HEY, THAT'S STILL NOT A TROUT: GETTING TO KNOW YOUR KNOTTYHEADS

Luke Etchison and Jacob Rash

North Carolina Wildlife Resources Commission

Note from the authors: In 2019, the North Carolina State Council of Trout Unlimited began producing *The Drift* (https://northcarolinatu.org/news/), a quarterly newsletter to share information with its over 5,000 members. North Carolina Wildlife Resources Commission staff have been given the opportunity to provide content for each edition, and to date, topics have covered a range of items relative to North Carolina's coldwater fisheries. However, we have also taken advantage of the column and its dedicated user group to explore the concept of broader aquatic conservation through the lens of coldwater conservation. What follows is our second article in our "Hey That's Not a Trout" series.

If you are a regular reader of *The Drift*, you are probably wondering if this column will ever have an article focused on trout exclusively. Of course, it will, but that is a fair question given the ground we have covered to date. The previous columns and range of topics are due to all of the amazing things associated with our coldwater fisheries outside of just trout themselves; so truthfully, it seemed (and seems) appropriate (and definitely fun) to take advantage of the freedoms allowed by the editors and to explore our aquatic resources. With that said, we wanted to expand upon our piece in the Fall 2019 edition of *The Drift* (https://issuu.com/coldwaterpress/docs/driftfall2019) and share even more info about some of the cool fish you catch now and again fly fishing.

If you remember last time, we discussed Rosyside Dace *Clinostomus funduloides* and Warpaint Shiner *Luxilus coccogenis* and their potential diet and habitat overlaps with trout. Although those are truly fascinating species, our goal within this article was to embrace the theme of collaboration shared throughout this edition of *The Drift* by highlighting the eco-engineers of our mountain streams: chubs.

Many folks may have seen or heard tales of the chubs ("knottyheads" or "hornyheads" as they're more commonly known) being caught while fishing streams in North Carolina. This is truly a cool group of fishes that will require a decent amount of information to capture their descriptions and behaviors, so please don't be intimidated by the amount of information that follows. We know that not everyone will catch one of these fishes, but our goal is for you to find this information not only informative but as interesting as these species are themselves. To do that, we don't have to look much farther than the name these fishes are grouped into: "knottyheads."

First, what is a "knottyhead?" Knottyheads are a bunch of species that have been lumped together by the identifying characteristic of horns, knots, or what are technically called breeding tubercles. These fishes can vary in size, color, and even "knottiness." Typically, tubercles are only present in male fish close to spawning season. Tubercles are made of keratin, which is what hooves and fingernails are made of, and these breeding tubercles function like antlers in deer and are used for fighting and for attracting a mate.

There are many fish species that grow breeding tubercles ranging from minnows and darters to topminnows. Even some trout and salmon species (e.g., Lake Trout *Salvelinus namaycush*, Artic Grayling *Thymallus arcticus*, and Huchen *Hucho hucho*) are known to get these breeding tubercles, even though they may not be as obvious as some of our local knottyheads.

In western North Carolina (WNC), there are five main knottyhead species that grow large, obvious tubercles: Bigmouth Chub *Nocomis platyrhynchus*, Bluehead Chub *N. leptocephalus*, River Chub *N. micropogon*, Creek Chub *Semotilus atromaculatus*, and even Central Stoneroller (*Campostoma anomalum*). However, finding and identifying them truly depends on what river basin you are in or which side of the continental divide you are on.

In most streams in WNC you have a chance to come into contact with Central Stoneroller and Creek Chub. Encountering the other three species definitely depend on where you are fishing.

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Luke Etchison is the Western Region Aquatic Wildlife Diversity Coordinator for the NCWRC. Luke is responsible for conservation and monitoring of mussels, crayfishes, native fishes, and aquatic snails in the New, Savannah, Little Tennessee, Hiwassee, French Broad, and Watauga river basins in North Carolina. Luke received a B.S. in Aquatic Biology and Fisheries Science, an M.S. in Aquatic Biology, and a Ph.D in Environmental Science from Ball State University, where he was involved in research on aquatic insects, aquatic snails, crayfishes, mussels, and fishes. After graduate school, Luke worked for the Florida Fish and Wildlife Conservation Commission mapping sensitive habitat on Florida's Wildlife Management Areas before moving to western North Carolina in 2016. Luke enjoys spending his weekends snorkeling, camping, and hiking.

Jacob Rash is the Coldwater Research Coordinator for the NCWRC, where he assists with the coordination of applied research and management of the state's trout resources. He received his B.S. in Zoology from NC State University (2000) and his M.S. in Fisheries and Wildlife Sciences from Virginia Tech (2003). After graduate school, he worked with freshwater mussels as a Research Specialist at Virginia Tech until he joined the NCWRC. He became an American Fisheries Society Certified Fisheries Professional in 2008. Although he spends his days at work thinking about fish, he enjoys spending his free time trying to find them with monofilament and fly lines.

Figure 1. Central Stoneroller males schooling with Tennessee Shiners *Notropis leuciodus* in Cartoogechaye Creek, Little Tennessee River Basin.

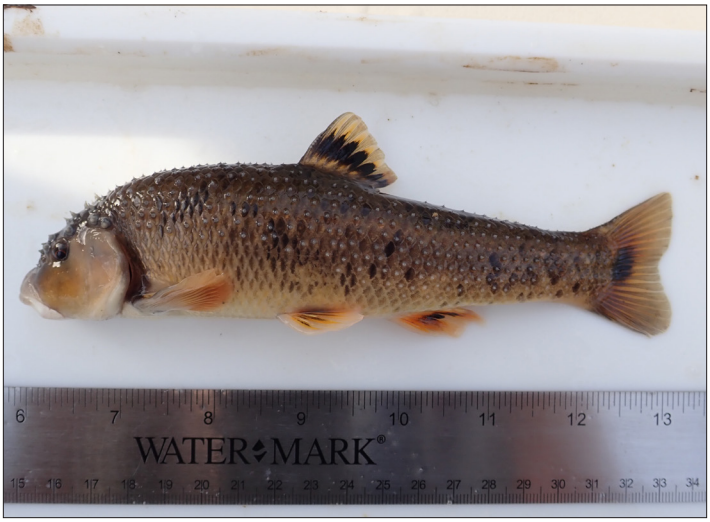

Figure 2. Male Central Stoneroller with breeding tubercles.

Figure 3. Closeup of male Central Stoneroller breeding tubercles present on its head.

Figure 4. Closeup of male Central Stoneroller dorsal fin with breeding tubercles on first ray.

Figure 5. Female Central Stoneroller.

Figure 6. Closeup of Central Stoneroller mouth.

CENTRAL STONEROLLER

Central Stoneroller (Figures 1–6) is a minnow species that often travels in large, mixed-species schools (Figure 1). Breeding males can be distinguished easily from other knottyheads by the presence of tubercles on much of the body (Figure 2) including the head (Figure 3) and dorsal fin (Figure 4). However, a non-breeding male and female Central Stoneroller (Figure 5) cannot be identified by these characteristics. The best trait for identifying a Central Stonerollers is the presence of a firm cartilage shelf (Figure 6) on the lower lip that is hard and used for scraping algae off of rocks, which is where the term "stoneroller" is from.

The remaining four knottyheads are all chubs that can grow up to around 12 inches and are commonly caught while fishing for trout and other sport fishes.

Figure 7. Male Creek Chub in early spawning condition.

CREEK CHUB

Creek Chub can be found anywhere in WNC and are easier to differentiate from the other three chubs considered knottyheads. Unlike the other knottyheads, Creek Chub has a dark spot on the front of the dorsal fin (the large fin on their backs) (Figure 7). These fish are commonly caught fishing and can easily reach over 12 inches in length.

Here is where it gets a little more challenging. The last three knottyheads can be extremely difficult to identify even if they are side by side. Each species has a similar diet, mouth position, and they all vary in coloration. Luckily for those of us trying to identify them, there are few places that these species co-occur, so identification really takes into account which river basin you are in (Figure 8). Unfortunately, all three of the following species can be found in the New River basin from what is likely due to the movement of fishes between basins by humans (something we'll discuss further in future columns).

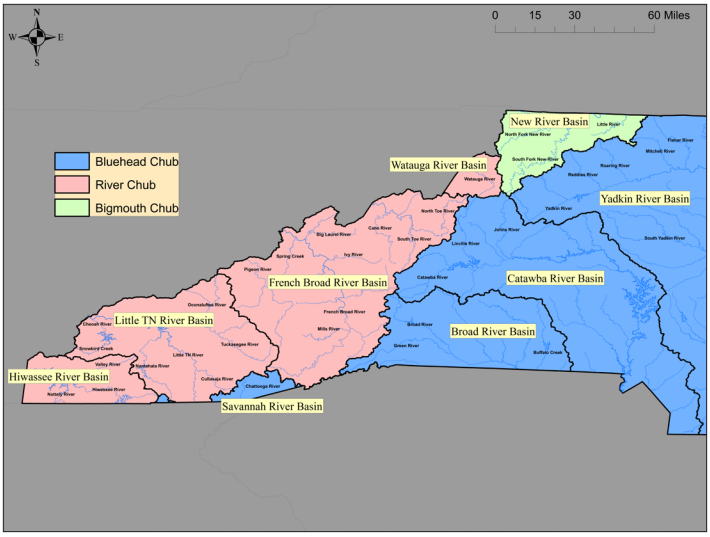

Figure 8. Native ranges of Bluehead Chub, River Chub, and Bigmouth Chub in western North Carolina.

BLUEHEAD CHUB

Bluehead Chub (Figures 9–12) is native to Atlantic slope river basins. This includes the Savannah, Catawba, Broad, and Yadkin/Pee Dee river basins. Bluehead Chub often have tan or yellow fins, except for some in the Savannah River watershed that show red fins (Figure 9) outside of spawning season. Spawning males grow large tubercles above the nostrils (Figures 10–11) and often have a bright blue head, and this position of the tubercles in a breeding male is the easiest way to differentiate these three species (Figures 13–14, at end of article).

Figure 9. Young Bluehead Chub from the Toxaway River, Savannah River Basin.

Figure 10. Male Bluehead Chub with spawning tubercles and colors. (Photo from NCFishes.com)

Figure 11. Male Bluehead Chub near spawning condition in the Savannah River Basin.

Figure 12. Female Bluehead Chub. (Photo from NCFishes.com)

RIVER CHUB

River Chub (Figures 15–16) is found in streams that flow into the Tennessee River from WNC; this includes any stream in the Hiwassee, Little Tennessee, French Broad, and Watauga river basins. River Chub is easiest to identify when it is a spawning male like Bigmouth and Bluehead Chubs. It can reach up to 13 inches and can be found anywhere from medium-sized streams to larger rivers. A breeding male grows large tubercles below the eyes on the snout. Its head also becomes very swollen and turns pink, purple, or red (Figure 16) when it is ready to spawn.

Figure 15. Young River Chub from the Little Tennessee River Basin.

Figure 16. Male River Chub from the Big Laurel River, French Broad River Basin.

BIGMOUTH CHUB

Bigmouth Chub (Figure 17) is similar to the other chub species, but it is only native to the New River basin of WNC and grows over 10 inches. As the name implies, this species has a larger mouth than its counterparts and it has a slightly more robust body shape. Unlike Bluehead Chub and River Chub, this species has many smaller tubercles above and below the nostrils. Similar to a River Chub, the Bigmouth Chub has a large pink to purple swollen head (Figure 17) when it is ready to spawn.

Figure 17. Male Bigmouth Chub from the New River in early spawning condition.

ROLES OF KNOTTYHEADS IN OUR ECOSYSTEMS

Okay, hopefully we have established how cool these fishes look, but they are much more than unique-looking fish. All five of these species play a significant role in maintaining our stream ecosystems. We mentioned earlier that they are the eco-engineers of our mountain streams, and they received this title given how they each modify habitats by building spawning nests that are often used or required for spawning by many other fish species. The importance of nest-builders like these species has been noted by many cultures including early Native Americans in the Hudson Bay area who called them "Awadosi," which translates to "stone carriers."

Male River Chub, Bigmouth Chub, and Bluehead Chub build large pebble mounds used for spawning. These mounds vary in size and are typically built by a larger male to attract females. As noted above, these chub mounds are used by many other species for spawning and play a critical role in stream ecology (take a look at Figures 18–20 to see this community effect in action).

Without the mounds built by these engineers, many of our aquatic species would have lower reproductive success or not

Figure 18. River Chub mound being used by Warpaint Shiners, Tennessee Shiners, and Central Stonerollers in the South Toe River, French Broad River Basin.

Figure 19. River Chub mound being used by Saffron Shiners *N. rubricroceus* and Tennessee Shiners *N. leuciodus* in the Little River, French Broad River Basin.

Figure 20. Mountain Redbelly Dace *Chrosomus oreas,* Saffron Shiners, Redlip Shiners *N. chiliticus,* and Rosyside Dace using a Bigmouth Chub mound in Helton Creek, New River Basin.

reproduce at all. Not only that, but due to their "engineering," they modify habitat, which is attributed to increasing species diversity and abundance of aquatic insects and fishes in the streams they occupy. Many additional species will use the nest (or "mound") for spawning and the associated school of fish for protection. Some fish species are so closely tied to chub mounds that they will not begin spawning until chub milt (sperm) is present in the mound.

Even Stoneroller and Creek Chub enjoy the added benefit of a mound in a stream. These species don't require a chub mound for spawning but are often found building spawning pits in the bases or sides of large chub mounds built by River Chub, Bigmouth Chub, and Bluehead Chub in WNC.

TROUT CONSERVATION FLOWS DOWNSTREAM

As we noted in our previous article, these are but a few of the native species that live here in North Carolina, and although taxonomy can be challenging, we hope that we've been able to help with the identification and awareness of additional fishes in our waters. We also know that anglers may not encounter these fishes on a regular basis, but you might (and given how big they get… maybe you should).

Nevertheless, just like the two minnow species for which we shared information previously, these knottyheads are interwoven into the health of our aquatic systems. There isn't a reader of this article who doesn't appreciate the value of North Carolina's aquatic resources, and for us and our interest in trout, we remain in a unique position to have our coldwater conservation efforts provide an expansive impact. The following text is taken from our previous article and remains true today: *…it is important to remember that trout conservation flows downstream. In the end, the good work done to help trout and their habitats has impacts beyond our favorite fishing holes.*

Just like the knottyheads, our actions have far-ranging impacts beyond their immediate goals. We're fortunate that our efforts directed towards trout have the opportunity to have a much larger conservation benefit to help everything lower in a watershed. In the end, trout conservation really does flow downstream.

References

Jenkins, R.E., and N.M. Burkhead. 1993. Freshwater fishes of Virginia. American Fisheries Society, Bethesda, Maryland.

Kratt, L.F., and R.J.F. Smith 1978. Breeding tubercles occur on male and female Arctic grayling (*Thymallus arcticus*). Copeia:185–88.

NCfishes.com No doubt you're somewhat interested in fishes if you've made it this far, so keep an eye on this developing website that helps with identification of North Carolina's fishes.

Figure 13. Visual guide to the chubs of western North Carolina. Figures obtained via Jenkins and Burkhead (1993).

Bluehead Chub

Let's talk tubercles: Tubercles on this species are only found above the nostrils (noted by an arrow). Tubercle scars or often visible outside of breeding season.

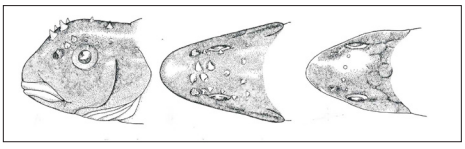

Figure 14a. Breeding tubercles of male Bluehead Chub.

River Chub

Let's talk tubercles: Tubercles on this species are only found below the eyes on the snout. Tubercle scars are often visible outside of breeding season.

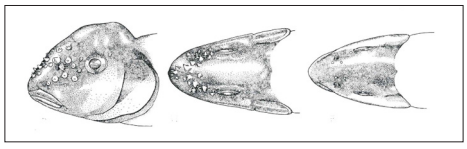

Figure 14b. Breeding tubercles of male River Chub.

Bigmouth Chub

Let's talk tubercles: Tubercles on this species are found above and below the eyes and nostrils (noted by an arrow). Tubercle scars are often visible outside of breeding season.

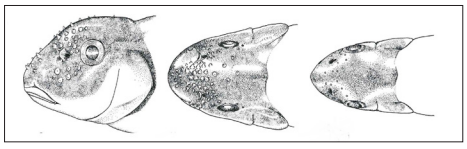

Figure 14c. Breeding tubercles of male Bigmouth Chub.