Stress Hormone Analysis of Deer (*Odocoileus virginiana* and *O. hemionus*) in the Alberta Oil Sands

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Introduction

Alberta, Canada is home to oil sands where new development is constructed for oil extraction. This development causes habitat destruction that could affect wildlife but the extent of these potential impacts is not yet fully understood. Fecal samples from white-tailed deer and mule deer (*Odocoileus virginiana* and *O. hemionus*) were collected with scat detection dogs to analyze stress hormones. GPS coordinates and cover were taken for all fecal samples collected in the field, and hormone levels of glucocorticoid (GC) and triiodothyronine (T3) were acquired by radioimmunoassays (RIA). This study will provide inference on how human development and disturbance at an oil extraction site are affecting two deer species.

Methods

**Conservation Canines**

Conservation Canines are trained domestic dogs (*Canis familiaris*) that detect scat of various species through scent. Trained dog handlers take the dogs in the field and collect scat of target species.

**Laboratory**

Radioimmunoassays (RIA) were performed on samples to collect hormone data. These assays use radioactive flags on antibodies to show concentrations of hormones in a sample. RIAs were conducted for glucocorticoid (GC) and triiodothyronine (T3).

**Statistical Analysis**

Multiple linear regression was used to explore the relationship between fecal hormone levels and the following explanatory variables: distance from the oil site, cover type (open, low, medium, high), and the interaction between these two variables. I tested for autocorrelation in the residuals using Moran’s I statistic.

Hypothesis

Under the hypothesis that human activity at the oil extraction site is stressful to deer, I predicted that fecal samples closer to the site would have higher stress hormone levels than those collected farther away.

Results

There were no significant relationships between T3 and the explanatory variables at a 0.05 alpha-level: distance (P = 0.06); cover type (P = 0.08); interaction (P = 0.29). Using Moran’s I statistic, there was significant spatial autocorrelation (P = 7.3e-14) at a 0.05 alpha-level.

Discussion

Although no significant main effects were found, the trends were opposite to what I expected. Stress levels increased along with distance from the oil extraction site. An explanation could be that deer feel safer close to human development because wolves avoid these areas. Improvements for future analysis might include exploring more factors like wolf presence, sex, age, DNA analysis to single out unique individuals, and pooling clumped samples so they are counted as a single data point to account for spatial autocorrelation.

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