



Using Trace Metal Concentrations in Muscle To Determine Geolocation of White Tailed Deer



Julie Chmura and R. Christopher O'Brien PhD
University of New Haven
Department of Forensic Science
Center for Wildlife Forensic Research

Introduction

- If the location of a deer could successfully be narrowed down to either state or region level, this could help with illegal poaching cases.
- Previous research done by Mesha Thompson (2009) conducted on animal bone showed how valuable trace metals are.
- Looked at elements Iron, Potassium, Magnesium, Zinc, Aluminum, Copper, Iron, and Phosphorus.
- Using ICP-AES, the concentrations of each trace element could be determined and compared in order to attempt to categorize each deer to a specific region or state.

Data & Graphs

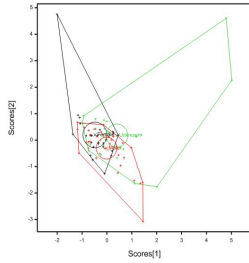


Figure 1: Discriminant Analysis of Sex of Deer

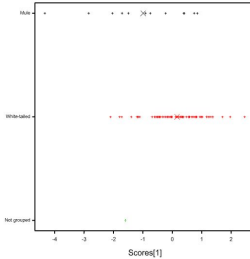


Figure 2: Discriminant Analysis of Species of Deer (Mule Deer and White Tailed Deer)

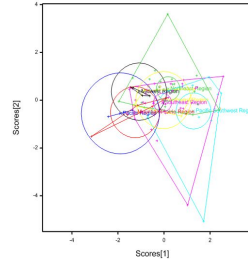


Figure 3: Discriminant Analysis with Regions according to US Fish and Wildlife

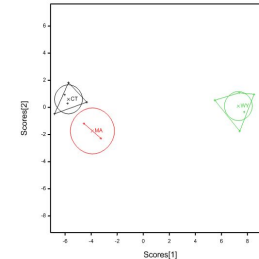


Figure 4: Discriminant Analysis of deer tissue from Wyoming, Connecticut, and Massachusetts

Results & Findings

- Several statistical tests were run and showed that even regions on opposite sides of the country had overlap when looking at the concentrations of trace metals in the deer's tissue.
- Deer originating from WY, MA, and CT seemingly displayed enough difference to want to investigate further. However, as shown in Figure 3, when multiple states were compiled and tested, a lot of overlap was seen.
- Numbers could not be acquired using ICP-AES for elements Selenium, Nickel, and Manganese.

Conclusions

- Data shows no significant difference, therefore geolocation of White Tailed Deer cannot be determined.
- The concentrations of trace metals found in the tissue did not demonstrate species differentiation between White Tailed Deer and Mule Deer, or between sex, Male and Female.

Acknowledgements

I'd like to thank the Summer Undergraduate Research Fellowship (SURF) staff for all the encouragement, support, and funding. Also the Forensic Science department and Dr. Tom Ireland at Boston University for being a crucial part in this research.

Methods & Materials

- 0.01g deer muscle digested in 1 mL of 70% Nitric Acid
- 35°C heat, covered with watch glass, for 3 hours
- Pipette 13 mL deionized water into medium test tube
- Add 1 mL of digested deer meat in acid into test tube
- Centrifuge test tubes for 3 minutes
- Perform gravity filtration (1 qualitative, 15 cm, Whatman filter paper)
- Analyzed digested samples with an ICP-AES at Boston University

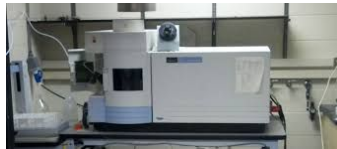


Image 1: Inductively coupled plasma atomic emission spectroscopy (ICP-AES)



Image 2: White Tail Deer were the focus of this research

References

Thompson, Mesha. "Differentiation of Bone from Deer (*Odocoileus Virginianus*), Pig (*Sus Scrofa*), and Rat (*Rattus Rattus*), Using Trace Element Analysis." *University of Ontario Institute of Technology*, 2009.