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Using Accelerometer Data to Remotely Assess Predation Activity of Arctic Wolves (*Canis lupus arctos*)

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Dr. Dan MacNulty
Utah State University

I. Introduction

Arctic wolves (*Canis lupus arctos*) play an important role in ecosystems located in the far northern regions of the world; however, little information is available about them and their impacts on prey populations due to their remote location. Recently, there has been concern about declining caribou populations, which serve as an important food source for local Inuit peoples. As a result, there is an urgent need to better understand Arctic wolves and their influence on caribou abundance.

Dr. Dan MacNulty, a professor at Utah State University, is currently conducting research on Arctic wolves in the Fosheim Peninsula of Ellesmere Island, Canada. In July 2014, four Arctic wolves, each from a different pack in the area, were captured and temporarily fitted with a global positioning system (GPS) radio-collar equipped with an accelerometer that records activity levels. Because capturing and eating prey takes time, clusters of GPS locations can be used to identify wolf predation events.

The objective of my project is to evaluate the utility of collar accelerometer data for inferring the presence of wolf-killed ungulates at GPS location clusters. Because predation is an energetically-intensive activity, I expected location clusters with high levels of activity at the onset of cluster formation to contain kills. Collar accelerometer data may provide a new tool for scientists and wildlife managers to remotely monitor the predatory impact of large carnivores.

II. Methods

Each radio-collar records the wolf's geographic position and acceleration (both left/right and front/back).

50 GPS location clusters were visited by Dr. MacNulty and his colleagues, and assessed for any signs of a kill, such as bones or hair. Each cluster was recorded as having a kill or not.

I used Microsoft Excel to create a scatterplot for each of the clusters, with time since the beginning of the cluster on the x-axis and the sum of activity on the y-axis.

A variety of variables were identified as possible characteristics of activity associated with a kill site, including total timespan of the cluster, the sum of activity, mean activity value, and the initial slope in activity within the first few hours of each cluster.

III. Results

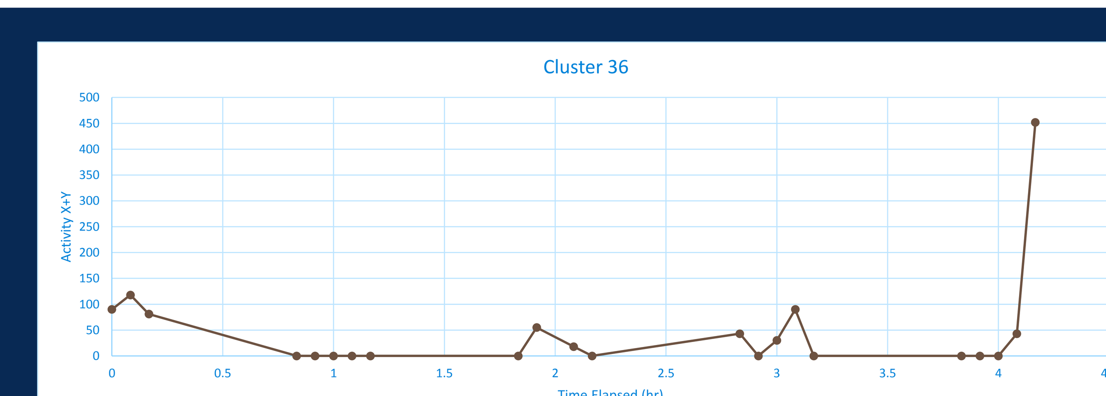
Out of the 50 visited clusters, 13 showed signs of a kill, 13 were determined to be rendezvous sites, and the other 24 showed no indications of being either.

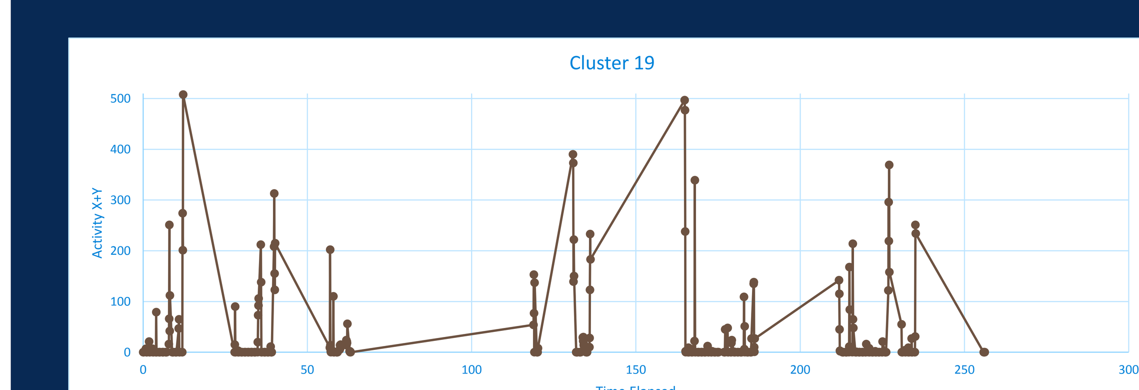
Most rendezvous and kill sites had larger time spans, with rendezvous sites having a much higher mean than kill sites. Similarly, kill and rendezvous sites usually had a higher number of points recorded within each cluster.

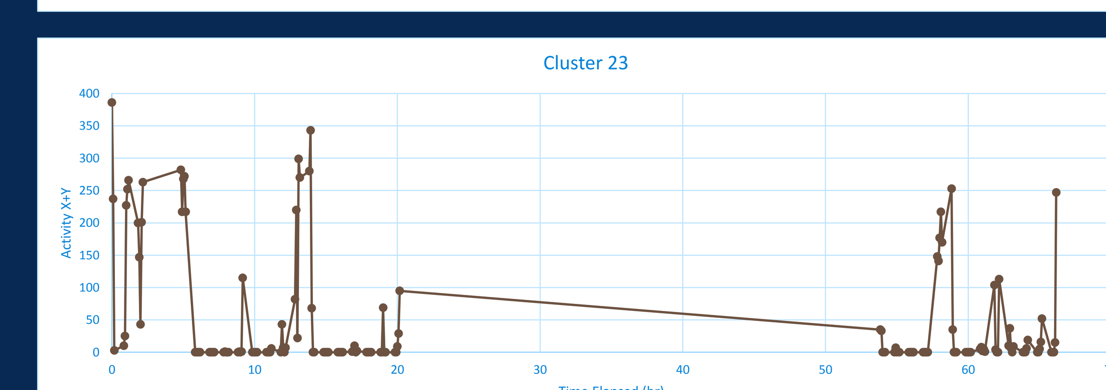
Kill sites usually had a higher initial activity recorded at the beginning of the cluster. Most had a steeper slope in activity within the first two hours of the cluster, in comparison to sites without kills. This supports the prediction that clusters formed at a kill site will have high levels in activity at the beginning of the cluster since the wolves will be actively taking down prey, followed by a decrease in activity once feeding.

Examples of Each Cluster Type:

Cluster 19 (below) – "Rendezvous"
Cluster 23 (bottom right) – "Kill"
Cluster 36 (top right) – "Other"







Study Site: Ellesmere Island

This Google Earth image shows 21 of the 50 visited cluster sites. Each pin represents a site. Blue pins mark the rendezvous sites. Red pins are kill sites. Yellow pins show sites without any signs of a kill or rendezvous.

IV. Conclusions

Examining the scatterplot of a given cluster can help predict whether or not it contains a kill site, especially when taking into account the overall timespan of the cluster and the slope in activity within the first 2 hours. Clusters formed from a rendezvous may be confused with a kill site since they tend to be more similar than the clusters formed from neither a rendezvous nor a kill.

I am currently conducting additional analyses to test the statistical significance of activity and other factors as predictors of the likelihood that a cluster includes a kill. By furthering this research, I aim to develop a statistical model capable of remotely identifying kill sites based on the activity data.

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