

## Robust Redhorse

### *Moxostoma robustum*

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### DESCRIPTION

#### Taxonomy and Basic Description

The Robust Redhorse is a large, heavy-bodied sucker that can reach lengths greater than 70 cm (28 in.) and weights up to 8 kg (17.6 lbs.). The Robust Redhorse has large, molar-like pharyngeal teeth specialized for crushing hard-bodied prey like native mussels. It resembles the River Redhorse, *M. carinatum*, but has 10 pelvic rays instead of 9 (Rohde et al 1994). The fish is bronze on the back and sides, and adults are faintly striped on the lower sides. Juveniles have intense red in the caudal fin, which becomes less obvious in adults. Breeding males develop prominent tubercles on the snout, head, and anal and caudal fins (GADNR 1999).

After specimens of a large redhorse collected in Georgia and North Carolina in the 1980s and early 1990s were determined to be the fish described by Cope (1870) as *M. robustum*, major revisions of sucker taxonomy were initiated. Jenkins and Burkhead (1994, in a footnote) applied the name *M. robustum* to the large rediscovered redhorse and called it Robust Redhorse. Smallfin Redhorse was moved to the newly elevated genus *Scartomyzon* and proposed the common name “Brassy” Jumprock. Its taxonomic status has still not been completely resolved (NatureServe 2004).

#### Status

The Robust Redhorse carries no legal status in South Carolina, but is listed as endangered in Georgia and North Carolina. It is considered critically imperiled (S1) in Georgia and North Carolina, which are the only other states where it occurs (NatureServe 2013). In a year 2000 assessment of Southeastern fishes, the Robust Redhorse was considered in danger of extinction throughout all or part of its range (Warren et al. 2000). Over the past decade, much has been learned about existing populations, and 3 experimental populations have been stocked out. While this progress has reduced the danger of extinction, regional drought and habitat limitations continue to be impediments to reaching the goals of population stability in all parts of its range (S. Lamprecht, pers. obs.).

#### POPULATION SIZE AND DISTRIBUTION

Wild populations of Robust Redhorse are now known to exist in the Ocmulgee and Oconee rivers (Georgia), the Savannah River (Georgia/South Carolina), and the Pee Dee River (North Carolina/South Carolina). In addition, small *stocked populations* have been established in Georgia by introducing Oconee River progeny in the Ocmulgee, Ogeechee, and Broad Rivers;

and in South Carolina by introducing Savannah River progeny in the Broad and Wateree Rivers. While mature individuals have been collected and spawning behavior observed, no natural recruitment into these populations have been detected (RRCC 2011).

Robust Redhorse population size in the Oconee River was originally estimated as approximately 1,000 to 3,000 adults in an 80 km (50 mi.) section of river. Annual sampling currently suggests that the Oconee population may not be reproducing at levels sufficient to sustain the population. Further, this population is vulnerable to catastrophic events (NatureServe 2004). The latest population estimate for the Oconee River could not be made because the population has decreased to the point where the available detection effort was unable to observe any fish in the spring of 2011 (RRCC 2011).

The Savannah River appears to be supporting a substantial population of Robust Redhorse (RRCC 2004). However, no estimates of the size of the Savannah population have been made to date. Repeated spawning efforts have recaptured adults at an average of about 30%. New individuals continue to be encountered, indicating relatively steady recruitment into the Savannah River population. While the Savannah population has not been studied as extensively as the Oconee and Pee Dee, 9 years of broodstock collection indicates that it is likely the most stable of the known wild populations (S. Lamprecht, pers. obs.).

In the Yadkin/Pee Dee drainage, Robust Redhorse are only found downstream of Blewett Falls Dam, the most downstream dam on the system. Initial collections were scant, but with the use of telemetry, 2 spawning shoals were identified and collection numbers increased to the point where over 20 individuals were actively tracked in 2010 (RRCC 2010). Researchers are currently studying the possible reintroduction of Robust Redhorse in upstream portions of the system (RRCC 2011).

Wirgin et al. (2001) examined mitochondrial DNA (mtDNA) variation in *M. robustum* and concluded that the Oconee/Ocmulgee River and Savannah River populations should be treated as evolutionarily significant units (ESU). These results were confirmed in 2011 by Tanya Darden (RRCC 2011) who also examined a larger Pee Dee population data set and confirmed the preliminary assessment that it too should be considered a distinct ESU. Both the Pee Dee and Savannah populations show high within-population diversity as well as low levels of inbreeding as compared to the average genetic diversity measured for freshwater fishes, despite relatively low effective population size estimates (RRCC 2011).

## HABITAT OR NATURAL COMMUNITY REQUIREMENTS

Robust Redhorse is known only from habitats in mainstream rivers where it has been collected in riffles, runs, and pools. Adults are usually found in association with tree snags, often in deep water near shore. Spawning occurs in coarse gravel habitats (GADNR 1999). Stocked juvenile Robust Redhorse have been collected in Thurmond Reservoir and in slower Coastal Plain river runs. One wild spawn juvenile was collected in Savannah River tidal freshwater. Adults in Georgia's Broad River utilize the downstream reservoir outside of spawning season. These reservoir collections tend to indicate a tolerance of, or a preference for, lentic habitat during a portion of the life cycle (RRCC 2000). Recent telemetry observations in both the Santee River

drainage and Georgia's Broad River support the hypothesis that adults select cooler water temperatures during the summer.

## CHALLENGES

Habitat loss and disruption of spawning migrations resulting from dams and impoundments; predation and competition by introduced nonnative species like buffalo, flathead catfish and blue catfish; and significant deterioration of water quality due to sedimentation and pollution are believed to have contributed to the decline of the Robust Redhorse. Additionally, the limited range of known populations and low rates of recruitment to the adult population represent challenges to the species' future (RRCC 2004).

## CONSERVATION ACCOMPLISHMENTS

The Robust Redhorse Conservation Committee (RRCC) was established in 1995 under a Memorandum of Understanding (MOU) between state and federal resource agencies, private industry, and the conservation community to work proactively to recover the population across its historic range. The RRCC was formed in lieu of listing the species under the Endangered Species Act. Partners include 13 signatory members to the MOU, 2 cooperating members under the MOU, and a variety of university research and resource management facilities as affiliate members.

A plan entitled *Conservation Strategy for the Robust Redhorse*, that provides overall conservation guidance to assure the continued survival of the species, was adopted by the RRCC in 1998 and updated in 2003. It establishes short- and long-term conservation goals, describes the status and distribution of the species, discusses problems facing the species, and presents conservation actions that should be implemented to accomplish short- and long-term goals (RRCC 2004). The recovery goal established by the RRCC is 6 self-sustaining populations of Robust Redhorse across its former range (Nichols 2003).

Efforts to restore Robust Redhorse to the Santee River drainage began in 2004 with Phase I fingerling stockings in the Broad River above and Below Parr Reservoir. Entering 2011 a total of 50,500 Phase I fingerlings were released in the 2 Broad River restoration sites. The Wateree River site has received 12,601 Phase I fingerlings, 2,400 Phase II juveniles (age 1+), and 400 Phase III juveniles (age 2+). Stocking efforts in these sites are to continue until progeny from 100 parental crossings are produced. To date, mature males and females have been collected and spawning behavior has been observed. Fish of all sizes have been collected, but no wild spawn recruitment has been detected. Telemetry study has shown long distance movement between spawning shoals in the spring and summer residence areas. Telemetry studies on the Pee Dee River have shown that some Robust Redhorse use the South Carolina portion of the river during the summer, fall, and winter, while critical spawning shoals occur in North Carolina.

See the SWAP chapter on SWG grants, particularly those pertaining to the Robust Redhorse.

## CONSERVATION RECOMMENDATIONS

- Continue work on habitat preference and utilization for various life stages for the Robust Redhorse.
- Continue refining our understanding of the life history of the Robust Redhorse.
- Maintain the MOU that formed the RRCC and continue working with partners to achieve the goals set forth in the conservation strategy developed by the RRCC.
- Complete the reintroduction of the Robust Redhorse to the Santee River Drainage and confirm natural recruitment.
- 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.
- Continue to develop educational materials to raise public awareness of nongame species and their ecological importance to the natural history of South Carolina's aquatic habitats.

## MEASURES OF SUCCESS

Since 2005, work on all of the initial recommendations has been initiated or is nearly completed for Robust Redhorse (RRH). Present occurrence of adult RRH is well defined, as well as habitat preferences of adults, but collection of juveniles continues to be problematic across its range. The genetic work done on RRH has lent insight into existing population health and what to consider as we move forward in efforts to enhance existing populations. The RRCC MOU has been renewed and partners continue to meet and cooperatively address current issues and questions. The importance of RRH has been elevated so that it has been considered in recent FERC relicensing and water flow recommendations that affect critical spawning habitat. South Carolina's Santee drainage reintroduction program is also nearing completion; the ultimate measure of success, natural recruitment, has yet to be observed.

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