

## Sculpin (Family Cottidae) Diversity in North Carolina

North Carolina is home to three species of sculpins: Mottled Sculpin, *Cottus bairdii*, Blue Ridge Sculpin, *Cottus caeruleomentum*, and Banded Sculpin, *Cottus carolinae* (Tracy et al. 2020). Sculpins, to the layperson, are often called molly crawlbottom, miller's thumb (in reference to the shape of a miller's thumb (<https://williamrubel.com/2016/09/09/the-millers-thumb/>), wartfish, and muddler, but the American Fisheries Society-accepted common names are Mottled Sculpin, Blue Ridge Sculpin, and Banded Sculpin (Page et al. 2013) and each species has a scientific (Latin) name (Appendix 1).

Sculpin are unusual looking small brown fish with big eyes atop a large, wide head, a large mouth, what appears to be a scaleless body, and big pointy fins. They often go unnoticed because they are cryptically colored to blend in with coarse substrates (i.e., large gravel, cobble and boulder) under which they often hide. They may be found in riffles and runs in fast flowing, clear cool to cold water trout-type streams in our mountain river basins. In North Carolina, sculpins as a whole do not get very big. They range in size from about 80 mm Standard Length (3.1 inches) for Blue Ridge Sculpin, about 91 mm Standard Length (3.6 inches) for Mottled Sculpin, and about 144 mm Standard Length (5.7 inches) for Banded Sculpin (Jenkins and Burkhead 12994; Kinziger et al. 2000).

Historically, no species were found east of the Appalachian Mountains, except for the Blue Ridge Sculpin in the upper Roanoke basin and the Mottled Sculpin in the upper Savannah basin. Mottled Sculpin, our most widely distributed and commonly collected species, is indigenous (native) in all river basins west of the Mountains, including the New and the Savannah. However, it is nonindigenous (introduced probably by bait-bucket introductions) in the upper Broad basin in Polk, Henderson, and Buncombe counties. Blue Ridge Sculpin, our most restricted species and the only species of sculpin in the Roanoke basin, is found only in the Little Dan River and the mainstem of the Dan River upstream from the Little Dan River to the North Carolina-Virginia state line in Stokes County (Tracy et al. 2020). Banded Sculpin, generally larger than Mottled Sculpin, also has a limited distribution. Currently, it is found only in the lower French Broad River and Shut-in Creek near Hot Springs, and French Broad River at Marshall (Madison County, French Broad basin) and from the Pigeon River downstream from Walters Lake into the gorge and in Big Creek (Haywood County, Pigeon basin) (Tracy 2020). Mottled and Banded Sculpin do not appear to be co-occur (i.e., be sympatric) in North Carolina.

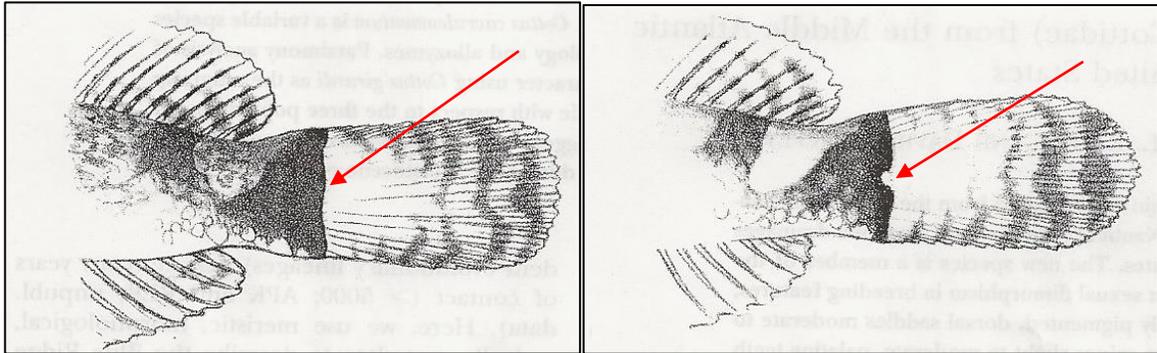
Both the Blue Ridge Sculpin and Banded Sculpin are listed as State Special Concern species because of their limited distributions and the potential anthropogenic impacts upon their habitats and stream water quality (NCAC 2017; NCNHP 2020; NCWRC 2017).

At the present time, their identification is "relatively" straight-forward. However, the taxonomic status of Mottled Sculpin in North Carolina has been unsettled for a long time (e.g., Jenkins and Burkhead 1994) and some researchers and museums record the species as *Cottus bairdii* complex or *Cottus* sp. (Gabriela M. Hogue, North Carolina Museum of Natural Sciences, pers. comm.). Until their taxonomy is resolved, any sculpin, except for the Banded Sculpin, found in our western Mountain streams is being called Mottled Sculpin (Tracy et al. 2020). Blue Ridge Sculpin is the only sculpin one would encounter in the upper Dan River system. Likewise, Banded Sculpin is the only species in the Pigeon River basin near the Tennessee-North Carolina state line and in the French Broad basin also near the state line. Mottled Sculpin is everything else.

Key characteristics for their proper identification include the pigmentation pattern of the caudal band and lateral bars, the number of pectoral fin rays, the number of preopercular spines, the size and shape of the uppermost preopercular spine, and the size of the palantine tooth patch in relation to the size of the vomerine tooth patch. Preopercular spines are best observed by examining the preserved specimen beneath a dissecting microscope and cutting away the overlying tissue. Palantine teeth and vomerine teeth are also best observed on preserved specimens using a dissecting microscope.

**Identification Key to the Species of Sculpins (Family Cottidae) in North Carolina**

- 1a. Caudal base band unnotched in at least one side (Figure 1). Pectoral fin rays modally 14 (Figure 2). Range restricted to the upper Dan River system in Stokes County (Roanoke River basin) ..... Blue Ridge Sculpin, *Cottus caeruleomentum*
- 1b. Caudal base band notched on both sides (Figure 1). Pectoral fin rays modally 15 or 16. Range restricted to Tennessee River drainage basins (Watauga, Nolichucky, French Broad, Pigeon, Little Tennessee, and Hiwassee basins), or to the New, Savannah, or Broad basins .....2



**Figure 1. Red arrow pointing to caudal base band. Left – caudal base band unnotched; Right – caudal base band notched. Illustration courtesy of Kinziger et al. (2000) and David Neely.**

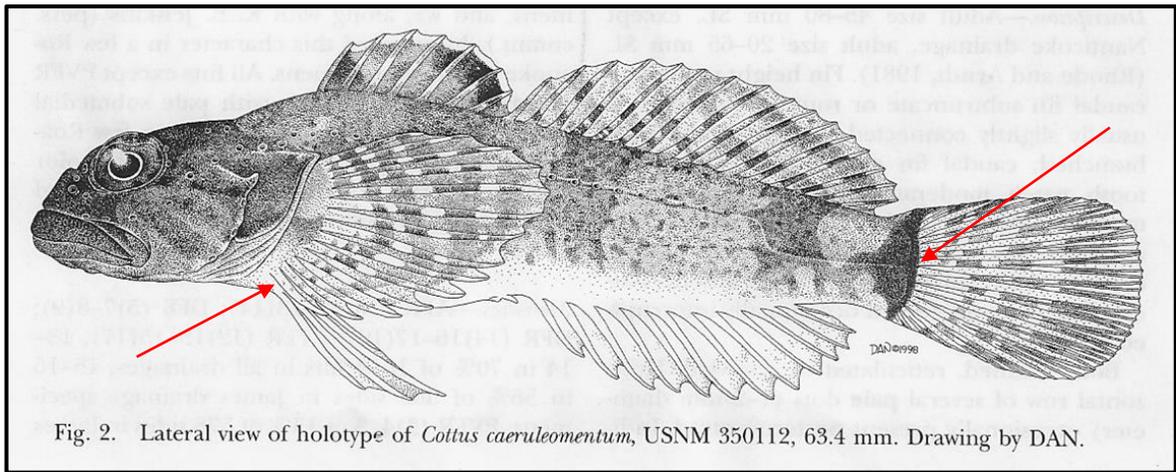


Fig. 2. Lateral view of holotype of *Cottus caeruleomentum*, USNM 350112, 63.4 mm. Drawing by DAN.

**Figure 2. Blue Ridge Sculpin with red arrows pointing to 14 pectoral fin rays and caudal base band. Illustration courtesy of Kinziger et al. (2000) and David Neely.**

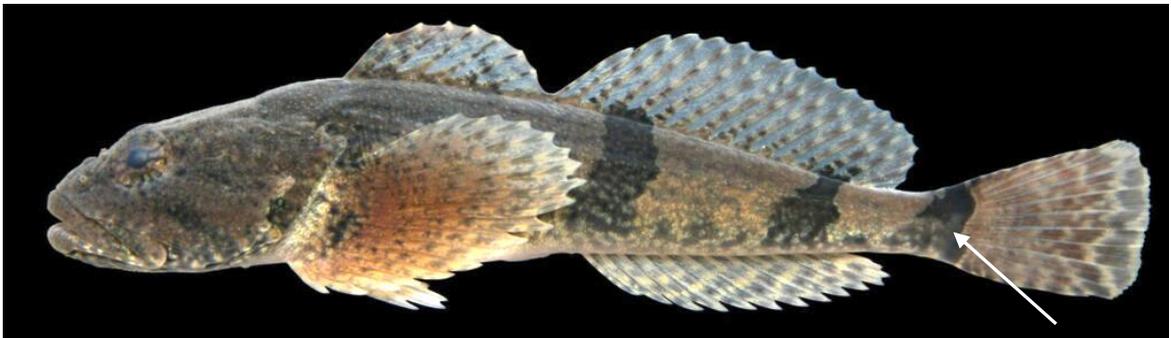
- 2a. Pectoral fin rays 14 or 15. Preopercular spines 1 or 2, upper spine smaller than pupil. Palantine tooth patch shorter than vomerine tooth patch. Lateral bars usually diffuse, not darker on edges than elsewhere (Figures 3 and 4)..... Mottled Sculpin, *Cottus bairdii*
- 2b. Pectoral fin rays 16 or 17. Preopercular spines 3, upper spine usually longer than pupil. Palantine tooth patch longer than vomerine tooth patch. Lateral bars distinct, darker on edges (Figure 5) ..... Banded Sculpin, *Cottus carolinae*



**Figure 3. Mottled Sculpin with white arrow pointing to the notched caudal base band. Specimen is from Burningtown Creek, Macon County, Little Tennessee River basin.**



**Figure 4. Mottled Sculpin with white arrow pointing to the notched caudal base band. Specimen is from Obids Creek, Ashe County, New River basin.**



**Figure 5. Banded Sculpin with white arrow pointing to the notched caudal base band. Specimen from the Holston River in Virginia . Photograph courtesy of David Neely.**