# Population characteristics and habitat use of *Alligator mississippiensis* at the edge of the geographic range

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## Introduction

American Alligators (*Alligator mississippiensis)* range from eastern Texas to North Carolina (Newsom et al. 1987, Palmer and Braswell 1995). Although alligators have received considerable scientific attention in the core areas of their geographic range, relatively scant information exists on northern peripheral populations (e.g., Birkhead and Bennett 1981, Fuller 1981, Hagan 1982, O'Brien and Doerr 1986). Demographic and habitat studies at the core of the range may not reflect patterns and processes at the fringe. For instance, North Carolina represents the northern limit of alligators and temperatures are much different from the core of the range, i.e. Florida and Louisiana.

The objective of this study is to collect demographic data as well as habitat data in a region that has received relatively little scientific attention. Our research was conducted in an area known as the Outer Banks of North Carolina, which part of the barrier island chain along the east coast of the United States, and is adjacent to Alligator River National Wildlife Refuge. We conducted mark-recapture in this area for demographics. Additionally, we conducted spotlighting and habitat analysis to possibly determine why alligators are not seen frequently, or at all, on the nearby barrier islands. Initial research began in 2011 and is ongoing for mark-recapture and spotlighting.

## Methods

*Mark-recapture*
Snaring techniques were used to capture alligators. Measurements including snout-vent length (SVL), total length, and sex (determined via manual palpation) for each individual captured. All animals were marked by removing a dorsal tail scute, and the tissue was preserved in 95% ethanol for future genetic analyses.

*Spotlighting*
Surveys were conducted after sunset on different days from habitat assessment. We used a 200,000 candle power spotlight (NiteOwl Dual Beam, WF Harris Lighting, Monroe, NC) and either a kayak, rowboat with trolling motor, or Carolina skiff (depending on size and accessibility of the location) to conduct the surveys.

*Habitat assessment*
Habitats were assessed using both aerial imagery and ground surveying. Aerial imagery was used to calculate total area (ha) (DeLorme, Yarmouth, ME) and soil type (Soil Survey Staff 2012). Transects were used for physical characteristics (i.e., canopy cover (%), water depth (cm), depth variance (cm), turbidity (cm), and submerged and emergent vegetation (%)) and water chemistry (i.e., salinity (ppt), dissolved oxygen (mg/L), conductance (μS/cm), and pH).

Non-metric Multidimensional Scaling and Multi-Response Permutation Procedure were used to analyze the habitat data.

**Results**

In 2011 we spotlighted 12 locations and found between 0 and 10 alligators. A majority of the alligators were found on the mainland; however, we unexpectedly spotted a juvenile alligator (salinity recorded: 17‰) on a nearby barrier island. In addition to spotlighting, we caught and marked 6 alligators (2M, 4F) between 5.1 and 8.3 ft. We'd like to make note that during 2011 field seasons there was a massive forest fire in ARNWR that lasted a few months.

In 2012 we spotlighted 21 locations and found between 0 and 4 alligators. Alligators were only found on the mainland. Analysis revealed some significant difference between barrier island sites and the mainland. In addition to spotlighting, we caught 8 alligators (5M, 3F) between 4.0 and 11.2 ft and 3 of them were recaptures from the previous summer.

**Discussion**

The mark-recapture of alligators is still ongoing in this area. Population models are also in progress as well because we're still gathering information to run them properly. We are processing and creating GIS layers for future analysis.

Spotlight surveys revealed that alligators were sparse in their distribution. Presence or absence from locations varied during day and night. For instance, multiple alligators were spotted at locations during non-survey times; however, no alligators were documented during subsequent spotlight surveys. Whether or not spotlighting is an appropriate method in this area requires further investigation on the detectability.

Habitat assessment revealed that Roanoke Island, an intermediate barrier island between the Outer Banks and mainland, was the only island significantly different from the mainland. In fact, the Outer Banks was more similar to the mainland than to Roanoke Island. Habitat characteristics on Roanoke Island consisted of deeper water depths with increased salinity, pH, and conductivity relative to other locations.

Additional investigations revealed that alligators had been previously observed in some locations on the Outer Banks near Cape Hatteras. In Frisco, NC, several recurrent alligator sightings were reported. Locals reported an adult alligator frequently basking in the ponds, which was confirmed by a State Biologist (Chris Turner, NC State Biologist, telephone, pers. comm.). However, there have been no recent sightings of alligators in the past two years in Frisco, NC possibly due to anthropogenic influences such as poaching (Douglas Oberbeck, Dare County Sheriff's Office Criminal Investigator, Manteo, NC, pers. comm.). Further investigation is required to determine if the recent absence of alligators from this area is environmental or anthropogenic.

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