

Movement Patterns of Adult Sicklefin Redhorse (*Moxostoma* sp.) in the Oconaluftee River

Description of Research

Introduction/background

The Sicklefin Redhorse (SFRH) is a medium-sized migratory freshwater fish from the genus *Moxostoma* in the sucker family Catostomidae. It is similar in shape and color to other redhorse species, but is identifiable by a sickle shaped dorsal fin. *Moxostoma* species are benthic omnivores that feed on macroinvertebrates, small bivalves, and gastropod mollusks (Jenkins 1999). Like many other freshwater suckerfish of the southern United States, the SFRH population is at risk due to habitat degradation, river and stream impoundments, eutrophication, siltation, and invasive exotic species (Coughlan 2007). When federal protection is gained under the Endangered Species Act, it will be one of only three federally listed endangered freshwater fish species endemic to North Carolina (USFWS 2014).

Fragmentation due to stream impediments, stream degradation, and loss of natural home range are hypothesized as the main factors influencing reduced populations of the SFRH (Warren et al. 2000, Stowe 2012). Stream impoundments result in physical barriers to natural migratory patterns, changes in flow regime, temperature, sedimentation levels, riparian vegetation, and changes to the overall contours of the stream. Each of these changes is known to adversely affect fish communities (McCartney 2009). A home range is defined as the distance that an individual travels through and uses for daily and uses for daily activities during its lifespan (Burt 1943). The complete effects of this dam and other natural barriers concerning the inhibition of the SFRH to access and find new spawning sites and home ranges are unknown.

The objectives of this study are to determine the effect of release site and individual variation on distance moved and home range size for adults that have been relocated into a river that is historically within its home range. In a similar redhorse study, the employment of radio telemetry was essential in assessing the effectiveness of the stocking program and whether individuals have the ability to integrate into a resident population (Grabowski 2009). The data received from our study will contribute to the success of future restoration efforts.

Methodology

Experienced personnel of the US Fish and Wildlife Service (USFWS) used boat electrofishing to capture 10 native SFRH from the Tuckasegee river in Swain County, NC. They were surgically implanted with radio transmitters and passive integrative transponder tags on August 26th. Approximate lifespan of transponders used are guaranteed for one year but may last up to 18 months.

After recovery, to assess complete movement variations, two release sites on the Oconaluftee River were chosen in Cherokee, NC. Each fish was measured, weighed, sexed, and had their health assessed and recorded before release. Transmitters were assigned an individual pulsation code to allow specific identification of individuals.

Tracking and location with antenna will be initially accomplished by vehicle using roadways parallel to the Oconaluftee River. After establishing general location of a fish, exact position will be visually verified and microhabitat conditions determined by entering the river and using snorkel gear and masks. When possible, a team of two or three people will float the river in kayaks to gain accurate locations to limit the possibilities of spooking the Redhorse from their preferred habitat. Microhabitat variables will coincide with previous research studies and will include water depth (m), water velocity (m/s), dissolved oxygen (mg/L), temperature (°C), substrate composition, cover percentage, distance to cover (m), distance to bank (m), and occurrence of possible food sources (Favrot 2009, Stowe 2012).

Global Positioning Systems (GPS) coordinates will be recorded each time a SFRH is successfully located. This information will be used to map movements and calculate home range individual SFRH using Geographic Information Systems (GIS) software. To assess impact of stream impediments on movement, we will identify nearby rapids, riffles (areas with shallow water and high flow velocity), and dams, and record whether or not SFRH are able to cross them. Fish will be tracked 1- 2 days a week from the time of release until transmitter battery life expires, with a goal of locating each fish at least once a week.

Body

Movement and dispersal of population structure are crucial to understanding the underlying dynamics of a population (Skalski and Gillam 2000). Other redhorse species have shown a high site fidelity and specificity to both spawning sites and home ranges (Grabowski and Isely 2006). With Robust Redhorse, a similar endangered *Moxostoma* species, introduced fish led researchers to new spawning grounds as well as other resident fish communities (Grabowski and Jennings 2009). Radio telemetry tracking will help in determining what drives location preferences of adult Redhorse within a new stretch of river.

Conclusion

This study will yield valuable information regarding the movement patterns of adult Sicklefin Redhorse in the Oconaluftee River in western North Carolina. This information will help with efforts currently being made by the US Fish and Wildlife Service as well as the Eastern Band of Cherokee Indians to restore and reintroduce the SFRH. Factors that have slowed conservation efforts for all Catostomid fish include a lack of basic natural and ecological life history and a misconception that suckers are tolerant fish with little social or ecological value (Cooke et al. 2005). There is a critical need to identify Sicklefin Redhorse home range and habitat preferences for reintroduction programs to be successful.

Timeline

This study’s movement assessment will take place weekly from September through April, 2015, with the potential of continued monitoring until expiration of radio transmitter life (possibly Spring of 2016). Data obtained from the release date until approximately March will be assessed and presented at the Spring Undergraduate research symposium. The study’s paper and analysis will be completed in the spring of 2015, with additional analyses continuing for the duration of the individuals’ battery life.

Budget with Justification

Item	Quantity	Source	Price Per Unit	Total Price
Travel to Study Sites	1,400 miles travel to River sites	UNC-Asheville	0.35 (minivans) and 0.41 (SUV)	500.00
Total				\$500.00

The US Fish and Wildlife Service and Eastern Band of Cherokee will be providing resources for the implantations as well as the tracking receivers and antennae. All other gear necessary was purchased through the Summer Undergraduate Research Grant. All expenses will go towards travel from various sites for students and volunteers. This budget will allow us to be able to continue this research and attribute to the overall success of the restoration of a threatened species.

Publication Outlet

The Sicklefin Redhorse movement data obtained during this study will be presented at UNCA during the spring undergraduate research symposium. In the spring a paper will be submitted for publication to the University of North Carolina at Asheville's Journal. It will also be submitted to a peer-reviewed Fisheries journal, possibly, *Transactions of the American Fisheries Society*.

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