

# A RECAP OF THE 2023 NANFA CONVENTION IN SOUTH CAROLINA

After several false starts due to COVID, the 2023 NANFA convention hosted by Dustin Smith was an outstanding success, with over 100 attendees from 24 states. The editors asked Jenny Kruckenberg to provide a summary of the talks, as she has done for previous conventions, and have tried to capture the essence of her extensive work. Dustin would like to thank the following for helping plan and conduct the convention: Stephen Beaman, James Clanton, Matt Knepley, Chip Rinehart, and Fritz Rohde.

## THURSDAY AFTERNOON

Two events were scheduled for the afternoon. Scott Smith and Bryn Tracy, from the NCFishes.com Team, demonstrated how to get superb photos of large riverine fishes (caught from the Congaree River by South Carolina Department of Natural Resources [SCDNR] biologists. Fritz Rohde hosted a visit to the Columbia Dam and its fishway with Shane Boring explaining the project's history.



## FRIDAY PRESENTATIONS

### COLUMBIA DAM FISHWAY

Shane Boring, JMT Inc., Lexington, SC

When this hydroelectric plant was built on the Broad River in Columbia, SC, in 1986, it was the second largest on the East coast. As part of the federal relicensing of the facility in 2005, the city was required to provide upstream passage for migratory fishes such as American Eel, American Shad, and Blueback Herring. As a result, the Columbia Fishway was built in 2007 along the east bank of the river alongside the Columbia Diversion Dam. It is a vertical slot fishway where fish can move upstream through the slots and then rest in the eddies provided before continuing upstream. A viewing window is provided for biologists to count and identify the fishes as they pass upstream. Monitoring is done five days a week from early March to mid-May. There have been challenges. A 2015 flood rendered the hydroelectric plant inoperable and breached the dike of the canal. Such "100-year" floods are occurring more frequently in recent

years. When river levels are high, the viewing window is inundated and the water is extremely turbid.



Fish counts began in 2007 and, while the emphasis is on shad and herring, all species that pass are enumerated. In 2022, 17 species in six families were observed using the fishway. The data can be highly variable. For instance, in 2021, over 1,000 American Shad were counted while in 2022, only 103 were noted; this was the lowest number of American Shad in the 16 years of data gathering. Environmental factors such as temperature usually influence the numbers. If water temperature is 15–16° C, the shad are there; if it's too cold, they aren't. Gizzard Shad and Threadfin Shad are the most abundant fishes that use the fishway, and a number of sucker species commonly use it.

## DARTER RECOVERY IN OHIO: THANK YOU, CLEAN WATER ACT

Brian Zimmerman, The Ohio State University

Brian talked about the 22 species of darters native to Ohio and the remarkable recovery they are making in Ohio streams. The Clean Water Act, the creation of the Ohio Environmental Agency, concern over non-point sources, and the creation of H2Ohio have all played huge roles in improving water quality. In 1974, eight darters were listed as endangered and four others should have been listed. As of 2022, improvements (higher numbers, range expansions) have been observed in nine of the 12 species.

### Recovery Through Time

Changes in status of Ohio's listed Darter Species...

	1974	1987	1990	1992	1997	2002	2007	2012	2017	2022	
Diamond Darter			ER	ER	ER	ER	ER	ER	ER	ER	
Eastern Sand Darter	E		SC	SC	SC	SC	SC	SC	SC	SC	
Gilt Darter			ER	ER	ER	ER	ER	E	E	E	Extinct EX
Longhead Darter	E	E	ER	ER	ER	ER	ER	ER	ER	ER	Extirpated ER
Channel Darter	E	E	E	E	T	T	T	T	T	T	Endangered E
River Darter	E	E	T	T	T	T	T	T	T	T	Threatened T
Slenderhead Darter	E		SC								Species of Concern SC
Spotted Darter	E	E	E	E	E	E	E	E	E	E	Not Listed/Common
Tippecanoe Darter	E		T	T	T	T	T	T	T	SC	
Bluebreast Darter			T	T	T	T	T				
Iowa Darter	E		SC	SC	SC	SC	SC	E	E	E	
Least Darter					SC	SC	SC	SC	SC	SC	

Brian has been involved in reintroductions of Ohio's fishes in greatest conservation need with a focus on translocation of riverine

species and on captive propagation of wetland/natural lake-oriented species. He has four projects currently underway involving the Bluebreast, Longhead, Variegate, and Tippecanoe darters, and two more projects (Mountain Madtom and Tippecanoe Darters in a different river) planned for 2023. Unlike many states, Ohio does not have a state-funded nongame biologist—it's all on Brian.

There was too much information in this 20-minute talk to capture here, but the future of Ohio's darters is looking better.

#### WHAT IN THE WORLD IS A DARTER HUNT Jen Kruckenberg, Inver Grove Heights, Minnesota

I got started young with fish as my family had a 55-gallon aquarium in our living room. Eventually, we had five tanks around the house. My little brother and I were tasked with cleaning the tanks, etc. In high school, college, and even after I got married and had kids, I always had at least two tanks running. One day at a pet store buying fish supplies I noticed a flyer for a fish show put on by the Minnesota Aquarium Society (MAS) and decided this was a good opportunity for me to get away from my husband and kids and do something I wanted to do. The show was inspiring, with MAS members' tanks bubbling away among the ferns and flowers of the Como Park Conservatory. I joined MAS right away and eventually got sucked into club activities and did artwork for our publication, the *Aqua News*.

Besides the show, another MAS activity that year was an opportunity to collect darters. They had a permit from the DNR to do this, and I joined them with my waders at the Cannon River. My first encounter was with some colorful male darters and I was in awe. When the Darter Hunt needed a new organizer, I volunteered. I applied for the necessary educational permit from the DNR, and it was granted.

The water bodies we went to were always chilly in May, but it was refreshing on a warm day. I was always kind of scared we were going to lose some kids on the darter hunts. Generally, we would keep the kids upstream of the nets, but some were actually excellent swimmers, and it was like being in a wave pool for them.

In addition to the Cannon River, we eventually expanded to include two more sites: Belle Creek, which had beautiful Fantail Darters, and the Old Mill Stream near the tiny town of Marine on St. Croix, which yielded the gorgeous Rainbow Darter. My friend Randy Carey always wanted to call it a "darter collection" versus a "darter hunt," but I liked calling it a "hunt" because, like an Easter egg hunt, we never knew what we were going to get!

NANFA's founder, John Bondhus, and his daughter joined us in 2003. I was able to get a roster of NANFA members and invited them to a "hunt." At this point, I asked DNR for an increase in our quota of darters from 50 to 75. John B. laughed at me and said, "Jenny, do you know how many darters are in any given stretch of the Cannon River?" I just didn't want people taking home too many. At some point, I contacted Konrad for advice about where else we could go. I faithfully gave a report to the DNR every year about where we had gone, who was taking what darters home, and other species we encountered. The DNR would continue granting the permit but over the years it went from one page to seven. It listed which locations were "infested" (e.g., with Zebra Mussels) and which were not, causing us to use separate gear and dictating in what order the sites were sampled ("uninfested" locations before "infested" ones to avoid spreading anything). The DNR also required bringing transport water from home, which was sometimes not the best for the fish.



#### STURGEON IN SOUTH CAROLINA Ellen Waldrop, SCDNR

Ellen's section of the SCDNR, the Diadromous Fish Section, is responsible for managing the five such species found in South Carolina: American Eel, Blueback Herring, American Shad, Atlantic Sturgeon, and Shortnose Sturgeon. The two sturgeon species can be found off the Atlantic coast from Canada to northern Florida; both are on the federal endangered species list. The Shortnose is smaller, weighing less than 50 pounds; the Atlantic is much larger, at up to 14 feet long and 800 pounds. Overfishing (for caviar) has caused a large decline in the numbers of both species, as has habitat loss due to dams that block upstream movement.

SCDNR has been setting nets to capture both species to be weighed, measured, and given an internal acoustic transmitter that can be detected by acoustic receivers. The tags can last from two months to 10 years depending on various factors. SCDNR has receivers spread throughout their rivers. Many of their studies have been funded either by the power companies who operate hydroelectric power plants on the major rivers or by state ports who wish to expand their facilities to attract larger container ships.

For example, Duke Energy is funding spawning habitat, population, and movement studies in the Great Pee Dee River and the Winyah Bay system in northeast SC, even though their hydroelectric plant and dam are upriver in North Carolina, 188 miles from the mouth. Since 2017, they have put transmitters into about 160 large Atlantic Sturgeon. They spawn in the Pee Dee River and, surprisingly, there are two peaks: one cohort spawns in the spring and one in the fall! This dual spawning has only been recently noted in one other southern river. Only one fish went as far as the dam; all the others stayed downstream in South Carolina. Different parts of the river are used by the spring and fall spawners, and genetic analysis has found that the two groups are genetically distinct. (The Shortnose Sturgeon only spawn in the spring.)

A SCDNR study involving the Shortnose Sturgeon population in the Cooper River below Pinopolis Dam, which is part of the Santee Cooper Hydroelectric Project, has been going since 1996. The dam was built to divert the Santee River into the much shorter

and tidal Cooper River, which moved Shortnose Sturgeon from the Santee into the Cooper. The adult population has been hovering around 200 individuals for quite some time and recruitment is low to non-existent. Santee Cooper just renewed their license, and one requirement is to translocate 50 adult Shortnose Sturgeon per year back into the Santee River.



There are a lot of sturgeon studies in the Savannah River, which forms the border between South Carolina and Georgia. Sturgeon movements are being monitored in Savannah Harbor as part of an expansion project, and adults of both species are tracked as they move upriver to spawn. The New Savannah Bluff Lock and Dam at Augusta (187 miles from the mouth) blocks upstream migration.

#### NATIVE FISH FOR TOMORROW

Drew Geving, MN, [Roughfish.com](http://Roughfish.com)

Drew spoke briefly about a new nonprofit organization called Native Fish for Tomorrow (or NF4T for short). Most of their work so far has been in Minnesota, where they have worked with state legislators and the MN DNR to change the way native fishes are treated in laws and regulations. The “No Junk Fish” bill they supported has since passed both houses of the MN legislature and has been signed by the governor. It requires the DNR to figure out how to differentiate native species currently called “rough fish” from non-native and invasive species such as the various carps, and to regulate native species scientifically. NF4T hopes these early successes in MN will help spread the word to other states. Another focus is education. The group intends to provide signage at boat ramps and other places where the public gets into the water clarifying the differences between native and invasive fishes. They are working with scientists to get more research on native fishes off the ground. The group is also working to get better enforcement of existing wanton waste laws so people will stop killing fish and throwing them on the bank or in the trash. See <https://nativefishfortomorrow.org/> for more information.

#### USE OF eDNA FOR BLACKBANDED SUNFISH CONSERVATION IN SOUTH CAROLINA AND GEORGIA

Kevin Kubach, SCDNR

If you Google eDNA you will get many, many obituaries for women named Edna, so search for “environmental DNA” instead. The definition is broad and includes any genetic material that is no longer with the organism. This material can be found in sediments/soil, air, and water. It is a way to look for the presence of rare or elusive fish and for detecting invasive species. Kevin likened it to a crime scene where samples are collected then analyzed.

The species they were looking for was the Blackbanded Sunfish, a small centrarchid, which inhabits backwaters with low pH, black

water, and swampy conditions with heavy vegetation. This species is imperiled over its entire range. It’s doing the best in South Carolina, ranging from abundant in some areas to a very low density in others. It is endangered in Georgia. During the 2000s, Georgia biologists sampled at 350 sites and found Blackbanded Sunfish at only two.

SCDNR chose to sample 30 sites (some random) for eDNA, and nine sites tested positive for the presence of the sunfish. Seven were randomly chosen; two were sites where they had been seen before. SCDNR went back to sample with dipnets, trap nets, and backpack electrofishers and found the sunfish at nine sites. In comparison, Georgia expected to detect Blackbanded Sunfish eDNA at one site and found it at five. Four sites were new: this was huge! In Georgia, despite the positive eDNA results, only one fish was found at one site. They found hundreds of Bluespotted Sunfish but no Blackbanded. Kevin concluded that the eDNA tool is effective, that genetic diversity in Blackbanded Sunfish is low across its range, and that there are conservation implications.

#### A PROGRESS REPORT ON THE DESCRIPTION OF THE THINLIP CHUB *CYPRINELLA* SP.

Bryn Tracy, Apex, NC

Fritz jokingly suggested that this talk should have been called “Why it’s hard to describe a fish.” While the Thinlip Chub has been known to be distinct since the 1970s, it has not been described. It is a species of greatest conservation need in North Carolina but can’t be given more stringent protection until it is described.

The Thinlip Chub, in the genus *Cyprinella*, is around 90 mm long with dark pigment along the top of its back and diamond-shaped scales. Three species of *Cyprinella* in North and South Carolina—Thicklip, Santee, and Thinlip chubs—have barbels at the bottom of the mouth. Using adults of both sexes, Bryn has done extensive meristic counts and morphometric measurements on the three species. In all, he took six pictures each of 120 (a total of 720 images). He has looked at 25–30 landmarks and 10 characteristics, for a total of 4,400 data points. Co-authors are working-up the genetic analyses.

#### PHYLOGENOMIC INVESTIGATIONS OF THE *HYDROPHLOX* GROUP, WITH EMPHASIS ON THE GREENHEAD/YELLOWFIN SHINER COMPLEX

Fritz Rohde, NOAA Fisheries Service

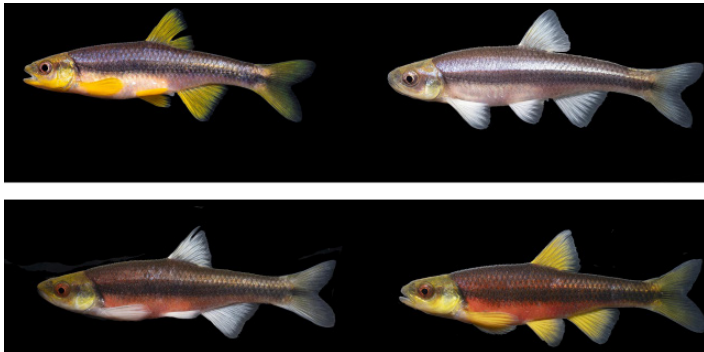
Fritz began by apologizing for any mistakes he would make, since he was presenting on behalf of Zach Alley, who had done the study for his Master’s thesis at the University of West Alabama.

*Hydrophlox* are a group of charismatic minnows endemic to the southeastern US known for their communal spawning behavior, chub mound association, and bright nuptial spawning coloration. Initially, 10 species were included in this genus/subgenus: Rosyface, Highland, Tennessee, Rainbow, Yellowfin, Rough, Greenhead, Saffron, and Redlip shiners, and Ozark Minnow. In her PhD studies, Molly Cashner whittled the group down to five species: Redlip, Saffron, Greenhead, Yellowfin, and Rainbow shiners. Earlier, Wood and Mayden had recognized that the Greenhead Shiner included an undescribed species that was later named the Piedmont Shiner.

Zach’s thesis included the following three objectives: chart the range of the Yellowfin and the Greenhead shiners, determine if his work agreed with Cashner’s, and describe nuptial coloration. He used Diversity Arrays Technology (DART) to assess nucleotide polymorphisms across the range of the *Hydrophlox* group. Looking

at the Greenhead/Piedmont/Yellowfin complex produced these results: Greenhead Shiner is in the Catawba, Piedmont Shiner in the Broad, and Yellowfin Shiner from the Saluda westward.


Zach's findings adequately explained the genetics, but questions remained about the phenotypes (i.e., how they look). There is a lot of plasticity and variability across the Greenhead/Piedmont/Yellowfin complex. Basically, you can't tell by looking at a fish which species it is. You have to know where it came from; even then, identification to species can be difficult. All of the fish in this photograph came from the same creek on the same day and are presumptive Greenhead Shiner from the Lynch's drainage. This work will continue.



### SUCKER DIVERSITY, DISTRIBUTION AND RECOVERY IN WESTERN NORTH CAROLINA

Luke Etchison, NC Wildlife Resources Commission

Luke is the river conservation biologist for western North Carolina. He works with fishes, crayfishes, mussels, and even aquatic snails. Suckers are important in many ways. They have close associations with mussels, some of which are endangered. For example, the Appalachian Elktoe is doing well where suckers are abundant but struggling where they are absent. Suckers are the "salmon of the South": their spawning migrations move nutrients within river ecosystems.



### WNC Sucker Projects

- Sicklefin Redhorse monitoring and restoration
  - Mark Recapture (PIT Tagging)
    - Hiwassee River Basin
    - Little Tennessee River Basin
- Reintroduction of Black Buffalo, Smallmouth Buffalo, and Smallmouth Redhorse in the French Broad River basin

NCFishes.com

Years ago, 50,000 buffalo (plus other suckers) might have made spring spawning runs up streams that are now missing suckers. Why? Factors limiting sucker abundance include land use practices such as logging, physical barriers such as dams, and manipulation such as dredging. Luke is concentrating his efforts on reintroduction of three suckers into the French Broad River basin (Black Buffalo, Smallmouth Buffalo, and Smallmouth Redhorse) and on restoration efforts for the Sicklefin Redhorse, which has not been formally described. The Cherokee people have long known them as "Ugiidatli," which means "wearing a feather," describing the dorsal fin.

Luke uses fyke nets in the Hiwassee River to trap Sicklefins. This method works well in shallow streams, especially in those that they cannot float a boat down easily. Otters are a problem, as the fyke nets provide them a "sucker buffet." Over the past four years they have captured and moved 94 fish; only a couple have been recaptured.

In contrast, on the Little Tennessee River, he can use a boat and electrofishing. They try to do this when the fish are coming together to spawn in order to collect the fish for their eggs and milt. So far, they have tagged 1,233 fish and recaptured 324.

Oxbows that were eliminated in western North Carolina rivers are slowly being restored. Some of these restoration projects were designed to benefit Muskellunge, but the Smallmouth Buffalo will also benefit. Luke is optimistic about the future.

### AN INVASIVE SPECIES IMPERILS THE SAVANNAH RIVER ENDEMIC BARTRAM'S BASS

Mark Scott, SCDNR

There are up to 15 black bass (*Micropterus*) species, at least three of them undescribed. Bartram's Bass is one of the "Redeye Bases" and the only true Redeye Bass inhabiting the upper Mobile Basin.

During the mid-1980s, the Alabama Bass was illegally introduced by anglers into the Savannah River. By the 1990s, biologists were arguing over bass identifications due to introgression and mixed phenotypes. By 2004, hybrids were showing up and by 2010, very few pure Bartram's Bass remained. Alabama Bass now dominate in South Carolina lakes, and there are lots of hybrids in tributaries.



In 2019, a multistate wildlife grant was awarded to study the distribution of Bartram's Bass. The results through 2021 included good and bad news. First, the bad: Alabama Bass (and hybrids) were distributed all over the Bartram's Bass range. The good news: many of the Alabama Bass occur close to reservoirs; populations of Bartram's Bass become less hybridized the farther (upstream) you go. Close to Lake Keowee there were almost all pure Alabama Bass, but further up Eastatoe Creek, a tributary, there were fewer Alabama Bass and a higher concentration of pure Bartram's Bass. There appears to be a correlation between the presence of pure Bartram's Bass and the percentage of impacted land in the watershed. Above about 50% of a watershed being impacted by urban or agricultural land use, the Alabama Bass and hybrid populations are more abundant.

### ADVENTURES IN ETYMOLOGY

Chris Scharpf, Baltimore, Maryland

To end the day, Chris gave such an interesting talk on the origins of fish names that the editors convinced him to write it up for *American Currents* instead of summarizing it here. Stay tuned!

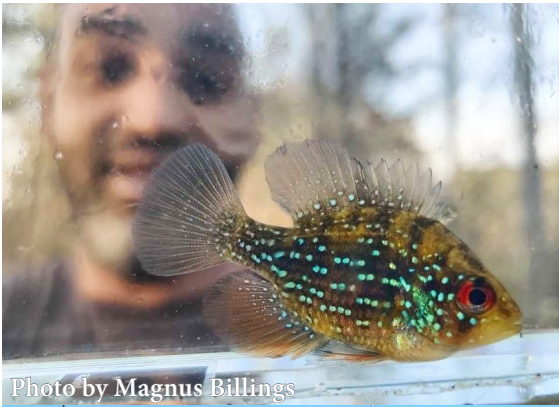


Photo by Magnus Billings



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Photo by Konrad Schmidt



Photo by Scott Smith



Photo by Scott Smith



Photo by Lawrence Kent



Photo by Scott Smith



Photo by Billy Woodring



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