Home Range and Spatial Ecology of Eastern Hognose Snakes (*Heterodon platirhinos*)

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ABSTRACT

Home Range Size and Spatial Ecology of Eastern Hognose Snakes (*Heterodon platirhinos*) at Brookhaven National Laboratory. WENDY FINN (University of Rhode Island, Kingston, RI 02881) JEREMY FEINBERG (U.S. Fish and Wildlife Service, Long Island National Wildlife Refuge Complex and Brookhaven National Laboratory, Environmental Services and Waste Management Division, Upton, NY 11973) TIM GREEN (Brookhaven National Laboratory, Environmental Services and Waste Management Division, Upton, NY 11973)

Once considered an abundant species on Long Island the eastern hognose snake, *Heterodon platirhinos,* is now found only in small fragmented portions of its former island range. After 1996, *H. platirhinos* was incorrectly believed to be extirpated from Long Island as there were no sightings of the species until 2001 when the species was rediscovered at Brookhaven National Laboratory (BNL). Since the spring of 2003, radio telemetry studies have been conducted at BNL on *H. platirhinos* to learn more about the factors triggering this species' decline. In this study, radio telemetry was utilized to discover more information about the snakes' habitat preferences, mortality rates, and home range sizes. The 2005 phase of this study consisted of eight snakes that were tracked and monitored daily with the use of GPS/GIS. Aside from tracking, snout vent

length, total length measurements and weights were recorded opportunistically to obtain data on growth rates and possible nesting behavior in the snakes. Snakes were active on 67% of days tracked during a portion of the activity season for the species. Preliminary data collected for home ranges displays a maximum home range of 10.7ha for SN30 with the a minimum size of 1.1ha for SN37 (excludes data for snakes introduced later into the study). The data collected from this study will be used to further enhance the conservation of this Special Concern status species.

INTRODUCTION

The Brookhaven National Laboratory (BNL) is located in the core of the Central Pine Barrens (CPB) of Long Island and provides ideal habitat for many declining species of herpetofauna native to the area. Due in part to the fact that the BNL property is protected from the spreading development occurring throughout the area, many rare and special concern species are found on the site with viable populations living among the sandy soils, pitch pine/ shrub forests, and wetlands of the CPB. A variety of herpetofauna such as spotted turtles (*Clemmys guttata*), eastern tiger salamanders (*Ambystoma tigrinum tigrinum*) and eastern Hognose snakes (*Heterodon platirhinos*) occur at BNL.

This study focused on a total of eight Eastern Hognose Snakes in 2005 and their movements during a portion of the activity season for the species, which generally falls between April and October. Historically an abundant species on Long Island, *H. platirhinos* was commonly found in habitats such as coastal dune communities and the sandy soiled Pine Barrens [1,2]. After losing much of its preferred habitat to

development on Long Island this understudied species was brought to biologists' attention after it was deemed extirpated in the area after 1996. Since its rediscovery in 2001 at BNL, *H. platirhinos* has become the focus of a three year (including current study) radio-telemetry project that has helped biologists gain a greater view into what factors are causing this species' decline. Since 2003, radio-telemetry studies have been implemented at BNL and have focused on a total of 19 snakes. Biologists from the US Fish and Wildlife Service and BNL have overseen the research. The goals of this study have helped these biologists gain a better understanding of this species' home range size, habitat preferences, and local distributions.

The range of *H. platirhinos* extends from central Minnesota to s. New Hampshire to Florida west to Texas and Kansas [3]. The hognose snake is a robust snake that varies in size from 500mm to 1156mm with an average length of 500 to 650mm for males and 650 to 850mm for females' [4]. The color of *H. platirhinos* is extremely variable with specimens ranging from yellow with dark bands to olive black with the normal coloring being tan with 20-30 darker bands placed laterally across the body [3]. A sharply upturned rostrum and wide neck aid the snake in its usual activities of foraging for its main prey the fowlers toad *(Bufo Woodhousei fowleri)*, burrowing for shelter, and bluffing perceived predators with its elaborate "cobra" display [5]. The snake generally uses a progressive behavioral defense technique that begins with its famous cobra imitation followed by its characteristic death-feigning act. Once disturbed, the snake will try to deter predators by fanning the hood of its neck, raising its head, mock striking while hissing loudly. If that act fails to dissuade the perceived threat, the snake

immediately resorts to playing dead by rolling over on its dorsal side and writhing about with its mouth agape and tongue lolling out. Even when manually placed back on its ventral side the snake will instinctively revert back to its belly-up position.

MATERIALS AND METHODS

A total of eight snakes were tracked on a daily basis excluding weekends to determine home range size, habitat use, and survivorship among the specimens. Five of the eight snakes (including SN16 and SN17 who were in the 2004 study) were originally captured at the site of BNL's Relativistic Heavy Ion Collider (RHIC), a heavily disturbed open area surrounded by a 4 km circumference 10m high man made berm. Since its construction, the RHIC ring has been the capture site of a majority of the snakes used in the previous two years of the study due to its sandy and open, high grass habitat. The three remaining snakes were captured in varying habitats such as SN40 who preferred high grass fields bordered by white pine groves, SN41 who was found at the residential heart of BNLs site, and SN44 who resided in the large portion of white pine forest on the site.

After the initial capture, surgery for transmitter implantation was performed by wildlife veterinarians at the Wildlife Health Center of the Wildlife Conservation Society (Bronx Zoo). Each snake was implanted with 5g Holohil SB-2 radio transmitter and released to their respective sites within fourteen days after the procedure. After the location of a snake was confirmed, weather data was collected with the use of a Sky

Master weather station for the relative humidity, air temperature and average wind speed. A GPS point was taken each day at each location using a Garmin Rino 110 unit. The location of snakes, macro and micro habitat, and activity were also recorded. The area was then flagged with information such as the snakes' identification number, air temp, date and time. Arc View 3.3 GIS was used to analyze the area of each snakes home range.

Snout vent length, total length and weights were obtained when possible but did not exceed once per week per snake. Measurements and weights were only obtained when the snake was active so as not to disturb the snake into false movements. Weights were taken to track growth and identify gravid females through the rapid weight gain and loss that is associated with egg development and oviposition.

RESULTS

Figure 1 displays the minimum convex polygons representing home range sizes for individual snakes through 30 July for three successive years located in the RHIC. Of the five snakes tracked in 2005 that Figure 1 displays, only one survived through 30 July. Broad overlapping of home ranges was observed with SN30, SN16, and SN17. Broad overlaps were also noted for SN16, SN17 and SN18 for 2004.

Figure 2 displays the minimum convex polygons representing home range sizes for individual snakes through 30 July for three successive season located near the center of the labs property. No overlap of homerange sizes was observed for these individuals with the preliminary data collected.

A Student *t*-test was performed with the data from the 2003, 2004, and current study to determine if there was a correlation between mass and home range size (hr) for *H. platirhinos*. The results showed no significant difference between the two variables for each comparison: 2003 vs. 2004(p=.2449hr and p=.3693mass), 2004 vs. 2005(p=.2093hr and p=.8508mass), and 2003 vs. 2005(p=.9876hr and p=.3030mass).

DISCUSSION AND CONCLUSION

Due to the high mortality rate among this species, it has been difficult to collect and compare long-term data on individual snakes between the years that this study began in 2003. Many factors contribute to the disruption of this study such as the discovery of loose transmitters on the ground with no apparent signs of predation. A possible solution to this puzzling phenomenon may have been found this season when SN37 was captured for the purpose of collecting morphological data on 27 June, 2005. It was discovered that the transmitter of SN37 was in the process of expulsion from the snake. The snake was collected and held in observation until it was transported to the Bronx Zoo for a new surgical technique to be applied to the transmitter placement surgery. Shortly thereafter on 7 July, 2005 another snake (SN40) was noted to be undergoing this same condition and was also collected for the new transmitter replacement procedure to be performed. A different suture technique was applied to both snakes to ensure the placement of the transmitters and has proven to be very effective to date.

This research about *H. platirhinos'* habitat preferences and life history characteristics will be extrapolated to further enhance the conservation of this species. The preservation of habitats preferred by *H. platirhinos* will likely play a key role in ensuring viable populations of this species for the future.

FIGURES

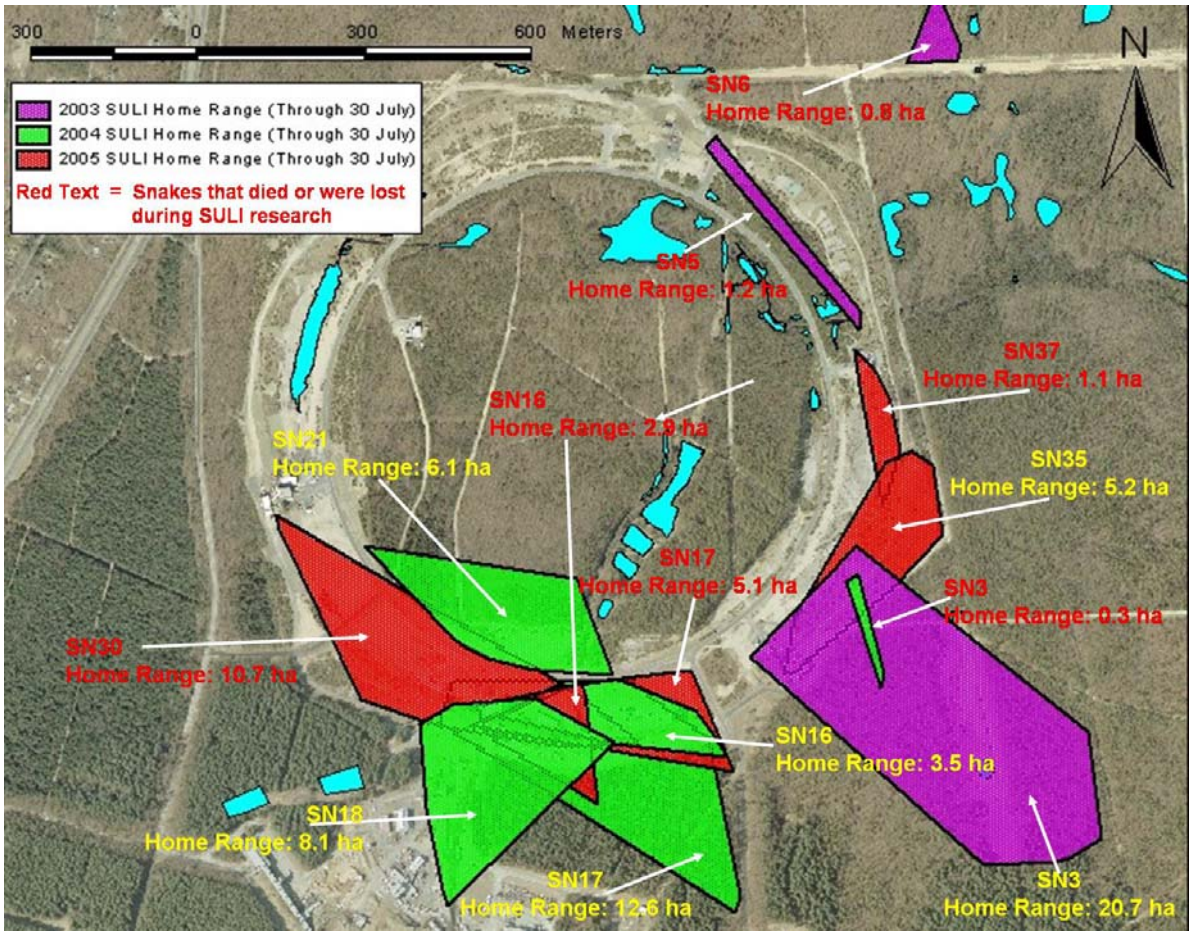

Figure 1. Minimum convex polygons representing home range for individual snakes (north area of BNL) through 30 July in three successive years (2003, 2004, and 2005).

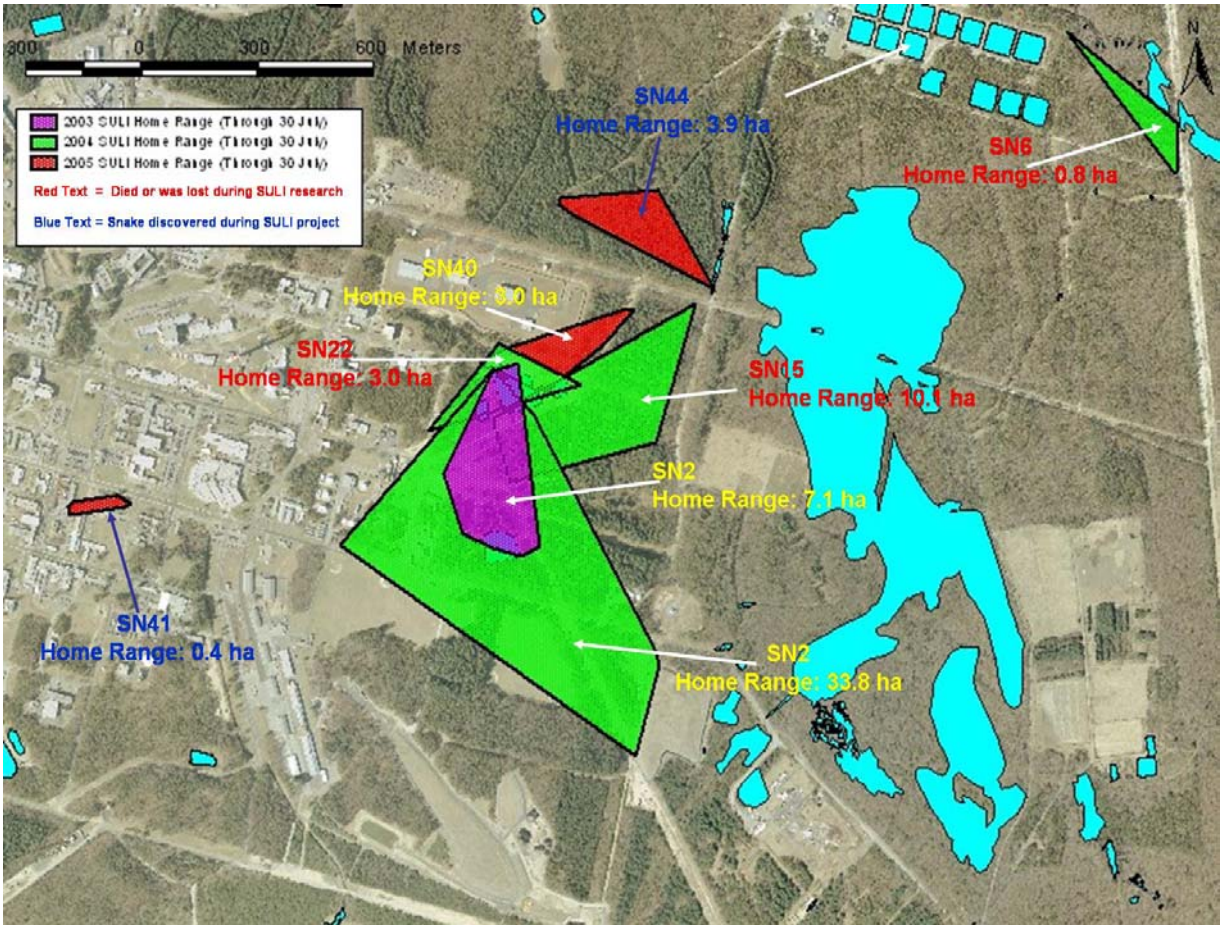
300 0 300 600 Meters
2003 SULI Home Range (Through 30 Jul)
2004 SULI Home Range (Through 30 Jul)
2005 SULI Home Range (Through 30 Jul)
Red Text = Died or was lost during SULI research
Blue Text = Snake discovered during SULI project
SN44
Home Range: 3.9 ha
SN6
Home Range: 0.8 ha
SN40
Home Range: 3.0 ha
SN22
Home Range: 3.0 ha
SN15
Home Range: 10.1 ha
SN2
Home Range: 7.1 ha
SN41
Home Range: 0.4 ha
SN2
Home Range: 33.8 ha

Figure 2. Minimum convex polygons representing home range for individual snakes (central area of BNL) through 30 July in three successive years (2003, 2004, and 2005).