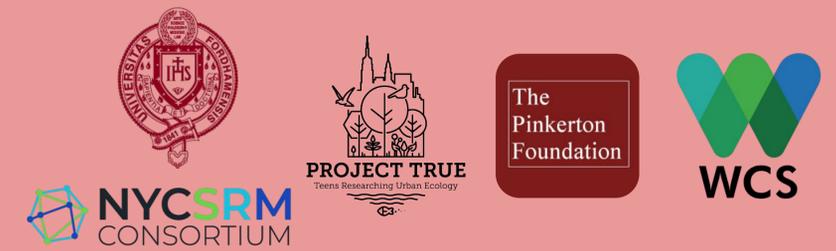


Unbelievable numbers: A study on the Distributions of American and European Eels in North America and Europe

SOHA CHHAPRA¹; CALLIOPE CAMBANIS²; LIZA SOLÓRZANO ESCOBAR³
¹The Bronx High School of Science; ²Stuyvesant High School; ³Fordham University



Introduction

The American eel (*Anguilla rostrata*) is the only anguillid occurring in eastern North American waters (ASMFC, 2012).¹ The European eel, (*Anguilla anguilla*) is a species typical of the waters of western Europe and the Mediterranean.² Based on the International Union for the Conservation of Nature (IUCN), American eels are endangered while European eels are critically endangered. Both species face challenges such as barriers to migration, habitat loss and alteration, hydro turbine mortality, overfishing, parasitism, and pollution of their waterways.³

This project is an extension of our summer research,⁴ elaborating on the migration of *A. rostrata* and including the migration of another eel species to further understand the

population distribution of these similar species. Over the summer, we noticed that American eel population numbers have declined over the years. The purpose of this study is to examine the relationship between urbanization and *A. rostrata* and *A. anguilla* population numbers.

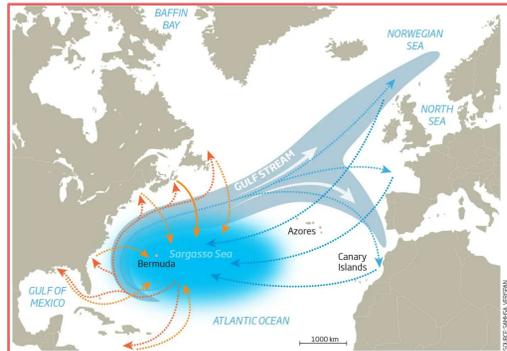


Fig 1. Migration patterns of the American eel (orange arrows) and European eel (blue arrows)⁶

Methodology

Study Sites and Google Earth Transect

We designated three rivers per continent that had roughly the same levels of urbanization, defined by development and population density, and have a mouth opening into brackish water. After picking our three main rivers in each continent, we established 6 transects using Google Earth going upstream (F) from the mouth of the river (A). Each transect had a radius of 20 km, and was 40 km away from the other transect.

iNaturalist

To 'sample' the number of eels within our transect, our data was collected using iNaturalist's database.⁵ We selected data based on whether it was within the 20 km transect radius within each of the rivers. Time of observation was not a disqualifier for our data collection due to the low observation count of these species.

Statistical Analysis

A chi-square test was used to investigate any associations between eel abundances and the transect distance from the mouth of the river to upstream and any association in between continents. We also used Pearson's R-stat to see the correlation between eel observation and population density.

Abstract

Both American and European eels (*A.rostrata* and *A. anguilla* respectively) are species of eels facing extinction threats due to anthropogenic urbanization. The purpose of this study is to compare the differences between publicly-made observations of American and European eels to determine if there is any correlation with the number of observations with levels of urbanization. We collected data using iNaturalist's open source database by first creating a map and then taking the data from those points on iNaturalist. Data was analyzed using Chi-Squared and Pearson's R-Stat, both of which were significant. Thus, our hypothesis is supported. The results of this study underscore the need for concentrated efforts to minimize the effect of urbanization on eel populations in North America and Europe.

Research Questions & Hypotheses

Research Question: How does the number of observations of eels in urbanized areas compare between *A. anguilla* and *A. rostrata* in both North America and Europe?

Hypothesis: There will be a significant difference in the number of eels found in urbanized areas, for both *A. rostrata* and *A. anguilla*, with *A. anguilla* having a higher number of observations due to the IUCN status differences.

Results

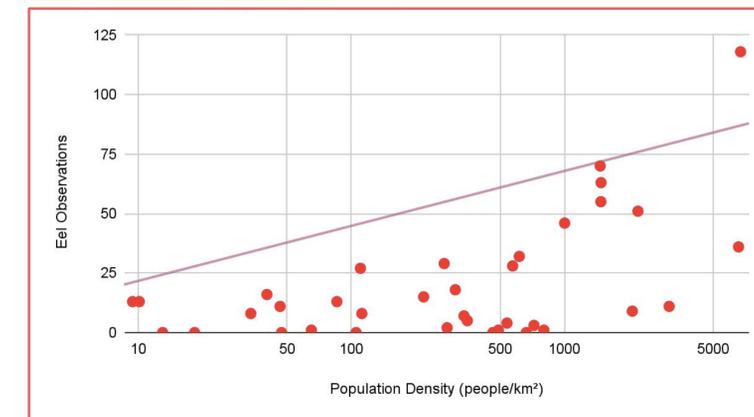


Fig 2. Human Population Density versus Total Eel Observations (of American and European eels).

Data was collected from iNaturalist using the map and filter features. Trendline represents Pearson's R-stat ($y = 0.0106x + 9.98$, $R^2=0.428$, $p < 0.0001$)

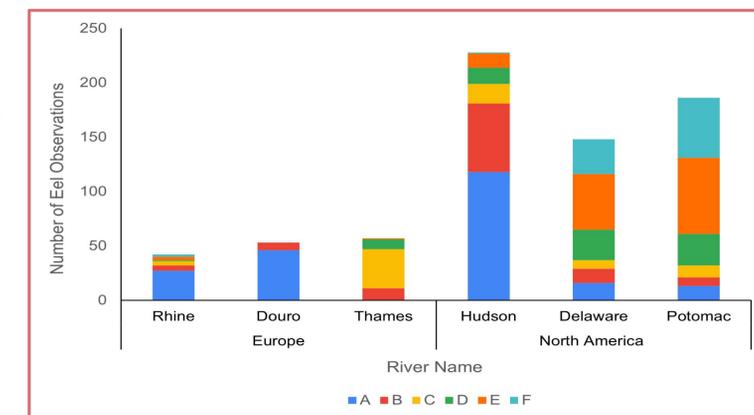


Fig 3. Eel Populations along the six river sites. Data was collected from iNaturalist using their map and filter features.

Legend corresponds to transect points, with A being at/close to the mouth of the river and F being the furthest upstream.



Image 1. *A. rostrata* adult yellow eel observed in the Bronx River. Photo credit: L. Solórzano Escobar

Discussion

Our results were significant for both the correlation between population density and eel observations and the eel population across the six river sites.

Our data showed there is a significant difference in the number of eels found in urbanized areas for *A. anguilla* and *A. rostrata*, which supports our hypothesis: there were significant correlations for the associations between continents ($p < 0.0001$), and between eel abundance and transect distance ($p < 0.0001$). However, this could be due to the fact that there are more iNaturalist users in America ($n = 293,225$) than there are in Europe ($n = 129,585$). It is important to mention that European eels are more at risk for extinction than American eels, which could also explain the pattern shown in our results.

Our experiment had some limitations. Due to their IUCN designations, American and European eels have their location tagged slightly off from their actual location, in order to avoid poachers. The broader implications of our study show that the effect of anthropogenic urbanization is a direct contributor to the decline in both American and European eels. Through this, we can inform our conservation efforts in order to better protect American and European eels.

Acknowledgements

We would like to thank Fordham University, Pinkerton Foundation, Project True, Wildlife Conservation Society, Max Falkenberg, Lowell Iporac, and Brian Saville for aiding us in this project.

References

- ¹W.B. Scott & E.J. Crossman, Freshwater Fishes of Canada, CAN. BULL. FISH. AQUAT. SCI. 184 (1973)
- ²van Ginneken, V. J.T., and Maes, G. E. (2005). Rev Fish Biol Fisheries (2005) 15:367–398 DOI 10.1007/s11160-006-0005-8
- ³Haro, A., Richkus, W., Whalen, K., Hoar, A., Busch, W-Dieter, Lary, S., Brush, T., & Dixon, D. (2000). Population Decline of the American Eel: Implications for Research and Management. Fisheries, 25(9), 7–16.
- ⁴Solórzano Escobar, L., Cambanis, C., Chhapra, S., Saeed, Y., Soadwa, N., Yousaf, A. (2025). Ap(eel)ing to Macroinvertebrates: A Study on American Eel and Macroinvertebrate Populations in the Bronx River [Poster Presentation].
- ⁵iNaturalist. Available from <https://www.inaturalist.org>. Accessed October 25, 2025.
- ⁶Pearce, F. (2016, March 16). How are baby eels made? We still don't know. New Scientist. <https://www.newscientist.com/article/2081008-how-are-baby-eels-made-we-still-dont-know/>