Common Name: ROBUST REDHORSE

Scientific Name: *Moxostoma robustum*

Other Commonly Used Names: none

Previously Used Scientific Names: *Ptychostomus robustus*

Family: Catostomidae

Rarity Ranks: G1/S1

State Legal Status: Endangered

Federal Legal Status: Not Listed

Description: The robust redhorse is a large, heavy-bodied sucker that attains total lengths greater than 70 cm (28 in) and weights up to 8 kg (17.6 lbs). Like the river redhorse, a related species, the robust redhorse has large molar-like pharyngeal teeth, which are a specialization for crushing hard-bodied prey such as native mussels. The robust redhorse is bronze on the back and sides, with scattered mid-lateral dark blotches. Adults have a broad faint lateral stripe that varies in intensity, and nuptial males have a dark intense stripe extending along lower sides to the snout tip. The lips are plicate (divided into longitudinal sections) with the posterior margin of the lower lip relatively straight except for a few central plicae that extend noticeably beyond the margin; this character is best developed in large adults. Juveniles will have intense red in the caudal fin and often in other fins as well, and this red coloration becomes less intense in adults. Adult males develop large prominent tubercles on the snout, head, anal, and caudal fins during the spawning season.

Similar Species: There are four other larger sucker species occurring within the Savannah and Altamaha River drainages that are similar to the robust redhorse. The notchlip redhorse (*Moxostoma collapsum*) can be distinguished from the robust redhorse by a less robust shape and semipapillose lips with a V-shaped posterior margin on the lower lip. Both of the jumprock species, striped jumprock (*Moxostoma rupiscartes)* and brassy jumprock *(M*. sp. *cf. lachneri),* can be distinguished by their slender shape and circumpeduncle scale row counts of 16 (12 in *M. robustum*). Spotted suckers (*Minytrema melanops*) can be distinguished by rows of dark spots on the sides (most individuals) and a slender caudal peduncle with 16 circumpeduncle scales. At a glance, robust redhorse could be confused with common carp (*Cyprinus carpio*) but a long dorsal fin base, barbels and lack of large fleshy lips allow this species to be easily distinguished from robust redhorse.

Habitat: The robust redhorse is primarily known from habitats in main-stem rivers and has been collected in riffles, runs, and pools. Adults in the Oconee River have usually been found in association with (tree) snags, in moderate to swift current, often in deeper water near shore. Spawning occurs in rivers over coarse gravel bed sediments, with water velocities ranging from .26 cm/sec to at least .67 cm/sec. Individuals released in the Broad River have also been collected in downstream Strom Thurmond Reservoir, which impounds the Savannah River and the lower portion of the Broad River. Adults are capable of long distance movements, and studies on populations in the lower Savannah and Ocmulgee rivers have documented movements in excess of 100km.

Diet: Asian clams (non-native) and a variety of aquatic insects. Large molariform pharyngeal teeth allow this species to utilize harder bodied prey items such as Asian clams, snails, native unionid mussels and crayfish.

Life History: In the Oconee and Savannah river populations, spawning occurs from late April through early June, when water temperatures approach 18-20°C (64-68°F). Spawning has been observed in rivers with water depths ranging from 0.29 to 1.04 m and velocities water ranging from 0.26 to 0.67 cm/sec over coarse gravel bed sediments. The spawning act almost always involves a female flanked on either side by two males. Fertilized eggs are buried in the gravel downstream from the spawning triad, as a result of the vigorous spawning act. A muddy plume often appears downstream from the spawning fish due to the magnitude of sediment disturbance. Young robust redhorse remain in the gravel after hatching, until they have absorbed the yolk sac and can swim. After absorbing their yolk sacs, individuals swim to the surface to inflate their gas bladder and return to the gravel for a period of time. Robust redhorse may live at least 25 years, and research being conducted on the Oconee River population may reveal an even longer life span. Diet studies on the robust redhorse are limited to Oconee River fish and hatchery reared individuals released into the Broad River.

Survey Recommendations: Monitoring of stocked populations, especially their reproductive success and recruitment, is essential for determining the effectiveness of population augmentation projects. Continuation of wild population monitoring for population size and evidence of recruitment is also essential. Coordination with the

Robust Redhorse Conservation Committee and their partners is required before attempting to sample this species.

Range: The robust redhorse historically occurred in southeastern Atlantic slope river drainages, from the Altamaha in Georgia northward to the Pee Dee of North and South Carolina. Currently a small population persists in a stretch of the Oconee River from Milledgeville south to just above Dublin, Georgia. Additional small populations of unknown size persist in the Savannah River below New Savannah Bluff Lock and Dam, Georgia / South Carolina, and the Pee Dee River, North and South Carolina. The robust redhorse has been re-introduced into the Broad River, a tributary of the Savannah River, and the Ogeechee and Ocmulgee rivers in Georgia, and has also been introduced into large tributaries in the Santee River drainage in South Carolina. Check the Fishes of Georgia Webpage for a watershed-level distribution map.

Threats: Currently, wild robust redhorse populations occur in the Oconee, Savannah and Pee Dee rivers, in upper Coastal Plain reaches below the fall zone. Large hydroelectric facilities have altered each of these rivers and prevented access to habitats in the Piedmont. Wild spawned individuals in the Oconee River have declined in abundance and this population has been augmented by the introduction of hatchery-reared individuals. Recent survey work in the Pee Dee River confirms a small population with ongoing recruitment, with several year classes being present. No recent evaluations or surveys have been conducted on the Savannah River population, but previous size distributions suggest ongoing recruitment.

Species like the robust redhorse that have limited ranges and narrow spawning habitat requirements are vulnerable to catastrophic accidents as well as general habitat degradation. Current studies on the Oconee River population suggest that recruitment of new individuals is very low, further increasing the overall vulnerability of this species. The section of the Oconee River inhabited by robust redhorse is altered by hydropower operations at Wallace and Sinclair dams. It is crossed by a major railroad and several well-traveled highways, and is within the corridor of a proposed interstate highway. Transportation accidents that result in spills of hazardous chemicals could result in a major fish kill that would effectively eliminate the robust redhorse in the Oconee River. Much more likely threats to the robust redhorse are increasing water pollution and habitat degradation that result from poor land-use practices. This region of the Oconee River basin is heavily mined for kaolin clay, and industrial spills have occurred in tributaries to this reach of the Oconee River in the recent past. Species like the robust redhorse which depend upon clean gravel bed sediments for spawning and early development of young are especially vulnerable to siltation, and any activities that contribute excessive amounts of sediment to the river are major threats. Additionally, proposed water withdrawals and discharges near a historical spawning location within the Oconee River could pose a threat to reproduction.

Large predatory catfish such as the blue catfish and flathead catfish are native to streams draining into the Gulf of Mexico, but have been introduced into many rivers draining into the Atlantic Ocean. The introduction of these species of catfish is often associated with a

decline in populations of suckers, sunfishes and native catfishes. Robust redhorse and other native species are threatened by the introductions of these large catfish. Currently, populations of flathead catfish are known from the Ocmulgee and Oconee river main-stem, but are not known to occur in the portion of the Savannah below Augusta where robust redhorse occur. Blue catfish have been introduced in the upper Oconee, and blue catfish and flathead catfish also occur in Strom Thurmond reservoir on the Savannah River. The expansion of the ranges of these catfish will further threaten already small populations of robust redhorse.

Georgia Conservation Status: Wild robust redhorse occur in the Oconee River downstream of Milledgeville and in the Savannah River downstream of Augusta. Although spawning has been observed in both wild populations as well as in the stocked population in the Broad River and on one occasion in the Ocmulgee River, recruitment still appears to be very limited in the Oconee, and has not been documented in the three stocked populations. The status of recent recruitment in the Savannah is unknown due to lack of sampling but previous observed size distribution suggests it is ongoing.

Conservation and Management Recommendations: Although progress has been made in recovery efforts for this species, primarily by establishing stocked refugial populations, the robust redhorse is among the most threatened species of fishes in Georgia. Conserving populations of the robust redhorse in Georgia depends upon unraveling the mysteries of its life history in the Oconee and Savannah rivers, as well as in introduced populations, and implementing management strategies that will help ensure long-term viability. Long-term research is essential to gather important information for future management decisions. Improving water quality and preventing any future habitat degradation in the Oconee and Savannah rivers are needed to help protect Georgia populations. An important first step toward improving spawning habitat in the Oconee River was taken in 2007 – 2009 with the initiation of significant gravel augmentation projects.

A recovery goal established by the Robust Redhorse Conservation Committee is to establish populations of robust redhorse in at least six river systems within the historic range. Robust redhorse have been released into the Broad, Ogeechee, and Ocmulgee rivers to begin establishing new populations in Georgia, and the Broad and Wateree rivers (Santee drainage) of South Carolina have been stocked as well. Assessing the status of these stocked populations is essential for making appropriate management decisions and for evaluating long-term success. Additionally, the population in the Oconee River has been augmented with stocked individuals to compensate for low recruitment in the wild population and a long-term monitoring program is essential for evaluating the relative success of these efforts.

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B. Freeman-Original Account: 1999, updates and edits to account 2009.
J. Evans-edits to account August 2009.
K. Owers-Updates: January 28th, 2009 Added picture, updated status and ranks, added fish atlas link, converted to new format, minor edits to text
C. Straight –Updates: July 8th, 2009 Changed picture to reflect proper copyright, updated account.
Z. Abouhamdan, April 2016: updated link