

Darter and Perch (Family Percidae) Diversity in North Carolina
By the NCFishes.com Team

Our native species of darters and perches are just as brightly colored as many fishes one would find in a pet shop, yet few people are aware of their existence. There are 38 species of darters and perches in North Carolina (Table 1), including several species found in only one river basin and at least two species, which may be re-named or split into additional species (Tracy et al. 2020). [Please note: Tracy et al. (2020) may be downloaded for free at: <https://trace.tennessee.edu/sfcproceedings/vol11/iss60/1>.] Distributional maps for every species may be found in Tracy et al. (2020; Map Nos. 206-245). Two species have been extirpated from our state – Blueside Darter, *Etheostoma jessiae*, and Sickle Darter, *Percina williamsi*.

You might have heard people calling them simply darters, Raccoon Perch, Ringed Perch, Lake Perch, Redfin Perch, Jack Salmon, Pike, Pike Perch, Jackfish, Walleyed Pike, River Slicks, or many other colloquial names. But each species has its own scientific (Latin) name, which coincidentally actually means something (please refer to The Meanings of the Scientific Names of Darters and Perches, pages 23 and 24), and an American Fisheries Society-accepted common name (Page et al. 2013).

Table 1. Species of darters and perches found in North Carolina.

Scientific Name/ American Fisheries Society Accepted Common Name	Scientific Name/ American Fisheries Society Accepted Common Name
<i>Etheostoma acuticeps</i> , Sharphead Darter	<i>Etheostoma thalassinum</i> , Seagreen Darter
<i>Etheostoma blennioides</i> , Greenside Darter	<i>Etheostoma vitreum</i> , Glassy Darter
<i>Etheostoma brevispinum</i> , Carolina Fantail Darter	<i>Etheostoma vulneratum</i> , Wounded Darter
<i>Etheostoma chlorbranchium</i> , Greenfin Darter	<i>Etheostoma zonale</i> , Banded Darter
<i>Etheostoma collis</i> , Carolina Darter	<i>Perca flavescens</i> , Yellow Perch
<i>Etheostoma flabellare</i> , Fantail Darter	<i>Percina aurantiaca</i> , Tangerine Darter
<i>Etheostoma fusiforme</i> , Swamp Darter	<i>Percina burtoni</i> , Blotchside Logperch
<i>Etheostoma gitselli</i> , Tuckasegee Darter	<i>Percina caprodes</i> , Logperch
<i>Etheostoma inscriptum</i> , Turquoise Darter	<i>Percina crassa</i> , Piedmont Darter
<i>Etheostoma kanawhae</i> , Kanawha Darter	<i>Percina evides</i> , Gilt Darter
<i>Etheostoma mariae</i> , Pinewoods Darter	<i>Percina gymnocephala</i> , Appalachia Darter
<i>Etheostoma nigrum</i> , Johnny Darter	<i>Percina nevisense</i> , Chainback Darter
<i>Etheostoma olmstedii</i> , Tessellated Darter	<i>Percina oxyrhynchus</i> , Sharpnose Darter
<i>Etheostoma perlongum</i> , Waccamaw Darter	<i>Percina rex</i> , Roanoke Logperch
<i>Etheostoma podostemone</i> , Riverweed Darter	<i>Percina roanoka</i> , Roanoke Darter
<i>Etheostoma rufilineatum</i> , Redline Darter	<i>Percina squamata</i> , Olive Darter
<i>Etheostoma serrifer</i> , Sawcheek Darter	<i>Percina westfalli</i> , Westfall's Darter
<i>Etheostoma simoterum</i> , Snubnose Darter	<i>Sander canadensis</i> , Sauger
<i>Etheostoma swannanoa</i> , Swannanoa Darter	<i>Sander vitreus</i> , Walleye

Darters and perches are found throughout our state from the Mountains to the Sand Hills to the Coastal Plain in reservoirs, creeks, large and small rivers, swamps, and channelized streams. [Note: see Supplemental Maps 1-3, page 25, showing North Carolina's 100 counties, 21 river basins, and 4 physiographic regions.] They can be found in turbulent and fast, cold, gin-clear Mountain streams to warm and turbid Piedmont streams to slow-moving, tannin (tea)-colored Sand Hills and Coastal Plain streams. Darters are generally found in riffles and runs, whereas Yellow Perch can also be found in reservoirs and ponds, and Walleye and Sauger may also be found in reservoirs and in pools and deep runs in low- to moderate-gradient rivers. At least two species, Banded Darter and Riverweed Darter, are closely associated with Riverweed, *Podostemum*, an aquatic plant that grows attached to rocks in riffles and runs. Most darters are only a few inches long, but Walleye and Sauger can reach almost 3 feet in length and along with Yellow Perch are widely sought after game species noted for their delectability.

Thirteen species of darters were scientifically described from North Carolina (Table 2; Tracy et al 2020). Four of these species were describe by Edward Drinker Cope in 1870, including two from Wake County near Raleigh.

Table 2. Species of darters scientifically described from North Carolina.

Common Name	Scientific Name	Type Locality
Carolina Darter	<i>Etheostoma brevispinum</i> (Coker) 1926	Paddys Creek near Lake James, Burke Co.
Greenfin Darter	<i>Etheostoma chlorbranchium</i> Zorach 1972	Cullasaja River near Franklin, Macon Co.
Tuckasegee Darter	<i>Etheostoma gitselli</i> (Hildebrand) 1932	Tuckasegee River near Ela, Swain Co.
Kanawha Darter	<i>Etheostoma kanawhae</i> (Raney) 1941	North Fork of the New River at Crumpler, Ashe Co.
Pinewoods Darter	<i>Etheostoma mariae</i> (Fowler) 1947	Outlet of Watson's Lake near Southern Pines, Moore Co.
Waccamaw Darter	<i>Etheostoma perlongum</i> (Hubbs & Raney) 1946	Lake Waccamaw, Columbus Co.
Redline Darter	<i>Etheostoma rufilineatum</i> (Cope) 1870	Spring Creek at Hot Springs, Madison Co.
Sawcheek Darter	<i>Etheostoma serrifer</i> (Hubbs & Cannon) 1935	Buffalo Creek near Wendell, Wake Co.
Glassy Darter	<i>Etheostoma vitreum</i> (Cope) 1870	Walnut Creek at Raleigh, Wake Co.
Wounded Darter	<i>Etheostoma vulneratum</i> (Cope) 1870	Spring Creek at Hot Springs, Madison Co.
Blotchside Logperch	<i>Percina burtoni</i> Fowler 1945	Swannanoa River near Oteen, Buncombe Co.
Appalachia Darter	<i>Percina gymnocephala</i> Beckham 1980	South Fork New River near West Jefferson, Ashe Co.
Chainback Darter	<i>Percina nevisense</i> (Cope) 1870	Falls of the Neuse River, Wake Co.

Each of North Carolina's 100 counties has at least one species of darter found within its borders. Yellow Perch is found in 18 of our 21 basins; it has yet to be found in the Savannah, Watauga, and Nolichucky basins. It has been introduced into the French Broad, Pigeon, Little Tennessee, and Hiwassee basins. Our most diverse basin is the French Broad where there are currently 13 indigenous (native) species and 2 nonindigenous (introduced) species (Yellow Perch and Swamp Darter); four species have been extirpated from the basin – Blueside Darter, Wounded Darter, Sickle Darter, and Blotchside Logperch (Figure 1). The least diverse basin is the small, headwaters Watauga basin with only Greenfin Darter and Tangerine Darter. Twelve species are found in only one basin (Table 3). Along with the four species extirpated from the French Broad basin, Walleye has long been extirpated from the Neuse basin.

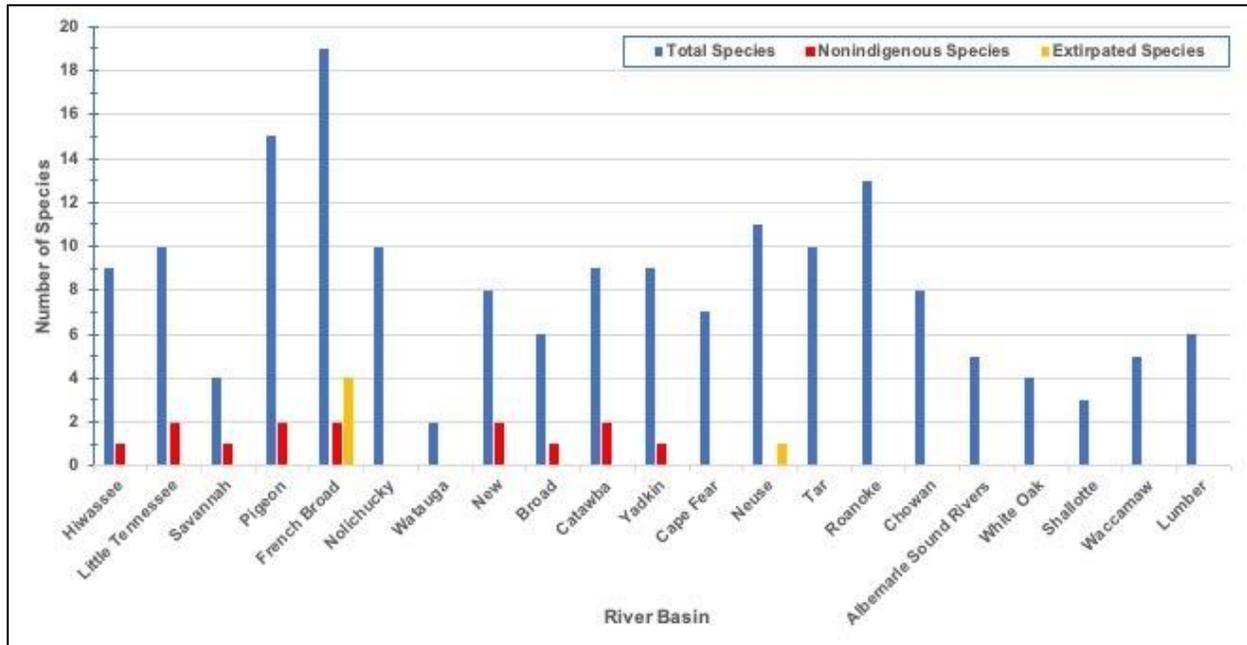


Figure 1. Diversity of the Family Percidae across North Carolina's river basins.

Table 3. Species of darters and perches found in only one river basin in North Carolina.

River Basin	Species
New	Kanawha Darter, Appalachia Darter, Sharpnose Darter
Nolichucky	Sharphead Darter, Blotchsides Logperch
Little Tennessee	Wounded Darter
Savannah	Turquoise Darter, Westfall's Darter
Roanoke	Riverweed Darter, Roanoke Logperch
Lumber	Pinewoods Darter
Waccamaw	Waccamaw Darter

Because many darter species are endemic to specific basins, 18 species are considered imperiled in North Carolina (Table 4; Krabbenhoft et al. 2006; NCAC 2017; NCNHP 2018; NCWRC 2017; Roberts and Rosenberger 2008). Walleye, Sauger, and Yellow Perch, on the other hand, are classified and managed as game species by the North Carolina Wildlife Resources Commission (NCWRC 2020). For more specific information on Walleye and Yellow Perch, please see: the North Carolina Wildlife Resources Commission sport fish profiles (NCWRC 2010; NCWRC 2011, NCWRC undated).

Table 4. Listings of imperiled darter and perch species in North Carolina (NCAC 2017, NCNHP 2020, and NCWRC 2017). *Federally Endangered.

Level of Imperilment	Species
Endangered	Blotchsides Logperch, Sharpnose Darter, Roanoke Logperch*
Threatened	Sharphead Darter, Turquoise Darter, Logperch, Waccamaw Darter
Special Concern	Carolina Darter, Pinewoods Darter, Snubnose Darter, Wounded Darter, Olive Darter, Westfall's Darter
Significantly Rare	Kanawha Darter, Riverweed Darter, Seagreen Darter, Appalachia Darter, Sauger

As compared to other families of fish, e.g., sunfishes and catfishes, few species of darters have been introduced outside of their native ranges in North Carolina. It is suspected that bait bucket dumps have led to the introduction of Tessellated Darter into the New basin and Redline Darter into the Little Tennessee basin. Transportation of aquatic plants may have led to the introduction of the Swamp Darter into the French Broad and Pigeon. And Yellow Perch, Walleye, and Sauger, have been stocked because of their popularity as game fishes.

Key characteristics for their proper identification include the presence/absence of modified scales on the belly; the presence/absence of scales on the nape and cheek; the presence/absence of a frenum; the number and thickness of anal fin spines; lateral line shape and scale counts; the number of un-pored lateral line scales; the number of spines and rays in the dorsal fins; overall color patterns; and the geographical distributions of the species (please refer to Identification Key to the Species of Darters and Perches (Family Percidae) in North Carolina). Most species can easily be told apart from one another, with the possible exceptions of Johnny vs. Tessellated darters and Swamp vs. Carolina darters where their ranges also overlap.

If you have troubles with your identifications, just send us (<https://ncfishes.com/contact/>) an e-mail and include as many quality digital photographs as you can along with all the pertinent locality descriptors so that we will know from where the fish came.

Identification Key to the Species of Darters and Perches (Family Percidae) in North Carolina^{1,2,3,4}

(Please refer to NCFishes.com for pictures and identifying characteristics for all species)

- 1a. Preopercle strongly serrate. Branchiostegal rays 72
- 1b. Preopercle smooth or occasionally weakly serrate. Branchiostegal rays 6, rarely 5.....4
- 2a. Sides with 6-8 prominent bars (Figure 1). Teeth small. Anal fin rays 6-9.....
.....Yellow Perch, *Perca flavescens*
- 2b. Sides uniform, mottled, or blotched. Prominent canine teeth. Anal fin rays 11-14.....3



Figure 1. Yellow Perch

- 3a. Lower lobe of caudal fin with a white tip (Figure 2). Spinous dorsal fin lacking small black spots. Last 1 or 2 interradial membranes nearly black.....Walleye, *Sander vitreus*
- 3b. Lower lobe of caudal fin without a white tip (Figure 2). Spinous dorsal fin with many dark spots. Last 1 or 2 interradial membranes not black..... Sauger, *Sander canadensis*

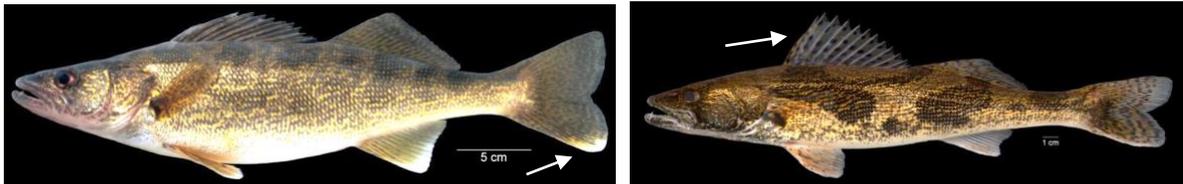


Figure 2. Left – Walleye with white arrow pointing to lower lobe of caudal fin with a white tip; Right – Sauger with white arrow pointing to spinous dorsal fin with black spots. Photographs courtesy of David Neely.

- 4a. 1-3 enlarged and often spiny scales between pelvic fins (often embedded in Logperch) and 1 enlarged scale usually present just behind mid-breast indentation (Figure 3)5
- 4b. No enlarged scale between pelvic fins or on middle of breast (Figure 3)..... 16

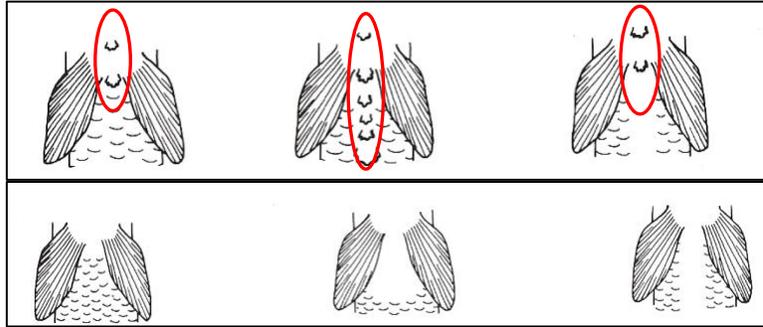


Figure 3. Top – Red ovals encircling the enlarged belly sculation in *Percina* darters; Bottom – Naked belly sculation in *Etheostoma* darters.

- 5a. Mouth inferior; snout conical and fleshy, “pig-like”. Lateral blotches usually separate, not forming a continuous lateral stripe6
- 5b. Mouth terminal or subterminal; snout not conical and fleshy, not “pig-like”. Lateral blotches usually connected to form a continuous lateral stripe8
- 6a. Sides with 9 or 10 horizontally oblong blotches (Figure 4). Soft dorsal fin rays 13 or 14. Nape, cheek, and opercle naked or poorly scaled. Currently restricted to the Nolichucky basin Blotchside Logperch, *Percina burtoni*
- 6b. Sides with 10-25 narrow vertical bars. Soft dorsal fin rays 15-17. Nape, cheek, and opercle well scaled. Not restricted to the Nolichucky basin7



Figure 4. Blotchside Logperch.

- 7a. Sides with 20-25 narrow vertical bars that cross the back (Figure 5). No yellow stripe in the spinous dorsal fin. Restricted to the New, French Broad, and Pigeon basins Logperch, *Percina caprodes*
- 7b. Sides with 10 ovoid bars that do not cross the back (Figure 5). Yellow stripe in spinous dorsal fin. Restricted to the upper Roanoke basinRoanoke Logperch, *Percina rex*

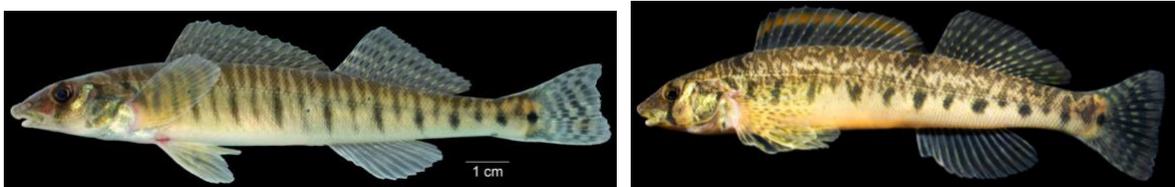


Figure 5. Left – Logperch; Right – Roanoke Logperch. Logperch photograph courtesy of David Neely.

- 8a. Midventral scales on belly not modified. Scales small, lateral line scales 89-100. Soft dorsal fin rays 14 or 15 (Figure 6). Range restricted to basins west of the mountains (except New) Tangerine Darter, *Percina aurantiaca*
- 8b. Midventral scales on belly enlarged. Scales large, lateral line scales 40-82. Soft dorsal fin rays 10-149



Figure 6. Tangerine Darter.

- 9a. Snout pointed. Subocular bar absent. Nape, cheek, and opercle well scaled or with embedded scales 10
- 9b. Snout blunt. Subocular bar present. Nape, cheek, and opercle often naked or weakly scaled 11
- 10a. Breast well scaled, at least laterally and posteriorly, scales small and embedded, visible without scraping. Basicaudal spot usually dark (Figure 7). Dorsal saddles indistinct. Restricted to the Nolichucky, French Broad, Pigeon, Little Tennessee, and Hiwassee basins Olive Darter, *Percina squamata*
- 10b. Breast naked or with a few scatter embedded scales, not usually visible without scraping. Basicaudal spot usually indistinct (Figure 7). Dorsal saddles usually distinct, at least on posterior half of body. Restricted to the New basin Sharpnose Darter, *Percina oxyrhynchus*

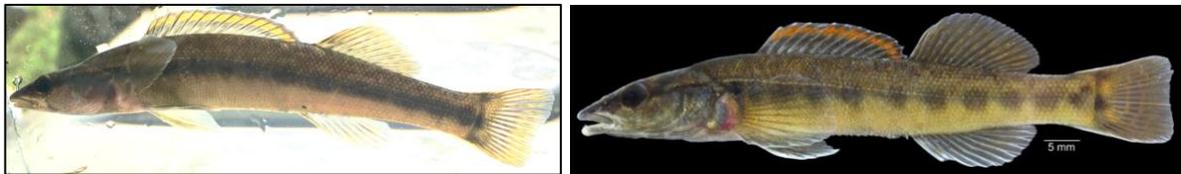


Figure 7. Left – Olive Darter; Right – Sharpnose Darter. Olive Darter photograph courtesy of Luke Etchison and Sharpnose Darter photograph courtesy of David Neely.

- 11a. Cheeks well scaled, scales often partially embedded. Breast with embedded scales. Gill membranes moderately joined, 70-80° angle. Restricted to the Savannah basin (Figure 8)..... Westfall's Darter, *Percina westfalli*
- 11b. Cheeks naked, occasionally weakly scaled. Breast naked except for a single enlarged scale or small central patch of scales. Gill membranes narrowly joined, 40-50° angle. Not restricted to the Savannah basin 12



Figure 8. Westfall's Darter.

- 12a. Restricted to the New, Nolichucky, French Broad, Pigeon, Little Tennessee, and Hiwassee basins 13
- 12b. Restricted to the Atlantic slope drainages 14
- 13a. Nape sparsely scaled. Restricted to the New basin (Figure 9)..... Appalachia Darter, *Percina gymnocephala*
- 13b. Nape usually well scaled. Restricted to the Nolichucky, French Broad, Pigeon, Little Tennessee, and Hiwassee basins (Figure 9) Gilt Darter, *Percina evides*

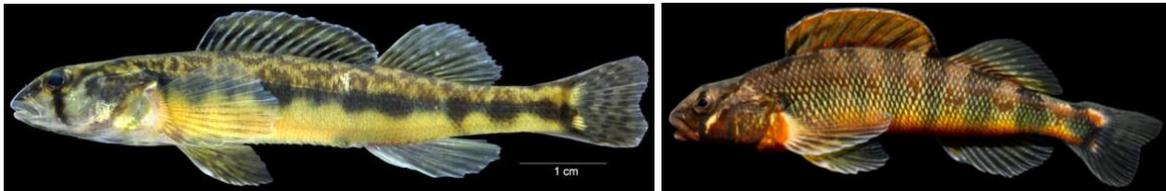


Figure 9. Left – Appalachia Darter; Right – Gilt Darter. Appalachia Darter photograph courtesy of David Neely.

- 14a. Spinous dorsal fin with 13 (12-15) rays. Lateral line scales 54-61 (52-64). Dark, wavy line often present above lateral stripe (Figure 10). Chainback Darter, *Percina nevisense*
- 14b. Spinous dorsal fin with 11 or 12 (10-13) rays. Lateral line scales 42-52 (40-54). Dark, wavy line absent above lateral stripe 15

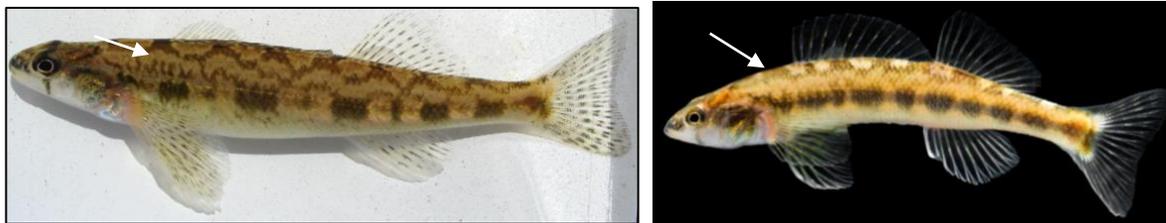


Figure 10. Chainback Darter with white arrows pointing to the dark, wavy line above the lateral stripe.

- 15a. Chin bar black, often mottled in Piedmont forms. Spinous dorsal fin with narrow yellow band bordered above with wide black band (Figure 11). Soft dorsal fin rays 12 (11-13). Restricted to the Broad, Catawba, Yadkin, Cape Fear, and Lumber basins Piedmont Darter, *Percina crassa*
- 15b. Chin bar absent. Spinous dorsal fin with wide orange band bordered above by narrow black band (Figure 11). Soft dorsal fin rays 10 or 11 (10-12). Restricted to Roanoke, Tar, and Neuse basins ...
..... Roanoke Darter, *Percina roanoka*

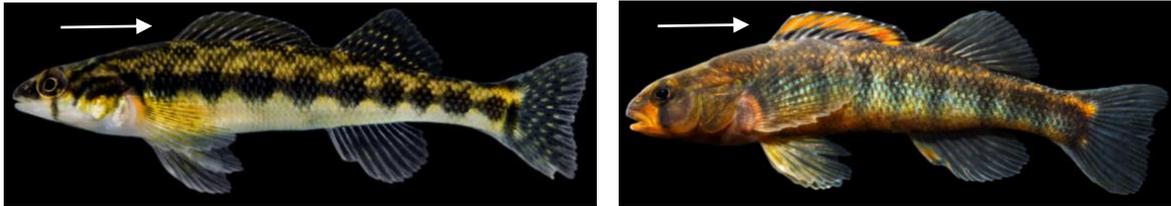


Figure 11. Left – Piedmont Darter with white arrow pointing to the spinous dorsal fin with narrow yellow band bordered above with wide black band; Right – Roanoke Darter with white arrow pointing to the spinous dorsal fin with wide orange band bordered above by narrow black band.

- 16a. Lateral line distinctly arched anteriorly, incomplete (Figure 12) 17
- 16b. Lateral line straight or slightly curved upward, usually complete or with 1-4 un-pored scales (Figure 12) 19

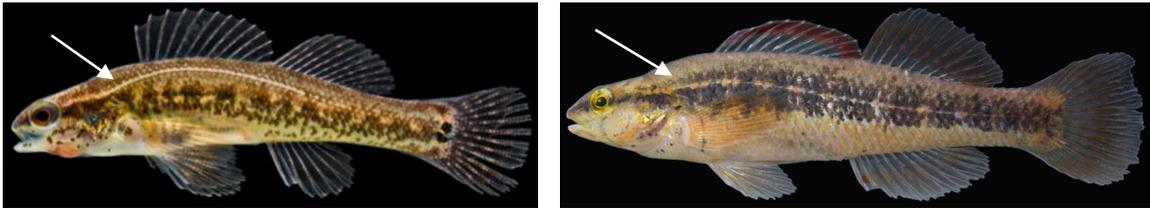


Figure 12. Left – white arrow pointing to distinctly arched lateral line; Right – white arrow pointing to the lateral line which is slightly curved upward.

- 17a. Caudal fin base with 2 black basicaudal spots, often ringed with orange (Figure 13). Preopercle margin serrate Sawcheek Darter, *Etheostoma serrifer*
- 17b. Caudal fin base without 2 black basicaudal spots, ringed with orange; usually with 3 vertical faint dark spots. Preopercle margin entirely smooth or partially serrate 18

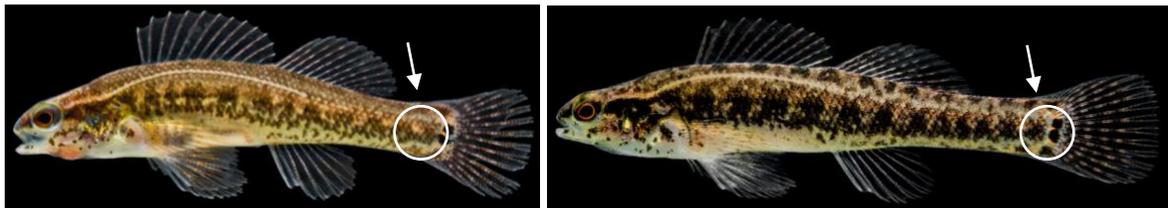


Figure 13. Sawcheek Darter with white arrows pointing to the two encircled black basicaudal spots.

- 18a. Anal fin spines 2 (Figure 14). Breast fully scaled. Head narrow and snout pointy when viewed from above (Figure 15)Swamp Darter, *Etheostoma fusiforme*
- 18b. Anal fin spines 1, sometimes 2. (Figure 14). Breast naked-30% scaled. Head broad and snout rounded when viewed from above (Figure 15).Carolina Darter, *Etheostoma collis*

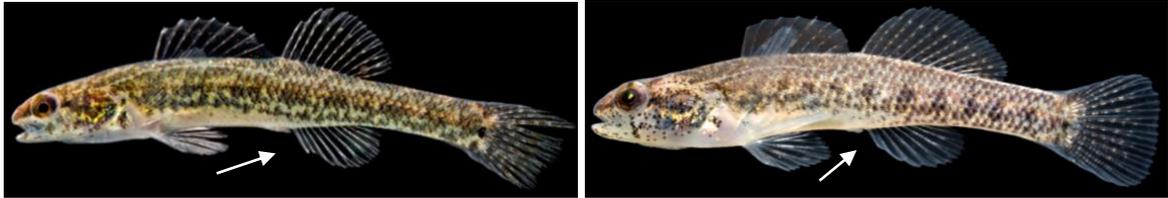


Figure 14. Left - Swamp Darter with white arrow pointing to the two anal spines; Right – Carolina Darter with white arrows pointing to the single anal spine.

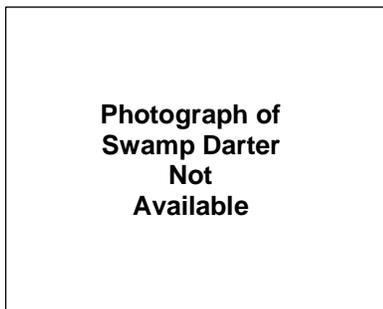


Figure 15. Dorsal views of head. Left – Swamp Darter showing the narrow head and pointy snout; Right - Carolina Darter showing the broad head and rounded snout.

- 19a. Anus surrounded by many fleshy, conical villi. Body yellow to beige, translucent in life, peppered with black or brown spots (Figure 16) Glassy Darter, *Etheostoma vitreum*
- 19b. Anus not surrounded by many conical fleshy villi. Body color not as above 20



Figure 16. Glassy Darter.

- 20a. Caudal fin rounded. Lateral line usually with 7-33 un-pored scales. Black line usually extends from snout through eye onto operculum 21
- 20b. Caudal fin seldom rounded. Lateral line usually complete or with 1-4 un-pored scales. Black line usually absent from snout to edge of opercle 22

- 21a. Lateral line scales modally 47 (39-57). Pored lateral line scales modally 40 (30-51). Total number of nuptial male transverse (vertical) bars modally 13 (9-18) (Figure 17). Restricted to the Broad, Catawba, and upper Yadkin basins Carolina Fantail Darter, *Etheostoma brevispinum*
- 21b. Lateral line scales modally 44 (39-56) for Atlantic slope populations and modally 50 (43-61) for New, French Broad, and Pigeon basin populations. Pored lateral line scales modally 27 (14-37) for Tar and Neuse basin populations, modally 35 (19-43) for all other Atlantic slope populations, and modally 39 (23-49) for New, French Broad, and Pigeon basin populations. Total number of nuptial male transverse (vertical) bars modally 17 or 18 (8-22) (Figure 17). Fantail Darter, *Etheostoma flabellare*

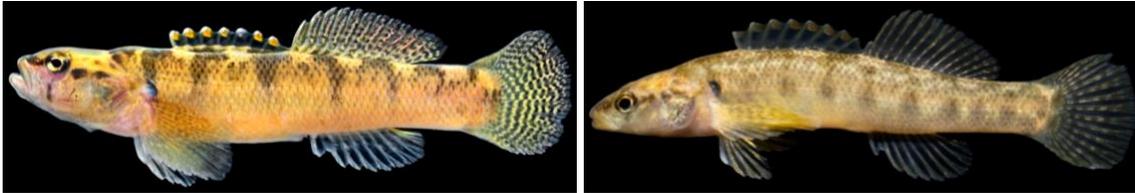


Figure 17. Left – Carolina Fantail Darter; Right – Fantail Darter.

- 22a. 1st anal spine stiff, as thick or thicker than 2nd spine. Anterior belly usually well scaled 23
- 22b. 1st anal spine flexible, as thin as 2nd spine. Anterior belly naked or poorly scaled 35
- 23a. Lateral line scales 35-38. Broad dusky lateral stripe and dorsal saddles usually present (Figure 18). Restricted to the headwaters of the Lumber basin Pinewoods Darter, *Etheostoma mariae*
- 23b. Lateral line scales 39-78. Dorsal saddles usually present. Not restricted to the headwaters of the Lumber basin..... 24



Figure 18. Pinewoods Darter with white arrow pointing to the stiff 1st anal spine.

- 24a. Sides with longitudinal streaks along each scale row. Nape naked. 25
- 24b. Sides with no longitudinal streaks along each scale row. Nape usually scaled; scales may be embedded 28
- 25a. Snout short and blunt to moderately pointed. Opercle scaled dorsally. Soft dorsal, caudal, and anal fins usually edged with black, often with light reddish submarginal band, often spotted in females. Sides without complete bars. Red spots may be present of sides and caudal and soft dorsal fins. Not restricted to the Nolichucky basin 26

- 25b Snout very long and pointed (Figure 19). Opercle naked. Soft dorsal, caudal, and anal fins not edged with black, light submarginal band absent. Fins not spotted with black. 11-15 narrow black bars cross entire sides. No red spots on body or fins. Restricted to the Nolichucky basin Sharphead Darter, *Etheostoma acuticeps*



Figure 19. Sharphead Darter.

- 26a. Cheek with 3-7 dark dashes or spots, 1 or 2 of these spots in the subocular area. Basicaudal region with cream-colored blotches shaped like an hour-glass (Figure 20) Redline Darter, *Etheostoma rufilineatum*
- 26b. Cheek with 0 or 1 dark dashes or spots, subocular bar absent or weak. Basicaudal region without cream-colored blotches shaped like an hour-glass 27

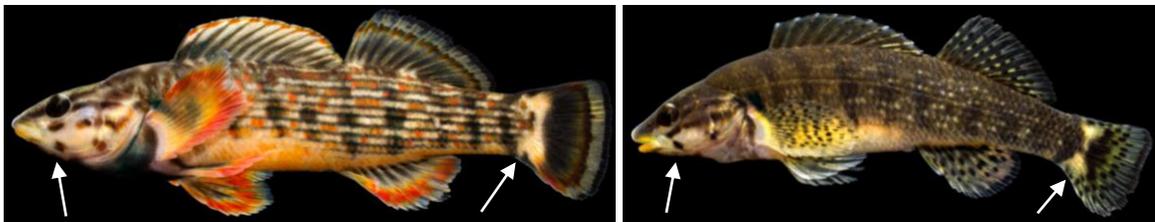


Figure 20. Redline Darters with white arrows pointing to the spotted cheeks and the hour-glass shaped basicaudal blotches. Left – Male Redline Darter; Right – Female Redline Darter.

- 27a. Snout pointed dorsally and laterally; upper lip protrudes well beyond snout. Cheeks scaled beyond eye. Lateral line scales 50-55. Adults with no light submarginal band on anal, caudal, and soft dorsal fins, margin black without thin light edge. Adults with irregularly placed red spots in center of scales on sides, red spot at tip of 1st interradial membrane of spinous dorsal fin, and red blotches on caudal fin base (Figure 21) Wounded Darter, *Etheostoma vulneratum*
- 27b. Snout rounded; upper lip protrudes but little beyond snout. Cheeks unscaled. Lateral line scales 57-70. Adults with light submarginal band on anal, caudal, and soft dorsal fins, black margin usually with thin light edge. Adults with no red spots on sides, with no red on spinous dorsal or on caudal fin bases (Figure 21) Greenfin Darter, *Etheostoma chlorbranchium*

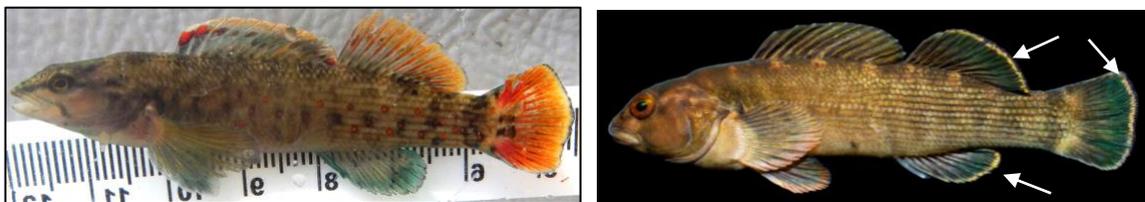


Figure 21. Left – Wounded Darter; Right – Greenfin Darter with white arrows pointing to the light submarginal bands. Wounded Darter photograph courtesy of Luke Etchison.

- 28a. Frenum recessed and greatly reduced. Upper jaw fits into deep groove under snout, groove as deep as width of upper jaw (Figure 22). Lateral line scales 58-78 29
- 28b. Frenum broad, not recessed (Figure 22) (except in Snubnose Darter which has a short snout and the frenum is narrow, sometimes obscured by a crease). Maxillary groove shallow. Lateral line scales 39-58 30

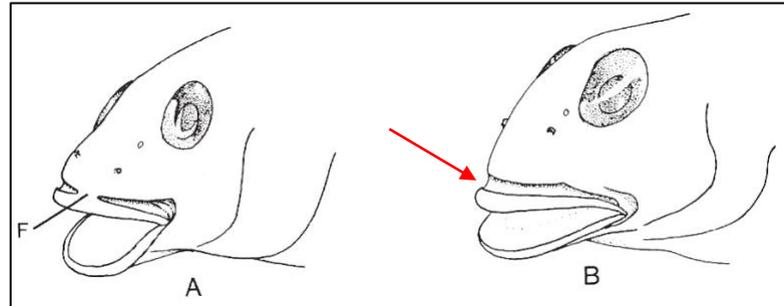


Figure 22. Left – Frenum (F) present; Right – Frenum absent and with a red arrow pointing to the deep groove under the snout.

- 29a. Long lip tip (a nipple-like formation on the upper lip) (Figures 23 and 24); occasionally with an overhung snout; no premaxillary frenum. Completely scaled belly. Opercle scaled. Lateral line scales modally 56 (49-63). Restricted to New and French Broad basins (Figure 25) Greenside Darter, *Etheostoma blennioides*
- 29b. No lip tip (a nipple-like formation on the upper lip) (Figures 23 and 24); overhung snout absent; frenum well-developed. Large and small naked areas on belly, naked belly anteriorly in most specimens. Opercle usually naked. Lateral line scales modally 71 (63-81). Restricted to Pigeon and Little Tennessee basins (Figure 25) Tuckasegee Darter, *Etheostoma gutselli*
- 29c. Restricted to Hiwassee basin (Figure 25) Intergrades between *Greenside Darter* and *Tuckasegee Darter*, *Etheostoma sp. cf. blennioides*

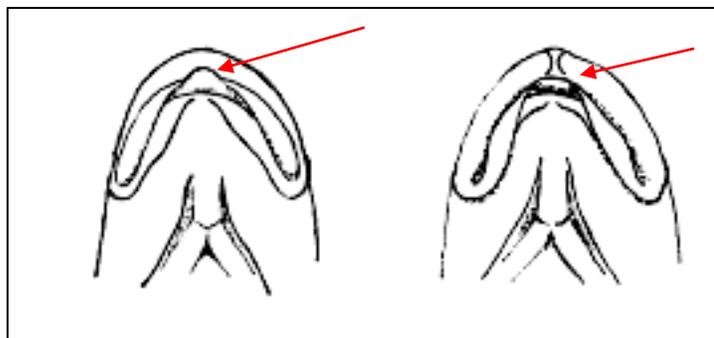


Figure 23. Left – Red arrow pointing to the long nipple-like formation on the upper lip; Right – Red arrow pointing to an absence of a lip tip. Illustrations from Miller (1968).



Figure 24. Left – Greenside Darter with white arrow pointing to the long nipple-like formation on the upper lip; Right – Tuckasegee Darter with white arrow pointing to an absence of the lip tip.



Figure 25. The three species of greensided darters in North Carolina.

30a. Snout very blunt (Figure 26). Frenum narrow, sometimes obscured by a crease. Opercle and anterior belly well scaled, cheek at least partially scaled. Restricted to lower French Broad and Nolichucky basinsSnubnose Darter, *Etheostoma simoterum*

30b. Snout not blunt. Frenum broad. Opercle, cheek, and anterior belly naked (except in Banded Darter). Not restricted to lower French Broad and Nolichucky basins 31



Figure 26. Snubnose Darter with white arrow pointing to the blunt snout. Photograph courtesy of David Neely.

31a. Sides with narrow greenish bars with posterior bars encircling the caudal peduncle (Figure 27). Opercle and cheeks at least partially scaled Banded Darter, *Etheostoma zonale*

31b. Posterior bars not usually encircling caudal peduncle. Opercle and cheeks naked 32



Figure 27. Banded Darter.

32a. Nape usually well scaled. Spinous dorsal fin 12-14. Restricted to the New basin (Figure 28) Kanawha Darter, *Etheostoma kanawhae*

32b. Nape with embedded scales near head. Spinous dorsal 10-13 (9-13). Not found in the New basin 33



Figure 28. Kanawha Darter.

- 33a. Spinous dorsal fin with an orange basal band (Figure 29). Belly fully scaled. Ranged restricted to the Nolichucky, French Broad, and Pigeon basins Swannanoa Darter, *Etheostoma swannanoa*
- 33b. Spinous dorsal fin without an orange basal band. Belly partially scaled. Ranged restricted to the Savannah, Broad, or the Catawba basins 34

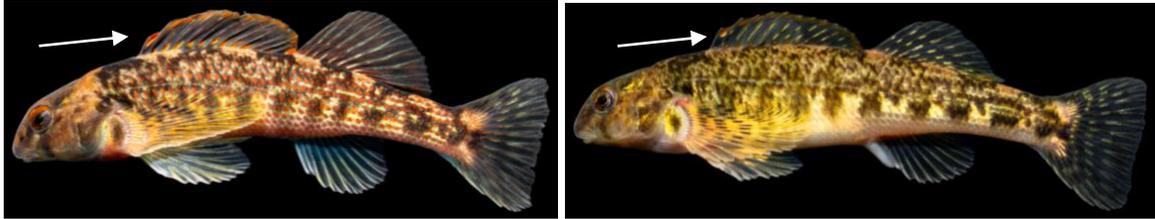


Figure 29. Swannanoa Darter with white arrows pointing to the spinous dorsal fin with an orange basal band.

- 34a. Dark saddles 7 (6 or 7). Sides of body without horizontal lines formed by red dots (Figure 30). Belly fully scaled anteriorly. Range restricted to the Catawba and Broad basins Seagreen Darter, *Etheostoma thalassinum*
- 34b. Dark saddles 5 (5 or 6). Males with horizontal lines of red dots (Figure 30). Belly naked anteriorly. Range restricted to the Savannah basin Turquoise Darter, *Etheostoma inscriptum*



Figure 30. Left – Seagreen Darter; Right – Turquoise Darter.

- 35a. Gill membranes broadly joined, 100-110° angle (Figure 31). Caudal fin rounded (Figure 32). Range restricted to the Roanoke basin Riverweed Darter, *Etheostoma podostemone*
- 35b. Gill membranes narrowly joined, 55-75° angle (Figure 31). Caudal fin emarginate to truncate. Range not restricted to the Roanoke basin 36

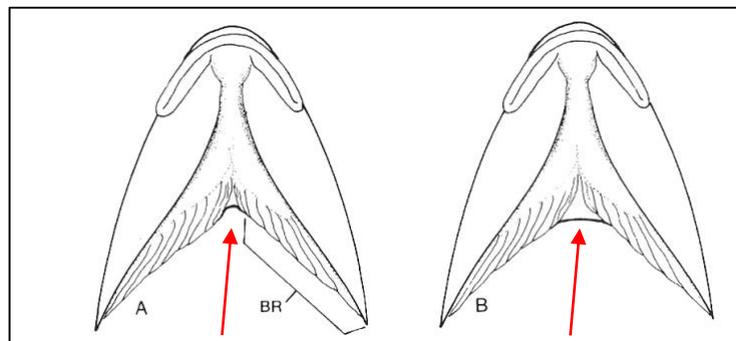


Figure 31. Left – Arrow pointing to gill membranes narrowly joined; Right – Arrow pointing to gill membranes broadly joined.



Figure 32. Riverweed Darter.

- 36a. Anal rays 8 or 9 (7-10). Lateral line scales 60-62 (58-66). Nape and cheek well scaled. Range restricted to Lake Waccamaw and Waccamaw River downstream of the lake (Figure 33) Waccamaw Darter, *Etheostoma perlongum*
- 36b. Anal rays 7 or 8 (7-10). Lateral line scales 39-54. Nape and cheek naked or poorly scaled. Range not restricted to Lake Waccamaw and Waccamaw River downstream of the lake 37



Figure 33. Waccamaw Darter.

- 37a. Anal spines 1. Infraorbital canal incomplete (Figure 34). Range restricted to upper Roanoke, Tar, and Neuse basins (Figure 35) Johnny Darter*, *Etheostoma nigrum*
- 37b. Anal spines 2 from Cape Fear basin west, anal spines 1 east of the Cape Fear basin. Infraorbital canal normally complete (Figure 34), often incomplete in Cape Fear basin (Figure 35). Widespread Tessellated Darter*, *Etheostoma olmstedi*

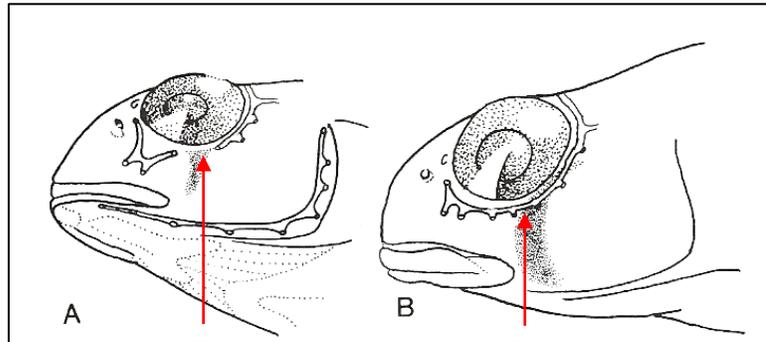


Figure 34. Left –Arrow pointing to the incomplete infraorbital canal in Johnny Darter; Tessellated Darter; Right – Arrow pointing to the complete infraorbital canal in Tessellated Darter.

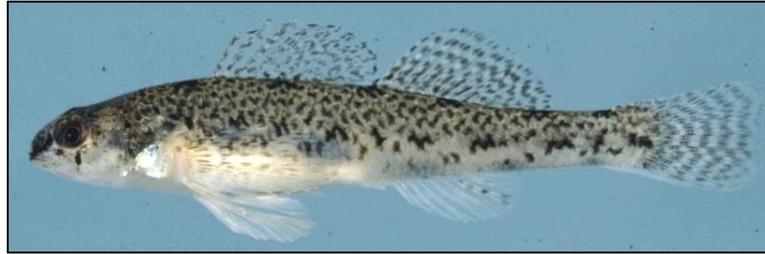


Figure 35. Top – Johnny Darter; Bottom – Tessellated Darter. Johnny Darter picture courtesy of the Roanoke College Fish Collection: <https://library.artstor.org/#/collection/87731240>.

¹Excluding Blueside Darter, *Etheostoma jessiae*, and Sickle Darter, *Percina williamsi*, which are extirpated from North Carolina.

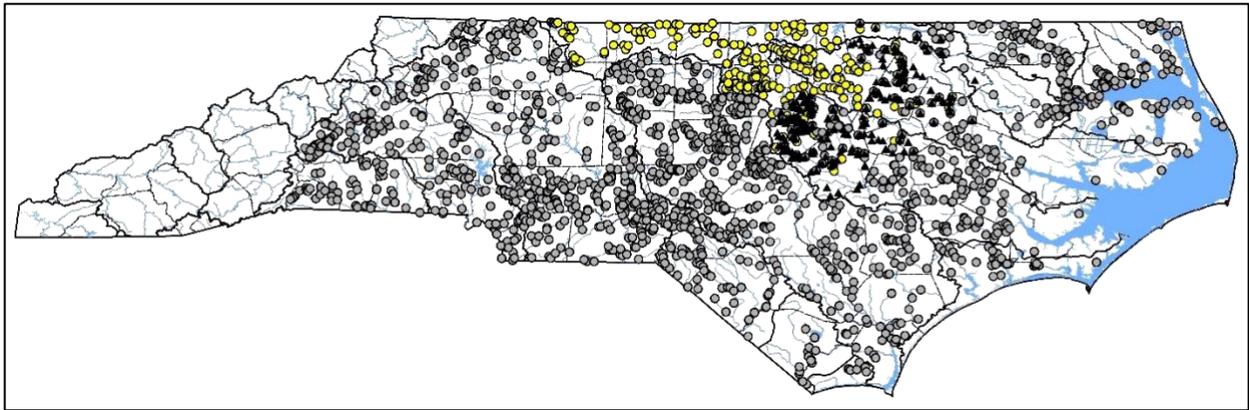
²Identification key adapted from Blanton and Schuster (2008), Menhinick (1991), Miller (1968), Piller and Bart (2017), and Rohde et al. (2009).

³Permission to use Figures 73 (page 760), 78 (page 763), and 81 (page 766) in Jenkins, and Burkhead (1994) was granted by the American Fisheries Society, October 19, 2020.

⁴Permission to use Figures 160-1 to 160-6 (page 160) in Menhinick (1991) was granted by the North Carolina Wildlife Resources Commission, November 10, 2020.

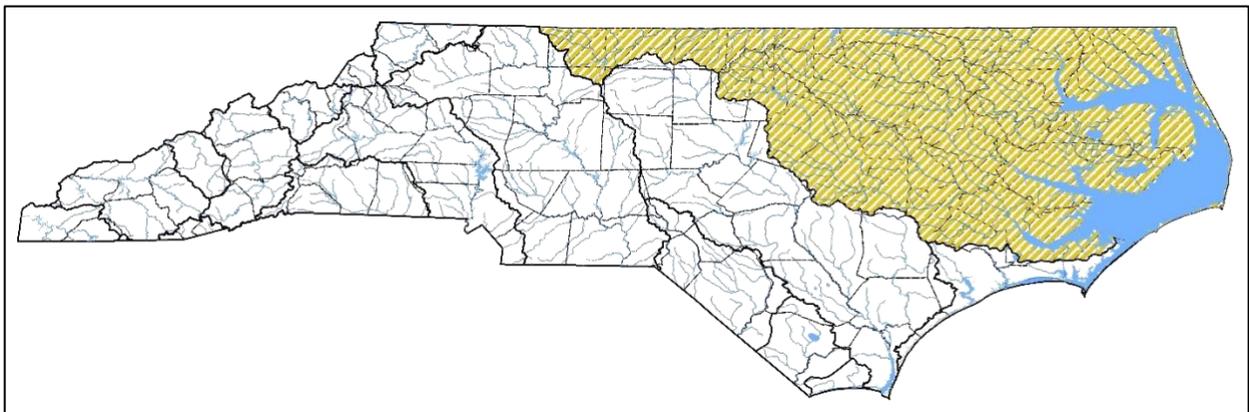
***Notes on the *Etheostoma nigrum*, Rafinesque, 1820, Johnny Darter, and *Etheostoma olmstedii*, Storer, 1842, Tessellated Darter.**

The taxonomic status of these two species has been unsettled for a long time (e.g., Cole 1967). Johnny Darter in North Carolina is found primarily upstream from the Fall Zone in the Piedmont regions of the Roanoke, Tar, and Neuse basins (Menhinick 1991). It is at the southeastern limit of its range in Atlantic slope streams in North Carolina (Bruner 1980). Tessellated Darter in North Carolina is found in all river basins east of the Mountains with an introduced population in the New basin (Cole 1967; Lee and McAllister 1980; Menhinick 1991). As currently understood (Menhinick 1991), the two species are sympatric near the Fall Zone along the eastern Piedmont and western Coastal Plain in the Neuse, Tar, and Roanoke basins and are often referred to as *Etheostoma* spp., *Etheostoma nigrum* complex, *Etheostoma olmstedii* complex, or *Etheostoma* sp. cf. *nigrum/olmstedii* (Map 1).



Map 1. Distribution of *Etheostoma nigrum*, Johnny Darter (yellow dots), *Etheostoma olmstedii*, Tessellated Darter (gray dots), and *Etheostoma* sp. cf. *nigrum/olmstedii* (black triangles). Map originally appeared in Tracy et al. (2020).

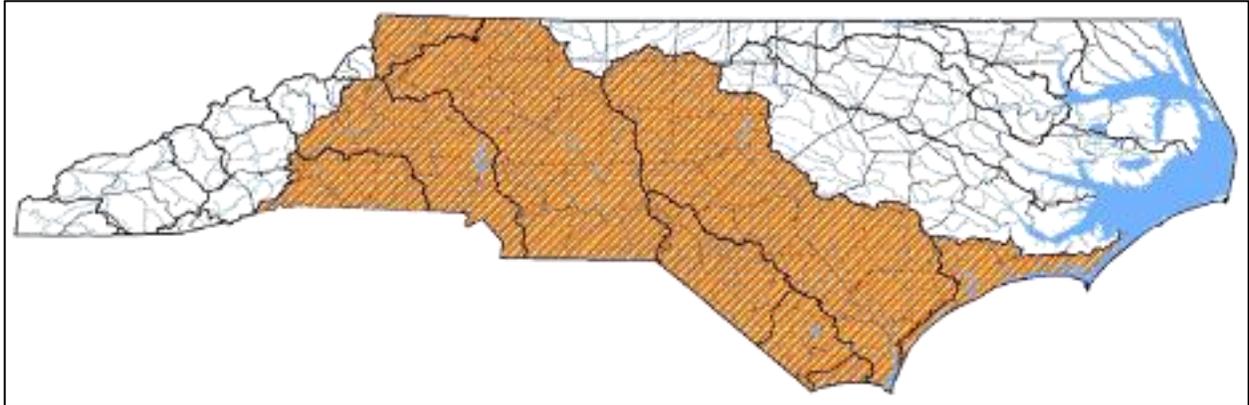
This species complex is currently being unraveled by Dr. Daniel MacGuigan (MacGuigan 2020). Dr. MacGuigan believes that an undescribed species, *E. sp. cf. olmstedii*, rather than *E. nigrum*, is found in the Roanoke, Tar, Neuse, Chowan, and Albemarle basins (Map 2).



Map 2. Proposed distribution of *Etheostoma* sp. cf. *olmstedii* (Daniel MacGuigan pers. comm.).

Dr. MacGuigan also proposes to elevate a subspecies of Tessellated Darter, *E. o. maculaticeps*, that was described by Edward Drinker Cope as *Boleosoma maculaticeps* and which was: "common in the upper waters of the Catawba River, N. Carolina" (Cope 1870a; 1870b). Currently, it is found throughout the Yadkin, Catawba, and Broad basins. The indigenous range of *E. maculaticeps* in North Carolina will include

the White Oak basin westward to the eastern slope of the Appalachian Mountains, and a nonindigenous introduction in the Little River system in the New basin (earliest vouchered specimens from 1979) (Map 3).



Map 3. Proposed distribution of *Etheostoma maculiceps* (Cope) (Daniel MacGuigan, pers. comm.).

Glossary

(Adapted from Jenkins and Burkhead (1994) and Rohde et al. (2009))

Basicaudal Spot – Spot at the base of the caudal fin

Branchiostegal Rays – One of the elongated and flattened bones that support the gill membranes ventral to the operculum

Caudal Peduncle – Narrow posterior part of a fish that connects the tail to the body

Chin Bar – Pigmented rectangular-shaped bar between the halves of the lower lip

Emarginate – Usually referring to the caudal fin having a notched fin margin

Embedded Scales – Scales that are not obvious owing to deep embedment in or full covering by skin

Frenum – Fleishy bridge or connection between the snout and the upper lip

Infraorbital canal – The pored canal passing just below the eye; part of the *cephalic lateralis* system

Interpelvic Area – The area between the pelvic fins

Interradial Membranes – Membranes between rays in the fins

Nape – The dorsal area between the posterior end of the head (occiput) and the dorsal fin

Preopercle – I-shaped bone located on the front portion of the gill cover and forming the posterior boundary of the cheek

Serrate – With a sawtooth edge

Soft Dorsal Fin – The posterior soft-ray dorsal fin

Spinous Dorsal Fin – The anterior spine-supported dorsal fin

Subocular Bar – A vertical or slightly oblique dark bar beneath the eye; often termed a suborbital bar

Villi (singular villus) – Small, narrow, fleshy growths

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The Meanings of the Scientific Names of Darters and Perches

(Adopted from Jenkins and Burkhead (1994) and Rohde et al. (2009))

Family Percidae Rafinesque 1815 – Perc-, from *Perca*, meaning “perch”. When resting on the bottom, these fishes often are propped (perched) by the pelvic fins

1. ***Etheostoma* Rafinesque 1819** – *Etheostoma*, meaning “various mouth”, was coined for differences in mouth size and position among the few species known to Rafinesque
 - i. ***Etheostoma acuticeps* Bailey, 1959** – *Acuticeps* means “sharp head”
 - ii. ***Etheostoma blennioides* Rafinesque, 1819** – *Blennioides* means “blenny-like”, referring to the similarity in form to many of the small marine blennies
 - iii. ***Etheostoma brevispinum* (Coker, 1926)** – *Brevispinum*, means “short spines” referring to the short spines of the spinous dorsal fin
 - iv. ***Etheostoma chlorbranchium* Zorach, 1972** – *Chlorbranchium* – means “green-arm” – referring to the green fins of adult males
 - v. ***Etheostoma collis* (Hubbs and Cannon, 1935)** – *Collis*, means “hill” for living in the Piedmont
 - vi. ***Etheostoma flabellare* Rafinesque, 1819** – *Flabellare*, means “fanlike”, applies to the rounded, expansive, strongly patterned tail of the adult males
 - vii. ***Etheostoma fusiforme* (Girard, 1854)** – *Fusiforme* means “spindle-shaped” – refers to its body form
 - viii. ***Etheostoma gutselli* (Hildebrand, 1932)** – *Gutselli* – named after Dr. James S. Gutsell, collector of the species and associate aquatic biologist with the U.S. Bureau of Fisheries
 - ix. ***Etheostoma inscriptum* (Jordan and Brayton, 1878)** – *Inscriptum* means “written-on”, referring to the markings present on the side of the mature males
 - x. ***Etheostoma kanawhae* (Raney, 1941)** – *Kanawhae* is based on the Kanawha River, the lower continuation of the New River in West Virginia
 - xi. ***Etheostoma mariae* (Fowler, 1947)** – *Mariae* – named after the wife of Mr. Emlen P. Darlington, whose generous sponsorship resulted in the discovery of this species by Henry W. Fowler
 - xii. ***Etheostoma nigrum* Rafinesque, 1820** – Rafinesque apparently had studied a nuptial male when he named *E. nigrum* as “black”
 - xiii. ***Etheostoma olmstedi* Storer, 1842** – For its discoverer, the naturalist Charles Olmstead
 - xiv. ***Etheostoma perlongum* (Hubbs and Raney, 1946)** – *Perlongum* signifies extremely long, referring to the darter’s long body
 - xv. ***Etheostoma podostemone* Jordan and Jenkins, 1889** – *Podostemone* is derived from *Podostemum*, a genus of Riverweed, a filamentous vascular aquatic plant which it occasionally associates.
 - xvi. ***Etheostoma rufilineatum* (Cope, 1870)** – *Rufilineatum* means “red-lined”
 - xvii. ***Etheostoma serrifer* (Hubbs and Cannon, 1935)** – *Serrifer* means “saw-bearing”, from the serrate edge of the preopercle
 - xviii. ***Etheostoma simoterum* (Cope, 1868)** – *Simoterum* means “snubnose”
 - xix. ***Etheostoma swannanoa* Jordan and Evermann, 1889** – *Swannanoa* was named after the Swannanoa River in Buncombe County, North Carolina
 - xx. ***Etheostoma thalassinum* (Jordan and Brayton, 1878)** – *Thalassinum* means “sea green”
 - xxi. ***Etheostoma vitreum* (Cope, 1870)** – *Vitreum* means “glassy”
 - xxii. ***Etheostoma vulneratum* (Cope, 1870)** – *Vulneratum* means “wounded” – is an analogy of the red spots on the body and fins to droplets of blood
 - xxiii. ***Etheostoma zonale* (Cope, 1868)** – *Zonale* means “banded”

2. **Perca Linnaeus 1758** – *Perca*, the old Latin word for “perch”
 - i. ***Perca flavescens* (Mitchill, 1814)** – *Flavescens*, “yellowish”, describes a dominant base color

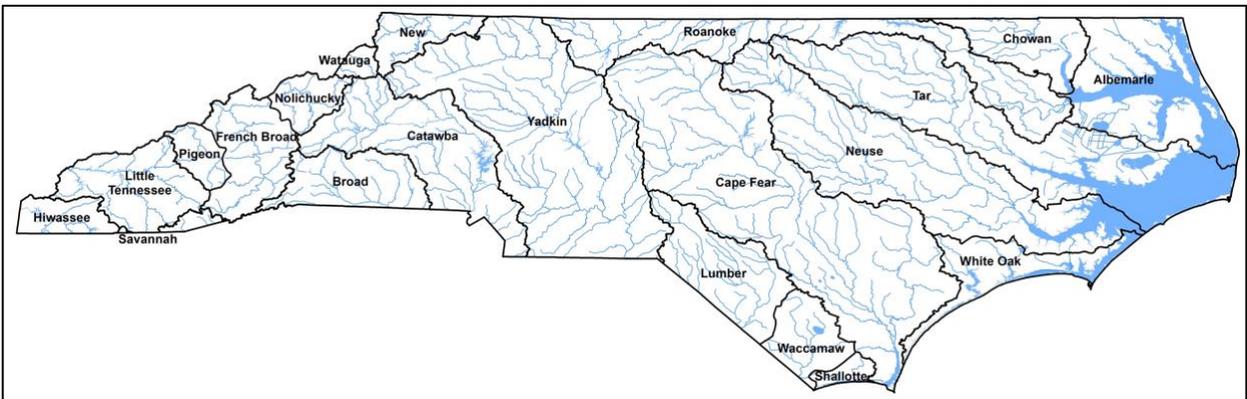
 3. **Percina Haldeman 1842** – *Percina*, diminutive for *Perca*, means “little perch”.
 - i. ***Percina aurantiaca* (Cope, 1868)** – *Aurantiaca*, means “orange-colored”
 - ii. ***Percina burtoni* Fowler, 1945** – *Burtoni*, for E. Milby Burton, former Director of the Charleston Museum, who caught the holotype
 - iii. ***Percina caprodes* (Rafinesque, 1818)** – *Caprodes* means “like a pig”, from the prominent snout that often is fleshy, upturned, and blunt
 - iv. ***Percina crassa* (Jordan and Brayton, 1878)** – *Crassa* connotes the “thick” body form
 - v. ***Percina evides* (Jordan and Copeland, 1877)** – *Evides* means “comely”
 - vi. ***Percina gymnocephala* Beckham, 1980** – *Gymnocephala* means “naked (unscaled) head”
 - vii. ***Percina nevisense* (Cope, 1870)** - In the book *American Darters*, Keuhne and Barber (1983) stated that *nevisense* means “birthmark,” probably referring to lateral blotches which Edward D. Cope, the species’ author, described as “dark chestnut quadrate spots” on sides. However, Christopher Scharpf believes that the most telling clue is the suffix *-ense*, neuter of *-ensis*, connoting place. Since *Etheostoma* is neuter, *-ense* makes sense. Cope described the species from one specimen from the Neuse River (in Wake County), so maybe Cope latinized the “u” to “v” (classical Latin used “v” for “u”) and maybe added the “r” for euphony (pers. comm. Christopher Scharpf to Fritz Rohde, May 25, 2020).
 - viii. ***Percina oxyrhynchus* (Hubbs and Raney, 1939)** – *Oxyrhynchus* means “sharp nose”
 - ix. ***Percina rex* (Jordan and Evermann, 1889)** – *Rex*, Jordan and Evermann (1889) crowned this darter *rex* – “king”
 - x. ***Percina roanoka* (Jordan and Jenkins, 1889)** – *Roanoka* refers to the Roanoke River, from which it was described
 - xi. ***Percina squamata* (Gilbert and Swain, 1887)** – *Squamata* means scaly
 - xii. ***Percina westfalli* (Fowler, 1942)** – *Westfalli* – named after Minter J. Westfall, Jr., collector of the species

 4. **Sander Oiken, 1817** – *Sander* (sand-er) refers to the German common name for the European relative of Walleye ([Fishes of Minnesota](#))
 - i. ***Sander canadensis* (Griffith and Smith, 1834)** – *Canadensis*, “of Canada”, referring to the provenance of the first-described specimens.
 - ii. ***Sander vitreus* (Mitchill, 1818)** – *Vitreus* meaning “glassy”, referring to the clarity of the large cornea of living fish.
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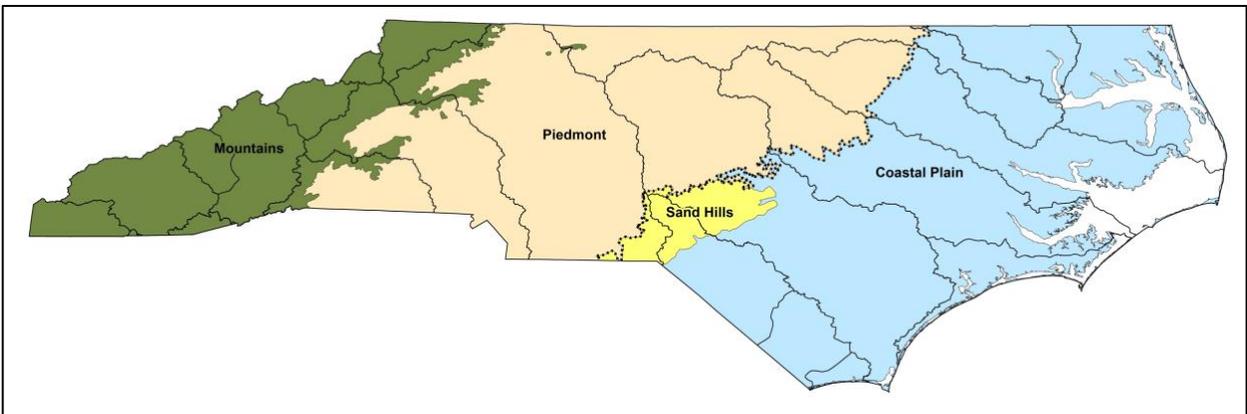
Supplemental Maps



Map No. 1. North Carolina's 100 counties. Map originally appeared in Tracy et al. (2020).



Map No. 2. North Carolina's 21 river basins. Map originally appeared in Tracy et al. (2020).



Map No. 3. North Carolina's four physiographic regions. Map originally appeared in Tracy et al. (2020).