"Bartram's" Redeye Bass

Micropterus sp. cf. *coosae*

Contributor (2005): Dan Rankin and Jason Bettinger [SCDNR]
Reviewed and Edited (2013): Jean Leitner and Mark Scott [SCDNR]

DESCRIPTION

Taxonomy and Basic Description

The Redeye Bass is a member of the family Centrarchidae. Redeye Bass represent one of only 2 native black basses in South Carolina; both Smallmouth and Alabama Bass (*Micropterus dolomieu* and *M. henshalli*, respectively) are introduced in this state. The closest relative of the Redeye Bass is the Shoal Bass (*M. cataractae*), which is endemic to the Apalachicola River system (Lee et al. 1980). Baker et al. (2013) have described new species from each of 3 Mobile Basin drainages, and from the Chattahoochee drainage, from what was part of the original *M. coosae* range. The Savannah Basin represents a distinct genetic lineage as well, possibly warranting separate species status with the suggested common name of "Bartram's Bass" (Freeman et al. 2013, in review). Further, Oswald et al. (2013, in review) found significant genetic diversity within the Savannah and identified multiple management units. The species has yet to be formally described, but is recognized so South Carolina populations of Redeye Bass will be referred to as "Bartram's" Bass.

Redeye Bass are similar in structural features and more closely related to Alabama Bass than to Smallmouth Bass. However, Redeye Bass are known to hybridize with both species (Turner and Bulow 1989; Pierce and Van Den Avyle 1997; Philipp et al. 2002). In native stream habitat, Redeye Bass range in length from 144 to 381 mm (5.6 to 15 in.) (Rohde et al. 1994); however, where found in the Savannah River impoundments, Redeye Bass often exceed this size range. Redeye Bass are typically olivaceous to bronze dorsally with black blotching or mottling. The jaw extends even with the back of the eye. Laterally, Redeye Bass have black vertical bars or blotches, which are not connected, unlike the lateral stripe of Spotted Bass. Redeye Bass typically have ten or fewer lateral bars or blotches, whereas Alabama Bass generally have more than ten. Redeye Bass have ventro-lateral streaks that are typically darker and more irregular than those in Spotted Basses. A white margin on the upper and lower tips of the caudal fin and often along the margin of the anal fin is a key characteristic. This margin may be less obvious in older specimens. The anal fin typically has dark pigmentation. About 60% of "Bartram's" Bass from the upper Savannah River basin possess a tooth patch on the tongue (SCDNR unpublished data).

Status

The Redeye Bass is currently listed as stable (Warren et al. 2000) and secure (G5) (NatureServe 2013). The Redeye Bass is not ranked in South Carolina (NatureServe 2013); however, recent studies show that South Carolina reservoir populations are imperiled due to introgressive

hybridization with nonnative black bass species, primarily Alabama bass (Bangs 2011). Hybrids have also been collected from stream populations though their impact is not yet fully understood (Leitner et al. 2013, in review). In Tennessee, Redeye Bass are considered vulnerable (S3) while in North Carolina they are considered imperiled (S1), largely due to their limited range (NatureServe 2013).

POPULATION SIZE AND DISTRIBUTION

The native range of the originally described Redeye Bass includes the Mobile Basin above the Fall Line and the upper Chattahoochee, Altamaha and Savannah Drainages (Etnier 1993; Rohde 1994; Lee 1980), although—as noted above—the Savannah populations have been shown to be distinct. Ramsey (1973) considered all populations outside this range to be a result of stocking. Redeye Bass have also been introduced in Tennessee, Kentucky, California and Puerto Rico (Etnier 1993; Lee 1980).

The “Bartram’s” Bass occurs in the Saluda River (Santee drainage), South Carolina, primarily in the river’s mainstem and tributaries below the Saluda Dam. One report of “Bartram’s” Bass from a tributary upstream of Saluda Dam is documented in the Clemson University’s museum collection. The species also occurs in the Enoree River. However, “Bartram’s” Bass are conspicuously absent from the adjacent Tyger River and the cool headwater rivers of the North, Middle, and South Saluda Rivers and their tributaries, in what appears prime habitat. This would tend to support taxonomists’ opinions that “Bartram’s” Bass are not native to the Santee River system. This is currently under study. The Chattooga River, once being a tributary to the Chattahoochee system (Ross 1970), likely explains the presence of Redeye Bass in the Savannah drainage. In South Carolina, “Bartram’s” Bass are also found below the Fall Line in the mainstem of the Savannah River (SCDNR unpublished data).

“Bartram’s” Bass appear somewhat resilient to habitat alterations. Coneross Creek, a tributary to the Seneca River arm of Lake Hartwell, harbors good numbers of “Bartram’s” Bass despite being severely impacted, both by increased sediment loading from agriculture and development, and by greatly increased nutrient loads from a large municipal sewage discharge. “Bartram’s” Bass appear to be fairly common in certain streams of the upper Savannah system (SCDNR unpublished data). Although Redeye Bass reportedly perform poorly in impoundments within their native range, “Bartram’s” Bass thrived in the large oligotrophic and mesotrophic reservoirs of the upper Savannah River system prior to the introduction of Alabama Bass (Barwick and Moore 1983; Barwick et al. 2006; Oswald 2007). However, recent studies show the “Bartram’s” Bass has since likely been eliminated from Lakes Keowee and Russel via introgressive hybridization. The species also declined by more than 60%in Lakes Jocassee and Hartwell over the 6-year period from 2004 –2010 (Bangs 2011). Hybrids between “Bartram’s” Bass and either Alabama or Smallmouth Bass were present in 5 of 8 streams sampled in 2009 and 2010, indicating an expansion of the Alabama Bass genome into lotic habitats and confirming the introduction of Smallmouth Bass to an area of the Savannah River near the lowermost portion of the “Bartram’s” Bass range (Leitner et al. 2013, in review).

It is not known what effects introduced black bass will have on “Bartram’s” Bass in tributary streams. Many of the tributaries to the lakes do have barriers to upstream fish movement, which

may protect stream populations of “Bartram’s” Bass from invasion of Alabama Bass or their hybrids. This is an area for further study. Based on South Carolina Stream Assessment (2006-2011) data, the mean statewide density estimate for Redeye Bass in wadeable streams was 0.04 (95% confidence interval: 0.00 – 0.09) per 100 m².

HABITAT OR NATURAL COMMUNITY REQUIREMENTS

“Bartram’s” Bass occur in a variety of habitats in South Carolina from fast flowing, high-gradient streams of the Blue Ridge and Upper Piedmont Ecoregions to low-gradient streams and the Savannah River below the Fall Line. It is found in small streams to large rivers and reservoirs.

CHALLENGES

“Bartram’s” Bass is primarily threatened by the introduction of non-native Alabama and Smallmouth Bass. Other threats may include land development, siltation, and hydrologic alterations such as channelization and construction of impoundments, acid deposition, and displacement by non-native fishes.

CONSERVATION ACCOMPLISHMENTS

“Bartram’s” Bass habitat is primarily protected by land ownership patterns in some key habitats including the Chattooga River, Chauga River, Eastatoee River, and Stevens Creek. However, the amount of unprotected habitat for this species far exceeds protected habitat.

The filling of information gaps with regard to the extent of hybridization in the Savannah Basin allows the informed use of resources to further the conservation of this species. Funding has been secured to establish more in-depth baseline genetic and habitat data on selected tributaries in the upper Savannah, to identify genetically pure populations, and to assess any protection provided headwater populations by in-place barriers. Results will guide prioritization of sub-watersheds for further conservation actions.

South Carolina Stream Assessment data have facilitated the calculation of standardized abundance (density) estimates for this species at multiple spatial strata including statewide, river basin, level-IV ecoregion, and “ecobasin” (ecoregion x river basin). These estimates, for the first time, provide an objective measure of current population status that will serve as a baseline for following future population trends and gauging the effectiveness of conservation actions.

CONSERVATION RECOMMENDATIONS

- Use South Carolina Stream Assessment decision-support GIS modeling tools to identify levels and spatial distributions of critical habitat factors to sustain the species in geographic areas of interest.
- Use South Carolina Stream Assessment decision-support GIS modeling tools to identify priority regions and watersheds at greatest risk of decline in stream integrity
- Assess introgression of non-native genes in lotic populations.

- Identify genetically pure tributary populations, of redeye bass.
- Consider identified management units, and strive to protect the full complement of genetic diversity among Redeye Bass populations within the Savannah Basin.
- Describe life history and habitat requirements of Redeye Bass.
- Inventory and monitor water quality and habitat in Redeye Bass streams to identify water quality threats as well as habitat needs and deficiencies.
- 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 in other areas that contain available habitat.
- Encourage responsible land use planning.
- Consider this species' needs when participating in the environmental permit review process.
- Educate motor vehicle operators of the negative effects of crossing streams at multiple locations and using stream bottoms as trails.
- Monitor the success of Redeye Bass habitat protection and advocate for additional protection through the environmental permit review process.
- Promote Redeye Bass as a sport fishery in larger streams.
- Conduct an education and outreach campaign to raise awareness of the impacts of illegal introductions of non-native species.

MEASURES OF SUCCESS

Identification of genetically pure populations that can benefit from conservation measures will be a key component in the protection of this species. Establishing refugia for pure "Bartram's" Bass populations above barriers that may deter immigration of nonnative black basses would be advisable. Determining the distribution, life history, habitat needs, and population structure and trends would represent a measure of success for this species. Methods that protect water quality are also likely to protect this species. In the event that more protective BMPs are implemented, population studies of this fish could assist in determining the effectiveness of those measures.

LITERATURE CITED

Bangs, M. 2011. Decline of the Savannah River redeye bass (*Micropterus coosae*) due to introgressive hybridization with invasive Alabama spotted bass (*M. punctulatus henshalli*). Masters Thesis, University of South Carolina, Columbia, South Carolina.

Barwick, D. H. and P. R. Moore. 1983. Abundance and growth of redeye bass in two South Carolina reservoirs. *Transactions of the American Fisheries Society* 112:216–219.

Etnier, D.A. and W.C. Starnes. 1993. The Fishes of Tennessee. The University of Tennessee Press. Knoxville, Tennessee. 681 pp.

Freeman, B., A. Taylor, K. Oswald, M. Freeman, J. Quattro, and J. Leitner. Shoal basses, a clade of cryptic identity. Pages XXX-XXX in Tringali et al. (2013). *In review.*

Lee, D.S., C.R. Gilbert, C.H. Hocutt, R.E. Jenkins, D.E. McAllister and J.R. Stauffer, Jr. 1980. Atlas of North American Freshwater Fishes. Publication #1980-12 of the North Carolina Biological Survey. North Carolina State Museum of Natural History. 867 pp.

Leitner, J. K., K. Oswald, M. Bangs, D. Rankin, J. Quattro. 2013. A consideration of the conservation impacts of hybridization between native Bartram's bass *Micropterus sp. cf. M. coosae* and two introduced species in the Savannah basin. Pages XXX-XXX in Tringali et al. (2013). *In review*.

NatureServe. 2013. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: March 26, 2013).

Oswald , K. J., J. Leitner, D. Rankin, D. H. Barwick, B. Freeman, T. Greig, M. Bangs, and J. M. Quattro. 2013. Evolutionary genetic diversification, historical demography, and conservation of Bartram's bass (*Micropterus sp. cf. M. coosae)*. Pages XXX-XXX in Tringali et al. (2013). *In review*.

Philipp, D.P., J.E. Clauseen, T.W. Kaassler and J.M. Epifanio. 2002. Mixing stocks of largemouth bass reduces fitness through outbreeding depression. Pages 349-363. *In*: Black bass: ecology, conservation, and management, D.P. Philipp and M.S. Ridgway, editors. American Fisheries Society, Symposium 31. Bethesda, Maryland.

Pierce, P.C. and M.J. Van Den Avyle. 1997. Hybridization between introduced spotted bass and smallmouth bass in reservoirs. Transactions of the American Fisheries Society. 126:939-947.

Ramsey, J.S. 1973. The *Micropterus coosae* complex in the southeastern U.S. (Osteichthyes, Centrarchidae). Association of Southern Biologist Bulletin. 20: 76

Rohde, F.C., R.G., Arndt, D.G. Lindquist and J.F. Parnell. 1994. Freshwater Fishes of the Carolinas, Virginia, Maryland, and Delaware. The University of North Carolina Press. Chapel Hill, North Carolina. 222 pp.

Turner, J.M. and F.J. Bulow. 1989. Morphological analysis of redeye bass (*Micropterus coosae*), small-mouth bass (*M. dolomieu*), and suspected hybrids in Roaring River, TN. J. Tenn. Acad. Sci. 64(2): 55.

Warren, M.L., Jr., B.M. Burr, S.J. Walsh, H.L. Bart, Jr., R.C. Cashner, D.A. Etnier, B.J. Freeman, B.R. Kuhajda, R.L. Mayden, H.W. Robison, S.T. Ross and W.C. Starnes. 2000. Diversity, distribution, and conservation status of the native freshwater fishes of the southern United States. Fisheries 25(10):7-31.