

Sunfish (Family Centrarchidae) Diversity in North Carolina

There are 23 species of sunfishes in North Carolina (Table 1), including one undescribed species, “Bartram’s” Bass and one species, Redeye Bass, found in only the Hiwassee River basin (Tracy et al. 2020). You might have heard people calling them Stumpknocker, Bream, Goggeye, Robin, Perch, Shellcracker, Bronzeback, Kentucky Bass, Welshman, Tinmouth, Sac-a-lait, or many other colloquial names. But each species has an American Fisheries Society-accepted common name (Page et al. 2013) and a scientific (Latin) name (Table 1; Appendix 1).

Sunfishes are found throughout our state from the Mountains to the Sand Hills to the Coastal Plain in reservoirs, creeks, large and small rivers, swamps, channelized streams, and permanent wetlands. They can be found in cool, gin-clear Mountain streams to warm and turbid Piedmont streams to low pH, tannin (tea)-colored Sand Hills and Coastal Plain streams. Sunfishes are generally found in deep pools or slow-moving runs, snags, or beneath undercut banks. They even blend in with their surroundings where submersed aquatic plants are plentiful. One can find some species of sunfishes thriving even in some of our most degraded urban streams.

Table 1. Species of sunfishes found in North Carolina. Common name enclosed within tick marks (“”) is a scientifically undescribed species.

Scientific Name/ American Fisheries Society Accepted Common Name	Scientific Name/ American Fisheries Society Accepted Common Name
<i>Acantharchus pomotis</i> - Mud Sunfish	<i>Lepomis marginatus</i> - Dollar Sunfish
<i>Ambloplites cavifrons</i> - Roanoke Bass	<i>Lepomis microlophus</i> - Redear Sunfish
<i>Ambloplites rupestris</i> - Rock Bass	<i>Lepomis punctatus</i> - Spotted Sunfish
<i>Centrarchus macropterus</i> - Flier	<i>Micropterus coosae</i> - Redeye Bass
<i>Enneacanthus chaetodon</i> - Blackbanded Sunfish	<i>Micropterus dolomieu</i> - Smallmouth Bass
<i>Enneacanthus gloriosus</i> - Bluespotted Sunfish	<i>Micropterus henshalli</i> - Alabama Bass
<i>Enneacanthus obesus</i> - Banded Sunfish	<i>Micropterus punctulatus</i> - Spotted Bass
<i>Lepomis auritus</i> - Redbreast Sunfish	<i>Micropterus salmoides</i> - Largemouth Bass
<i>Lepomis cyanellus</i> - Green Sunfish	<i>Micropterus</i> sp. "Bartram's" Bass -
<i>Lepomis gibbosus</i> - Pumpkinseed	<i>Pomoxis annularis</i> - White Crappie
<i>Lepomis gulosus</i> - Warmouth	<i>Pomoxis nigromaculatus</i> - Black Crappie
<i>Lepomis macrochirus</i> - Bluegill	

Sunfishes range in size from the petite *Enneacanthus* species (Bluespotted, Banded, and Blackbanded sunfishes) who are less than four inches in length to the big-bellied “hawgs” of the Black Basses who approach 30 inches in length. Most people are familiar with sunfishes because they are recreationally important sport and gamefish.

Each of North Carolina’s 100 counties has at least one species of sunfish found within its borders and there are three species, Redbreast Sunfish, Bluegill, and Largemouth Bass, that can be found in each of North Carolina’s 21 river basins. Historically, 19 species called North Carolina home with the Cape Fear, Lumber, Waccamaw, and Shallotte River basins having the most diverse faunas, each having 13 of the 19 indigenous (native) species. Some of our indigenous species were restricted to very specific river basins or physiographic regions. For example, Roanoke Bass was endemic to the Tar, Neuse, and Roanoke River basins and “Bartram’s” Bass was restricted to the Savannah River basin. Four species were found only west of the Appalachian Mountains – Smallmouth Bass, Spotted Bass, Rock Bass, and White Crappie; other species were found only east of these mountains – Redbreast Sunfish, Pumpkinseed, and Warmouth. Bluegill was not found north of the White Oak River basin; it was not indigenous to the Neuse, Tar, Roanoke, Chowan, or Albemarle River basins. Even today, Mud Sunfish, Flier, Bluespotted Sunfish, Blackbanded Sunfish, Banded Sunfish, Dollar Sunfish, and Spotted Sunfish are found almost exclusively in the Coastal Plain and Sand Hills. Historically, it is believed that Largemouth Bass was found in every basin, except for the New.

Our most diverse basin today is the Yadkin where 19 species are found, but 7 are nonindigenous (introduced). Our least diverse basins are the small headwater basins of the Savannah and Watauga where just six species are found in each basin and two of them are introduced. Despite widespread

introductions and stockings, the White Oak and Shallotte basins continue to have more than 90% of their original faunas intact. And because of their small size and unimportance as sportfish, seven species have never been introduced into other river basins – Mud Sunfish, Flier, Blackbanded Sunfish, Banded Sunfish, Bluespotted Sunfish, Dollar Sunfish, and Spotted Sunfish.

Because of their popularity as a sport fish, several species have been introduced, legally or illegally, outside their historical North Carolina ranges or have been imported into our state. In the New basin, unbelievably, no species of sunfishes were historically found; but today, all nine species which are found there are introduced – Rock Bass, Redbreast Sunfish, Green Sunfish, Pumpkinseed, Bluegill, Redear Sunfish, Smallmouth Bass, Largemouth Bass, and Black Crappie. Green Sunfish, Redear Sunfish, Redeye Bass, and Alabama Bass were not indigenous to North Carolina, but are now part of our fauna. Alabama Bass is North Carolina's most recent unauthorized introduced species and is now found in several of our Piedmont reservoirs and big rivers. One of the deleterious consequences of these widespread introductions is that several of the genera, e.g., *Lepomis*, *Ambloplites*, and *Micropterus* readily hybridize within their genus resulting in fish that are not "pure" species anymore. Hybrids of the Black Basses (Spotted, Largemouth, Smallmouth, and Alabama) are now common where the species co-occur. Hybrids of the endemic Roanoke Bass and introduced Rock Bass can now be found in the upper Roanoke basin and have displaced and genetically swamped the endemic Roanoke Bass.

Because all the species in the Family Centrarchidae are classified and managed as game species by the North Carolina Wildlife Resources Commission (NCWRC 2020a), none are considered imperiled in North Carolina (NCAC 2017; NCNHP 2020; NCWRC 2017). However, the North Carolina Natural Heritage Program has listed the Roanoke Bass, Blackbanded Sunfish, Banded Sunfish, and "Bartram's" Bass (listed as Redye Bass) as Significantly Rare (NCNHP 2020).

Key characteristics for their proper identification include the shape of the caudal and pectoral fins; the pattern of blotches along the lateral line; counts of anal and dorsal fin spines and lateral line scales; size of mouth; and overall color patterns. Most species can easily be told apart from one another, with the possible exceptions of Black Bass and *Ambloplites* hybrids and females and juveniles of Banded vs. Bluespotted sunfishes.

Identification Key to the Species of Sunfishes (Family Centrarchidae) in North Carolina

- 1a. Anal spines 3 (Figure 1)2
- 1b. Anal spines 5 or more (Figure 1)..... 18

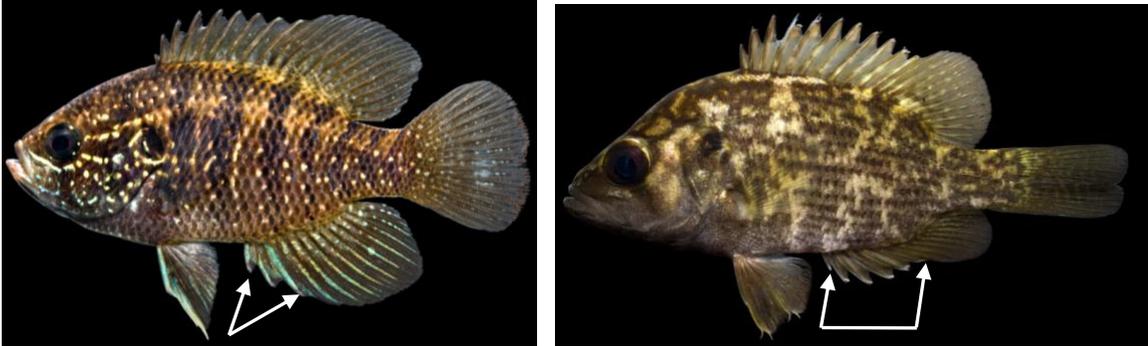


Figure 1. Left – Banded Sunfish showing three anal spines; Right – Roanoke Bass showing six anal spines.

- 2a. Body short and deep, not elongate. Dorsal fin not notched (appearing very slightly notched in Blackbanded Sunfish)3
- 2b. Body elongate. Dorsal fin moderately or deeply notched 13
- 3a. Caudal fin rounded4
- 3b. Caudal fin forked or emarginate6
- 4a. Dorsal fin with first 2 or 3 membranes black. 5 or 6 narrow black bars extending around the body with the first bar passing through the eye (Figure 2) Blackbanded Sunfish, [*Enneacanthus chaetodon*](#)
- 4b. Dorsal fin without first 2 or 3 membranes black; all dorsal membranes uniformly pigmented. Bars on sides brown and variable (Figure 2)5

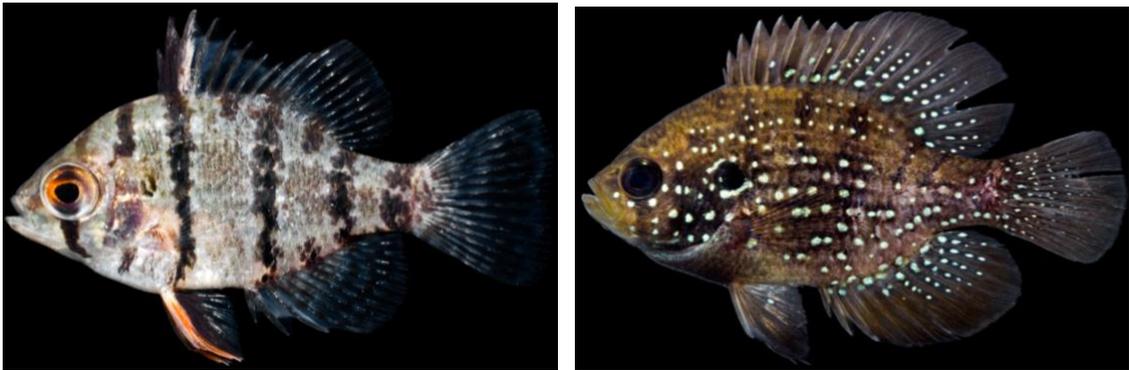


Figure 2. Left – Blackbanded Sunfish with 5 or 6 narrow black bars extending around the body with the first bar passing through the eye; Right – Bluespotted Sunfish with bars on sides brown and variable.

- 5a. Circumpeduncle scales (17) 19-22 (24). Body side pattern of adult male dominated by broad dark vertical bars. Opercular spot dark, large, and equal to or larger than eye. Iridescent color under the eyes is more or less a continuous crescent (Figure 3) Banded Sunfish, [*Enneacanthus obesus*](#)
- 5b. Circumpeduncle scales (14) 16-18 (20). Body side pattern of adult male dominated by many pale spots. Dark bars on side, if present, narrow and indistinct. Opercular spot dark, smaller in diameter than eye (Figure 3). Iridescent color under the eyes tends to be broken up into spots or short dashesBluespotted Sunfish, [*Enneacanthus gloriosus*](#)



Figure 3. Left - Banded Sunfish; Right – Bluespotted Sunfish.

- 6a. Gill rakers short, reduced to knobs (Figure 4). Mouth small, upper jaw not reaching even with pupil. Cheeks with numerous blue streaksDollar Sunfish, [*Lepomis marginatus*](#)
- 6b. Gill rakers medium to long, their length 2-10 times their width (Figure 4). Mouth and cheek color variable 7

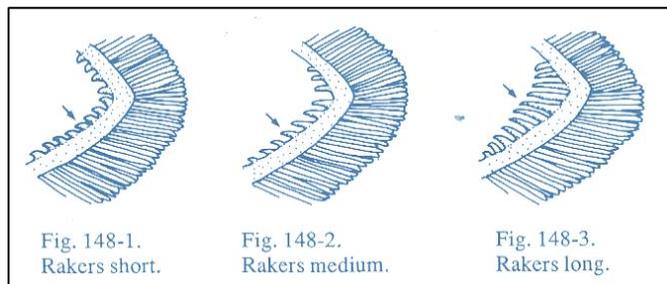


Figure 4. Top – Gill rakers; Bottom - Dollar Sunfish showing the upper jaw not reaching even with the pupil. Illustration courtesy of Menhinick (1991).

- 7a. Tongue with a small median patch of teeth. Mouth large, upper jaw reaching to a point below middle of the eye. Dark lines radiating back from eye usually wide and straight (Figure 5) Warmouth, [Lepomis gulosus](#)
- 7b. Tongue without a small median patch of teeth. Mouth small, except in Green Sunfish. Upper jaw not reaching to a point below middle of the eye. Lines radiating back from eye absent or narrow and irregular (Figure 5).....8



Figure 5. Left – Warmouth showing the upper jaw reaching to a point below middle of the eye; Right – Pumpkinseed showing the upper jaw not reaching to a point below middle of the eye.

- 8a. Dark basal spot or blotch present in posterior portion of soft dorsal fin (Figure 6)9
- 8b. Dark spot or blotch absent in posterior portion of soft dorsal fin..... 10
- 9a. Mouth large, upper jaw length greater than eye diameter. Pectoral fin rounded and short (Figure 6) Green Sunfish, [Lepomis cyanellus](#)
- 9b. Mouth small, upper jaw length about equal to eye diameter. Pectoral fin pointed and long (Figure 6) Bluegill, [Lepomis macrochirus](#)

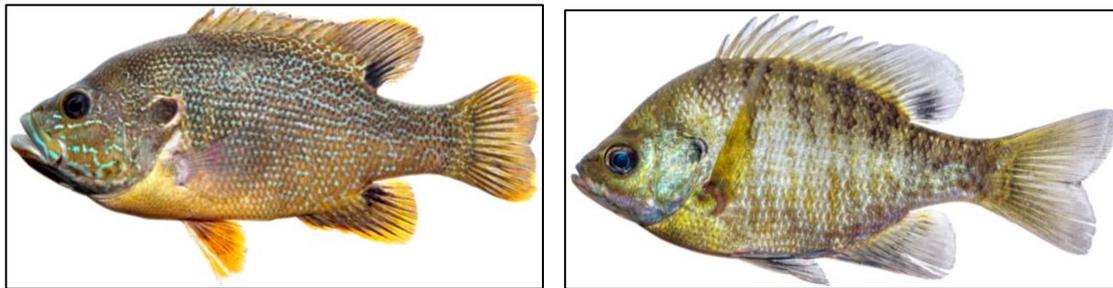


Figure 6. Left – Green Sunfish with a large mouth; Right – Bluegill with a small mouth.

- 10a. Pectoral fin long and pointed, tip extending past front of eye when fin is bent forward and pressed against head..... 11
- 10b. Pectoral fin short and rounded, the tip does not extend past the eye 12
- 11a. Body often with distinct pale spots encircled with dusky marks. Dorsal and anal fins mottled or spotted. Cheek and opercle with dusky wavy lines (Figure 7) Pumpkinseed, [Lepomis gibbosus](#)
- 11b. Body lacks distinct pale spots encircled with dusky marks. Dorsal and anal fins not mottled. Cheek and opercle lacking wavy lines (Figure 7)..... Redear Sunfish, [Lepomis microlophus](#)

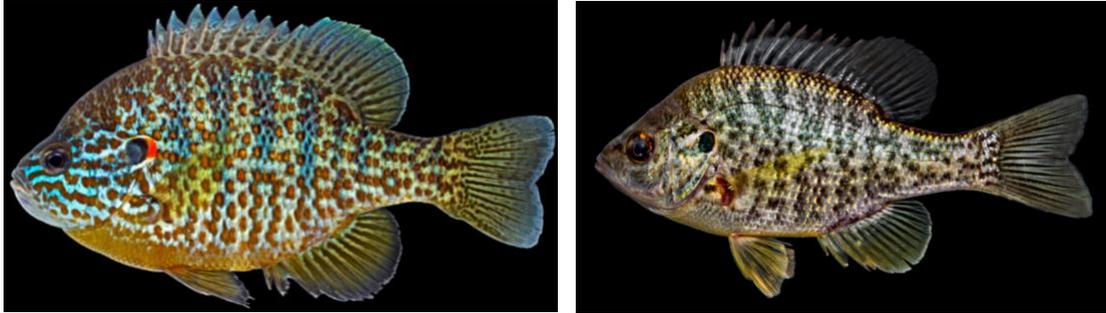


Figure 7. Left – Pumpkinseed with body with distinct pale spots encircled with dusky marks; Right – Redear Sunfish with body lacking distinct pale spots encircled with dusky marks.

- 12a. Mouth small, rear edge not reaching to front of eye. Sides of body with numerous black or brown spots. Opercular lobe short and stiff (Figure 8) Spotted Sunfish, [Lepomis punctatus](#)
- 12b. Mouth large, reaching to or beneath front of eye. Sides of body lacking black or brown spots. Opercular lobe long and fleshy (Figure 8) Redbreast Sunfish, [Lepomis auritus](#)



Figure 8. Left – Spotted Sunfish with numerous black or brown spots and short opercular lobe; Right – Redbreast Sunfish with body lacking black or brown spots and long opercular lobe.

- 13a. Dorsal fin deeply notched. Maxilla extends behind eye in adults (Figure 9). Base of anal and soft dorsal fins with no scales or with very few embedded scales. Tooth patch absent on the tongue
..... Largemouth Bass, [Micropterus salmoides](#)
- 13b. Dorsal fin shallowly notched. Maxilla does not usually extend behind eye in adults (Figure 9). Base of anal and soft dorsal fins with scales. Tooth patch present on the tongue..... 14

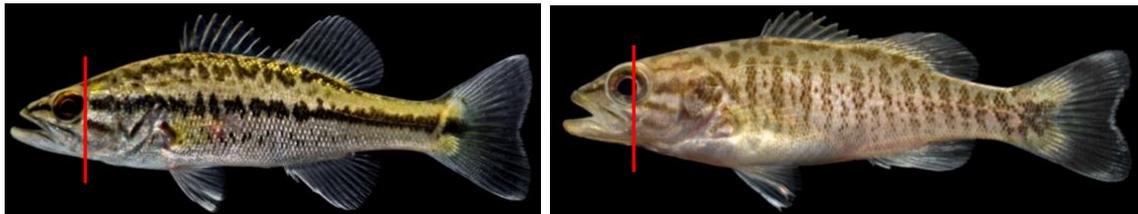


Figure 9. Left – Largemouth Bass juvenile showing the maxilla extending almost to behind the eye; Right – Smallmouth Bass juvenile showing the maxilla extending only to the middle of the eye.

- 14a. Dorsal soft rays 13-15 (very rarely 12). Anal soft rays 11 (occasionally 10 or 12). Pectoral rays 16-18 (almost never 15). Scales above later line 12 or 13 (rarely 11 or 14) (Figure 10)..... Smallmouth Bass, [Micropterus dolomieu](#)
- 14b. Dorsal soft rays 12 (infrequently 11 or 13). Anal soft rays 10 (occasionally 9 or 11). Pectoral rays 15 or 16 (rarely 14 or 17). Scales above later line 7-10 15



Figure 10. Smallmouth Bass with white arrows pointing to the location of key characteristics – dorsal soft rays, anal soft rays, pectoral rays, and scales above lateral line.

- 15a. Color pattern consisting chiefly of a lateral series of dark blotches which tend to be confluent, so as to form an irregular lateral stripe. Basal caudal spot and opercular spot prominent (Figure 11) ... 16
- 15b. Color pattern consisting principally of vertical dark bars which are frequently faint and always obscured with age, and on the caudal peduncle are often modified into light-centered rhomboids. Basal caudal spot not prominent (Figure 11) 17



Figure 11. Left – Spotted Bass with lateral series of dark blotches which tend to be confluent, so as to form an irregular longitudinal stripe; Right – *Micropterus* sp. “Bartram’s” Bass with color pattern consisting principally of vertical dark bars which are frequently faint and always obscured with age. Photographs courtesy of the North American Native Fishes Association (Spotted Bass) and David Neely (*Micropterus* sp. “Bartram’s” Bass).

- 16a. Lateral line scales 75 (68-84). Scales above lateral line 8 (7-9). Circumpeduncle scales 29 (26-32). A series of blotches on caudal peduncle (Figure 12)Alabama Bass, [Micropterus henshalli](#)
- 16b. Lateral line scales 65 (60-71). Scales above lateral line 7 (5-7). Circumpeduncle scales 25 (21-28). Solid dark line on caudal peduncle (Figure 12) Spotted Bass, [Micropterus punctulatus](#)



Figure 12. Left – Alabama Bass with white arrow pointing to a series of blotches on the caudal peduncle; Right – Spotted Bass with white arrow pointing to a solid dark line on the caudal peduncle. Photographs courtesy of David Neely (Alabama Bass) and North American Native Fishes Association (Spotted Bass).

- 17a. Blotches on posterior one-half of lateral side of body faint or diffuse. Fin rays of posterior portions of dorsal, caudal, anal and pectoral fins red. Known in North Carolina only from the Hiwassee River basin (Figure 13) Redeye Bass, [Micropterus coosae](#)
- 17b. Blotches on entire lateral side distinct. Fin rays of posterior portions of dorsal, caudal, anal and pectoral fins green or yellow-green, not red. Known in North Carolina only from the Savannah basin where it is indigenous and from the Green River in the Broad River basin where it is introduced (Figure 13)..... [Micropterus sp. “Bartram’s” Bass](#)



Figure 13. Left – Redeye Bass with blotches on posterior one-half of side of body diffuse; Right – *Micropterus* sp. “Bartram’s” Bass with distinct blotches on the side. Photographs courtesy of Brian Zimmerman (Redeye Bass) and David Neely (*Micropterus* sp. “Bartram’s” Bass).

- 18a. 2 or 3 dark, broad stripes radiating posteriorly from the eye (Figure 14). Anal base short, 1.5–2 times in dorsal fin base 19
- 18b. Dark, broad stripes not radiating posteriorly from the eye. Anal base long, 1-1.2 times in dorsal fin base..... 21
- 19a. Caudal fin rounded. Anal spines 5. Body dark green, with 2-3 dark stripes radiating posteriorly from the eye (Figure 14). Scales cycloid.....Mud Sunfish, [Acantharchus pomotis](#)
- 19b. Caudal fin emarginate. Anal spines 6 (5). Body olivaceous, with a dark spot on each scale forming rows of dark dots between light stripes. Scales ctenoid 20



Figure 14. Left – Mud Sunfish with 2 or 3 postocular bands and rounded caudal fin; Right – Rock Bass with an emarginate caudal fin.

- 20a. Cheek fully scaled, the scales medium-sized and slightly or moderately embedded, the posterior margins obvious. Body lacking distinct round pale spots, although vague pale areas may be present. Anal fin of adult dark-margined (Figure 15) Rock Bass, [Ambloplites rupestris](#)
- 20b. Cheek naked or partly scaled, the scales tiny or small and much embedded. Body often with distinct round pale spots. Anal fin of adult not dark-margined (Figure 15)
Roanoke Bass, [Ambloplites cavifrons](#)



Figure 15. Left – Rock Bass; Right – Roanoke Bass.

- 21a. Dorsal spines 11-13. Anal spines 7 or 8. Body often greenish, each scale with black or brown spot forming horizontal rows of dark dots on sides. Young with a dark blotch on posterior base of dorsal fin (Figure 16)Flier, [Centrarchus macropterus](#)
- 21b. Dorsal spines 5-8. Anal spines 5 or 6. Body light with dark spots, spots on sides not in horizontal rows (Figure 16) 22

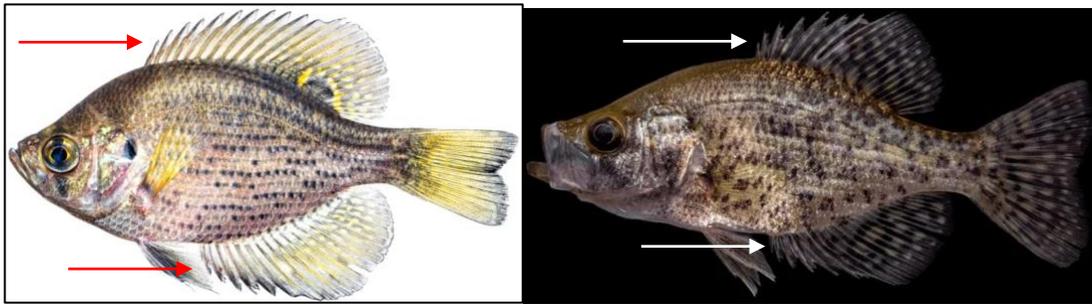


Figure 16. Left – Flier with red arrows pointing to 11-13 dorsal spines and 7 or 8 anal spines; Right – Black Crappie with white arrows pointing to 5-8 dorsal spines and 5 or 6 anal spines.

- 22a. Dorsal spines (6) 7 or 8. Length of dorsal fin base equal to or greater than distance from first dorsal spine to center of eye. Sides with irregularly arranged dark flecks or small blotches (Figure 17) Black Crappie, [Pomoxis nigromaculatus](#)
- 22b. Dorsal spines 5 or 6 (7). Length of dorsal fin base less than distance from first dorsal spine to center of eye. Sides with dark flecks tending to form vertical bars (Figure 17)
White Crappie, [Pomoxis annularis](#)

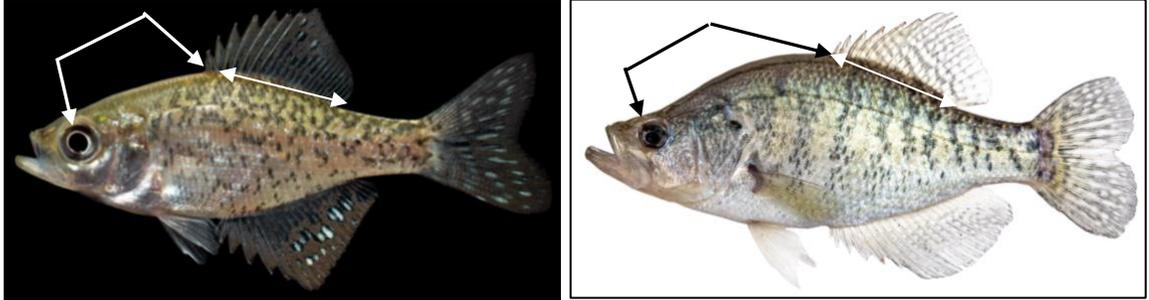


Figure 17. Left – Black Crappie with white arrows pointing to the length of the dorsal fin base equal to or greater than the distance from first dorsal spine to center of eye; Right – White Crappie with black and white arrows pointing to the length of dorsal fin base less than the distance from first dorsal spine to center of eye.