THE RESPONSE OF SNAPPING TURTLES (*CHELYDRA SERPENTINA*) POPULATION TO BULLFROG REMOVAL IN THE MORA RIVER OF NORTHERN NEW MEXICO

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Abstract

Snapping turtles (*Chelydra serpentina*) are not well studied in New Mexico, and they have not been studied with relation to invasive species in Northern New Mexico. Recently, there have been many studies on herpetofauna and their responses to the invasive American bullfrog (*Lithobates catesbeianus*) along the Mora River at the Rio Mora National Wildlife Refuge. In a past study, bullfrogs were eradicated experimentally for a basis to learn about their impacts on native species. Snapping turtles live in the same habitats as bullfrogs and their hatchlings are potentially prey for bullfrogs. After bullfrog eradication, we have found neonate snapping turtles while no neonates were seen in the area where bullfrogs are still present. So I surmise that bullfrogs may have an impact on the population of snapping turtles. In this study I will evaluate the behavior and abundance of both adult and juvenile snapping turtles in response to the presence or absence of bullfrogs. I will equip 8 snapping turtles with ATS radio telemetry transmitters and follow them for the next year documenting their preferred habitat, mating and nesting grounds. I will also perform systematic mark and capture throughout the summer to understand their demography and distribution. Understanding the habitat that snapping turtles select will help land managers incorporate protection of these habitats for this unrecognized and elusive species. Not only will this study provide baseline data on the behavior of snapping turtles in this region, it will provide a better understanding of the interactions between invasive and native species.

Figure 1. Adult common snapping turtle (*Chelydra serpentina*).

Introduction

Herpetofauna species including snakes, lizards, alligators, salamanders, frogs and turtles are recognized for their valuable contributions to natural diversity as well as their important roles in ecosystems (Guilfoyle, 2010) They are critical in the food web as either predators or prey (Goin et. al., 1978). However, there are many different human induced factors threatening reptiles, including: habitat loss and degradation, invasive species introduction, pollution, diseases, and climate change (Gibbons et al., 2000).

Invasive species are a huge problem in New Mexico and throughout the world. They threaten native species through competition, exclusion and predation. In particular the American bullfrog (*Lithobates catesbeianus*) is known to out compete native aquatic species including the plains leopard frog (*Lithobates blairi*) and the northern leopard frog (*Lithobates pipiens*) (Kraus, 2009). Snapping turtles could potentially be affected by their presence as well. Much of their native range actually overlaps with the American bullfrog, except in the proposed region of study in northern New Mexico. Even though, the snapping turtles native range overlaps with much of the bullfrogs range, they may not have adaptations to overcome the high densities of bullfrogs that occur in New Mexico.

Snapping turtles are the largest and widest ranging Mid-Atlantic fresh water turtle (Strain, Anderson, Michael, & Turk, 2012). They are highly aquatic, spending most of their time in shallow pools hiding in vegetation (Carl H. Ernst, 2009). Snapping turtles are more active during the night in the southern regions (Carl H. Ernst, 2009) which coincides with the activity of bullfrogs. These overlaps in active time and feeding preferences may be contributors to enhanced competition in this region. They are rare and not greatly studied in New Mexico and their interactions with bullfrogs have not yet been examined.

Bullfrogs have a “sit and wait” strategy for prey and they consume anything they can overcome and fit down their throats (Degenhardt, Painter, & Price, 1996). Bury and Whelan (1984) documented that they can eat a wide variety of animals including turtles. This is a potential problem because in New Mexico native turtle populations are not abundant. A high potential for predation by bullfrogs exists because snapping turtle neonates are small enough to be eaten. On top of the risk of predation by bullfrogs, both snapping turtles and bullfrogs are generalist omnivores (Carl H. Ernst, 2009; Bury & Whelan, 1984), so they are likely to compete for food resources.

Recent research at the Rio Mora National Wildlife Refuge (RMNWR), removed adult bullfrogs and bullfrog tadpoles from an experimental region and a control region was left untouched. This study site allows us to compare abundances of potential prey species and the behavior of animals that are in direct competition with, or suffer predation from, bullfrogs between the two regions.

This study aims to determine whether the removal of bullfrogs change the behavior or abundance of the snapping turtles. Habitat preferences will be determined by: 1) monitoring the behavior and habitat selection of eight adult snapping turtles with two males and two females at both the experimental and at the control region using telemetry, 2) compare abundance and demographics of turtles between regions using transect sampling, trapping, and seining and 3) build a behavioral repertoire of snapping turtles using focal sampling, to learn more about their diet and behavior.

Methods

Study site description

The study site is located at the Rio Mora National Wildlife Refuge along a section of the Mora River in Mora County, NM (figure 3). The extent of the research area encompasses a semi arid canyon and grassland ecosystem on the eastern side of the Rocky Mountains with cottonwoods and willows in the riparian area. In an experimental section of the river, adult bullfrogs were removed for two seasons.

Capturing and handling turtles

We will continuously capture all ages of turtles throughout the year long study. The turtles will be caught opportunistically as well as with fish baited hoop-net traps (figure 2) (Obbard & Brooks, 1981). These baited traps will be laid out partially submerged in the river at locations with high preference to snapping turtles. Immediately after catching turtles, the water and air temperature will be taken. If the turtle is caught on land, the temperature of closest water will be measured. We will take a series of morphological measurements including: mass, carapace length, carapace width, sex and age. Age estimates will be determined using annual growth lines on the surface of plastral or carapacial scutes (Galbraith & Brooks, 1989).

Telemetry

Eight adult turtles will be caught, preferentially an even number of males and females in both the experimental and the control region. Radio transmitters (figure 4) will be attached to the turtles using a fast drying marine epoxy (2 packets of Hardman Double Bubble Epoxy) and they will be kept overnight to allow the epoxy to cure properly. Once we have all of the turtles radio tagged we will continue trapping additional turtles to estimate their total abundance in both regions. As soon as turtles are caught PIT tags will be deployed under the skin for mark and recapture. This is done to ensure, that if the animal is lost or the transmitter accidentally becomes dislodged, we will still be able to identify the animal. This method will allow differentiation between animals, so turtle morphologies can be tracked over time when recaptured.

Behavior and Abundance Surveys

Focal surveys will be performed during the mornings and evening when turtles are most active (Obbard & Brooks, 1981). Focal surveys will consist of finding a radio tagged turtle and watching them for an hour recording their behavior. Video recording will also be used to document their behavior.

In case turtles are not caught by the baited traps, night surveys will be implemented, by scanning the river with a spotlight. Transect sampling techniques will be applied to determine abundance. This will consist of walking the river and scanning the ponds during the dusk hours with a headlamp and counting the number of turtles present.

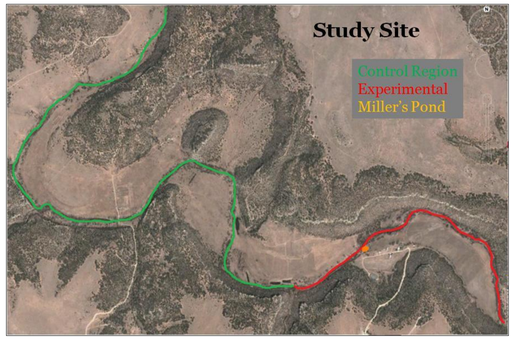

Figure 3. Study location at the Rio Mora National Wildlife Refuge W(35°50'8.58"N, 105° 2'29.94"W) with the experimental and control region denoted.

Figure 2. Hoop net traps.

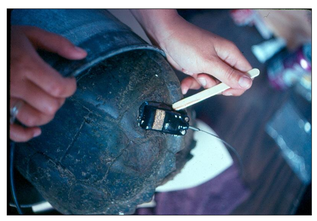

Figure 4. Adult Common snapping turtle with a transmitter being affixed.

Figure 5. Juvenile common snapping turtle in comparison to a hair tie (approximately 2 inches carapace length).

Significance

Snapping turtles have a low abundance in New Mexico, most likely from the lack of suitable hibernacula, minimal wetlands and permanent bodies of water in the state. There has been a report of the loss of approximately 90% of riparian ecosystems in the last hundred years (U.S Fish and Wildlife Service, 2012). This means the remaining suitable sites are most likely diminishing as well. The Mora River has been identified as the fifth highest conservation priority river in the state (NM Department of Game and Fish, 2006), so conservation efforts should be focused on this high priority region. Understanding the relationships between the occurrence of invasive species and the behavior of this mostly aquatic reptile will be beneficial to the conservation of the species and a part of maintaining the diversity of the riparian ecosystems. Also, determining the most suitable and preferred habitat for snapping turtles will help land managers better protect these locations.

The knowledge gained from this research will fill gaps in the scientific knowledge of the interactions between native and invasive herpetofauna in New Mexico. Most studies on snapping turtles have been performed in the eastern U.S. including Mississippi and Missouri or in their northern range in Canada, where there is substantially more water than in New Mexico. This research provides a basis on snapping turtle behavior in more arid environments. This study will show whether or not the invasive bullfrog will impact the behavior of the most massive and minimally recognized turtle of New Mexico.

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