What do Wynken, Blynken, and Nod have to do with North Carolina's Herring Diversity (Family Clupeidae and Dussumieriidae)?[1]
By the NCFishes.com Team
(Written by Bryn. H. Tracy)

I grew up with this children's poem, "Wynken, Blynken, and Nod", written by Eugene Field (1850-1895, published 1889), as have my two daughters and now my grandson. I often visited Eugene Field's house, now a historical site, growing up in St. Louis, MO and memorized his poem at an early age. Only many, many years later would I realize that there are actually herring fish that live in the deep blue sea and other places, and I am still able to recite this poem:

> "Wynken, Blynken, and Nod one night sailed off in a wooden shoe, sailed on a river of crystal light into a sea of dew. "Where are you going, and what do you wish?" The old moon asked the three. "We have come to fish for the herring-fish that live in this beautiful sea; nets of silver and gold have we," said Wynken, Blynken, and Nod.
>
> The old moon laughed and sang a song, as they rocked in the wooden shoe; and the wind that sped them all night long ruffled the waves of dew. The little stars were the herring-fish that lived in the beautiful sea. Now cast your nets wherever you wish, never afraid are we!" so cried the stars to the fishermen three, Wynken, Blynken, and Nod.
>
> All night long their nets they threw to the stars in the twinkling foam, - Then down from the skies came the wooden shoe, bringing the fishermen home: 'Twas all so pretty a sail, it seemed as if it could not be; and some folk thought 'twas a dream they'd dreamed of sailing that beautiful sea; but I shall name you the fishermen three: Wynken, Blynken, and Nod.
>
> Wynken and Blynken are two little eyes, and Nod is a little head, and the wooden shoe that sailed the skies is a wee one's trundle-bed. So shut your eyes while Mother sings of wonderful sights that be, and you shall see the beautiful things as you rock in the misty sea, where the old shoe rocked the fishermen three: - Wynken, Blynken, and Nod."

To my wonder later on, I learned that North Carolina is home to 13 species of herrings (Table 1). But you may know only the more common ones such as American Shad, Hickory Shad, Alewife, Blueback Herring, Atlantic Menhaden, Gizzard Shad, and Threadfin Shad. Few people, except for perhaps some fishermen along the coast, have ever heard of or seen Round Herring, Yellowfin Menhaden, Atlantic Herring, Scaled Sardine, Atlantic Thread Herring, or Spanish Sardine.

Table 1. Species of herrings found in or along the coast of North Carolina.

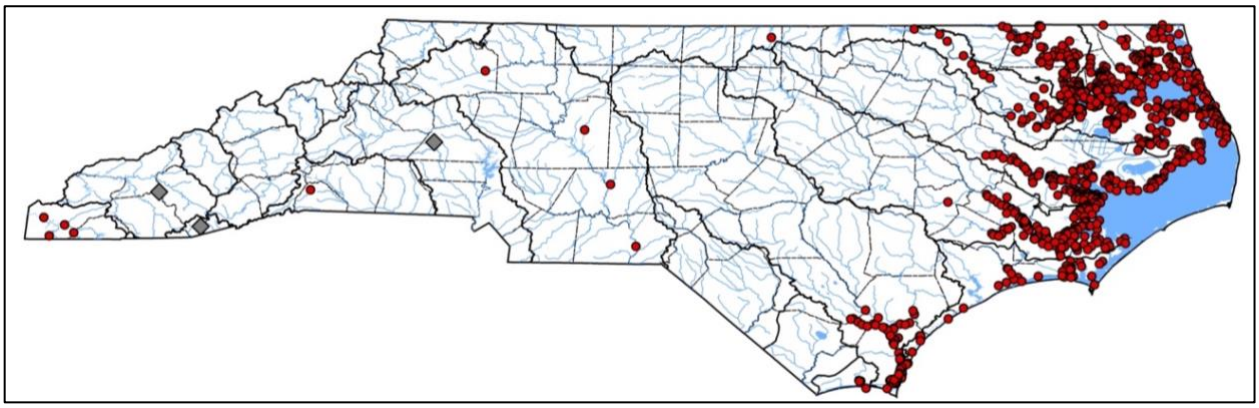
Scientific Name/ American Fisheries Society Accepted Common Name	Scientific Name/ American Fisheries Society Accepted Common Name
Alosa aestivalis, Blueback Herring	*Dorosoma cepedianum,* Gizzard Shad
Alosa mediocris, Hickory Shad	*Dorosoma petenense,* Threadfin Shad
Alosa pseudoharengus, Alewife	*Etrumeus sadina*, Round Herring[1]
Alosa sapidissima, American Shad	*Harengula jaguana,* Scaled Sardine
Brevoortia tyrannus, Atlantic Menhaden	*Opisthonema oglinum*, Atlantic Thread Herring
Brevoortia smithi, Yellowfin Menhaden	*Sardinella aurita,* Spanish Sardine
Clupea harengus, Atlantic Herring	

[1] Until recently, Round Herring, *Etrumeus sadina* (previously known as *E. teres*), was placed, along with all the other clupeids found in North Carolina, in the Family Clupeidae. Fish taxonomists now place this species in the Family Dussumieriidae.

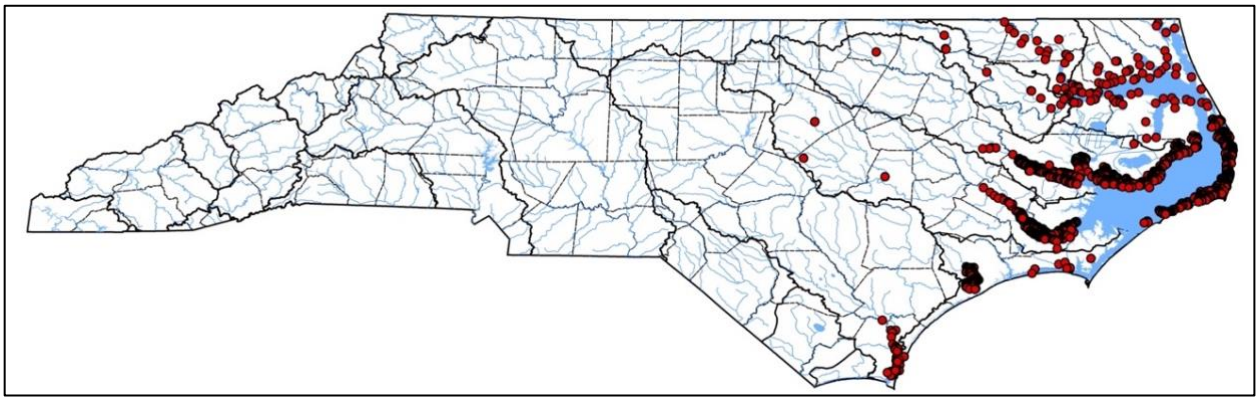
Alewife and Blueback Herring are often referred to as "River Herring"; other colorful names applied to this family of fishes include glut herring, bigeye herring, nanny shad, stink shad, or just plain "shad". As we have learned, each species has its own scientific (Latin) name which actually means something (please refer to The Meanings of the Scientific Names of Herring, pages 16 and 17) along with an American Fisheries Society-accepted common name (Page et al. 2013).

[1] This blog post is an update to Scott A. Smith's original blog posting on Shad Identification, dated June 16, 2015 (https://ncfishes.com/shad-identification/).

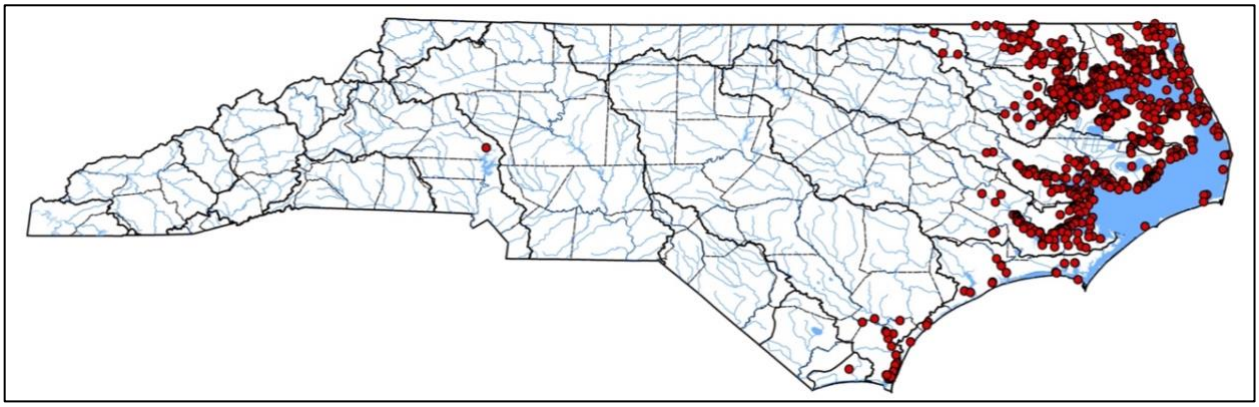
Herring occur across the state in freshwater and saltwater environments, but especially in many of our reservoirs, coastal rivers, estuaries, and offshore (Tracy et al. 2020; NCFishes.com [Please note: Tracy et al. (2020) may be downloaded for **free** at: https://trace.tennessee.edu/sfcproceedings/vol1/iss60/1.] Most species are found along the coast (Maps 1-13), but Gizzard Shad is our most widely distributed species found in all basins, except for the New, Watauga, and Savannah (Map 6). [Note: see Supplemental Maps 1-3 , page 19, showing North Carolina's 100 counties, 21 river basins, and 4 physiographic regions.]



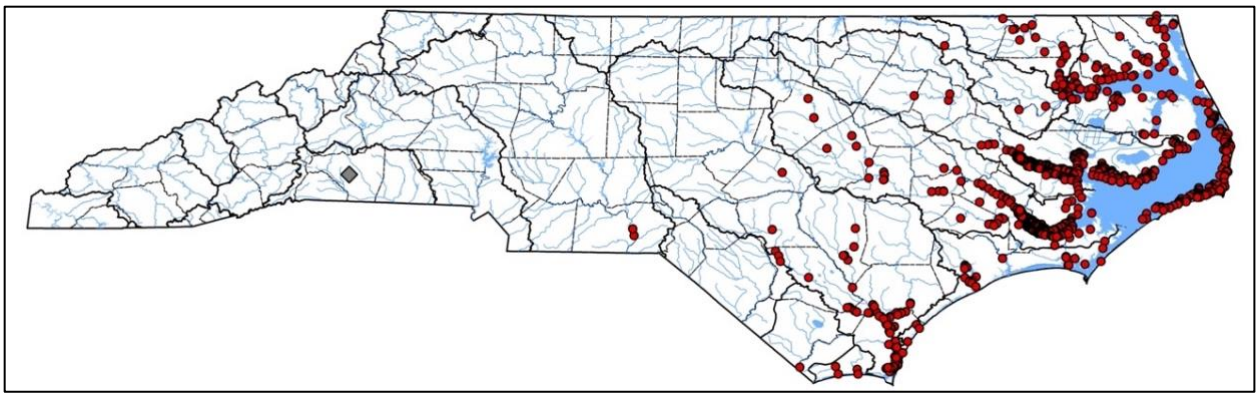
Map 1. Distribution of Blueback Herring, *Alosa aestivalis*, in North Carolina. Map originally appeared in Tracy et al. (2020).



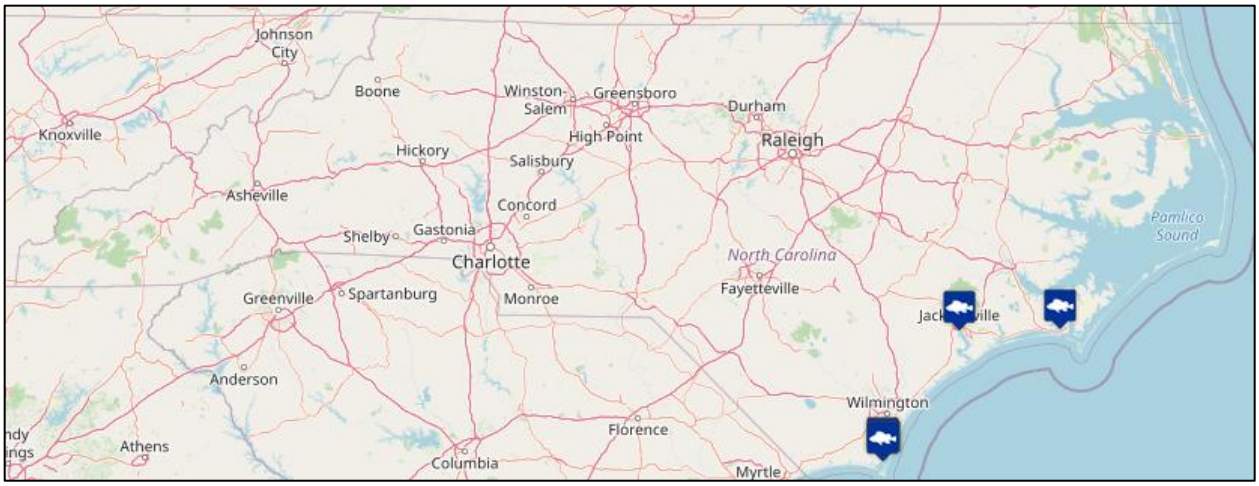
Map 2. Distribution of Hickory Shad, *Alosa mediocris*, in North Carolina. Map originally appeared in Tracy et al. (2020).



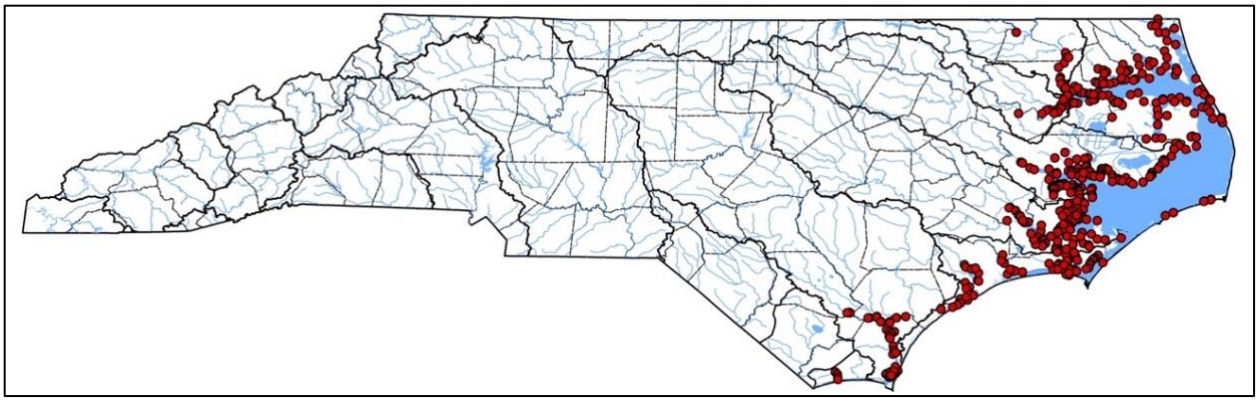
Map 3. Distribution of Alewife, *Alosa pseudoharengus*, in North Carolina. Map originally appeared in Tracy et al. (2020).



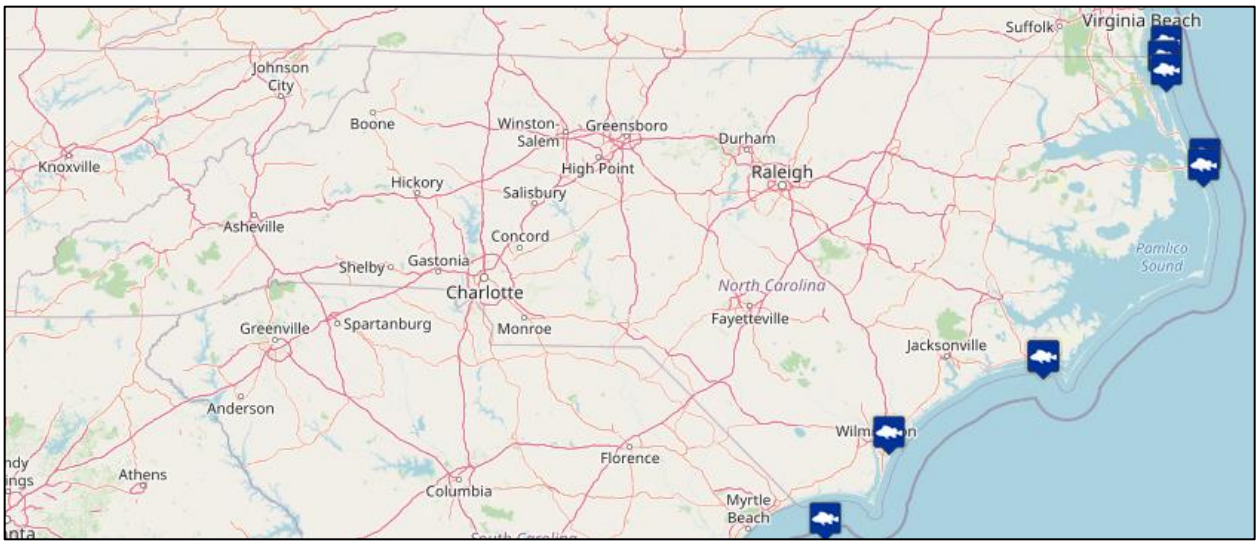
Map 4. Distribution of American Shad, *Alosa sapidissima*, in North Carolina. Map originally appeared in Tracy et al. (2020).



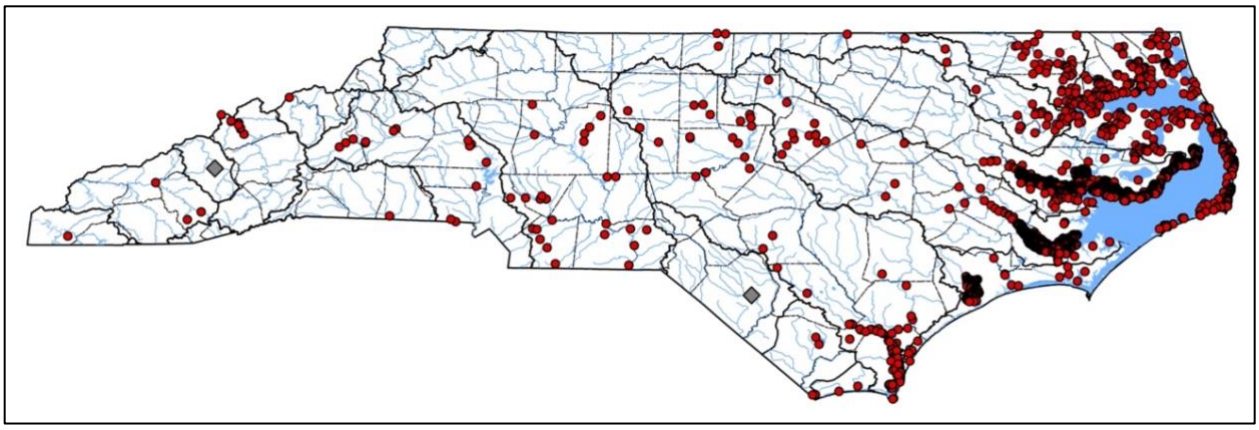
Map 5. Distribution of Yellowfin Menhaden, *Brevoortia smithi*, in North Carolina. Map based upon vouchered specimens at the North Carolina Museum of Natural Sciences; accessed 12/12/2020.



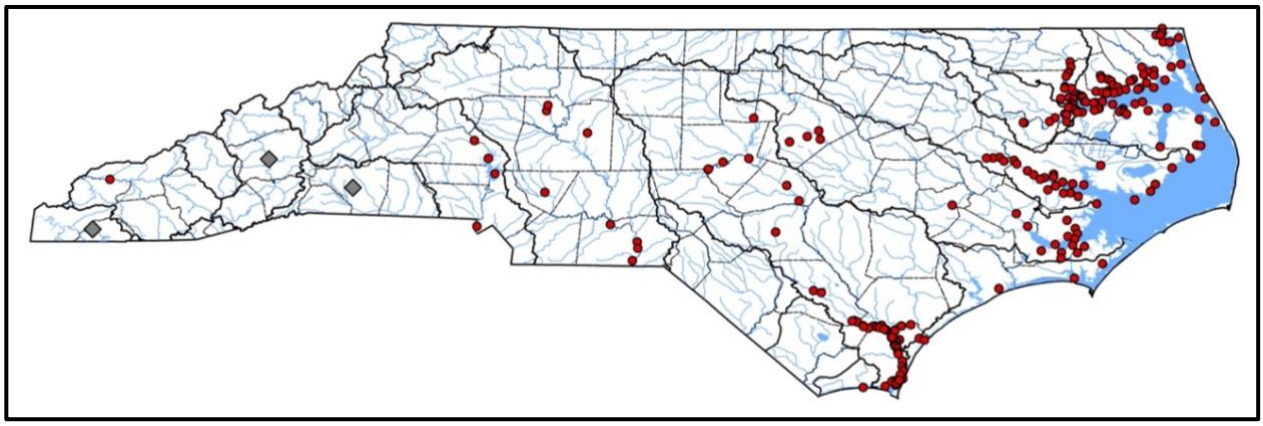
Map 6. Distribution of Atlantic Menhaden, *Brevoortia tyrannus*, in North Carolina. Map originally appeared in Tracy et al. (2020).



Map 7. Distribution of Atlantic Herring, *Clupea harengus*, in North Carolina. Map based upon vouchered specimens at the North Carolina Museum of Natural Sciences; accessed 12/12/2020.

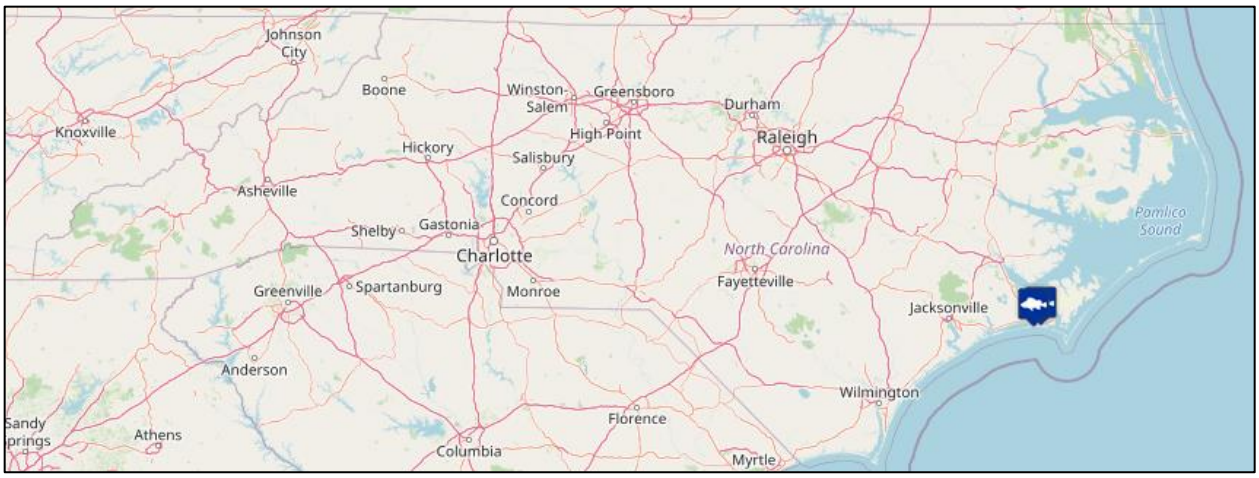


Map 8. Distribution of Gizzard Shad, *Dorosoma cepedianum*, in North Carolina. Map originally appeared in Tracy et al. (2020).



Map 9. Distribution of Threadfin Shad, *Dorosoma petenense*, in North Carolina. Map originally appeared in Tracy et al. (2020).

Map 10. Distribution of Round Herring, *Etrumeus sadina*, in North Carolina. Map does not show NCSM 81453 [off of North Carolina, ca. 54.6 km east center of Avon. Map based upon vouchered specimens at the North Carolina Museum of Natural Sciences; accessed 12/12/2020.



Map 11. Distribution of Scaled Sardine, *Harengula jaguana*, in North Carolina. Map based upon vouchered specimens at the North Carolina Museum of Natural Sciences; accessed 12/12/2020.

Map 12. Distribution of Atlantic Thread Herring, *Opisthonema oglinum*, in North Carolina. Map based upon vouchered specimens at the North Carolina Museum of Natural Sciences; accessed 12/12/2020.

Map 13. Distribution of Spanish Sardine, *Sardinella aurita*, in North Carolina. Map based upon vouchered specimens at the North Carolina Museum of Natural Sciences; accessed 12/12/2020.

Able to convert phytoplankton and zooplankton into fish biomass and as important prey species for commercially and recreationally important piscivorous species such as Striped Bass and Largemouth Bass, Gizzard Shad and Threadfin Shad have been stocked in many reservoirs across the state as forage fish. Threadfin Shad, a nonindigenous (nonnative) species was stocked, at times illegally, as a forage fish in many of Piedmont reservoirs in the Roanoke, Yadkin, Catawba, Broad, Savannah, Little Tennessee, and Hiwassee basins. Over time it has found its way downstream to the coast and is now widely distributed from the Albemarle to the Shallotte basins. Alewife, indigenous to our Atlantic Slope streams, was illegally introduced into Lake Norman as wishfully new forage fish for the Striped Bass and Largemouth Bass fishery. Like most poorly thought-out introductions, Alewife and Blueback Herring have caused more harm than good to the fisheries in reservoirs such as lakes James, Norman, and Hiwassee.

As a family, herrings vary greatly in size. On the short-end-of-the-stick, Threadfin Shad and Scaled Sardine reach a maximum size of about 180 mm (~ 7 inches) whereas a mature American Shad may reach close to 760 mm (30 inches). Because of their size and abundance, herring were historically and remain today a commercially and recreationally important group of fishes with seasonal and river-basin specific creel and landing limits (e.g., NCDMF 2020; NCWRC 2019, 2020). John White illustrated Alewife

[although it could possibly be a Blueback Herring or American Shad] labeled with the Algonquin word used by the Croatoan First Peoples for Alewife, Chaham (https://www.coastalcarolinaindians.com/updated-algonquian-word-list-by-scott-dawson/), and noted: "*The hearing. 2. foote in length*" (Figure 1).

Figure 1. Painting of Alewife by John White, 1585-1593. Painting courtesy of the British Museum, Museum No. SL,5270.100 (https://www.britishmuseum.org/collection/object/P_SL-5270-100).

More than a century after John White painted Alewife, herrings and shads were mentioned as occurring in North Carolina's waters by John Lawson in 1709 who described them as: "*Shads are sweet Fish, but very bony; they are plentiful at some Seasons*" (Lawson(1709), p157). He went on to write: "*The Herrings in Carolina are not so large as in Europe. They spawn there in March and April, running up the fresh Rivers and small fresh Runs of Water in great Shoals, where they are taken. They become red if salted; and, drest* [dressed] *with Vinegar and Oil, resemble an Anchovy very much; for they are far beyond an English Herring, when pickled"* (Lawson (1709), p 158).

Species of *Alosa*, except for land-locked reservoir populations, make late Winter-early Spring migratory spawning runs up the coastal rivers. Historically the runs occurred far upstream into the Piedmont until dam construction along the Fall Zone and over-fishing halted their migrations. Implementation of strict harvesting quotas has helped some of the species on their road to recovery, but recovery may take a long time to succeed. Although some populations are severely depleted, no species is listed as imperiled (NCNHP 2018; NCWRC 2017).

The identification of herrings is relatively straight-forward. Key characteristics for their proper identification include the shape and position of the upper jaw; presence or absence of a long filament in the dorsal fin; body, caudal fin, and peritoneum pigmentation (please refer to the Identification Key to the Species of Herrings (Family Clupeidae and Dussumieriidae) in North Carolina. However, several species can co-occur within the same habitats at the same time, rendering field identifications a challenge.

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.

And now you know who Wynken, Blynken, and Nod are.

Identification Key to the Species of Herrings (Family Clupeidae and Dussumieriidae) in North Carolina

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

(Identification key adapted from Munroe and Nizinski (2002) and Rohde et al. (2009))

1a. A single, W-shaped pelvic scute present (Figure 1); other abdominal scutes absent..... .....Round Herring, *Etrumeus sadina*

1b. W-shaped pelvic scute absent; pelvic scute (and most others) with lateral arms; series of abdominal scutes present, often keeled 2

Figure 1. Left - Cross section of abdominal area at the pelvic fin of Round Herring; Right - Round Herring. Photograph courtesy of the Smithsonian Tropical Research Institute's Shorefishes of the Greater Caribbean online information system, https://biogeodb.stri.si.edu/caribbean/en/pages/random/8754, accessed December 09, 2020.

2a. Upper jaw with a deep median notch (Figure 2) ..... 3[2]

2b. Upper jaw without a median notch (Figure 2) ..... 10[2]

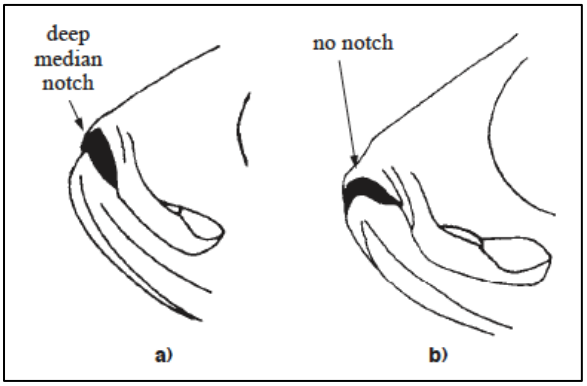


Figure 2. Upper jaws showing the presence or absence of a deep notch. Illustration courtesy of Munroe and Nizinski (2002).

3a. Last dorsal fin ray filamentous (Figure 3) 4

3b. Last dorsal fin ray not filamentous 5

[2] Also see Couplet Nos. 13a and 13b for fishes possessing a filamentous last dorsal fin ray

4a. Mouth inferior, subterminal (snout bulbous and fleshy, projecting past upper jaw). Upper jaw with a notch in the posterior ventral margin. Anal-fin rays 25-37. More than 50 (52 to 70) scales in lateral series. Color of caudal fin dusky (Figure 3) .....Gizzard Shad, *Dorosoma cepedianum*

4b. Mouth terminal (snout more pointed and not extending anterior to upper jaw). Upper jaw without a notch in the posterior ventral margin. Anal-fin rays 17-27. Fewer than 50 (41 to 48) scales in lateral series. Color of caudal fin yellow (Figure 3).....Threadfin Shad, *Dorosoma petenense*

Figure 3. Red arrows pointing to the filamentous last dorsal fin rays and the pigmentation of the caudal fins. Left – Gizzard Shad; Right – Threadfin Shad.

5a. Modified predorsal scales present on either side of dorsal midline (Figure 4); other scales deeply overlapping and irregular with serrate posterior margins. Six branched pelvic fin rays 6

5b. Predorsal scales along dorsal midline normal, not enlarged and fringed; other scales with smooth posterior margins. Eight branched pelvic fin rays 7

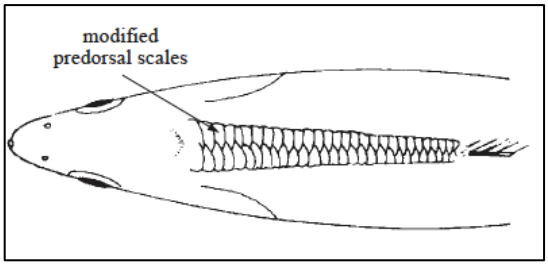


Figure 4. Modified predorsal scales on *Brevoortia* spp. Illustration courtesy of Munroe and Nizinski (2002).

6a. Pelvic fin with oblique and almost straight posterior margin, inner rays markedly shorter than outer rays when folded back (Figures 5 and 6)..... Yellowfin Menhaden, *Brevoortia smithi*

6b. Pelvic fin with rounded posterior margin, inner rays equal or nearly equal with outer rays when folded back (Figures 5 and 6) ..... Atlantic Menhaden, *Brevoortia tyrannus*

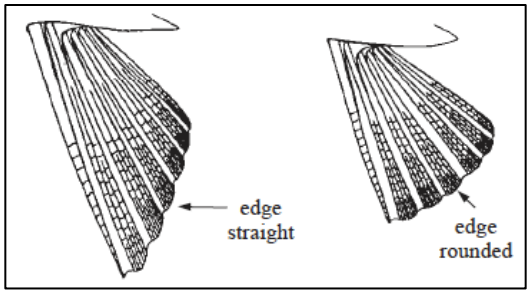


Figure 5. Pelvic fins of *Brevoortia* sp. Left – Yellowfin Menhaden; Right – Atlantic Menhaden. Pelvic fin of Illustration courtesy of Munroe and Nizinski (2002).

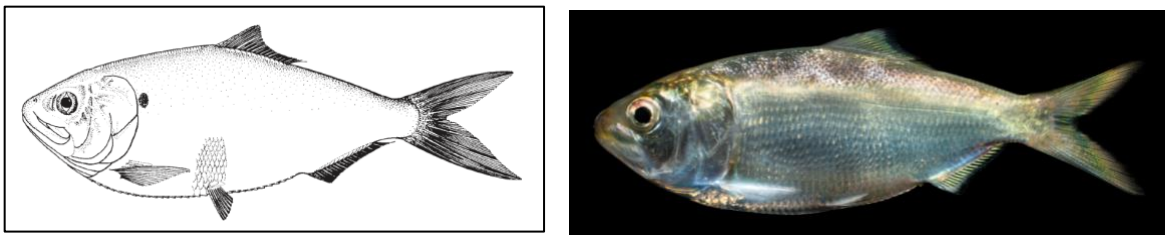


Figure 6. Left - Yellowfin Menhaden; Right – Atlantic Menhaden. Illustration courtesy of Munroe and Nizinski (2002).

7a. Upper margin of lower jaw rising steeply within mouth (Figures 7 and 8).....8

7b. Upper margin of lower jaw rising gradually not steeply within mouth (Figures 7 and 8) 9

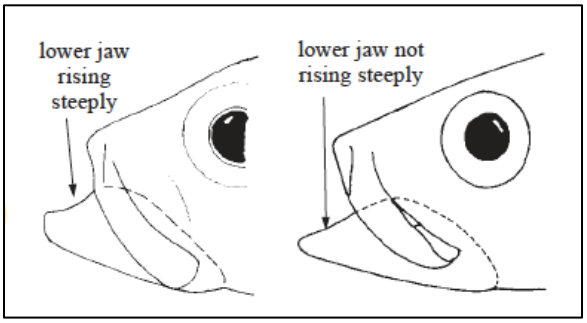


Figure 7. Left - Upper margin of lower jaw rising steeply within mouth; Right - Upper margin of lower jaw rising gradually not steeply within mouth. Illustration courtesy of Munroe and Nizinski (2002).

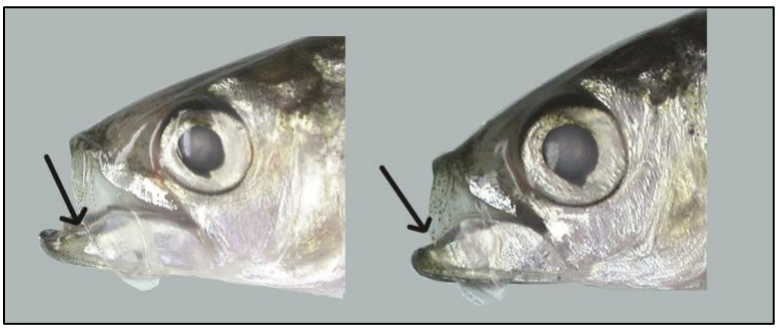


Figure 8. Black arrows pointing to the upper jaws. Left – American Shad; Right - Blueback Herring. Photograph courtesy of Rohde et al. (2009).

8a. Peritoneum silvery to pale gray (visible upon dissection), dorsum grayish green (Figure 9). Eye diameter greater than length of snout.....Alewife, *Alosa pseudoharengus*

8b. Peritoneum sooty or black (visible upon dissection), dorsum distinctly blue (Figure 9). Eye diameter less than length of snout .....Blueback Herring, *Alosa aestivalis*

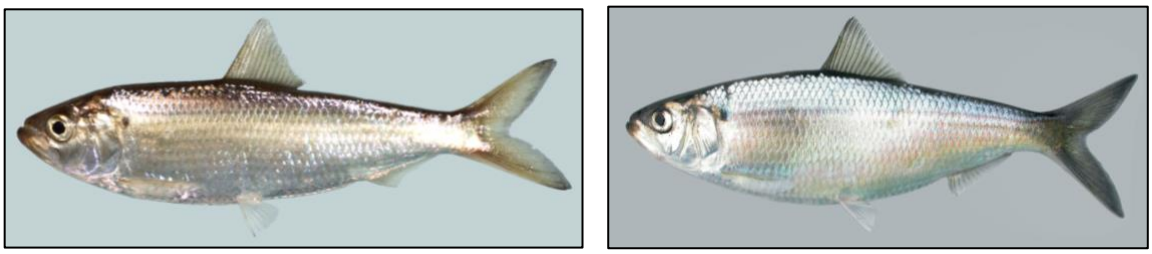


Figure 9. Left – Alewife; Right – Blueback Herring.

9a. Mouth superior; lower jaw part of the dorsal profile with tip projecting forward of the snout when mouth is closed (Figures 10 and 11). Jaw teeth present. Cheek about as deep as wide. Gill rakers on lower limb of anterior arch 18-23 and widely spaced .....Hickory Shad, *Alosa mediocris*

9b. Mouth terminal; lower jaw not part of the dorsal profile with tip even with or projecting slightly forward of the upper jaw when mouth is closed (Figures 10 and 12). Jaw teeth minute or absent in adults. Cheek deeper than wide. Gill rakers on lower limb of the first gill arch number 59-76 (26-43 in specimens less than 125 mm Total Length) and crowded ..... American Shad, *Alosa sapidissima*

Figure 10. Red bars showing the positioning of the lower jaw in relation to the snout. Left – Hickory Shad, Right – American Shad.

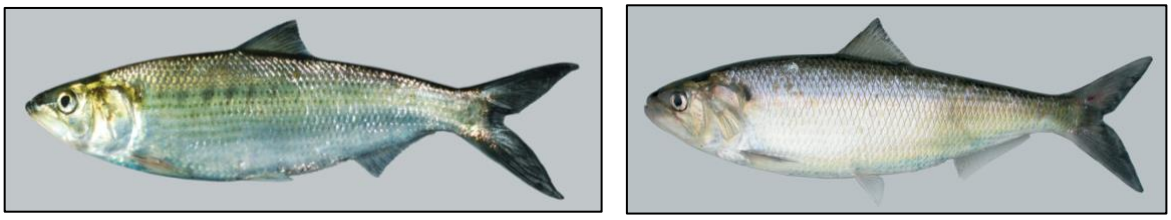


Figure 11. Left – Hickory Shad; Right - American Shad.

10a. Posterior border of gill opening with two fleshy knobs (Figure 12) 11

10b. Posterior border of gill opening evenly rounded (Figure 13) ..... Atlantic Herring, *Clupea harengus*

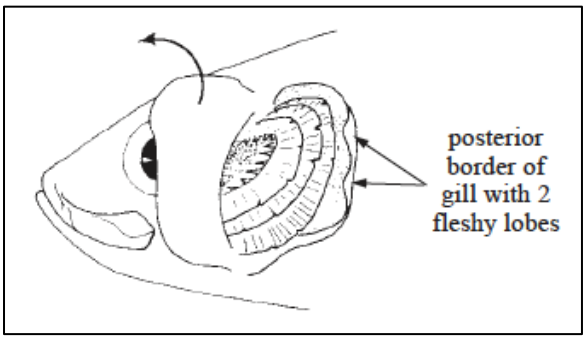


Figure 12. After raising the operculum seeing the posterior border of the gills with two fleshy lobes. Illustration courtesy of Munroe and Nizinski (2002).

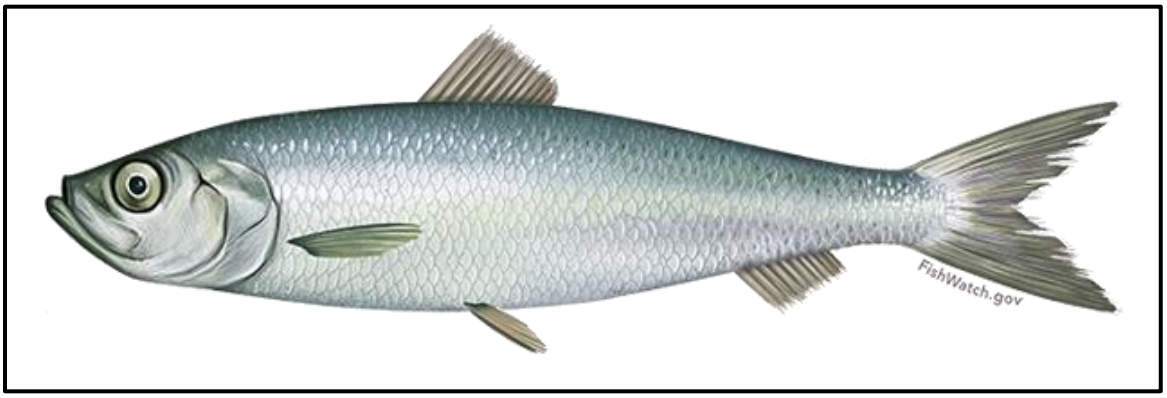


Figure 12. Atlantic Herring. Illustration courtesy of https://www.fisheries.noaa.gov/species/atlantic-herring.

11a. Small, toothed hypomaxilla present between posterior tip of premaxilla and expanded blade of maxilla (Figures 13 and 14) ..... Scaled Sardine, *Harengula jaguana*

11b. No small, toothed hypomaxilla between posterior tip of premaxilla and expanded blade of maxilla 12

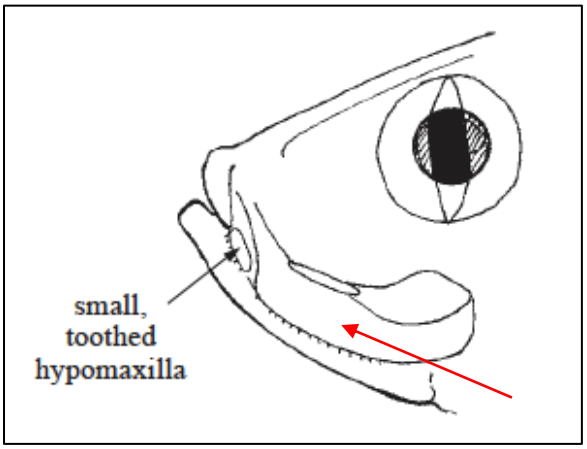


Figure 13. Small, toothed hypomaxilla of Scaled Sardine. Red arrow is pointing to the maxilla. Illustration courtesy of Munroe and Nizinski (2002).

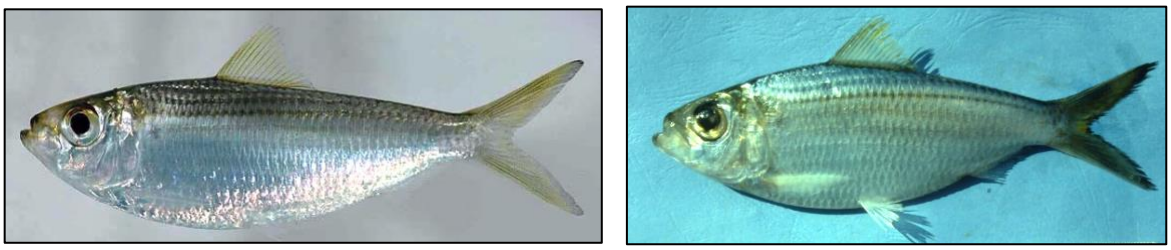


Figure 14. Scaled Sardine. Left – Photograph courtesy of the Smithsonian Tropical Research Institute's Shorefishes of the Greater Caribbean online information system, https://biogeodb.stri.si.edu/caribbean/en/pages/random/3359, accessed December 09, 2020; Right - Photograph courtesy of George H. Burgess.

12a. Last dorsal fin ray filamentous (Figure 15). Seven branched pelvic fin rays .... *Atlantic Thread Herring, Opisthonema oglinum*

12b. Last dorsal fin ray normal (Figure 16). Eight branched pelvic fin rays .... Spanish Sardine, *Sardinella aurita*

Figure 15. Thread Herring. Left- red arrow pointing to last dorsal ray which is filamentous.

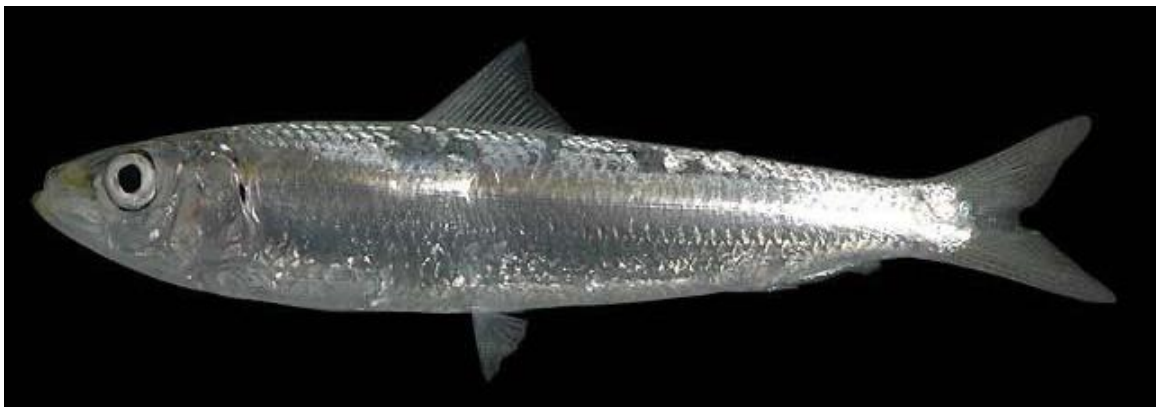


Figure 16. Spanish Sardine. Photograph courtesy of the Smithsonian Tropical Research Institute's Shorefishes of the Greater Caribbean online information system, https://biogeodb.stri.si.edu/caribbean/en/pages/random/5909, accessed December 09, 2020.

13a. Posterior border of gill opening with two fleshy knobs (Figures 12 and 17). Upper jaw without a deep median notch (Figure 2)..... Atlantic Thread Herring, *Opisthonema oglinum*

13b. Posterior border of gill opening evenly rounded (Figure 17). Upper jaw with a deep median notch 14

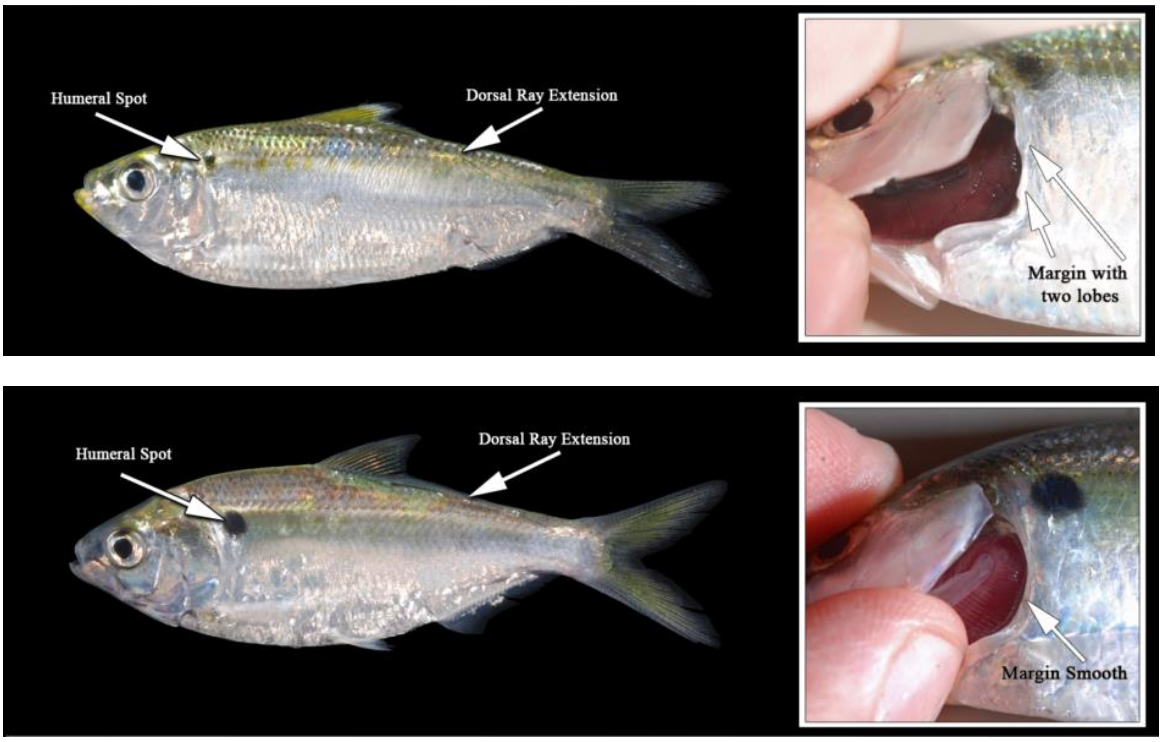


Figure 17. Top – Atlantic Thread Herring with posterior border of gill opening with two fleshy knobs; Bottom – Threadfin Shad with posterior border of gill opening evenly rounded. Photograph courtesy of Robert Aguilar, Smithsonian Environmental Research Center, Edgewater, MD.

14a. Mouth inferior, subterminal (snout bulbous and fleshy, projecting past upper jaw). Upper jaw with a notch in the posterior ventral margin. Anal-fin rays 25-37. More than 50 (52 to 70) scales in lateral series. Color of caudal fin dusky (Figure 18) .....Gizzard Shad, *Dorosoma cepedianum*

14b. Mouth terminal (snout more pointed and not extending anterior to upper jaw). Upper jaw without a notch in the posterior ventral margin. Anal-fin rays 17-27. Fewer than 50 (41 to 48) scales in lateral series. Color of caudal fin yellow (Figure 18).....Threadfin Shad, *Dorosoma petenense*

Figure 18. Red arrows pointing to the filamentous last dorsal fin rays and the pigmentation of the caudal fins. Left – Gizzard Shad; Right – Threadfin Shad.

Glossary

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

Hypomaxilla – upper jaw bone below the maxilla

Maxilla – bone in the upper jaw that lies immediately above (or behind) and parallel to the premaxilla

Peritoneum – the membrane lining the abdominal cavity

Premaxilla – the most anterior paired bones of the upper jaw; usually extending distinctly posterior to form much of the side of the lower jaw in fishes with a protractile jaw

Scute – a large, modified, often thick scale or plate

Serrate – sawtooth-like, bearing a series of serrae

References

Jenkins, R.E., and N.M. Burkhead. 1994. Freshwater fishes of Virginia. American Fisheries Society. Bethesda, MD. 1080p.

Lawson, J. 1709. A new voyage to Carolina; containing the exact description and natural history of that country: together with the present state thereof. And a journal of a thousand miles, travel'd thro' several nations of Indians. Giving a particular account of their customs, manners &c. London, England. 258p.

Munroe, T.A. and M.S. Nizinski (FAO 2002). 2002. Clupeidae. Herrings (shad, menhadens). pp 804-830. Carpenter, K.E. (ed.). The living marine resources of the Western Central Atlantic. Volume 2. Bony fishes part 1 (Acipenseridae to Grammatidae). Food and Agriculture Organization of the United Nations, Rome, Italy. 4099p. (Available at: FAO 2002).

North Carolina Division of Marine Fisheries (NCDMF). 2020. 2020 North Carolina recreational coastal waters guide for sports fishermen – October version. North Carolina Division of Marine Fisheries. Morehead City, NC. Available at: NCDMF Coastal Fishery Guide.

North Carolina Natural Heritage Program (NCNHP). 2018. Natural Heritage Program list of rare animal species of North Carolina 2018. North Carolina Natural Heritage Program. North Carolina Department of Natural and Cultural Resources. Raleigh, NC. 167p.

North Carolina Wildlife Resources Commission (NCWRC). 2017. Protected wildlife species of North Carolina. North Carolina Wildlife Resources Commission. Raleigh, NC. 9p.

North Carolina Wildlife Resources Commission (NCWRC). 2019. Herring and shad identification tips. North Carolina Wildlife Resources Commission. Raleigh, NC. Available at: NCWRC Herring and Shad Identification Tips.

North Carolina Wildlife Resources Commission (NCWRC). 2020. North Carolina Inland fishing, hunting & trapping regulations digest. 2020-2021. North Carolina Wildlife Resources Commission. Raleigh, NC. Available at: NCWRC 2020-2021 Fishing, Hunting, and Trapping Regulations.

North Carolina Wildlife Resources Commission (NCWRC). Undated. Herring and shad in North Carolina. Brochure. North Carolina Wildlife Resources Commission. Raleigh, NC. Available at: NCWRC Shad Identification Brochure.

Page, L.M., H. Espinosa-Pérez, L.T. Findley, C.R. Gilbert, R.N. Lea, N.E. Mandrak, R.L. Mayden, and J.S. Nelson. 2013. Common and scientific names of fishes from the United States, Canada, and Mexico. 7th edition. American Fisheries Society, Special Publication 34, Bethesda, MD. 384p.

Rohde, F.C., R.G. Arndt, J.W. Foltz, and J.M. Quattro. 2009. Freshwater fishes of South Carolina. University of South Carolina Press, Columbia, SC. 430p.

Tracy, B. H., F.C. Rohde, and G.M. Hogue. 2020. An annotated atlas of the freshwater fishes of North Carolina. Southeastern Fishes Council Proceedings No. 60. 198p. (Available at: https://trace.tennessee.edu/sfcproceedings/vol1/iss60/1).

The Meanings of the Scientific Names of Herrings

Adopted from the ETYFish Project by Christopher Scharpf and Kenneth J. Lazara, accessed December 08, 2020, http://www.etyfish.org/

Family Clupeidae Cuvier 1816 – The Herrings

***Alosa* Linck 1790 -** presumably tautonymous with *Clupea alosa* (no species mentioned): from *alausa*, Latin word for shad

a. ***Alosa aestivalis* (Mitchill 1814) -** of the summer, presumably referring to later spawning run compared to *A. pseudoharengus* (Mitchill called it the "Summer Herring")
b. ***Alosa mediocris* (Mitchill 1814) -** mediocre, referring to taste or food value compared to *A. sapidissima*
c. ***Alosa pseudoharengus* (Wilson 1811) -** *pseudo*-, false; *harengus*, low Latin for herring, described as "not so fat as European Herring" (*A. alosa* or *A. fallax*)
d. ***Alosa sapidissima* (Wilson 1811) -** most delicious: the very two words Wilson used to describe the palatability of this shad

***Brevoortia* Gill 1861 -** in honor of James Carson Brevoort (1818-1887), "the well-known ichthyologist of New York" (Brevoort was a businessman and philanthropist who supported various literary and scientific societies and institutions and was himself a fine amateur naturalist; his zoological library was then reputed to be the finest in the country)

a. ***Brevoortia smithi* Hildebrand 1941 -** in honor of ichthyologist Hugh M. Smith (1865-1941), Hildebrand's former chief at the U.S. Bureau of Fisheries, for his "outstanding accomplishments in fishery research" and "useful" book, *The Fishes of North Carolina* (1907)
b. ***Brevoortia tyrannus* (Latrobe 1802) -** ruler, so named for its relationship to a copepod (*Cymothoa praegustator*, a "pretaster") that lives in the mouths of many specimens and thus represents "the minion of a tyrant … for he is not without those who suck him" (i.e., like all tyrants, this fish has parasites or hangers-on (perhaps reflecting Latrobe's enthusiasm for American independence from England)

***Clupea* Linnaeus 1758 -** Latin vernacular for a herring-like fish, perhaps derived from Clypea or Clupea, a North African coastal town (2nd century BC) whose name was confused by Renaissance naturalists (e.g., Rondelet and Salviani) with a fish (probably a lamprey) but also applied by Giovio (1524), along with "*alosa*," for the species now known as *Alosa alosa*

a. ***Clupea harengus* Linnaeus 1758 -** low Latin for herring, allied to the German *Heer*, army, i.e., a fish that swims in armies

***Dorosoma* Rafinesque 1820 -** *dora*, lanceolate; *soma*, body, allusion unclear, possibly referring to shape of body (larval specimens are lanceolate) or to elongated dorsal-fin ray

a. ***Dorosoma cepedianum* (Lesueur 1818) -** *–anum*, belonging to: Bernard-Germain-Étienne de La Ville-sur-Illon, comte de [count of] La Cepède (also spelled as La Cépède, Lacépède, or Lacepède, 1756-1825), author of the first five volumes of *Histoire Naturelle des Poissons*
b. ***Dorosoma petenense* (Günther 1867) -** *–ensis*, suffix denoting place: Lake Peten, Guatemala, type locality

***Harengula* Valenciennes 1847 -** diminutive of *harengus*, low Latin for herring, allied to the German *Heer*, army, i.e., a fish that swims in armies

a. ***Harengula jaguana* Poey 1865 -** *–ana*, belonging to: "bahía de Jagua" (bay of Jagua, but likely a port on the Bay of Cienfuegos), Cuba, presumed type locality (no type specimens are known)

***Opisthonema* Gill 1861 -** *opistho*-, behind; *nema*, thread, referring to long, filamentous last ray of dorsal fin

a. ***Opisthonema oglinum* (Lesueur 1818) -** allusion not evident, perhaps from ogle, referring to its large eyes

***Sardinella* Valenciennes 1847 -** diminutive of *Sardina*, a sardine, “similar to the external form of a sardine” (translation)

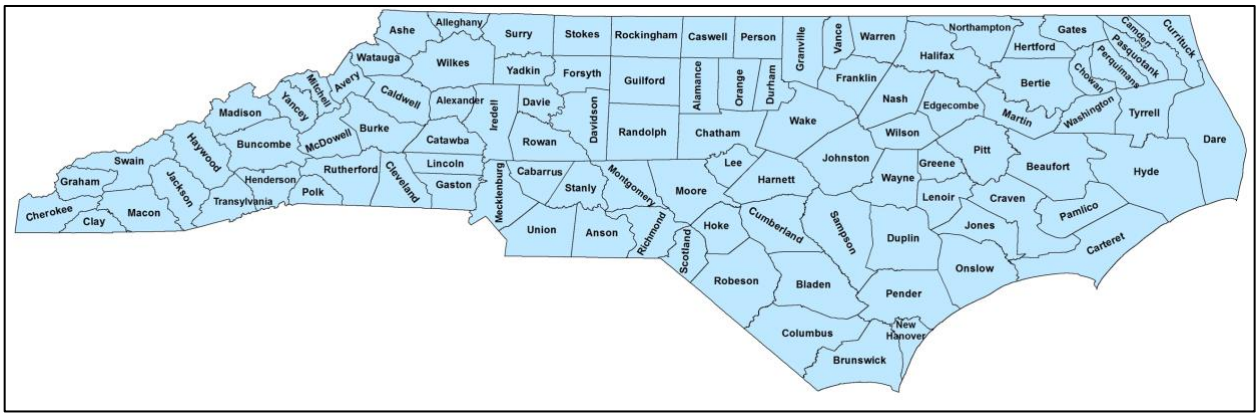
a. ***Sardinella aurita* Valenciennes 1847 -** eared, probably referring to black spot at hind border of gill cover

Family Dussumieriidae Gill 1861 – The Round Herrings; patronym for Jean-Jacques Dussumier (1792–1883), French voyager and merchant who collected zoological specimens from southeastern Asia and the Indian Ocean,

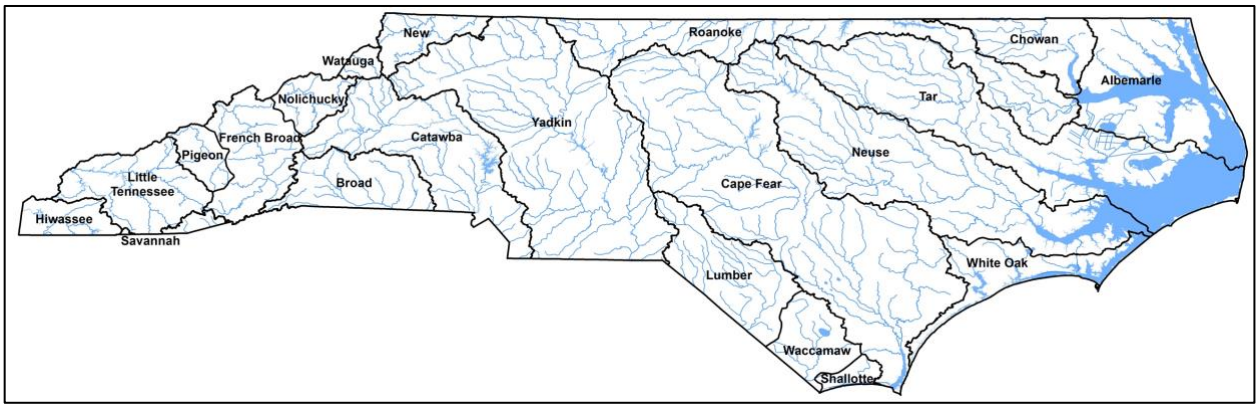
***Etrumeus* Bleeker 1853 –** from *Etrumei wasi* (also spelled *Etrumei-Iwashi*), Japanese vernacular for *E. micropus*

a. ***Etrumeus sadina* (Mitchill 1814) -** diminutive of *shad*; Mitchill called it a “Shadine”

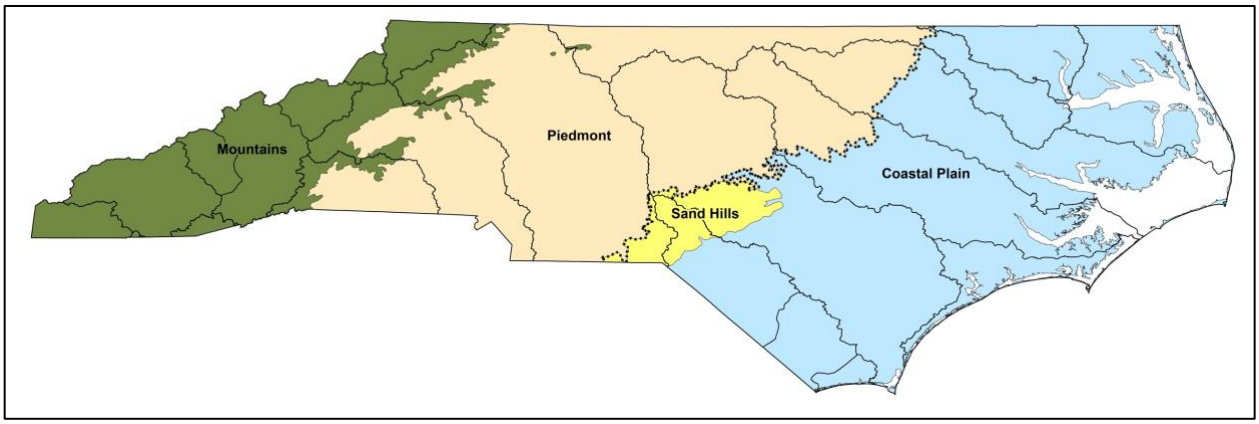
Supplemental Maps



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).