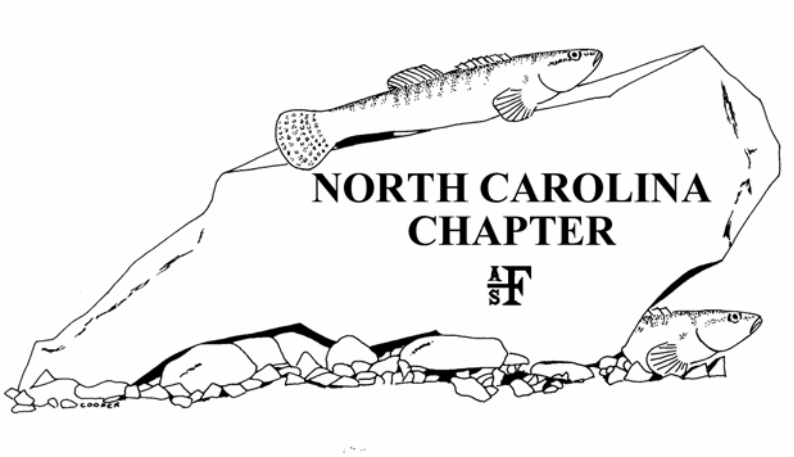
20th Annual Meeting
of the
North Carolina Chapter
American Fisheries Society



2009 Program

February 23 – 25, 2009

Courtyard Marriott

Burlington, North Carolina

Meeting Support Provided By:

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2009 Annual Meeting – North Carolina Chapter American Fisheries Society
Courtyard Marriott, Burlington, North Carolina
February 23 – 25, 2009

Monday, February 23, 2009

5:00 – 6:00 Registration (Alamance Room)

8:00 – 10:30 **Welcoming Social** (Carolina Room)

Tuesday, February 24, 2009

8:00 – 1:00 Registration (Alamance Room)

8:00 – 10:00 **Continuing Education Short Course**: *Climate Change and its Effects on Fisheries and Aquatic Resources*

10:00 – 10:20 Break

10:20 – 12:00 **Continuing Education Short Course**: *Climate Change and its Effects on Fisheries and Aquatic Resources*

12:00 – 1:10 Lunch (on your own)

1:10 – 1:20 **Welcome and Introductions**
Christian Waters, President, North Carolina Chapter American Fisheries Society

Technical Session I: Conservation of Rare and Endangered Aquatic Species
Moderator: David Yow

1:20 – 1:40 Lessons in endangered aquatic species conservation
Brena Jones *North Carolina Wildlife Resources Commission*

1:40 – 2:00 Status of rare fishes in the Catawba, French Broad, and New River systems in Western North Carolina
Steve Fraley and T. R. Russ *North Carolina Wildlife Resources Commission*, Bryn Tracy *North Carolina Division of Water Quality* and David Matthews *Tennessee Valley Authority*

2:00 – 2:20 Reproductive and habitat ecology of the sicklefin redhorse, an imperiled endemic species
Thomas J. Kwak and Scott D. Favrot *North Carolina State University*

2:20 – 2:40 Status and distribution of seven priority fishes in the Dan River sub-basin, NC
Chris J. Wood *North Carolina Wildlife Resources Commission*

2:40 – 3:00 Edward D. Cope's contributions to our knowledge of the North Carolina fish fauna and re-visiting North Carolina's type localities
Bryn H. Tracy *NC Division of Water Quality*

3:00 – 3:20 Break

Technical Session II: Management of Lake and Reservoir Fisheries
Moderator: Chad Thomas

3:20 – 3:40 Applying sonar technology to analyze late summer fish distribution in lower Lake Norman
Michael Abney *Duke Energy Carolinas*

3:40 – 4:00 An evaluation of baited hoop nets for sampling catfish in small impoundments
Benjamin C. Wallace*, Daniel M. Weaver and Thomas J. Kwak
North Carolina State University

4:00 – 4:20 Successes and failures of Lake Norman riparian zone plantings, 2005–2008
Hugh Barwick and Gene Vaughan *Duke Energy Carolinas*

4:20 – 4:40 Dissolved oxygen dynamics in dense emergent plants at lakes Istokpoga and Kissimmee, Florida
Aaron Bunch *North Carolina Wildlife Resources Commission*,
Mike Allen and Dan Gwinn *University of Florida*

4:40 – 5:00 Competitive and predatory interactions with newly stocked striped bass fingerlings in a southeastern reservoir: a preliminary analysis
Marybeth Brey*, Derek Aday and Jim Rice *North Carolina State University,*
Brian McRae *North Carolina Wildlife Resources Commission*

5:00 – 6:00 **2010 AFS Southern Division Spring Meeting planning session**

7:00 – 10:30 **Catered Social and NCSU Sub-unit Raffle**

Wednesday, February 25, 2009

Technical Session III: Management of Coastal Fisheries
Moderator: Kim Baker

8:00 – 8:20 Relationship between environmental variables and largemouth bass catch-per-unit-effort in coastal rivers of North Carolina
Justin Homan and Robert Barwick *North Carolina Wildlife Resources Commission*

8:20 – 8:40 Feasibility of using mobile hydroacoustic surveys for estimating spawning stock size of blueback herring in Western Albemarle Sound, North Carolina
Warren A. Mitchell *North Carolina State University*, J. Christopher Taylor *National Oceanic and Atmospheric Administration*, Joseph E. Hightower and Jeffrey A. Buckel *North Carolina State University,* and M. Terry Pratt *Commercial Fisherman*

*** student presentation**

8:40 – 9:00 Investigating Neuse River striped bass recruitment: implications for stock recovery
Robert Barwick and Justin Homan *North Carolina Wildlife Resources Commission*

9:00 – 9:20 Migratory patterns of American shad transported above dams on the Roanoke River
Julianne E. Harris* and Joseph E. Hightower *North Carolina State University*

9:20 – 9:40 Spawning activity and migratory characteristics of American shad and striped bass in the Cape Fear River, NC
Joseph A. Smith* and Joseph E. Hightower *North Carolina State University*

9:40 – 10:00 Break

Technical Session IV: Management of Stream Fisheries
Moderator: Jake Rash

10:00 – 10:20 Characteristics of riverine smallmouth bass populations in Western North Carolina
Kevin Hining, Amanda Bushon, David Goodfred and David Yow *North Carolina Wildlife Resources Commission*

10:20 – 10:40 Accuracy of snorkeling techniques for estimating stream fish populations
Daniel M. Weaver*, Thomas J. Kwak and Kenneth H. Pollock
North Carolina State University

10:40 – 11:00 Fluctuations in an unexploited Southern Appalachian rainbow trout population
Todd Ewing and James Borawa *North Carolina Wildlife Resources Commission*

11:00 – 11:15 Break

11:15 – 1:00 **NCAFS Business Meeting**

*** student presentation**

20th Annual Meeting
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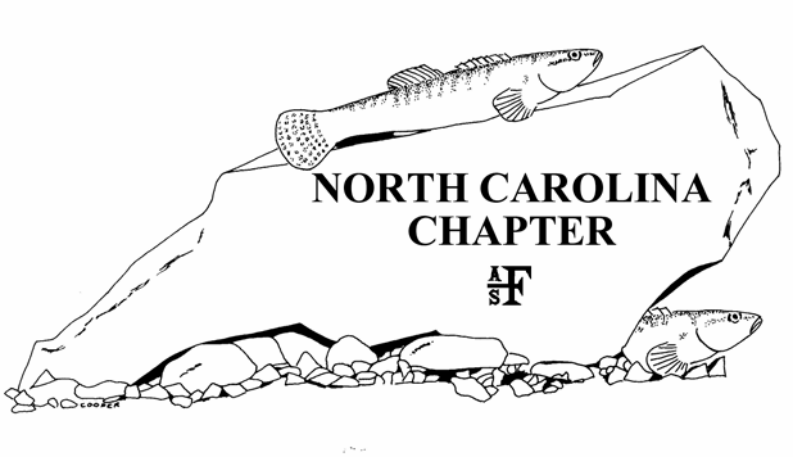

2009 Abstracts

February 23 – 25, 2009

Courtyard Marriott

Burlington, North Carolina

Meeting Support Provided By:

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Technical Session I: Conservation of Rare and Endangered Aquatic Species

Lessons in Endangered Aquatic Species Conservation

Brena Jones, North Carolina Wildlife Resources Commission, 1142 I-85 Service Road, Creedmoor, NC, 27522, 919-528-9886 brena.jones@ncwildlife.org

Freshwater mussels are among our most imperiled fauna: over 70% of North America's native mussel species are imperiled or extinct. In North Carolina, the federally endangered Carolina heelsplitter (*Lasmigona decorata*) mussel is facing extirpation from large portions of its limited range. The North Carolina Wildlife Resources Commission spent ten years attempting to protect the heelsplitter in the Goose Creek watershed near Charlotte, once considered a stronghold for this species. Due to lack of effective coordination and support among federal, state, and local governments which limited ability to effect real improvement in the stream itself, and an unstoppable tide of urban development, this population continues its drastic decline and much of its habitat has been destroyed. However, valuable lessons in watershed management have been learned and important life history and captive propagation information has been garnered as a result of this effort. These experiences have already been and continue to be applied in other priority conservation areas around the state in order to improve aquatic species management and prevent these losses from being repeated.

Status of Rare Fishes in the Catawba, French Broad, and New River Systems in Western North Carolina

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David Matthews, Tennessee Valley Authority dcmatth5@tva.gov

In 2007 and 2008, NCWRC Aquatic Wildlife Diversity staff sampled fish communities at selected sites throughout the Catawba, French Broad, and New river systems in western North Carolina. NCWRC's sampling regime focused on areas not covered by NCDWQ (all systems) and TVA (French Broad only) IBI programs and specifically on assessing the present distribution and relative abundance of selected rare fish species. Data collected by each agency were combined. Total sites sampled was 50 in the New (WRC=28, DWQ=22), 60 in the Catawba (DWQ=37, WRC=23), and 75 in the French Broad (TVA=31, DWQ=25, WRC=19). Species of interest included state listed Endangered, Threatened, and Species of Concern, NHP-listed Significantly Rare, and Wildlife Action Plan priority species. Number of focal species per river system was: New=9, Catawba=9, French Broad=30. In general, results were mixed with a few notable declines in some species (e.g. sharpnose darter, *Percina oxyrhynchus* [New], Santee chub, *Cyprinella zanema* [Catawba]). We failed to detect 13 species in the French Broad, seven of which were already presumed to be extirpated; however Mooneye (*Hiodon tergisus*) and Mountain madtom (*Noturus eleutherus*) were collected for the first time since 1977 and 1888, respectively. Fish densities were notably low in the lower South Fork New and mainstem New rivers, but species richness was generally as expected.

Reproductive and Habitat Ecology of the Sicklefin Redhorse, an Imperiled Endemic Species

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The sicklefin redhorse *Moxostoma* sp. is a potamodromous, undescribed and imperiled species endemic to a restricted geographic range in the Blue Ridge physiographic province of North Carolina and Georgia. Little is known about its ecology, behavior, and reproduction. We quantified the spawning migration, seasonal movement patterns, microhabitat use and suitability, and behavior of sicklefin redhorse in the upper Hiwassee River Basin, North Carolina. Adult sicklefin redhorse most frequently occupied Hiwassee River tributaries during the spawning season (March–May), lower reaches of tributaries and Hiwassee River during the postspawning season (June–November), and lower reaches of Hiwassee River during winter (December–February). They were highly mobile during the spawning season, and displayed site fidelity during the postspawning season, before migrating downstream in winter. Sicklefin redhorse selected microhabitat non-randomly. They were associated with swift thalweg currents, shallow depths, and coarse substrates (e.g., boulder and bedrock) supporting river weed *Podostemum ceratophyllum*, but different microhabitats were occupied during spawning. Sicklefin redhorse reproductive behavior was similar to that for the genus *Moxostoma*, with several important exceptions. Our results demonstrate that sicklefin redhorse ecology is unique among its congenerics, and increased knowledge of this species may guide and enhance management to ensure its survival.

Status and Distribution of Seven Priority Fishes in the Dan River Sub-Basin, NC

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The Dan River harbors one of the most diverse fish assemblages in NC. Sixty eight species of fish have been recorded in the NC portion of the Dan River and its major tributaries. Seven of those are State and/or Federally listed: the Bigeye jumprock (*Moxostoma ariommus*; State Special Concern), Cutlips Minnow (*Exoglossum maxillingua*; State Endangered, Federal Species of Concern), Orangefin Madtom (*Noturus gilberti*; State Endangered, Federal Species of Concern) Riverweed Darter (*Etheostoma podostemone*; State Special Concern), Roanoke hogsucker (*Hypentelium roanokense*; State Special Concern), Rustyside Sucker (*Thoburnia hamiltoni*; State Endangered, Federal Species of Concern), and the newly discovered Roanoke logperch (*Percina rex*; State Endangered, Federally Endangered). Eighteen sites in the Dan, Mayo, and Smith Rivers were sampled in 2008 to determine presence/absence, CPUE, and distribution for all fish species. Presence/absence data from a subset of sites (n=11) were then compared to data from the early 1990's to determine any temporal changes in occurrence for listed fishes. Results suggest that distributions of most listed fishes in the Dan River sub-basin have remained stable over the past 15–18 years. All listed fishes except the Rustyside sucker occurred at similar frequencies between the 1990's and 2008 surveys. The Rustyside sucker was not captured during the 2008 surveys and may be extirpated from NC. Conversely, the Federally

endangered Roanoke logperch was captured in one new waterway suggesting a range expansion or possibly the discovery of an unknown population. Surveys will continue during 2009 to further assess the Dan River fish fauna.

Edward D. Cope's Contributions to Our Knowledge of the North Carolina Fish Fauna and Re-visiting North Carolina's Type Localities.

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The first 5 of 203 described and indigenous freshwater fish species known from North Carolina were scientifically named in 1758 by Carolus Linnaeus, though generally from locales in the northern USA. A flurry of activity in the late 1810s by Constantine Rafinesque ascribed names for 25 more nominal species, again from locales outside North Carolina. Between 1860 and 1870, 48 species were described, 43 of them by Edward D. Cope. No ichthyologist has had more impact on the taxonomy of the state's fauna than Cope. As a young man of 29 years with a wife and an age-three daughter in tow, 140 years ago Cope spent from late August until early December during 1869 in North Carolina. Equipped with only a small seine of fine mesh, a great fervor, and a penchant for interacting with the local commercial fishermen and their weir traps, his travels took him from Warm Springs in Madison County to Wilmington in New Hanover County including stops along the way in Pleasant Garden, the Koontz Plantation, New Garden, and Raleigh. He collected more than 95 described and undescribed species during his travels. By June 07, 1870, less than six months since leaving North Carolina, Cope had described approximately 20 percent of the species currently recognized in the state. Under current species concepts, there are 34 type localities in North Carolina of which 15 are Cope's. In 2008 a study was begun, hopefully with volunteerism from NC AFS and SFS members, to revisit each of these sites, including Cope's, to determine if the species are still present, what are the existing site conditions, or to determine why the species are absent. In sites revisited thus far, preliminary results suggest that four species may be extirpated from their type localities (Cape Fear Shiner, Carolina Madtom, Wounded Darter, and Blotchside Logperch) and five species are still extant (Waccamaw Killifish, Waccamaw Silverside, Carolina Fantail Darter, Waccamaw Darter, and Carolina Pygmy Sunfish).

Technical Session II: Management of Lake and Reservoir Fisheries

Applying Sonar Technology to Analyze Late Summer Fish Distribution in Lower Lake Norman
Michael Abney, Duke Energy Environmental Center, 13339 Hagers Ferry Road, Huntersville, NC 28078
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The alewife, an anadromous species native to the northern and mid-Atlantic coast, was introduced into Lake Norman in the late 1990's and serves as forage for many sport fish. Having constituted as much as 25% of the pelagic forage fish population, alewife percent composition has decreased in recent years to 5% or less. During normal, late-summer stratification adults follow cooler water to the deepest areas of the hypolimnion and become trapped as the metalimnion becomes anoxic. As stratification intensifies in late August and the hypolimnion becomes anoxic, the lack of oxygen likely contributes to the depletion of remaining alewife. Since 2003, Duke Energy personnel have used hydroacoustic technology to document the summer distribution of hypolimnetic forage fish. In 2008, a DIDSON video camera was deployed to record real-time fish behavior including predation, schooling under hypoxic conditions, and the presence of both forage and predator fish under anoxic conditions. Concurrent images from both technologies suggest that predator fish descend through the metalimnion to feed on hypolimnetic forage fish.

An Evaluation of Baited Hoop Nets for Sampling Catfish in Small Impoundments
Benjamin C. Wallace*, Daniel M. Weaver, and Thomas J. Kwak
U.S. Geological Survey, North Carolina Cooperative Fish and Wildlife Research Unit,
Department of Biology, North Carolina State University, Raleigh, NC 27695-7617

* Student Presentation

Many U.S. state fishery agencies manage and stock channel catfish (CCF) into small impoundments to provide recreational fishing opportunities. However, effective standardized methods for sampling catfish in small impoundments have not been developed for wide application. In recent years, baited hoop nets have effectively collected CCF in Midwestern impoundments; thus, we examined their use in two North Carolina small impoundments. Three treatments of tandem hoop nets were applied to Lake Raleigh and Bass Lake during the fall of 2008. Both lakes have received some level of CCF stocking within the last three years, but traditional sampling methods have failed to adequately quantify catfish in either lake. In Lake Raleigh, hoop nets with no bait sampled zero CCF, nets baited with soybean cake sampled 93 CCF, and nets baited with sunflower cake sampled 46 CCF. In Bass Lake, a Community Fishing Program site, hoop nets with no bait sampled 570 CCF, nets baited with soybean cake sampled 4,730 CCF, and nets baited with sunflower cake sampled 660 CCF. Bycatch and mortality were minimal. Early results suggest the use of tandem hoop nets baited with soybean cake are effective for sampling catfish populations in North Carolina small impoundments and should improve catfish management. Sampling will continue into the spring of 2009 to further investigate the use of baited hoop nets by season.

Successes and Failures of Lake Norman Riparian Zone Plantings, 2005-2008
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704/382-0805 dhbarwic@dukeenergy.com;
Gene Vaughan, Duke Energy Carolinas, gevaughan@dukeenergy.com

In recent years, considerable effort has been devoted to enhancing fish habitat in southern reservoirs. Such habitat enhancing projects have ranged from the installation of various types of fish attractors to plantings of aquatic vegetation. While the success of such efforts has been mixed, it is safe to say that plantings of native aquatic vegetation have had the poorest success. However, there remains a need to identify native wetland and aquatic plants that can be used to enhance fish habitat and to also stabilize reservoir shorelines in high energy areas without becoming a nuisance to boaters, lake homeowners, and local utilities. In 2005–2008, Duke Energy and a dedicated group of Island Adopters from the NC Wildlife Federation conducted a series of trials to identify potential plant species and planting techniques that might be useful in this effort. Water willow (*Justicia americana*) and black willow (*Salix nigra*) are two plant species identified that have potential to create fish habitat while stabilizing high-energy shorelines in Lake Norman.

Dissolved Oxygen Dynamics in Dense Emergent Plants at Lakes Istokpoga and Kissimmee, Florida
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Altered hydrology (i.e., water level stabilization) in Florida lakes can exacerbate the formation of dense plant stands in littoral zones. Anoxia and hypoxia associated with dense plant stands can provide quality habitat for small-bodied fishes utilizing the oxygen-rich surface layer, but reduce habitat for species that depend on oxygen within the water column. We identified spatial and temporal trends in dissolved oxygen (DO) in several emergent plant species (i.e., cattail, pickerelweed, water primrose, smartweed, and torpedograss) and coverage levels (i.e., percent area coverage; 50-64%, 65-79%, and 80-95%) at Lakes Istokpoga and Kissimmee, Florida. There were plant-specific differences in the oxygen environment available to fishes. Dissolved oxygen exhibited substantial spatial and temporal variability at small scales (i.e., meters and hours). However, DO tended to be low in most habitats throughout the study. Plant species varied in structural complexity, canopy characteristics, organic sediment accumulations, and other aspects of their life histories, thus variation in DO concentration among habitats was expected. Management strategies aimed to limit expansive areas of dense plants should decrease the extent and longevity of hypoxia, and thus, may expand habitat for some fishes (i.e., centrarchids), and increase overall fish diversity. However, managers should first recognize that patches of dense emergent plants provide important habitat for hypoxia-tolerant fishes, and other wildlife including wading birds, reptiles, and amphibians.

Competitive and Predatory Interactions with Newly Stocked Striped Bass Fingerlings in a Southeastern Reservoir: A Preliminary Analysis

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Brian McRae, North Carolina Wildlife Resources Commission
Derek Aday and Jim Rice, North Carolina State University

*Student Presentation

Fingerling striped bass (*Morone saxatilis*) are stocked annually in many reservoirs to maintain recreational fisheries. The fate of fish immediately following stocking, however, is largely unknown. In Lake Norman, an impoundment of the Catawba River in North Carolina, striped bass are stocked as fingerlings each June. In 2007 and 2008, electrofishing gear and experimental gillnets were used to sample newly stocked striped bass fingerlings and the associated fish community at 6 hours, one day, two days and three days post-stocking. Objectives were to assess 1) the immediate dispersal of striped bass fingerlings following stocking, 2) predators of striped bass following stocking, and 3) diet overlap with abundant, nearshore fishes as a proximate measure of competition. Striped bass fingerlings showed no consistent pattern of shoreline dispersal; only 209 fish (0.13% of the total stocked) were collected in 2007, and none were collected in 2008. Diets of potential predators were examined for presence of fingerling striped bass. In 2007, eight (N=467) predators consumed 19 striped bass, and in 2008, two predators (N=468) consumed three striped bass. Key predators of striped bass included flathead catfish (*Pylodictis olivarus*) and spotted bass (*Micropterus punctatus*). A Proportional Similarity Index (PSI) was calculated to provide a measure of diet overlap between striped bass, bluegill, and black bass, the most abundant nearshore fish species. The PSI indicated strong diet overlap at a broad scale between all three fish. If predation is low and competition is short-lived, as stripers quickly disperse offshore, shoreline stocking may be satisfactory for stocking striped bass.

Technical Session III: Management of Coastal Fisheries

Relationship Between Environmental Variables and Largemouth bass Catch-Per-Unit-Effort in Coastal Rivers of North Carolina

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Largemouth bass are popular among anglers fishing coastal rivers of North Carolina; however, obtaining accurate and reliable estimates of population abundance has been challenging. Sportfish managers have had mixed success interpreting estimates of largemouth bass relative abundance (catch-per-unit-effort, CPUE) collected using electrofishing techniques due to the influence of environmental factors on catch. To monitor population abundance using relative abundance indices, the effects of environmental variables on largemouth bass catch should be quantified. To address this need, we sampled largemouth bass populations in the Neuse River weekly from March–May of 2006 and 2007 to investigate the relationship between CPUE and dissolved oxygen, conductivity, water temperature, discharge, river stage, percent wetted area, wetted area, moon phase, photoperiod, and Julian day for multiple size classes of largemouth bass. Catch-per-unit-effort was primarily related to discharge, the amount of inundated habitat, and conductivity. Relationships between largemouth bass CPUE and moon phase, Julian day, and dissolved oxygen were less evident. Results from this study can be used to facilitate more reliable comparisons of relative abundance in the future.

Feasibility of Using Mobile Hydroacoustic Surveys for Estimating Spawning Stock Size of Blueback Herring in Western Albemarle Sound, North Carolina

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wamitche@ncsu.edu; J. Christopher Taylor, National Oceanic and Atmospheric Administration
Joseph E. Hightower and Jeffrey A. Buckel, North Carolina State University
M. Terry Pratt, Commercial Fisherman

Recent landings from Albemarle Sound's river herring fishery (collectively; blueback herring Alosa aestivalis and alewife Alosa pseudoharengus) are dramatically lower than historical levels. A harvest moratorium established in 2006 increases the likelihood of recovering these stocks but it also eliminates a source of information about stock status. Here we present first-year findings from a fishery-independent approach for assessing spawning stock size of blueback herring. A split-beam hydroacoustic system was deployed in downward orientation from a mobile survey vessel, and spatial analysis techniques were used to estimate weekly fish densities. Spatial interpolation of hydroacoustic data has shown regions of high fish density from the middle of western Albemarle Sound to four miles north of the Highway 17 Bridge. Species composition data from independent gillnet catches were used to apportion acoustically-estimated biomass. Blueback herring accounted

for 5% of the total gill-net catch, with Atlantic menhaden (Brevoortia tyrannus) most abundant in downstream samples and white perch (Morone americana) most abundant in upstream samples. Blueback herring were most abundant between 08 and 23 April, peaking in gill-net samples upstream of the Highway 17 Bridge on 18 April (27% composition). Preliminary peak abundance estimates for the Chowan River region (815,745) were within the range of spawning-aged blueback herring estimates from recent stock assessments (600,000 – 1,200,000). Sampling with hydroacoustic and gill-net gears was successful at determining the timing, location and magnitude of river herring abundance in western Albemarle Sound; this tool may be useful in future plans to monitor spawning stock size of blueback herring.

Investigating Neuse River Striped Bass Recruitment: Implications for Stock Recovery

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Investigating trends in striped bass *Morone saxatilis* spawning success is important for determining which factors may affect recruitment. We evaluated the abundance and distribution of juvenile striped bass in the Neuse River from 2006–2007 using beach seines and electrofishing techniques. Overall, we detected evidence of poor recruitment in both years. Juvenile striped bass were not documented in the system during summer of 2006 and were collected in low densities from isolated areas (2 of 34 sample sites) during summer of 2007. Juveniles of hatchery origin were collected in the estuary while wild-produced juveniles were collected from freshwater areas of the river. Because catch was low, we could not adequately describe nursery habitat or determine why segregation existed between wild and hatchery-reared juvenile striped bass. Furthermore, these fish collection techniques may not be appropriate for quantifying spawning success for populations with low juvenile production. We suggest that poor recruitment will be a major impediment to stock recovery if environmental factors are responsible for early-life mortality.

Migratory Patterns of American shad Transported Above Dams on the Roanoke River

Julianne E. Harris* and Joseph E. Hightower, North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University, Department of Zoology Campus Box 7617, Raleigh, NC, 27695 (919) 513-2469 jeharris@ncsu.edu; jhightower@ncsu.edu

*Student Presentation

Dams block access to spawning habitat for American shad in rivers along the Atlantic coast. In the Roanoke River, NC and VA, American shad spawn below the most downstream dam at Roanoke Rapids; however, suitable spawning habitat also exists in riverine stretches above Kerr Dam. To examine movements and spawning above dams, American shad were collected in 2007 and 2008, tagged with ultrasonic transmitters, and transported to lakes Gaston and Kerr and to the Staunton

River. Movements were determined by stationary receivers and manual tracking and spawning was evaluated by plankton sampling for eggs. Survival for transported fish was > 80% in both years and was highest in cooler water temperatures. Approximately 28% of tagged fish released in Lake Gaston reached the Kerr Dam tailrace, whereas only 8% released in Kerr Lake reached the Staunton or Dan rivers suggesting that American shad migrated more successfully through the smaller reservoir. Ninety-four percent of tagged fish released in the lower Staunton River initially moved downstream into Kerr Lake, but 55% later migrated back upstream into the Staunton and Dan rivers. While only 3% migrated downstream through Kerr Dam, 45-56% moved through Gaston and Roanoke Rapids dams with estimated turbine mortality rates of 8-30%. No American shad eggs were collected in the upper river, but individuals reached riverine areas during seasonal periods when spawning occurs at Roanoke Rapids. Trap and transport may be one option for restoring American shad to historic spawning areas presently blocked by dams.

Spawning Activity and Migratory Characteristics of American Shad and Striped Bass in the Cape Fear River, NC

Joseph A. Smith* and Joseph E. Hightower, North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University, Department of Zoology Campus Box 7617, Raleigh, NC, 27695 (919) 513-2469; jasmit11@ncsu.edu; jhightower@ncsu.edu

*Student Presentation

Anadromous fish populations within the Cape Fear River, NC have experienced declines since the late 1800s. Three low-head lock and dam structures contributed to this decline by limiting access to upstream habitat. We used 2008 egg and larval fish sampling and sonic telemetry to characterize patterns of migration and spawning activity for American shad and striped bass. Plankton samples were taken below each lock and dam, and at two locations further upstream. Distribution of American shad eggs and observed spawning activity suggest that most American shad spawning took place below the lowermost lock and dam (rkm 97). Collected eggs decreased by an estimated 80% for each successive dam. Twenty American shad and 20 striped bass were tagged and released downstream of the lowermost lock and dam. Telemetry results show 65% of both species made upstream movements past the lowermost lock and dam. Furthermore, 46% of American shad and 23% of striped bass that made upstream movements were able to migrate upstream of the uppermost lock and dam (rkm 186). Egg collection results indicate spawning activity of American shad is greatest in areas below the dams, while telemetry data show usage of upstream habitat by both species.

Technical Session IV: Management of Stream Fisheries

Characteristics of Riverine Smallmouth Bass Populations in Western North Carolina

Kevin J. Hining, Amanda M. Bushon, David W. Goodfred and David L. Yow, North Carolina Wildlife Resources Commission, Marion, NC 336-818-0283 hiningk@charter.net

Rivers and streams containing viable smallmouth bass *Micropterus dolomieu* populations provide important fishery resources. However, little is known regarding riverine smallmouth bass population dynamics in North Carolina. Consequently, during 2007 North Carolina Wildlife Resources Commission (NCWRC) began a five-year study to obtain riverine smallmouth bass data in western North Carolina. Study objectives were to identify smallmouth bass populations, collect life history information, and evaluate management opportunities. When feasible, backpack or boat mounted electrofishing gear was used to obtain samples. Where access or physical habitat impaired electrofishing sampling efficiency, fish were collected using hook-and-line sampling. During summer 2007 and 2008, NCWRC personnel collected 1058 and 1066 smallmouth bass, respectively. Thirty-three different populations were sampled, of which 16 were sampled both years. Total length and weight were recorded, and otoliths were removed from all captured smallmouth bass. Smallmouth bass mean PSD, RSD-14, and RSD-17 values were 27, 6, and < 1, respectively. Mean relative weight (±SE) of each population ranged from 79 ± 2 to 105 ± 2. Generally, relative weight declined as total length increased. Currently, age and growth information is being analyzed; however, preliminary data suggest growth rates vary considerably among populations. Additional surveys are planned for summer 2009, with final report completion by April 2011.

Accuracy of Snorkeling Techniques for Estimating Stream Fish Populations

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* Student Presentation

Snorkeling is a potentially useful technique for estimating stream fish density when other sampling gears are not appropriate. While snorkeling techniques offer many advantages, the accuracy of resulting estimates is relatively unknown. We quantified the efficiency (percent of the true population sampled) of snorkeling counts by comparison with prepositioned electrofishing catch in the same stream reach. We assumed that prepositioned electrofishing best represented the fish community, as documented in other studies. We observed the lowest snorkeling efficiency with suckers (4.0%) and the highest efficiency with central stonerollers (19.5%). Overall, snorkeling detected 13.0% of the true total fish community. Among macrohabitat types, we found the highest snorkeling efficiency in riffle and run habitats for shiners and the highest efficiency in pools for darters, central stonerollers, and river chubs. Overall, efficiency was highest in pools (14.7%) compared to riffles (11.7%) and runs (3.8%). We then adjusted strip transect fish density estimates of

count data for sampling efficiency. Strip transect and distance sampling density estimates were 12.0% and 16.0% of adjusted estimates, respectively. Our results demonstrate that while snorkeling, a large percentage of fish go undetected, and that strip transect and distance sampling estimates should be considered highly conservative. These findings aid and improve interpretation and application of fish abundance estimates using snorkeling techniques.

Fluctuations in an Unexploited Southern Appalachian Rainbow Trout Population

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Salmonid populations exhibit inter-annual fluctuations in population density. The factors responsible for these fluctuations have been the focus of much debate. We attempted to elucidate the factors that drive these population fluctuations using ten years of data for an unexploited rainbow trout (*Oncorhynchus mykiss*) population from Beetree Creek in western North Carolina. Rainbow trout recruitment was highly and negatively correlated with the maximum daily flow occurring during the incubation and emergence stages. Additionally, after statistically controlling for the effects of spring discharge, the density of spawning-age adults was positively correlated with the density of age-0 fish. Thus, the fluctuations in this population appear to be controlled by a combination of spring discharge and to a lesser extent, spawning-stock abundance, with the stock-recruitment relationship being linear. This study has potential implications for management of tailwater fisheries and trout streams in areas with high amounts of impervious surface.