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## Objectives

- Examine microbial diversity in Icelandic rock ptarmigan's ceca
- Explore the relationship between rock ptarmigan's microbiome and their health and population cycles.

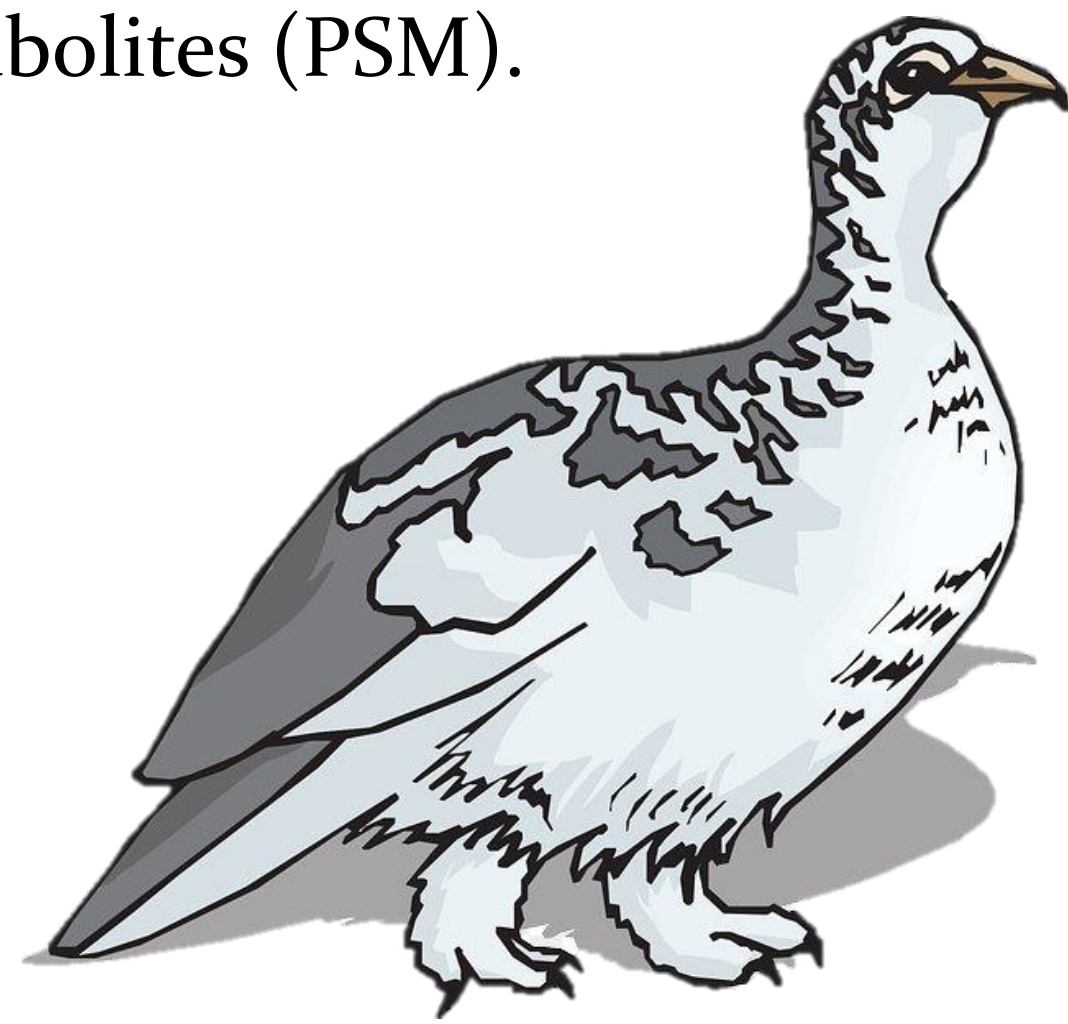
## Preliminary Findings

- Temporal dynamics in cecal microbiome relating to diet and body condition
- Weight of ptarmigan is independent of cecum length
- Longer ceca length may relate to lower body conditions and health

## Introduction

The rock ptarmigan (*Lagopus muta*) is a medium-sized game bird found in the sub-Arctic and Arctic regions of the world. Generally, rock ptarmigan **populations have multiannual cycles that fluctuate every 10-12 years**. Some populations vary in cycle periods depending on geography and their ecological interactions. In recent years, rock ptarmigans have shown **an overall negative trend** in their cyclic patterns, especially in Iceland. It's important to study these birds because they are a vital food source for hunters, predators, and Indigenous people.

While main predators in Iceland like small game hunters and **the gyrfalcon (*Falco rusticolus*) contribute to this, ptarmigan health can also play a part**. These ptarmigans live in rocky habitats above the tree lines desolate of shrubs and vegetation in the high Arctic or high-alpine tundra. Their diet consists of catkins, seeds, insects, buds, and berries. Due to the scarcity of nutrient-rich foods, they must forage continuously and sometimes digest chemically defended plants that contain toxic plant secondary metabolites (PSM).



The ceca are rich in microbes, some which help degrade these PSMs, and play an essential role in the digestion and processing of food in herbivores, especially ptarmigans. The function of **the ceca is to ferment or break down the complex food molecules** from the small intestine to the large intestine. The efficiency of this function depends on various factors like food quality, cecum size, and residence time of dry matter, which controls how much energy used.

There **is little known about the cecum's multifunctionality** and how it differs between species, ecological exchanges, and gut morphology. This efficacy can be vital in retaining their physiology and fitness, which may influence their lifespan. This study explores the relationship between the cecal microbiome and rock ptarmigan health.

## Methods

- Obtained 100 cecal samples content every year for 10 years
- Took health and morphology measurements: age, weight, height, cecum length, demographic
- Amplify 16s rRNA V3/V4 region using amplicon sequencing
- Quality checks and assessments with Mothur
- Bioinformatics using R programming

## Results

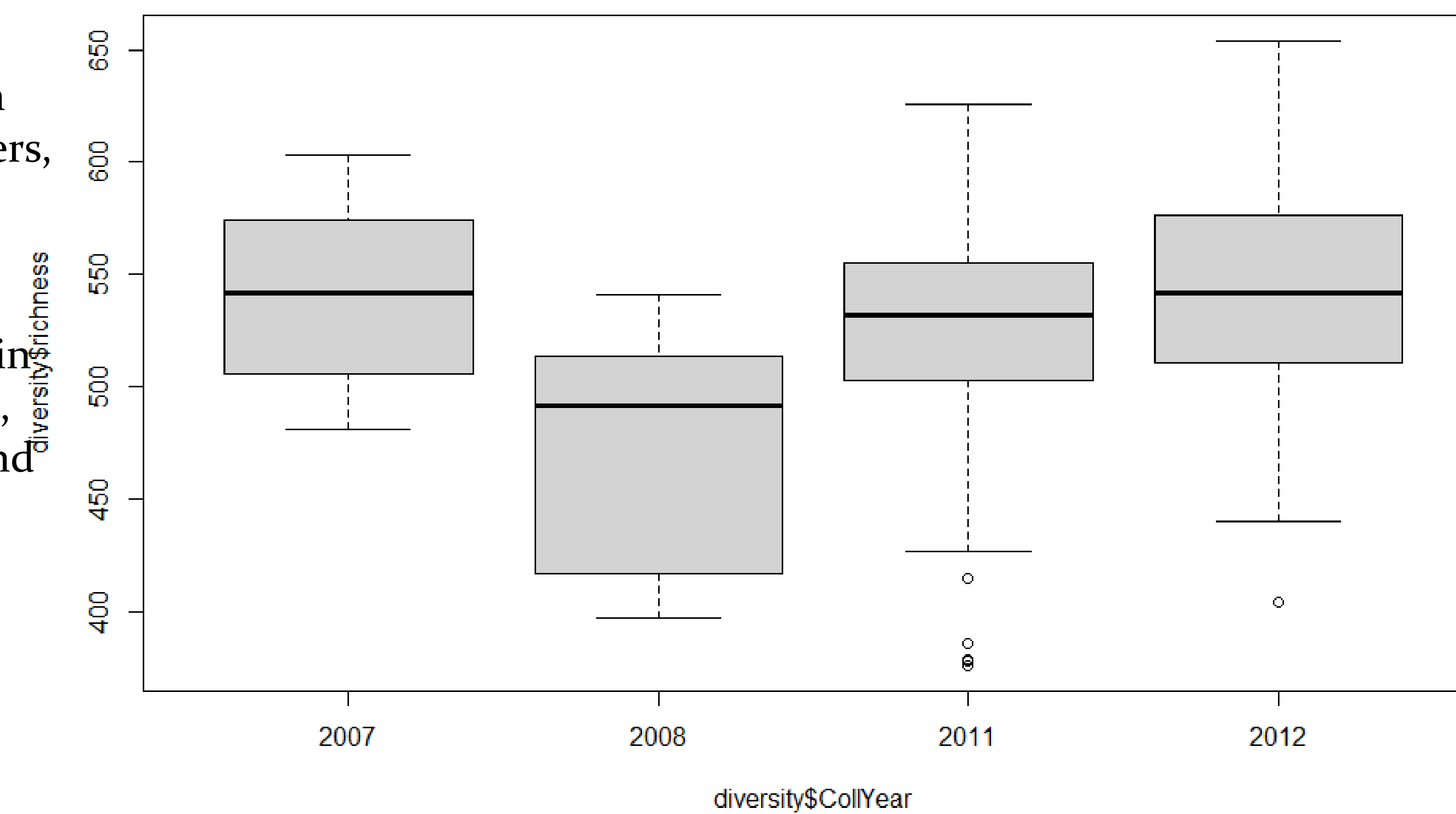


Figure 1: Total bacterial species in each cecal content sample taken from collecting years 2007, 2008, 2011, 2012.

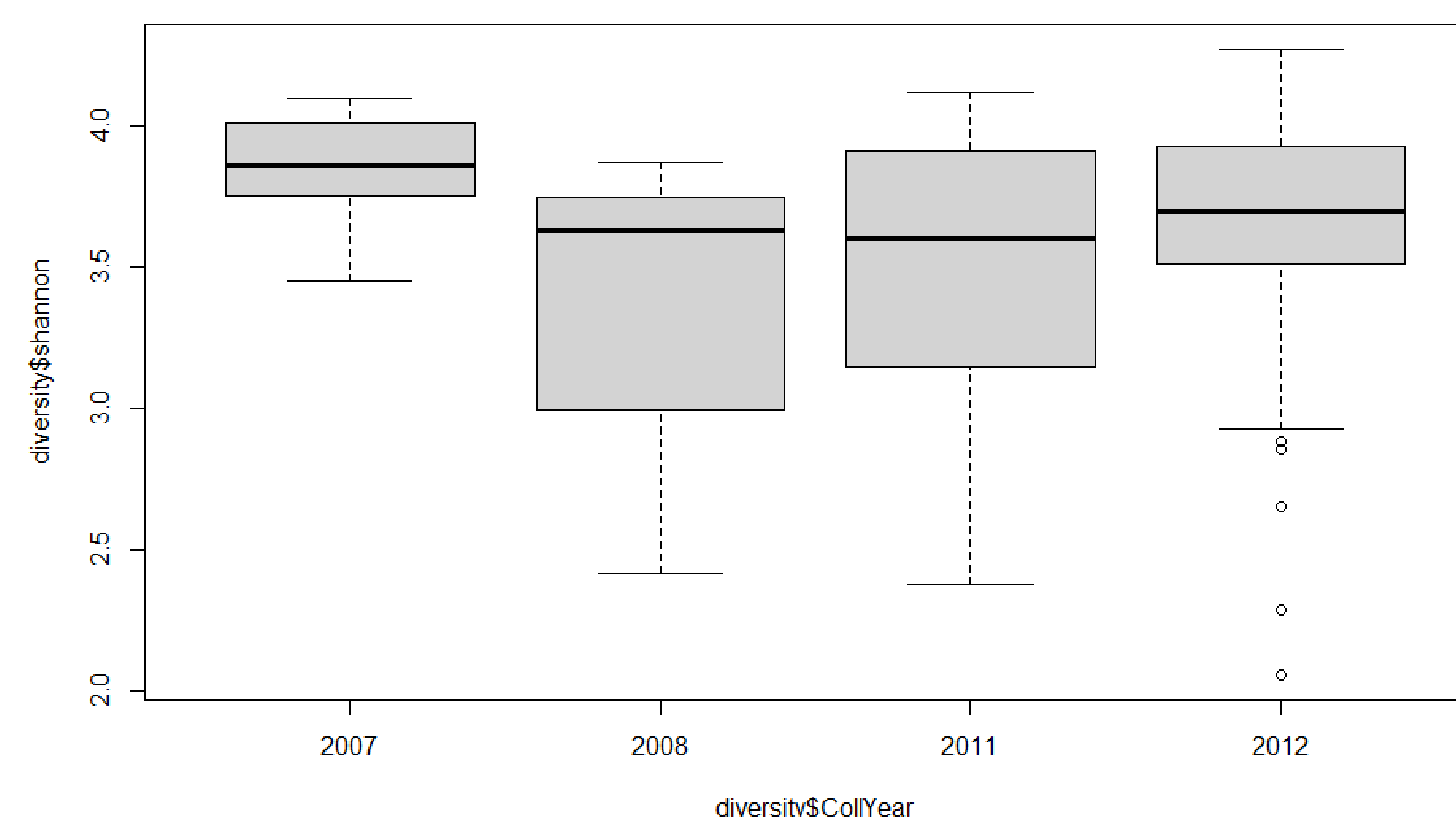


Figure 2: Using Shannon-Wiener diversity index: Species diversity in each cecal content sample taken from collecting years of 2007, 2008, 2011, 2012.

## Discussion

- Because we are still analyzing our data, our results may change.
- We have found data in some of the results that may connect the diet and body condition of rock ptarmigan to the fluctuations in population cycles.
- In my specific library pool of about (150 samples), we did not find any major significance between cecum length and species diversity or weight and species diversity.
- Not enough analysis to determine other possible factors of health that relate to the cecal microbiome.

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## Acknowledgements

I'd like to acknowledge the help from BLaST in mentoring, the National Science Foundation grant funding the GUTT project that allows me to do this work, and all the help from Iceland