

Sliding Into an Ecosystem!

Analyzing the Effect of Invasive Turtle Species on Native Turtle Biodiversity in the Northeastern United States

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Introduction

Within the eastern United States, riparian zones serve as essential habitats for reptilian populations. These habitats contain several turtle species, both of native and non-native status. Species include, but are not limited to: **red eared-slider** (*Trachemys scripta elegans*), **eastern painted turtle** (*Chrysemys picta picta*) and the **common snapping turtle** (*Chelydra serpentina*). While *C. picta picta* and *C. serpentina* are endemic to the US' northeast, *T. s. elegans* was anthropogenically introduced into the area.³

Over recent years, *T. s. elegans* populations have increased dramatically in these environments. With strong evolutionary advantages, such as larger body size, rapid growth, aggressive behaviors, and high reproduction rate, this turtle species occupies and outcompetes native turtles in their ecological niches.^{2,10,11} A previous study aimed to survey the abundance of *T. s. elegans* in comparison to *C. picta picta* and *C. serpentina*, and recovering more *T. s. elegans* than either of the native species combined, further reinforcing its role in undermining native turtle abundance.⁷

This study aims to incorporate citizen science data centered in three eastern US riparian zones to assess the relationship between the population density of native turtle populations in ecosystems where *T. s. elegans* is introduced, hypothesizing that **areas of high invasive species abundance will display disproportionately low native species abundance.**



Image 1

C. picta picta (left); *T. s. elegans* (right). Credit: Brian Saville



Image 2

C. serpentina, in Bronx River. Credit: Aveena Khan

Methodology

This study spanned across three sites along the eastern United States: **Manhattan, New York (M)** the **Charles River (CR)**, and the **John Heinz National Wildlife and Refuge Center (WRC)**. Manhattan, located in New York City, contains several urban greenspaces which house riparian habitats. The Charles River runs through Massachusetts, spanning 80 miles before emptying out into the Atlantic Ocean. The John Heinz National Wildlife and Refuge Center was established in 1972 with a primary goal in preserving and restoring the Tinicum Marsh, located in southern Pennsylvania.⁶

Three species were surveyed along these sites, with data for each species being recorded at each site. Data was compiled via iNaturalist, a public online access database that requires citizen participation. The iNaturalist database was used to extract sightings of each species over a period of 10 years, and only 'research grade' observations were used. An Analysis of Variance (ANOVA) test was conducted per site. When applicable, a 'post-hoc tukey' test was followed in order to test between-group statistical significance.

Abstract

Trachemys scripta elegans, commonly known as the red-eared slider turtle, is an invasive freshwater species whose introduction to the eastern coast of the United States has been detrimental to riparian habitats. Due to its high evolutionary competitiveness, it has been able to outcompete native turtle species *Chrysemys picta picta* (eastern painted turtle) and *Chelydra serpentina* (common snapping turtle). By accessing public online database iNaturalist, this study aims to identify differences between the population densities of invasive *T. s. elegans* and native *C. picta picta* and *C. serpentina*. It was hypothesized that there would be a negative correlation between abundances of *T. s. elegans* and species populations of native turtle species across all observed sites. Results, however, only supported the hypothesis at one site, for which it is recommended that conservation efforts to protect

Research Question & Hypothesis

Question: What is the relationship between the abundance of *T. scripta elegans* and native freshwater turtle species in eastern U.S. riparian habitats?

Hypothesis: There is a negative correlation between abundance of *T. scripta elegans* and native turtle species observations in eastern U.S. riparian habitats.

Results & Figures

Fig. 1 - Manhattan Green Spaces (M)

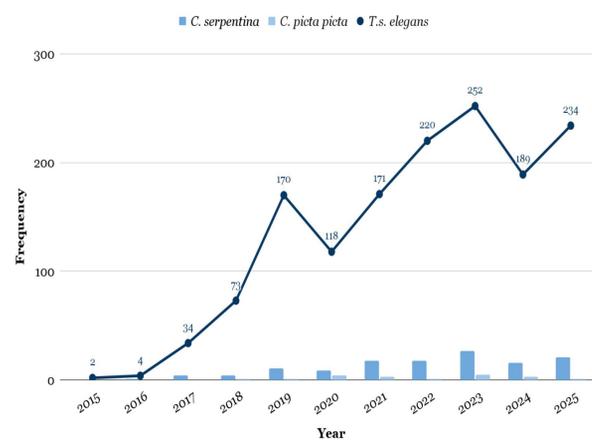


Fig. 3 - John Heinz National Wildlife and Refuge Center (WRC)

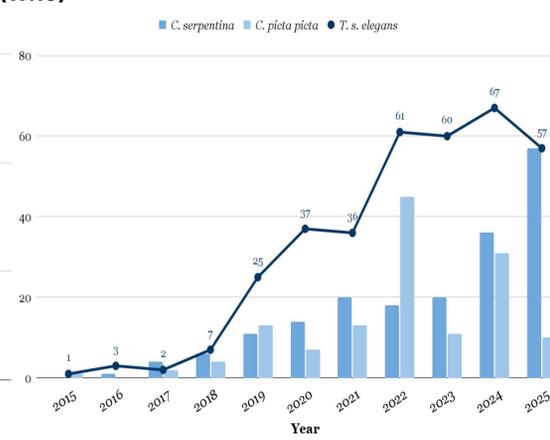


Figure 1 (Site M), Figure 2 (Site CR), and Figure 3 (Site WRC) Population relationships between the invasive *T. s. elegans* (line) and the native species *C. picta picta* and *C. serpentina* (bars). Figure 4 Map of all observed sites.

Fig. 2 - Charles River (CR)

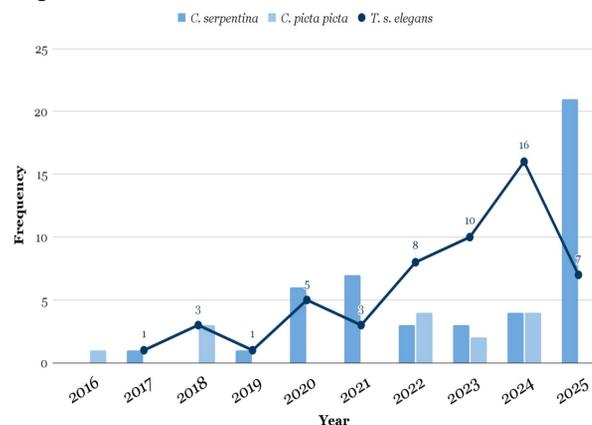


Fig. 4 - Sites



Analyses

The abundance of *T. s. elegans* on sites WRC (n = 356) and CR (n = 54) had no discernible effect on the populations of *C. picta picta* and *C. serpentina* at those sites (p > 0.05), and native turtle populations were not verifiably impacted by the presence of *T. s. elegans*.

However, abundances of *T. s. elegans* have a significant effect on both native turtle species (p << 0.05) in the HR site (n = 1467). An ANOVA test was conducted in order to test for significance between the groups; if significance was found, a "post-hoc tukey" test was employed in order to determine the significance between each group. The test allowed us to further specify the effects of *T. s. elegans* abundance upon each of the native species, as well as any effects the native groups may have on each other.

Discussion

Based on the data collected, *T. s. elegans* had significantly higher observations compared to native turtle populations in Site M, but not in Sites WRC or CR. *T. s. elegans* has been proven to thrive in polluted waters compared to *C. picta picta* and *C. serpentina*, (Dupuis-Desormeaux et al. 2022). This allows *T. s. elegans* to further outcompete the native species in the area. The hypothesis was partially supported.

This study has several limitations due to its methodology. The iNaturalist database cannot discern between individuals among a species; it is plausible that the same individual was uploaded more than once. This database relies on citizen participation to compile data, meaning that measured populations include what could be observed from public areas. Without proper equipment and resources, we cannot discern true population sizes and abundance due to the elusive, aquatic nature of turtles.

In Manhattan, protections should be put into place for *C. picta picta* and *C. serpentina*; it is critical to ensure that their populations do not drop further. In addition, efforts to begin relocation of specimens of *T. s. elegans* should be put into action. Further eliminating the species from the pet trade may also have positive effects, as they continue to be anthropogenically introduced to waterways.

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