



Use of the Program DISTANCE to Assess Population Size of the Eastern Hognose Snake (*Heterodon platirhinos*) at the Brookhaven National Laboratory

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INTRODUCTION

The eastern hognose snake (*Heterodon platirhinos*) is a species of particular interest on Long Island and throughout the northeast, where habitat loss and declines in reported sightings have become a cause for concern. In the early 20th century, *H. platirhinos* was described as being found by “the bucket full” in several areas on Long Island, such as the Rockaways (Engelhardt et al., 1915) and Fire Island (Yeaton, 1972), where the species now appears to be extirpated. There are currently few viable populations remaining on Long Island. The combined effects of several anthropogenic factors, including habitat destruction and habitat fragmentation appear to be the most likely contributors to the snake’s decline.

The eastern hognose snake displays unique defensive behaviors that can be described as bluffing and “feigning death.” When threatened, *H. platirhinos* will spread its head and neck like a cobra. The snake then hisses and makes forward thrusts but does not bite. If the snake is continually harassed, it will rub its mouth against the ground and turn belly up, writhe for a short while, and then lie still with its mouth open and tongue sticking out (Edgren, 1955). If the snake is turned over, it will immediately roll onto its back again. Once the threat or disturbance has passed, there is a short recovery period that typically lasts for several minutes. After this recovery period has passed, the snake will resume its normal activities.

Despite this snake’s fascinating behavior and the growing concern about the status of *H. platirhinos*, little research has been conducted on this species. Few previous efforts have been made to assess the abundance or population size of hognose snakes. The software package DISTANCE was used as a survey technique in an attempt to determine the population size of *H. platirhinos* at Brookhaven National Laboratory (BNL).

METHODS AND MATERIALS

The program DISTANCE is computer software that allows the user to design and analyze sampling surveys of wildlife populations. It generates transects through a designated area and produces a population estimate upon the input of all sightings. Before using DISTANCE, preliminary information regarding the snake’s general ecology and life history characteristics needed to be reviewed and considered. Hognose snakes prefer open, sandy areas that can be found in the Pitch pine/Oak forest, grassland, and successional habitats of BNL. A GIS vegetation map of the BNL property was carefully looked over and these three habitats were selected as possible *H. platirhinos* habitat. Since *H. platirhinos* sometimes tends to move from these habitats to more forested areas (J. Feinberg, unpublished data), a 122 m buffer was added to this to insure the inclusion of all hognose snake habitat. The final transect survey area, including the 122 m buffer, encompassed over 99% of the positions of located hognose snakes from previous capture locations, sightings, and positions of snakes involved in a radio telemetry study (J. Feinberg, unpublished data). A survey was then created using DISTANCE, which included 91 line transects that totaled 243 km. These transects were walked from mid-May to early July, the period of greatest activity for hognose snakes at BNL. The transects were walked between 0700h and 1500h, which was previously described as peak hognose activity hours (Plummer, 2000).

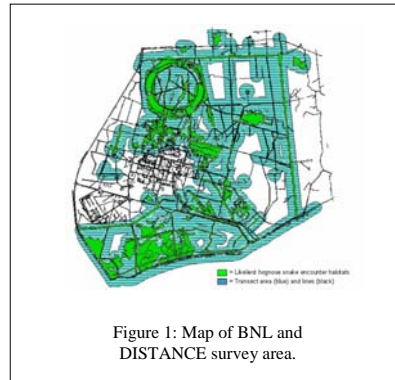


Figure 1: Map of BNL and DISTANCE survey area.

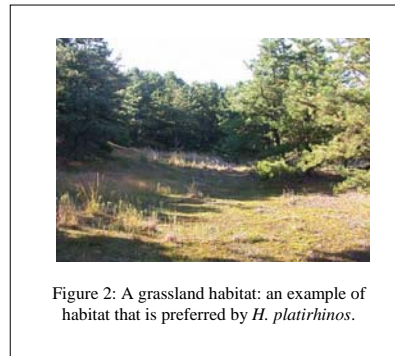


Figure 2: A grassland habitat: an example of habitat that is preferred by *H. platirhinos*.

DISCUSSION AND CONCLUSIONS

The total number of eastern hognose snakes observed while walking transects was one ($N = 1$). A sample size of 60-80 is suggested as a minimum for a reliable estimate of population size and density (Buckland et al., 2001), so analysis would not produce an accurate population estimate and was futile. The program DISTANCE, and predetermined, linear walking transects in general, do not appear to be efficient in the estimation of hognose snake population size.

Several explanations can be proposed for the failure to accumulate enough hognose snake sightings. One is that there are too many variables involved in the snake’s activity. An example of this is the snake’s shed cycle. Most of the transects were located in areas where hognose snakes had been seen most often in the past and were walked while the snakes were in their shed cycle. During the shed cycle, the snakes become inactive and are often not visible. They may be in a rock pile, burrowed in sandy soil, or hidden at the base of a grass tussock. It was not possible to know the snakes were in this inactive cycle until shed skins were found after the fact. Another possible explanation for the inability to accumulate hognose snake sightings is that the buffer created may have been too large and too much marginal hognose snake habitat may have been included. The buffer habitat was actually greater in area than the preferred habitat that was surveyed. It was necessary to include this habitat though, as some individual hognose snakes utilize marginal habitat, on occasion.

Due to the cryptic nature of *H. platirhinos* and its complex activity cycles, an intricate formula that accounts for the snake’s activity throughout the year is necessary to conduct an accurate population estimate. Data collected by Jeremy Feinberg appears to indicate that random pedestrian surveys may be more efficient than systematic transects in the accumulation of snake sightings. For example, during the brief period of this study, six hognose snakes were found in 29 hours of random surveys, whereas only one snake was found in approximately 114 hours of walking transects.

Thus, the incompatibility between the required sampling protocols of DISTANCE and actually finding snakes in areas where they are definitely known to occur appears to indicate that the DISTANCE software package is not an effective means of estimating *H. platirhinos* population size at BNL. Whether or not this conclusion can be applied to other populations of this species in different habitats (e.g., beach dunes, prairies, etc.) or to other species cannot be determined at this time, but may be the case, especially among other cryptic species.

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