

# THE CLINCH DACE

## SHORT STORIES ABOUT A SHORT FISH



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The more I learn, the more I begin to see ecological science as a story. It's the true story of the world around us with a curious cast of characters including species and people. Usually the things that illuminate this story, give it richness, and make it most vibrant in our minds are our experiences. The summer of 2014, my first field research season as a graduate student at Virginia Tech University was partially supported by a grant from NANFA to study occupancy and environmental DNA detection of Clinch Dace (*Chrosomus* sp. cf. *saylori*) (Figure 1). Statistically relevant results are months away. There remains DNA to extract from filters and databases full of species records to plug into distribution modeling programs. What are most tangible now are the observations, the photographs, and the stories which have bolstered my understanding of this species. For now, the best way for me to tell the tale of the Clinch Dace is with two short stories.

### STORY ONE: THE SEARCH FOR TREASURE, THE BEGINNING OF A CLINCH DACE STREAM

I pulled the dusty Tacoma truck off of a winding mountain road, finally safe from the coal trucks that sped down the valley at unnerving speeds. The sun illuminated a clearing cut for a small gas well. At the edge of the clearing was the spot my technician, Hunter, and I thought we had been searching for. Walking to a small creek, we found ourselves at the confluence of two divergent branches. The left made a beeline up a hollow choked with fallen trees, while the right meandered through a stand of mature hemlocks and hardwoods. Heaving the backpack shocker onto my shoulders (Figure 2), I leaped into the stagnant, mud-bottomed pool at the confluence. The shocker began its rhythmic beeping. As

we scanned the water for fish, nothing fled from our charge aside from a few crayfish and salamanders. . Up the valley the streams dwindled to trickles, forcing us downstream. As we hacked through suffocating groves of rhododendron, I imagined the stream was a rainbow: if we followed it far enough, it might reveal a treasure in flashes of red and gold.

Eventually, the stream became deeper and the first tiny fish rolled their white bellies skyward. Many were so small that they slipped through the mesh in our nets. We identified the remaining fry as Blacknose Dace (*Rhinichthys atratulus*) and resumed our trek. Rounding a corner, the stream corridor finally opened up to a large pool. We readied our nets.



Figure 1. Nuptial male Clinch Dace from the Upper Clinch River Basin, VA. (Photo by C. E. Skelton)



Figure 2. Michael Moore, Hunter Hatcher, and Allison Mosley use backpack electrofishing to survey Clinch Dace in Virginia. (Photo by Michael Moore)

Michael Moore is a graduate student under the advisement of Dr. Donald Orth in the Fish and Wildlife Conservation Department at Virginia Tech University. Before moving east, he spent the majority of his first 22 years in Columbia, Missouri, where he earned a B.S. in Fisheries and Wildlife Sciences from the University of Missouri in 2012. He also spent summer field seasons working with darters in Alabama, big river fish communities in Montana, and crayfish in the Ozarks. He notes that the latter experience turned him into a bit of crayfish geek.





Figure 3. Clinch Dace captured in the spring of 2014 that is beginning to exhibit its characteristic yellow fins and gold lateral bar for the spawning season. The red belly will follow soon. Note the two gold specks at the base of the caudal fin. This characteristic among others is believed to distinguish Clinch Dace from other *Chrosomus* daces. (Photo by Michael Moore)

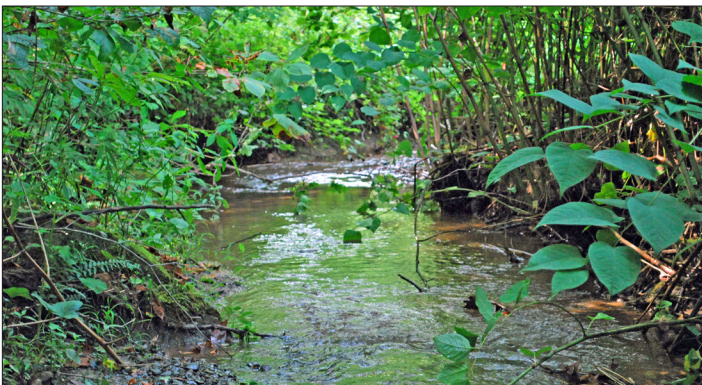


Figure 4. Clinch Dace habitat in the Upper Clinch River Basin, Virginia. The species inhabits pools and runs of low-gradient headwater streams such as these. (Photos by Michael Moore [top] and D. J. Orth)

At the push of the shocker's trigger, the pool exploded with fleeing fish. Several net swoops later and we saw it: imperceptibly small scales, the dual black bars with a hint of gold between (Figure 3). We had gone far enough; we had located the beginning of a Clinch Dace stream and with it a source of water that floats the hope for this rare species' persistence.

We can glean a lot of useful information about the Clinch Dace from the above, the characteristics of the stream that

we sampled that day provide insight into the habitat associations of Clinch Dace and how it eluded biologists until its discovery in 1998. The Upper Clinch River Basin is famous for its diverse and imperiled mussel fauna, but the assemblage of native fishes is equally impressive. Yet most of the Clinch's diversity comes from larger streams where colorful species such as the Tangerine Darter (*Percina aurantiaca*) and the Golden Darter (*Etheostoma denoncourti*) can be found. On the other hand, the Clinch Dace occurs far off of the beaten path in some of the smallest headwater creeks accessible to fish. The average species richness in fish communities containing Clinch Dace during my surveys was 6.5 (range 5–8). Common associates of the Clinch Dace include mostly widely distributed species such as Blacknose Dace, Creek Chub (*Semotilus atromaculatus*), White Sucker (*Catostomus commersonii*), Central Stoneroller (*Camptostoma anomalum*) and Fantail Darter (*E. flabellare*). Noticeably absent from this list are members of the family Centrarchidae (sunfishes and bass) which may impose predatory controls on Clinch Dace. The condition of the stream's geomorphology and riparian corridor also is consistent with the species' distribution. Clinch Dace are usually found in lower gradient streams with predominantly forested catchments, containing step-pool habitats and wide-ranging substrate profiles (Figure 4).

#### STORY TWO: SPAWNING FRENZY

It was June and we had been eagerly watching for signs of the spawn. Clinch Dace males became more colorful with each passing day. One day, after finishing work early, we decided to check a nearby site for spawning activity. We remembered seeing multiple vacant nests under construction by the engineers of the streams, Central Stonerollers and Creek Chubs. When we arrived, the first nest was no longer vacant. A group of 5–6 male Clinch Dace, their fins a brilliant canary yellow, staged over the depression in the substrate, dancing and darting in pursuit of drab-colored females. Hunter observed that they looked like bumblebees from above.

The next day we returned to check on the dace, but a storm the night before had muddied the creek and, in response, Clinch Dace had abandoned the nest. A look in the pool above revealed why. Through the stained water we could still see Clinch Dace holding position in current breaks against a stone retaining wall, darting out and picking at food items drifting downstream.

The next day, possibly with renewed energy from the previous day's feeding, the Clinch Dace engaged in chases more fervently than before. As with many nest associates, they were focused on the task at hand and would let us come reasonably close to capture photos and video of their behavior. Initially, my unfamiliarity with the species led me to as-

sume it was a Creek Chub nest, because we had caught few stonerollers at the site. However, a large tubercle-encrusted male stoneroller suddenly returned and began renovating the nest. All the while, hordes of Blacknose Dace and occasionally even Clinch Dace buried their snouts in the substrate searching for eggs to eat.

This scene better illustrates aspects of the species' taxonomy, reproductive biology, and feeding ecology. The physical anatomy: red belly, black and yellow lateral bands, and slightly subterminal mouth, leaves no doubt as to which genus it belongs to. *Chrosomus*, formerly known as *Phoxinus*, contains seven species in North America. Collectively called the "redbelly daces," all species look similar. The Clinch Dace's subtle differentiating characteristics include two black lateral lines that are continuous through the caudal peduncle and two small gold specks at the base of the caudal fin in breeding individuals. Although the Clinch Dace has not yet been described as a distinct species, genetic and morphological assessments have proven it distinct and it will likely be formally described soon.

Like many other *Chrosomus* daces, Clinch Dace are nest associates. This means other species do the heavy lifting building depressions or mounds of silt-free, well oxygenated substrate where they can lay their eggs. Shannon White also observed Clinch Dace nest association with stonerollers, but it is reasonable to suspect nest association with Creek Chubs as well. Clinch Dace may be obligate nest associates or may also spawn on deposits of clean gravel. Spawning usually occurs from April to July at water temps ranging from 15 to 20 C.

Shannon White discovered that Clinch Dace were less omnivorous than other *Chrosomus* species and fed more on animal matter. They are likely predominantly drift feeders on aquatic insects which explains why, after the rain, feeding activity had amped up in response to the increasing food available in the elevated flows.

### CONSERVATION OUTLOOK AND FUTURE RESEARCH

While these stories alone tell us a lot about the biology of the Clinch Dace, much still remains unknown. The main objective of my study was to better determine the distribution of Clinch Dace in the Upper Clinch River Basin and fine-tune sampling methods to aid in future monitoring of this species. With the combination of survey records of Chris Skelton and Shannon White, a majority of the suspected core range of the species has been sampled and the results emphasize its rareness. We used repeat visits to sites to compare the detection probability of Clinch Dace using backpack electrofishing and environmental DNA sampling. Environmental DNA collection involves filtering stream water and trapping DNA from fish scales and mucous in fine-pored



Figure 5. Male Laurel Dace. (Photo by Dave Neely)

filters. We are currently working on DNA primer design, so we can test the filters collected at our sites for presence of Clinch Dace DNA.

Clinch Dace occur sporadically in nine tributary systems to the Upper Clinch in two counties in Virginia. The Laurel Dace (*Chrosomus saylori*) (Figure 5) is the sister species to Clinch Dace, but the Laurel dace occurs in Tennessee. The size of the Clinch Dace's distribution is comparable to the Laurel Dace, a federally listed endangered species. Although not currently listed under the Endangered Species Act, the Virginia Department of Game and Inland Fisheries considers Clinch Dace a Tier 1 species of conservation concern in Virginia. Under no circumstances should Clinch Dace be collected from the wild for home aquariums or for use as bait. Besides harvest, other threats to this species include degradation of water quality and in-stream habitat from timber harvest, livestock, mineral extractions, introductions of piscivorous fishes, and habitat fragmentation from poorly constructed road crossings that block stream channels.

We hope that our research sheds more light on the habitat conditions this species requires to survive and reproduce. More research is needed to estimate individual population sizes and dispersal rates and to ensure that the Clinch River doesn't lose one of its most colorful characters.

### References

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