

Bobcats, Coyotes & Foxes

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1 Introduction

This paper is for a midterm project dedicated towards replicating the results from a paper on a morphometric modeling approach to distinguishing among bobcat, coyote, and gray fox scats. This midterm project requires determining the best approach for addressing research questions as shown in Section 1.2.

Understanding the distribution and behavior of various species is fundamental to ecology, as it helps ecologists understand the relationship between organisms and their environments. There is a lot of ecological significance behind tracking such species, as researchers can see precisely when individual animals depart from one location and arrive at another. Such insights reveal an individual animal's seasonal movements, feeding locations and more. Such information is valuable because the more ecologists know about animals' seasonal usage of habitats, the more they can protect the areas the animals need to survive.

Given that adult Gray Foxes have a greater average body length than adult Bobcats, and a smaller average body length than adult Coyotes, we hypothesize that Gray Fox scat will exhibit a significantly larger average diameter than Bobcat scat, but a smaller average diameter than Coyote scat.

1.1 Background Information

Conservation ecologists monitor species populations to assess the health of the ecosystem and just how effective conservation strategies are. While there are several methods for estimating population sizes, such as mark-recapture and camera-trap surveys, an alternative approach to this is analyzing biological remnants such as scat, as performed by Dr. Reid.

In a 2015 study by Dr. Rachel Reid, Reid had investigated whether morphological, biogeochemical and contextual traits distinguish between bobcat, coyote and fox scat. Morphological traits are the most cost-effective for field identification, while biogeochemical traits require laboratory analysis.

1.2 The Research Questions

The purpose of this paper is to analyze the data to evaluate whether specific morphological or biogeochemical traits can reliably differentiate species. We also research biological and ecological factors that explain the observed patterns. The research questions are listed as follows:

- Which (if any) morphological and biogeochemical traits distinguish between originating species of the scat samples?
- Why do you think those traits differ across species?

1.3 The Diet, Habitat & Physical Characteristics of Bobcats

Bobcats are mostly carnivorous. Their diet consists of a variety of animals, such as rabbits, rodents, wood rats, birds, insects and many more. They also will consume plant material such as grass. Bobcats will also hunt pets or small livestock such as chicken if they're not kept in a secure enclosure. Bobcats can be found in diverse habitats throughout California. Suitable Bobcat habitat includes vegetation types, brushy stages of low and mid-elevation conifer, forests and desert environments. Interestingly, Bobcats prefer areas with dense bush cover. When it comes to physical characteristics, Bobcats are medium-sized cats with muscular bodies. They weigh between 12 and 25 pounds. Bobcats have a round face with ruffs of fur on the side of the head. They have pointed ears, and appear to be approximately one quarter of the size of a mountain lion.

1.4 The Diet, Habitat & Physical Characteristics of Coyotes

The diet of a coyote consists mainly of mice, rats, ground squirrels, gophers, rabbits and carrion. They also eat insects and birds. In rural areas of California, they prey heavily on sheep, cattle and poultry. In urban and suburban areas, domestic cats, dogs and other pets can be food items. Coyotes can be found in the hotter drier regions of California. They can also be found in mountainous or humid areas in the state. Some physical characteristics of the coyote are that they are medium-sized animals that belong to the Dog family. They can weigh between 22 to 25 pounds on average, with males being the larger sex. They also have large erect ears, slender muzzle and a bushy tail. Lastly, they have a distinctive voice and are proficient predators.

1.5 The Diet, Habitat & Physical Characteristics of Gray Foxes

The diet of a gray fox consists mainly of small rodents, birds and berries. They will also eat insects, eggs, acorns and fungi. Gray foxes can be found in populating coastal or mountain forests at lower elevations. They rarely dig their own dens, but will instead rest in crevices, under boulders and in hollow logs. Some physical characteristics of Gray Foxes are that it has short legs, a silvery-gray coat with patches of yellow, brown, rust, or white on the throat and the belly. Black tipped guard hairs form a dark line down its back to the tip of the tail.

1.6 Population Estimation Methods for Conservation

Next, we look at the different population estimation methods for conservation. We also look at their strengths and weaknesses.

1.6.1 Mark & Recapture Benefits and Drawbacks

For mobile organisms, we use a method called Mark & Recapture. This method involves marking a sample of captured animals and then releasing them back into the environment to allow them to mix with the rest of the population. A common issue with mark-recapture methods is that the process of capturing and marking the animals changes their behavior. This is otherwise known as a trap response.

1.6.2 Quadrants Benefits and Drawbacks

A quadrant is a frame used in ecology to isolate a standard unit of area for the study of the distribution of an item over a large area. Quadrats typically occupy an area of 0.25 m^2 , and are traditionally square. Some benefits it is quick, inexpensive and portable. Some of the disadvantages are it is not very accurate and the sample can seem unintentionally biased.

1.6.3 Transects Benefits and Drawbacks

A transect is a straight line that cuts through a natural landscape so that standardized observations and measurements can be made. Some advantages of using transects are it is quick, inexpensive and portable. A disadvantage of transects is that it is often used in inappropriate situations, so care must be taken when deciding whether or not to use a transect.

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