thinlip chub, broadtail madtom, and golden topminnow were only found at one site each. Spotted sunfish were the most widespread, found at seven sites, although never in high densities. Others, like the ironcolor and taillight shiners, when present, were found in large schools. No fish were found outside of their expected range. Further surveys are warranted for the broadtail madtom, thinlip chub, and banded sunfish, as these fish should have been present at more sites and in greater numbers throughout the sampling area.

NORTH CAROLINA CHAPTER

AFS

AGENDA
Annual Business Meeting

Wednesday 23 February 2011 Drury Inn Charlotte, NC

Call to Order	Kevin Dockendorf
Determination of Quorum	Kevin Hining
Welcome and Introductions • AFS Parent Society EXCOM • Southern Division EXCOM and Past Presidents • NCAFS Past Presidents	Kevin Dockendorf
AFS Parent Society Update	John Boreman – AFS First Vice President
Southern Division Update	Elizabeth Osier – SDAFS Secretary-Treasurer
February 2010 Business Meeting Minutes	Kevin Dockendorf
Secretary-Treasurer Reports	Kevin Hining
Committee Reports	
• Program and Arrangements	Michael Abney, Jeff DeBerardinis, David Goodfred
• Registration	Jerry Finke, Kevin Hining
• Newsletter	Kim Sparks, Kim Baker, Jerry Finke
• Environmental Concerns	David McHenry, Bryn Tracy, Thomas Thompson Micky Clemmons, Win Taylor, Marla Chambers
• Education and Outreach web update mtg. abst. pdf	Chris Wood, Joe Hightower Jessica Baumann, Nick Shaver
• Webmaster	Jerry Finke
• Finance	Kevin Hining, Mike Swing, Brian McRae
• Awards	John Crutchfield
• Nominations	Chad Thomas
NCSU Student Fisheries Subunit	Katie Pierson, Jake Hughes
Old Business	Bylaws Approved; Procedures Manual finalized;
New Business	Chapter Funding Request – pdf form and guidelines Lifetime NCAFS membership; Other New Business
Awards Presentations	John Crutchfield
Installation of New Officers	Kevin Dockendorf
Adjourn	

NORTH CAROLINA CHAPTER

NCAFS History – Chapter Presidents and Secretary-Treasurers – "Roll call"

Year	***President***	***Secretary-Treasurer***
1988	Tony Mullis	Don Cloutman
1989	Scott Van Horn	Don Cloutman
1990	Jim Rice	Mickey Clemmons
1991	Don Cloutman	
1992	Jerry West	
1993	Frank McBride	
1994	Wilson Laney	Shari Bryant
1995	Don Degan	Shari Bryant
1996	Joe Hightower	Chad Thomas
1997	Hugh Barwick	Chad Thomas
1998	David Yow	Chad Thomas
1999	Dave Coughlan	Chad Thomas
2000	John Crutchfield	Kim Baker
2001	Bob Curry	Kim Baker
2002	Shari Bryant	Kim Sparks
2003	Tom Kwak	Kim Sparks
2004	Mallory Martin	Brian McRae
2005	Duane Harrell	Brian McRae
2006	Lawrence Dorsey	Brian McRae
2007	Kent Nelson	Brian McRae
2008	Christian Waters	Kevin Hining
2009	Chad Thomas	Kevin Hining
2010	Kevin Dockendorf	Kevin Hining
2011	Michael Abney	Kevin Hining