

Moderate Conservation Priority – Mountains and Upper Piedmont

Blacknose Dace *Rhinichthys atratulus*

Central Stoneroller *Campostoma anomalum*

Eastern Brook Trout *Salvelinus fontinalis*

Contributors: Dan Rankin and Jason Bettinger

DESCRIPTION

Taxonomy and Basic Description

The blacknose dace is a widely distributed cyprinid of the genus *Rhinichthys*, first described in 1804. *Rhinichthys* exhibit considerable morphological and genetic variation (Etnier 1993). Two members of this genus occur in South Carolina (Rohde 1994), with an additional three species in the western United States (Etnier 1993). Two subspecies of blacknose dace are recognized: an Atlantic slope form, *R. a. atratulus*, found in and north of the New River, Virginia; and a western form, *R. a. meleagris*, in north-central North America (Jenkins and Burkhead 1993). Recently, a third subspecies (*R. a. obtusus*), an upland form found in the southern Ohio River to Mobile Basin, was elevated to species status and named the western blacknose dace (*R. obtusus*) (Nelson et al. 2004). It would stand to reason, based on the zoogeographical evidence (Ross 1971) of a historic connection between the upper Savannah and upper Tennessee River system, that blacknose dace in South Carolina would most likely be more closely related to the western blacknose dace. However, the species in South Carolina is currently recognized as *R. atratulus* (blacknose dace) (Nelson et al. 2004).



Adult blacknose dace range in length from 44 to 100 mm (1.7 to 3.9 inches) (Rohde 1994). The species has small scales, a frenum, a subterminal mouth with a small barbel in each corner, a moderate sized head, small eye, moderate-sized mouth and fleshy lips. The breast and belly are fully scaled. There is a black lateral stripe extending from the snout through the eye to the caudal area, separating a brownish back from a whitish belly (Jenkins and Burkhead 1993).



The central stoneroller was first described in 1820 from Kentucky (Jenkins and Burkhead 1993). The genus *Campostoma* is systematically complex and dynamic. Five species are currently recognized: *C. anomalum*, widespread in central and eastern North America; *C. ornatum* in Mexico, southern Arizona and Texas (Etnier and Starnes 1993); *C. oligolepis* in the

middle and lower Tennessee drainage; *C. pauciradii* in the southeastern United States (Jenkins and Burkhead 1993); and *C. pullum* in the Great Lakes drainage, the Wabash River portion of the Ohio River drainage, the Susquehanna River drainage and direct tributaries to Mississippi River (Etnier and Starnes 1993). There are two subspecies of *Campostoma anomalum*: *C. a.*

anomalum, and *C. a. michauxi* (Lee et al. 1980). The geographic limits of these subspecies have not been defined, but upper Tennessee and Santee drainage fish are considered to be *C. a. michauxi* (Jenkins and Burkhead 1993). Page and Burr (1991) tentatively assigned *C. a. anomalum* to the Ohio River and upper Atlantic drainages, and *C. a. michauxi* to the Santee and Savannah River drainages. Based on zoogeographical evidence (Ross 1971) of a historic connection between the upper Savannah and upper Tennessee River system, central stonerollers in South Carolina would most likely be *C. a. michauxi*. Further investigation is indicated to make this determination.

Adult central stonerollers range in length from 122 to 239 mm (4.8 to 9.4 inches) (Rohde 1994). The species is a round-bodied, chub-like minnow with a ventral mouth, hard ridge along the lower jaw, moderate head and eye, and a rounded snout. The back is brown to olive with a brassy sheen. The belly and fins are typically light colored (Jenkins and Burkhead 1994).

The eastern brook trout is a member of the family Salmonidae. Although its common name identifies this fish as a trout, it is actually a char from the genus *Salvelinus*, which contains seven to ten species (Behnke 1980; Cavendar 1980; Kendall and Behnke 1984). However, it has been suggested that this genus may contain as many as 16 species (Behnke 1990). The eastern brook trout is the lone living member of the subgenus *Baione*, as its only



other member, the silver char (*Salvelinus agassizi*), has become extinct (Jenkins and Burkhead 1993). Native southern Appalachian populations south of the New River in Virginia are genetically distinct from northern populations at subspecific levels (Stoneking et al. 1981; McCracken et al. 1993; Danzmann et al. 1998; Guffey et al. 1999). In South Carolina, only three populations of the genetically pure southern Appalachian genotype are known to occur out of more than a dozen documented stream populations (Guffey 1995). Two additional populations possess low levels of introgression of northern alleles.

The brilliantly marked char range in adult length from 130 to 508 mm (5.1 to 10.0 inches) (Rohde et al. 1994); however, in the southern Appalachians, eastern brook trout rarely exceed 250 mm (9.8 inches) (Jenkins and Burkhead 1993). This char is identified by a white leading margin on a black sub-margin or streak on the ventral fins; yellow and olive pale spots and red spots with a pale blue halo on an olive background along the side; and a vermiculate (wormlike) back. The belly is brilliant orange-red bordered by black at the ventrolateral margin, especially in breeding males. Larger breeding males develop a distinct kype (hook) on the lower jaw.

Status

The blacknose dace is listed as a species of special concern in South Carolina, but is currently stable within its range (Warren et al. 2000, NatureServe 2004). The blacknose dace is considered critically imperiled (S1) in South Carolina and vulnerable (S3) in Georgia (NatureServe 2004). This listing for South Carolina may be overly pessimistic in that much of blacknose dace habitat has been protected in the Mountain Bridge Wilderness Area at Jones Gap State Park in Marietta, South Carolina.

The central stoneroller is currently stable within its native range (Warren et al. 2000). NatureServe (2004) listed the status as secure globally (G5). There currently is no state ranking assigned in South Carolina.

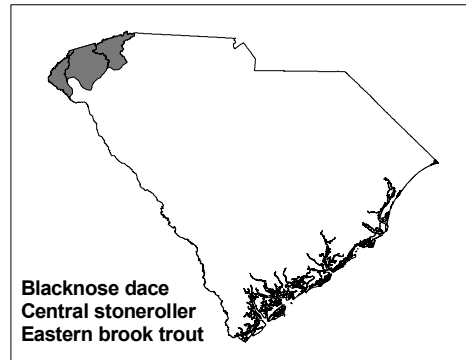
Eastern brook trout are considered currently stable and secure (G5) by Warren et al. (2000) and NatureServe (2004), respectively. NatureServe (2004) listed eastern brook trout in South Carolina as imperiled (S2). South Carolina is the only state in the species' range where it is considered imperiled.

POPULATION DISTRIBUTION AND SIZE

Distribution

The blacknose dace is found in Atlantic, Great Lakes, Hudson Bay, Mississippi, and upper Mobile Bay basins from Nova Scotia to Manitoba and south to Nebraska, northern Alabama, northern Georgia and the coastal plain in Virginia (Page and Burr 1991; NatureServe 2004). In South Carolina,

blacknose dace are found in the upper Savannah River drainage and Saluda River system in the Blue Ridge and inner piedmont ecoregions (SCDNR unpublished data).



The central stoneroller is found throughout much of the eastern and central U.S. in the Atlantic, Great Lakes, Mississippi River and Hudson Bay (Red River) basins from New York and southern Ontario west to North Dakota and Wyoming, and south to South Carolina and Texas; Thames River system, Ontario; gulf slope drainages from Galveston Bay, Texas to Rio Grande, Mexico; and isolated populations in southwestern Mississippi and eastern Louisiana (Page and Burr 1991). In South Carolina, the central stoneroller is found in the mountain and upper piedmont ecoregions of the upper Savannah River drainage, Saluda and Broad River systems (SCDNR unpublished data).

The native range for eastern brook trout extends from Canada south and east to Hudson Bay and southward through the northern states from eastern Minnesota and northeastern Iowa eastward to Pennsylvania. The native range also includes the Appalachian uplands, particularly the Blue Ridge, south to Georgia. Drainage changes in the region, stream captures and piracies (Ross 1970) likely explain the occurrence of eastern brook trout in Atlantic slope drainages of the southern Appalachians, south of the New River, Virginia. These drainage changes in headwaters

of the Savannah River drainage and Saluda River system in South Carolina, coupled with the occurrence of pure southern Appalachian genotypes in both systems (Guffey 1995), are indicative of native heritage for South Carolina brook trout. The eastern brook trout has been widely introduced outside its native range in North America and is established on all continents except Australia and Antarctica (Jenkins and Burkhead 1993).

Population Size and Trend

Blacknose dace are common throughout their range (Page and Burr 1991, Rohde et al. 1994, Etnier and Starnes 1993). NatureServe (2004) has a local ranking of imperiled and vulnerable for South Carolina and Georgia, respectively; this indicates limited abundance along the species southernmost range. Healthy populations are known to occur in Howard Creek (Savannah drainage), Matthews Creek and Big Falls Creek (Santee drainage). Blacknose dace also occur in lower abundance in the Chattooga, Whitewater, Eastatoee, Middle Saluda and South Saluda Rivers (SCDNR unpublished data).

In the broad sense, the central stoneroller is common to ubiquitous throughout its native range (Etnier and Starnes 1993) and common in most Blue Ridge drainages westward. Page and Burr (1991) describe the species as common to abundant throughout much of its range, generally absent on the piedmont and in the coastal plain and uncommon in the Great Plains. The central stoneroller is very abundant in the Chattooga River (SCDNR unpublished data).

The eastern brook trout is widespread and seemingly stable across its range; however, a troubling decline in miles of stream occupied in the southern Appalachians has occurred over the last century (Etnier and Starnes 1993). The range for eastern brook trout in Great Smoky Mountains National Park (Moore 1981) was estimated to have declined approximately 70 percent since monitoring efforts began. Factors resulting in this decline are deforestation (King 1937; Jenkins and Burkhead 1993) causing excessive siltation and warming, acidification, competition from non-native introductions and global warming (Etnier and Starnes 1993; Larson and Moore 1985; Moore et al. 1986). A similar level of decline appears to have taken place in South Carolina and likely other regions of the southern Appalachians. Wild brook trout inhabit over 3,000 km (1,864 miles) of streams across the southern Appalachian region (Habera and Moore 2005). Southern Appalachian brook trout populations are distributed from the New River drainage in Virginia southward into Tennessee, North Carolina, South Carolina and Georgia. The southern Appalachian genotype (subspecies) comprises only about 17 percent of these streams. Most populations are located in the upper Tennessee River (Mississippi River) system; however, a few also occur in three Atlantic coast and two gulf coast drainages. About fifty percent of brook trout streams in the Tennessee River system are the pure southern genotype, while only about five to ten percent of stream populations in the Atlantic slope are pure. Seventy percent or more of the known brook trout resource in the southern Appalachians within each state and 88 percent overall occurs on public lands (Habera and Moore 2005).

HABITAT AND NATURAL COMMUNITY REQUIREMENTS

The blacknose dace occurs in small to medium size coolwater creeks with slow to rapid current and a diverse substrate of sand, gravel and rock (Rohde et al. 1994). In South Carolina,

blacknose dace are known to occur sympatrically with eastern brook trout (SCDNR unpublished data).

The central stoneroller is found in small to medium rivers with cool clear water, moderate or sometimes rapid current and gravel or rubble substrates. It commonly occurs in pools with current and riffles of small rocky streams. Occasionally central stonerollers are found in slow-moving turbid water (NatureServe 2004).

The eastern brook trout inhabits rocky, often high-gradient, well-shaded, pristine coldwater mountain creeks (Rohde et al. 1994), generally above 600 m (1,969 feet) in elevation, but occasionally down to 490 m (1,608 feet) in streams with north-facing aspects (Etnier and Starnes 1993). Brook trout require high dissolved oxygen levels and cannot tolerate temperatures regularly above 20 degrees Celsius (68 degrees Fahrenheit). This trout also occurs in high elevation beaver ponds and lakes. Brook trout are the most tolerant of the salmonids with regard to acidity, tolerating pHs from 4.5 to 9.5 (Jenkins and Burkhead 1993).

CHALLENGES

In South Carolina, the blacknose dace is vulnerable because of its limited distribution. The central stoneroller may be somewhat vulnerable in South Carolina due to its limited distribution that is apparently associated with drainage changes (Ross 1971). Additionally, development, deforestation, loss of riparian cover, siltation and impoundments in coolwater streams adversely affects these species.

The eastern brook trout is challenged by deforestation; specifically the associated water temperature rises and siltation from timber harvesting practices (King 1937; Jenkins and Burkhead 1993). Additionally, impoundments, acid deposition and displacement by non-native salmonids adversely affect this species (Etnier and Starnes 1993; Larson and Moore 1985; Moore et al. 1986).

CONSERVATION ACCOMPLISHMENTS

Populations of blacknose dace found in Matthews Creek, Big Falls Creek and Howard Creek have been protected through fee simple land purchase and/or conservation easements in those areas.

Many conservation practices have been accomplished for the eastern brook trout. Range and population levels have been monitored across the species' range and taxonomic characterization of the eastern brook trout is well advanced. Further, water quality designations designed to protect the species have been implemented. The American Fisheries Society–Trout Committee's position paper (management plan) is a valuable tool for management of the southern Appalachian population of eastern brook trout.

Additionally, the recent development of a state, federal and non-governmental organizations (NGOs) "joint venture" will focus on protection and restoration of eastern brook trout across its range in the U.S. To assist in this restoration, successful biological restoration techniques have

been developed for this species. The South Carolina Department of Natural Resources, the National Park Service, U.S. Forest Service, and Trout Unlimited are partnering to restore eastern brook trout populations in South Carolina; however, funding is currently inadequate to fully implement restoration. Education and outreach efforts regarding conservation of this species have been successful; however, these efforts need to be intensified.

CONSERVATION RECOMMENDATIONS

- Determine statewide distribution and population status with statewide stream surveys for the blacknose dace, central stoneroller and eastern brook trout.
- Describe life history and habitat requirements for the blacknose dace, central stoneroller and eastern brook trout.
- Identify streams with healthy populations and intact critical habitat in the upper Savannah River drainage, and Saluda River System for blacknose dace and the upper Savannah River drainage, Saluda River System and Broad River system for central stoneroller. Protect these areas, once identified.
- Determine the status of known eastern brook trout populations; establish long-term monitoring programs for those populations.
- Refine distribution information for eastern brook trout, primarily on privately owned lands.
- Assess water quality and habitat in brook trout streams to identify threats and deficiencies; establish long-term water quality and habitat monitoring programs in those streams.
- Protect critical habitats from future development and further habitat degradation by following best management practices and protecting and purchasing riparian areas.
- Promote land stewardship practices through educational programs both within critical habitats with healthy populations and other areas that contain available habitat.
- Encourage responsible landuse planning.
- Consider species needs when participating in the environmental permit review process.
- Develop a Non-Game Fishes of South Carolina poster and other educational materials in order to raise public awareness of nongame species and their ecological importance to the natural history of South Carolina's aquatic habitats.
- Educate motor vehicle operators of the negative affects of crossing streams at multiple locations and using stream bottoms as trails.
- Aggressively seek protection of brook trout habitat through land acquisition, conservation easements, agreements and other methods.
- Seek protection of brook trout populations from over-harvest through a creel limit reduction and minimum size limit to protect spawning stocks.
- Where feasible and appropriate, implement brook trout restoration in headwater streams.
- Conduct water quality monitoring and habitat enhancement in brook trout streams where habitat is determined to be impaired.

MEASURES OF SUCCESS

Determining the distribution, life history, habitat needs and southeastern population structure and trends would represent a measure of success for these species. Methods that protect water quality are also likely to protect most of these species. In the event that more protective BMPs are implemented, population studies of these fish could assist in determining the effectiveness of those measures. An increase in native brook trout populations within the state would also indicate that restoration and habitat protections were successful.