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Habitat Suitability, Occupancy, and a Novel Monitoring Technique for an Imperiled Reptile

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Introduction

Reptile species and populations are declining globally, and habitat destruction, degradation, and fragmentation are important factors in this decline (4). Therefore, protection of key habitat for reptiles is important for their conservation.

Characterizing habitat needs for imperiled species helps researchers determine what defines important or quality habitat. Habitat suitability indices (HSI) are a method for quantitatively determining if habitat is suitable for a given species based on measurable characteristics. HSI model outputs fall between 0 (totally unsuitable) and 1 (optimum habitat) (6, 9).

Occupancy modelling is used to predict species occurrence in habitat patches. Occupancy is defined as the fraction of patches where a species is present. Measureable habitat characteristics are factored into occupancy models as covariates affecting presence or absence. These models are used for determining how many unsuccessful survey visits to a patch are required before being able to confidently declare species absence, and for predicting presence or absence at habitat patches that have not been surveyed or where the species has not been detected (3).

The Northern population segment of the Copper-bellied Watersnake (Nerodia erythrogaster neglecta) is endangered in Indiana, Michigan, and Ohio, and federally listed as threatened. Copperbellies are known to move up to hundreds of meters between wetlands, travel between wetlands many times per season (7), and avoid crossing roads (8). Total population size was estimated as 116 individuals between wetlands, travel between wetlands many times per season (7), generally listed as threatened. Copperbellies are known to move up to hundreds of meters between wetlands, travel between wetlands many times per season (7), and avoid crossing roads (8). Total population size was estimated as 116 individuals between wetlands, travel between wetlands many times per season (7), and avoid crossing roads (8).

Copperbellies are state-endangered and federally listed as threatened. Their population is very small and declining. Frequent monitoring of imperiled animals is essential for determining conservation status, population trends, and which steps are necessary for their protection. Due to their rarity and clandestine nature, copperbellies are difficult to visually encounter, so having other ways to survey would be useful.

Objectives:
1) Determine which habitat traits most influence copperbelly occurrence
2) Formulate habitat suitability models to designate quantitative conservation value to habitat patches
3) Formulate occupancy models to predict the presence or absence of copperbellies in habitat patches in which they have not been detected
4) Use occupancy models to determine how many unsuccessful surveys are required to confidently assert absence
5) Determine if wildlife cameras and artificial basking platforms are a viable surrogate for (or addition to) visual encounter occupancy surveys for copperbellies

Methods

The wetland complexes in this study include all wetlands within 200m of each other with no roads between them. Specific complexes and wetlands have been identified for surveying due to historical or recent copperbelly sightings.

Artificial basking platforms will be set up in wetlands at which copperbellies have been found in previous years. Wildlife cameras locked to trees near these platforms will be used to monitor them, taking pictures every 5 minutes.

Occupancy data collection consists of walking around wetland borders, recording visual encounters of copperbellies, number of individuals sighted, and location for each individual. Wetlands will be surveyed three times this season.

Habitat characteristics which might impact copperbelly occurrence will be quantified for wetlands where they have been sighted recently. These include dominant vegetation type and wetland classification (2). Also, wetland and complex borders will be measured by recording tracks with a GPS. ArcGIS will be used to calculate wetland and complex area, and distance to nearest road and nearest wetland.

Problem and Research Objectives

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References


Timeline

April 2014
Assemble and set out basking platforms at field sites. Set out wildlife cameras to monitor these platforms.

May – June 2014
Collect occupancy data for visual encounters at field sites. Change camera locations, batteries, SD cards as needed.

July – August 2014
Characterize habitat at field sites. Continue to change camera locations, batteries, SD cards as needed.

September – December 2014
Analyze data, formulate HSI and occupancy models.

Significance

The copperbelly is imperiled and declining. The occupancy and HSI models formulated during this study will benefit conservation efforts by quantitatively designating conservation value to habitats in the range where this small population is found and determining probability of presence of the snakes at sites where they have not been detected. This study will provide researchers and conservationists with a better understanding of why copperbellies occur at certain habitat patches but not others.

Basking platforms and wildlife cameras have not been used prior to this study as a means to monitor snake populations. The data from this study will indicate whether this novel approach is viable as a technique to monitor snakes, in conjunction with or in place of visual encounter surveys. If successful, this portion of the study will be particularly useful for future copperbelly researchers, because it has the potential to reduce amount of survey effort and travel expenses required by current techniques for long-term monitoring.

December 2014
Analyze data, formulate HSI and occupancy models.