



Comparing Longworth live traps to hair tubes for describing small mammal communities

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Abstract

Ecologists are always interested in studying populations of a certain area. There are many reasons for this, but two reasons include to see the change in distribution over time and because it can help tell about interactions between species. A traditional way of studying small mammal populations that has been commonly used is live trapping. As useful as it has been, live trapping does have some downfalls. It requires handling animals and is time restrictive. An alternate method of collecting small mammal population data has been explored and was tested in this experiment. My results demonstrated that abundance data from hair-tube traps was significantly positively correlated with traditional live-trap mark recapture population estimates. However, hair identification was difficult, so live trapping is still necessary to identify the species.

Introduction

Ecologists are always interested in what animals live in a habitat. Live traps have been a common way to sample the small mammal population in an area. Traditional small mammal live trapping involves opening traps in the evening and checking them early the next morning. The animals cannot be left in the trap for too long. Live trapping also involves the handling animals and ethics behind live mammal trapping can sometimes be questioned because it requires disrupting the wildlife. Also, many studies only need the species diversity or abundance for an area, so it is not necessary to capture the wildlife. A new method of trapping, hair tubes, has been described (Chiron 2018). Unlike a Longworth live trap, the animal does not get trapped, rather their hair is collected in a tube with sticky tape. More than one animal can run through the hair tube and leave evidence that they were active in the area. Hair traps have been used in previous studies of shrews (Pocock and Jennings 2006) and small mammals of northern forest habitats (Schwingel and Norment 2010).

In previous studies (Chiron 2018), hair tubes were placed in different habitats and used live trapping data as a comparison. They used pvc pipes with a notch cut on either side to place the tape onto. This form was used for my study. In their results, the number of tubes with hair had a positive significant relationship to the numbers caught in live traps. It was also stated that the hair tube traps worked better than the live traps because, by using tubes of different sizes, they were able to detect species in places where the live traps did not. In this study it was determined that hair tube traps are effective when done alongside live trapping but identifying the species by the hair is time consuming and expensive (Chiron 2018).

The purpose of this experiment was to determine the effectiveness of hair tubes by comparing them with abundance data from established live-traps grids in the montane meadows in Colorado; and to explore methods to identify native small mammals from their hair.

Methods

The hair tubes were made using pvc pipe of two different sizes (Large=40mm; Small=30mm diameters). Both sizes were sawed into pieces 15 cm in length. A cut was made on both ends of each pipe at an approximate 90-degree angle to place the tape crossing about the middle of the pipe. The purpose of this was so that the mammals' hair would stick on the tape as they squeezed through to get to the bait. This tube design was modified from Chiron et al. 2018.

The hair tubes were placed in 3 sites which are Bellview, Kettle Ponds and Maxfield Meadow in the East River Valley near Gothic, Colorado. These sites are shown in **figure 1**. These sites already had 7 by 7 grids (10 m apart) of Longworth live traps so this was used for comparison of the species of small mammal at the sites.

At each one of these 3 sites, 23-25 tubes were placed, baited with oats and collected after 5 days. Unlike live traps, hair tubes can be left out for long periods of time. The bait was the same type of bait that is used in the live traps. These traps were usually placed by the odd numbered live traps. This was done twice for each site, separated by at least one week in July and August 2018.

Live traps cannot be left open more than 12 hours because the mammal's life will be risked if it is left in the trap for too long. They must also be checked very early in the morning, usually before 7 am, because if the sun comes out this can hurt the mammals in the traps, which are nocturnal. For live traps, data was collected from trapping a total of 6 mornings at Maxfield Meadow; and 5 mornings at Bellview Bench and Kettle Ponds. Live traps were opened the night before trapping, around 7pm. In the morning, we went out at 6am to the sites. We walked to all 49 traps in each site. If the door was closed, the trap was placed into a plastic bag where it is shaken so that both parts of the trap fall apart. The mammal would fall out of the trap and was held onto so the components of the trap could be shaken out of the bag. The bag was then weighed using a spring scale. The animal was then handled to expose its belly but keep our hands away from its teeth to prevent being bitten. The animal was marked with safe dye by giving it a black mark on its belly. If the animal caught already had a black mark on its belly, that meant it was a recapture. At the same time, this animal was also sexed. The animal was then released from the bag and then the bag was weighed and subtracted from the original weight taken.

Identification of small mammal species based on hairs caught in the tubes was originally a critical part of this project. Reference slides of hairs were made taken from museum specimens of known species and also from reference slides already found in the RMBL Natural History Collection. The hairs varied by length, width, color, and scales. The hair collected from the tubes were attempted to be identified using these reference slides through a microscope. For each piece of tape collected that had hair, about 10 pieces of hair were measured using a dissection scope and caliper. However, some were impossible to measure because the hairs were bent or too bunched to distinguish between individual hairs. A hair index and length measurements were taken from each of the species expected to live in the meadows, (based on those previously caught in live traps at the 3 sites). The species list included: *Microtus montanus*, *Tamias minimus*, *Peromyscus maniculatus*, *Zapus princeps*, *Thomomys talpoides*, and *Sorex spp.*

Results

Small mammal population estimates

The hair tubes were successful in collecting hairs. At Maxfield Meadow, 8% of the traps had hair at both the first and second collection. At Kettle Ponds, 34% of the traps had hair at the first collection and 32% of the traps had hair at the second collection. Finally, at Bellview Bench, 32% of the traps had hair at the first collection and 40% of the traps had hair at the second collection. **Figure 2** shows the results of hair captured in hair tube traps. Also, the different sized tubes were good for capturing different sized hairs, as shown in **figure 6**.

The population estimate for the live trap data was found using the Schnabel estimate, the equation $N = \sum CtMt^2 \div \sum RtMt$, with N = population. This equation was attempted with each species at each site. However, for some species in certain sites there was not enough data to properly use this formula, so the MKA, minimum known alive, was used. **Table 1** shows whether the N or MKA and what value was used to estimate the population. The reason this formula did not work for some of these data sets is because not enough recaptures were captured, making $\sum RtMt = 0$. **Table 1** shows the data used to estimate the population.

Figure 3 shows data from live trapping.

Figure 4 shows a significant positive correlation between the percentage of hair tube traps with hair and the total estimated number of animals in the area, based on live-traps.

Small mammal hair identification

The hairs from the reference collection were examined microscopically for color and cuticle patterns, but these were not distinctive enough to differentiate the species. The hair lengths fell into three categories (**Figure 5**), three species have very short hairs (*Sorex*, *Zapus*, adult *Peromyscus*), two have very long hairs (*Tamias*, *Microtus*) and one was intermediate (juvenile *Peromyscus*)

A comparison of the known and the “unknown” hairs collected in the tubes would allow for exclusion of some species (i.e. NOT *Microtus* or *Tamias*) but could not confidently attribute hairs to one species (i.e. could be EITHER *Peromyscus* OR *Zapus*). This is illustrated for hairs collected in tubes at the Kettle Pond site in **figure 7**.

Discussion

The comparison of hair tubes to live-trapping demonstrates that the hair tubes do provide accurate evidence of the abundance of small mammals in a community. The two sizes of the traps collected different sizes of hair, which could be of different species. This study, demonstrating the abundance using the hair tube traps, is consistent with the previous study done by Chiron (2018). I would recommend the use of hair tubes only if the species is not necessary, until a more

effective way to identify hairs is discovered. The advantages of hair tube traps are that there is no need to handle animals, putting both the animal and human at less risk, and there is no need for permits. The disadvantage is that you cannot rely on it to get accurate identification of the species. In this case the advantages of the hair tubes did outweigh the disadvantages but only because it was done alongside live trapping.

Identifying the hairs by species using lengths and under microscope was not possible. There were obstacles that were not anticipated at the beginning of this study in identifying mammal hair. There are few resources available to help in identifying animal hair (Mathiak 1938). All the hairs seemed similar in color and had similar scales under the microscope. Hair cuticles, length and diameter may not be enough to identify between closely related species (Schwingel & Norment, 2010). A species has a maximum hair length that it will usually not exceed (Mathiak 1938). However, some of these overlap within species making it difficult to tell them apart. Also, it was found that hair of the same species can vary by season and age of the animal (Mathiak 1938). **Figure 5** shows this as it includes hair lengths for juvenile *Peromyscus* and adult *Peromyscus*, who's lengths are significantly different. So even slides with hair of the same species can look different depending on the age of the animal. The lengths were not a good indicator to differentiate between species. As shown on **figure 5**, the lengths of some of the species overlap.

Overall, the hair tube traps are a good indicator for abundance in an area, but live traps are still necessary to determine the species. The hair tube traps can be used in the future to determine the abundance in new, unknown areas. If a better way to identify the hair was determined, the hair tube traps would be a less invasive way to study small mammal communities.

Literature Cited

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Tables and Figures

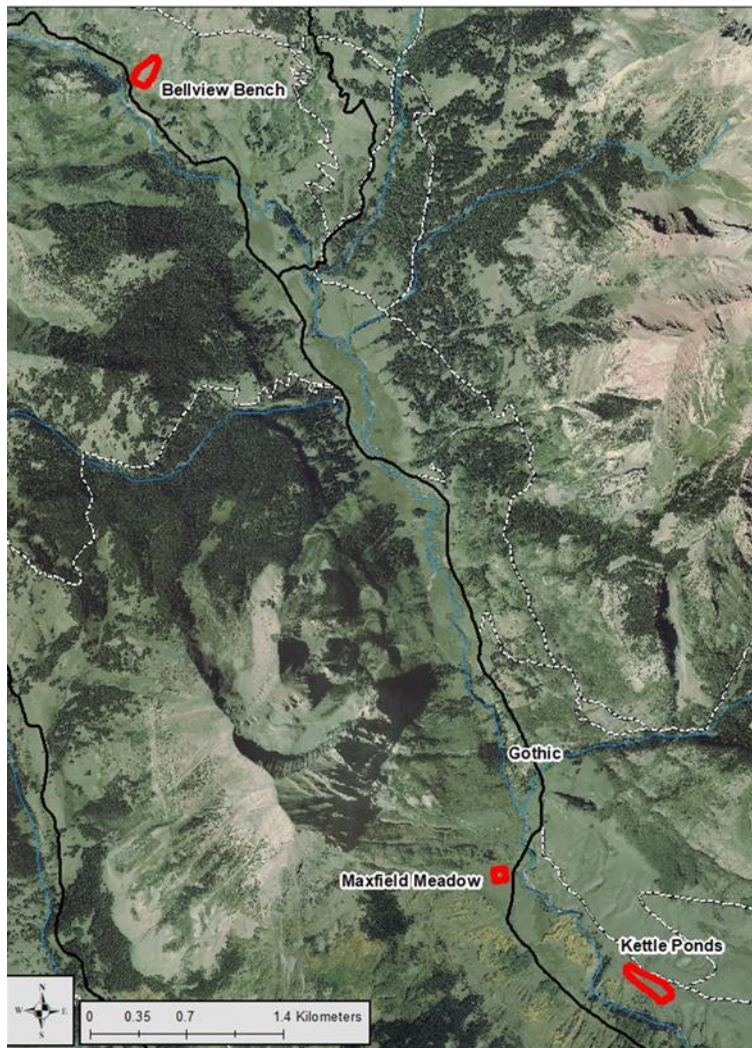


Figure 1

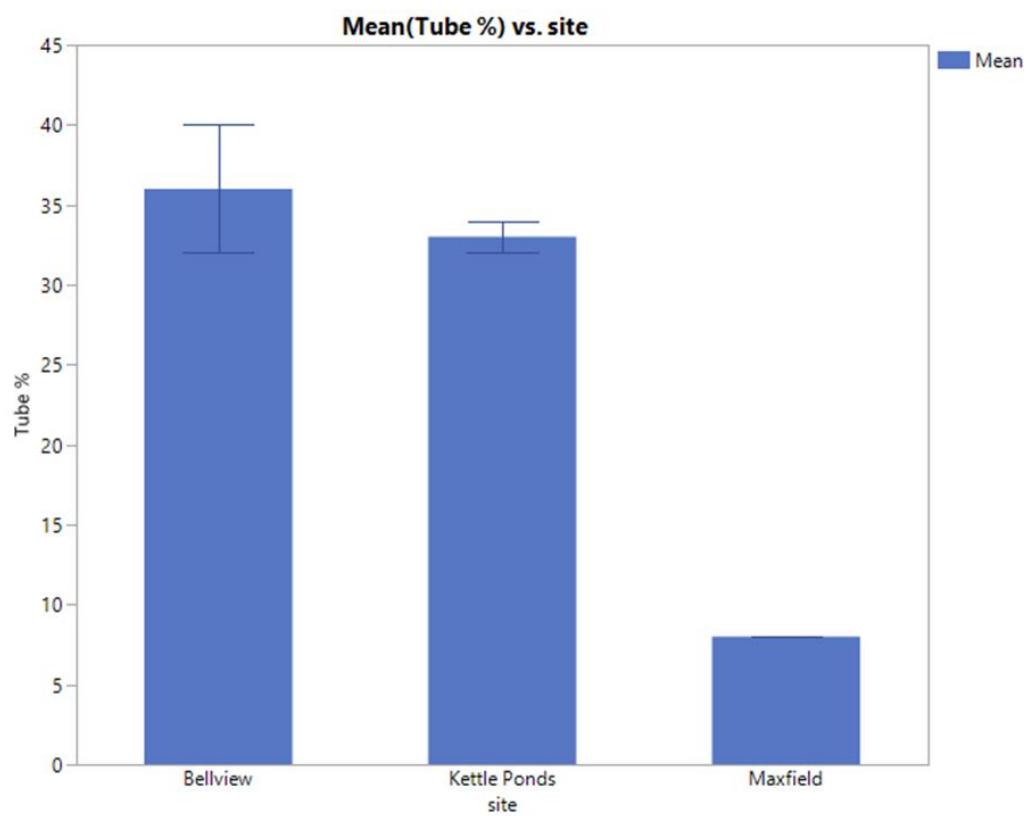


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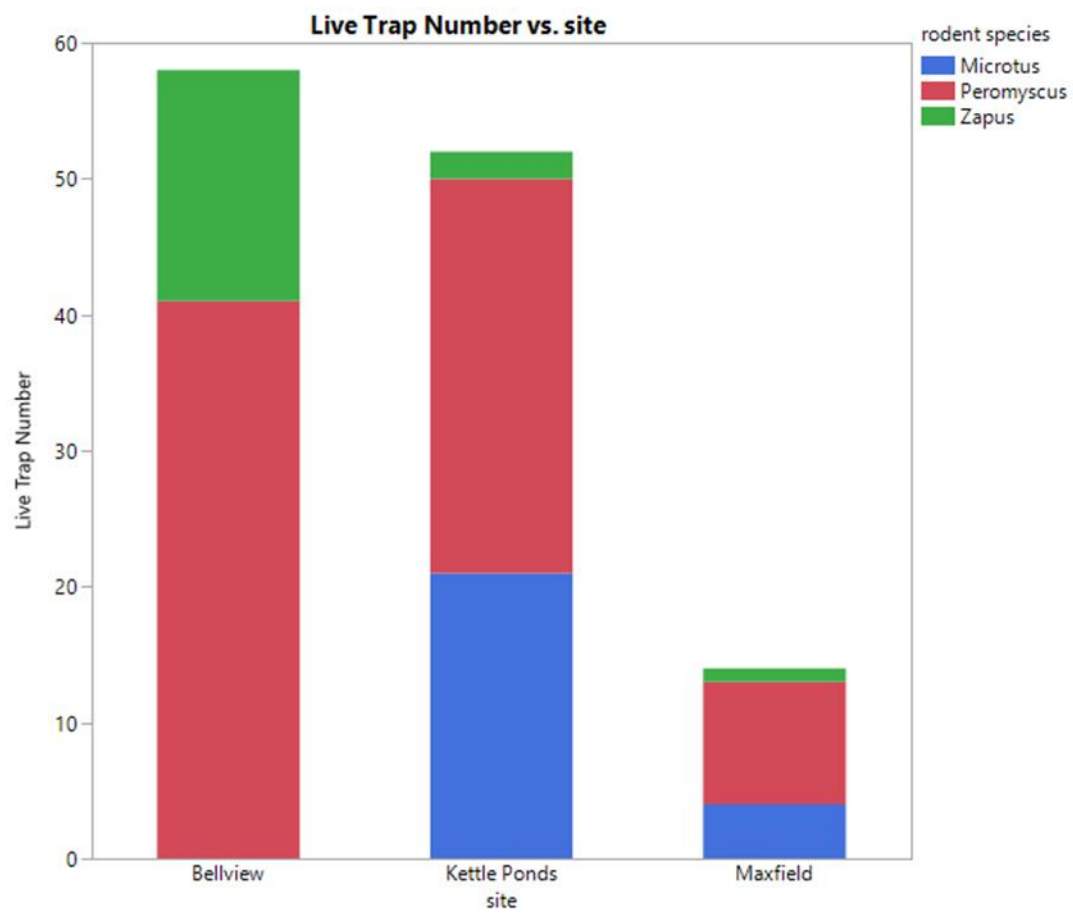


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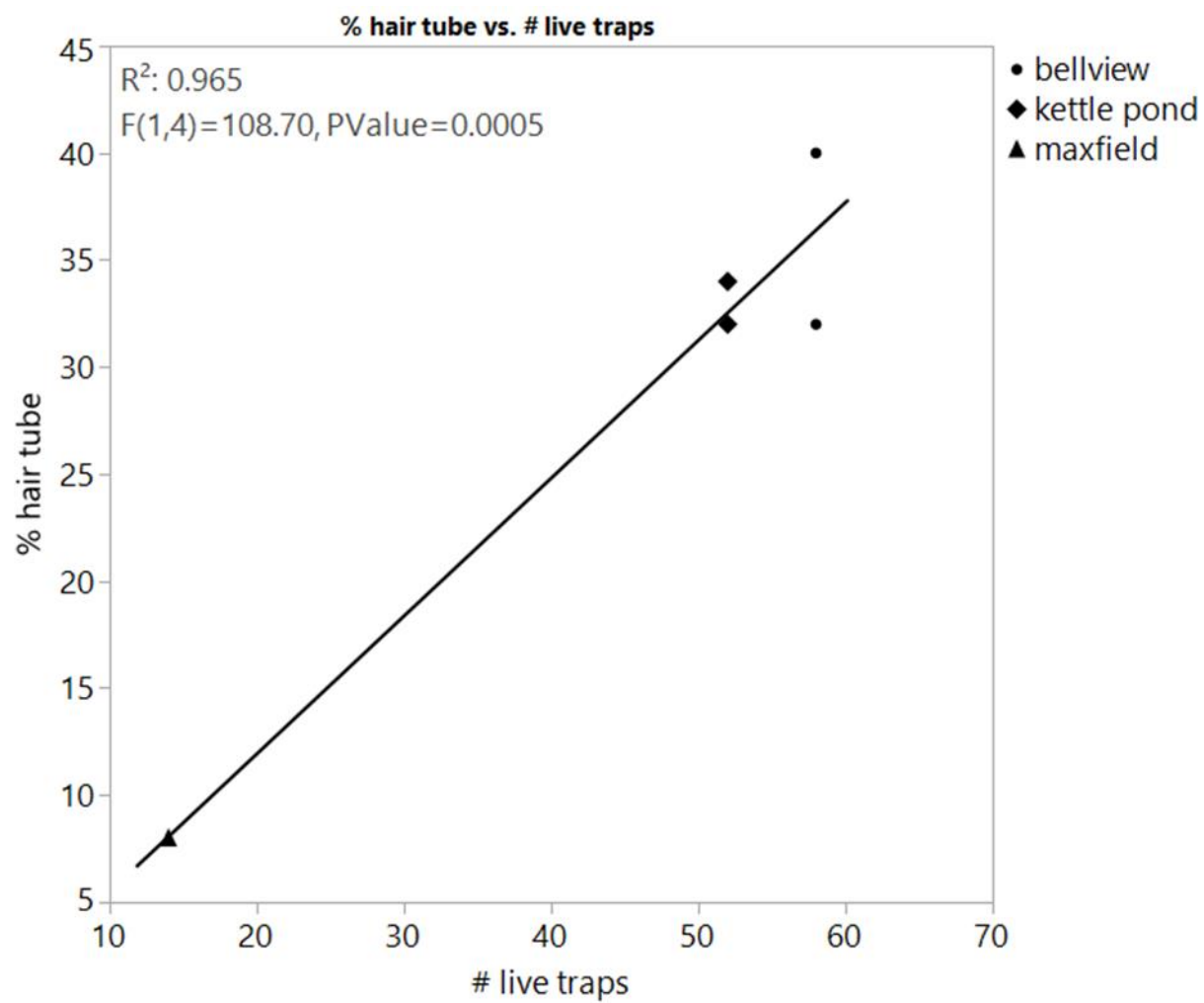


Figure 4

Site	Species	N/MKA	
Maxfield	Pm	N	9
Maxfield	Zp	MKA	1
Maxfield	Mm	MKA	4
Kettle Ponds	Pm	N	29
Kettle Ponds	Zp	MKA	2
Kettle Ponds	Mm	MKA	21
Bellview	Pm	N	41
Bellview	Zp	N	17
Bellview	Mm	MKA	0

Table 1

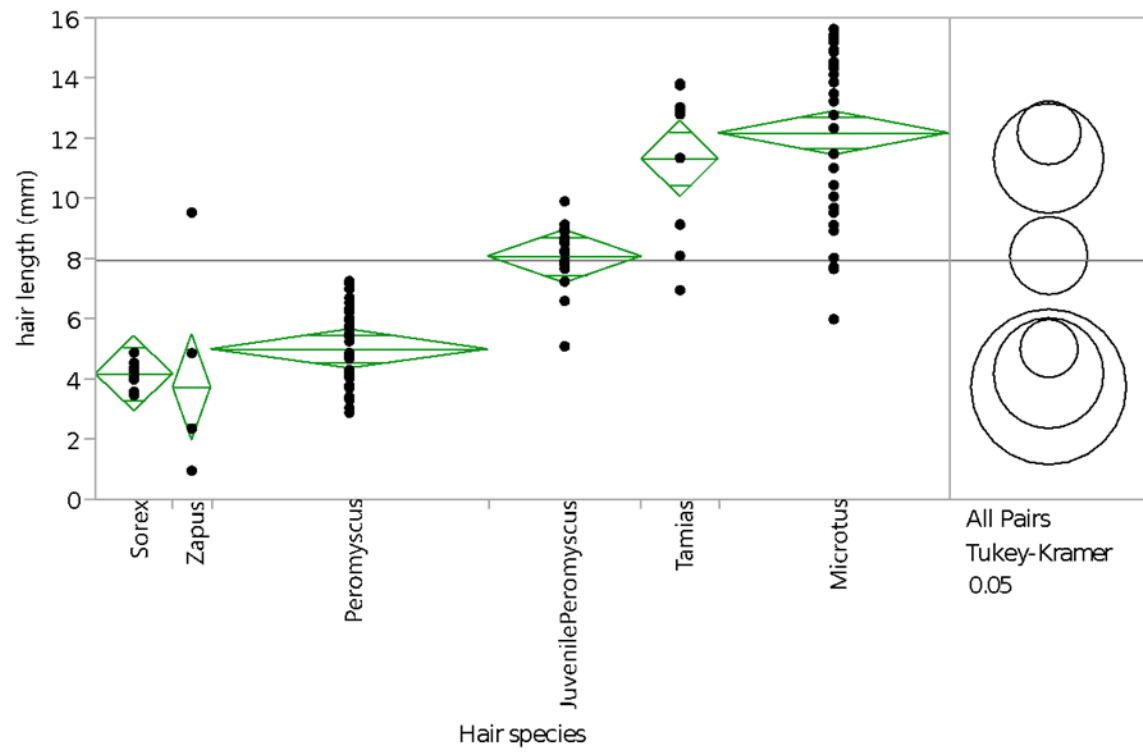


Figure 5

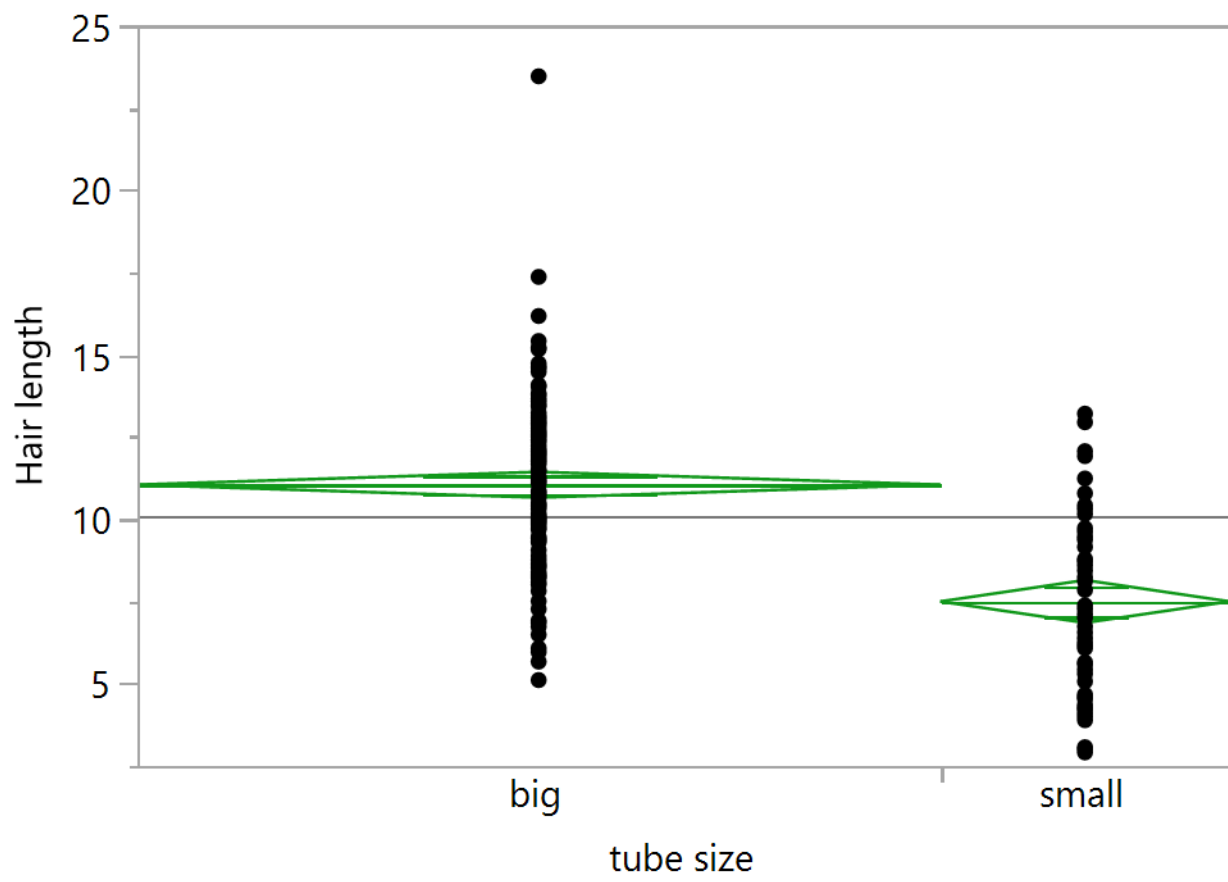


Figure 6

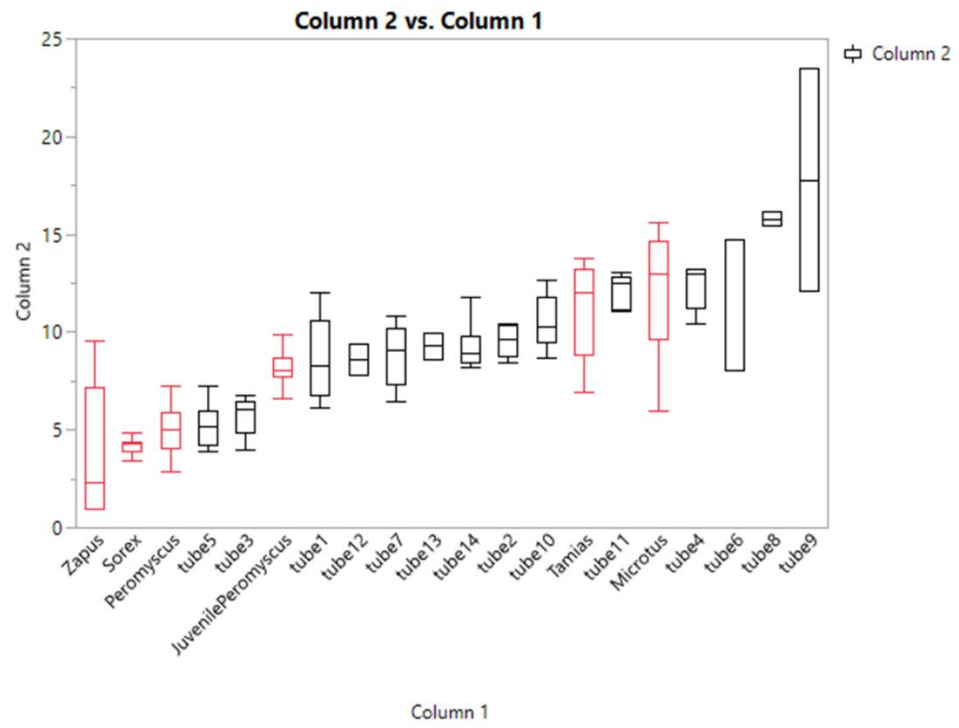


Figure 7