

**Brett Hollingshead**

**0556309**

# **Does Body Size Affect Animal Popularity in Zoo Mammals?**

**BIOL 4180H**

**Due: November 24, 2016**

## **Abstract**

The purpose of our study is to determine what factors affect the popularity in zoo mammals. We measured mammalian popularity based on body size, social levels, and whether indigenous to Canada or not using survey and observational data. We predicted that mammals with a smaller body size would have higher mammalian popularity. Survey results showed statistically significant differences in the votes for favourite mammals made by different genders and age groups ( $p=0.04$ ). Otters, camels and meerkats were most popular from survey data. Observational data shows statistically significant differences between small vs. large ( $p=3.77 \times 10^{-8}$ ) and social vs. solitary ( $p=1.64 \times 10^{-6}$ ). Survey data is partially explained by preferences for visually appealing and active interactive mammals. Observational data is explained by the number of individuals present in one exhibit as well as level of activity in the animals.

## **Introduction**

Zoos often have animals and exhibits that are most popular with visitors; although it is sometimes unclear what makes certain species popular. The purpose of our study is to determine what factors affect the popularity in zoo animals, specifically mammals. Based on literature (Surinova, 1971; Balmford *et al.*, 1996; Ward *et al.* 1998), we believe affects animal popularity is the body size. Animal body size can be crucial to a mammal's popularity as it is impressive for a visitor to watch. It is also crucial as it helps a mammal be spotted in its exhibit; as animals harder to see are not as interesting. We measured mammalian popularity based on body size at the Riverview Zoo in Peterborough Ontario using survey and observational data. Other factors we tested for mammalian popularity include native to Canada vs. exotic and solitary vs. social

animals. We predicted that mammals with a smaller body size would have higher mammalian popularity. This is due to the fact that smaller body size means a higher metabolic rate (Glazier, 2008), meaning a more active mammal in the exhibit and therefore more desirable to watch.

### **Methods & Data Analysis**

Three days of study were conducted at the Riverview Zoo in Peterborough on three separate days: October 21, November 12, and November 13, 2016. Prior to the start of the first study period, the surveyor visited each exhibit to make a record of all mammalian species at Riverview Zoo. The surveyor recorded the heights and weights for each species from the information sign. As well, it was recorded whether any given species was native or exotic to Canada or if it was a social or solitary species. The study consisted of two components: survey and observation. The survey component consisted of an approximate 30 minute period where the surveyor circled the zoo surveying as many visitors as possible. The survey consisted of a single question: What is the visitor's favourite mammal at the zoo? Their answer was recorded along with their gender and one of two age ranges, age 1-20 or 20+. The observation component consisted of visiting each mammalian exhibit for 10 minutes at a time. While at any given exhibit, the surveyor recorded the number of visitors at the exhibit as well as length of stay.

Data analysis consisted of displaying survey data for males, females, visitors ages 1-20 and 20+. This data was displayed in a line graph (fig. 1) with species against number of votes for each species. Additionally, ANOVA tests without replication were done comparing these four parameters. The observational data underwent F and t-tests comparing large vs. small, native vs. exotic and solitary vs. social mammals. The results of these tests are displayed in a table below (Table 1).

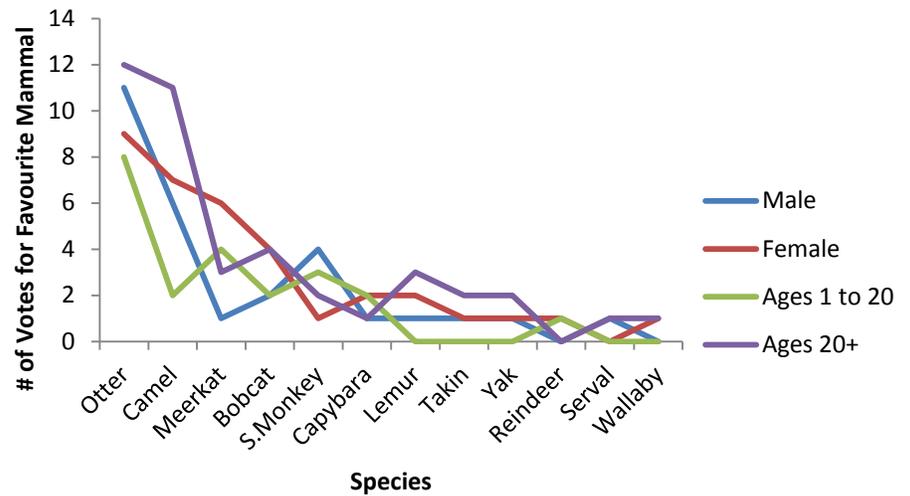
## Results

Figure 1 showed differences in preference of favourite mammals based upon survey results. Otters, camels and meerkats were the favourite choices across both genders and age groups.

Further statistical analyses showed statistically significant differences in the votes for

favourite mammals made by males, females, ages 1-20 and 20+ ( $p=0.04$ ). As well, there were significant differences in the number of votes between mammalian species ( $p=2.74 \times 10^{-10}$ ). When broken down further, ANOVA tests revealed that votes made between males and females were not significant ( $p=0.41$ ), whereas votes between ages 1-20 and 20+ were not significant as well ( $p=0.07$ ).

Results of the observational data, summarized in Table 1, show statistically significant differences between small vs. large mammals ( $p=3.77 \times 10^{-8}$ ) and social vs. solitary mammals ( $p=1.64 \times 10^{-6}$ ).



**Figure 1.** Survey data comparing number of survey votes for mammalian species by gender and age group. Data collected at Riverview Zoo, October-November, 2016.

**Table 1.** F and t-test results on observational data between parameters: small vs. large, social vs. solitary, and exotic vs. native mammals. Data collected at Riverview Zoo, October-November, 2016.

	Small	Large	Social	Solitary	Exotic	Native
Mean	2.557692	1.807229	1.979592	2.651934	2.22314	2.507936508
Variance	2.239902	1.538372	1.880729	2.139288	1.985982	2.705581157
F	1.456021		0.879138		0.734032	
F Critical	1.265842		0.797083		0.740363	
T-test P value	3.77E-08		1.64E-06		0.199331	
Significance	Significant		Significant		Not Significant	

Based upon mean values, small mammals and solitary mammals respectively were more preferred than their counterparts. Differences between exotic vs. native mammals were found to be not significant ( $p=0.20$ ) but mean values show a slight preference for native species.

## **Discussion**

Survey data from figure 1 shows noticeable trends concerning the popular votes from visitors. Comparing male (29) and female votes (35), we see that females had more votes than males for most mammalian species. Despite no statistically significant difference, species where males voted more than females were the otter, squirrel monkey and serval. The differences between genders can be partially explained as females prefer animals that look visually appealing whereas males typically prefer animals that are more active and interactive. A study looking at animal-related attitudes of people found that females like popular or neutral species more and males like less preferred animals more (Bjerke & Østdahl, 2004). This partially explains our results as female visitors enjoyed most popular or neutral species more; but does not explain why males preferred species liked otters or squirrel monkeys more as they are some of the most popular mammals.

Comparing votes of age groups 1-20 (22) and 20+ (42) is more difficult as there are more votes by visitors ages 20+ than ages 1-20, skewing the data. However, mammalian species where ages 1-20 voted more than 20+ were the meerkat, squirrel monkey and reindeer. Explanations for why visitors ages 1-20 voted for these mammals can be partially explained by a preference for more active, interesting mammals like the meerkat and squirrel monkey. The reindeer can be explained for how close the survey was conducted to the winter holidays. Visitors, specifically of a very young age, may prefer reindeer because of its familiarity to Christmas celebrations. Votes made by visitors ages 20+ were much higher than ages 1-20 for species like camel, lemur, sichuan takin and yak. This is likely because older visitors have more of an appreciation for these species than younger visitors as they are not native to Canada and visitors will not get to see them often in their lives.

From the results of the observational data, we know that there are significant differences in preference for small vs. large mammals and social vs. solitary mammals; with the preference towards smaller and more social animals respectively. In depth analyses revealed that comparing social vs. solitary small mammals, there were not significant differences ( $p=0.19$ ); but social, small mammals had a longer average visit time than solitary, small mammals. In contrast, when comparing small vs. large social mammals, there was a significant difference ( $p=0.001$ ) where small, social mammals had a longer average visit time than large, social mammals. These results help to show that size does have an effect on mammalian popularity at the zoo. Solitary vs. social does have a significant effect on mammalian popularity, but not enough to differentiate further between social & small to solitary & small. Lastly results found that exotic vs. native parameters had no significant differences in mammalian popularity.

Observational results are both supportive and contradicting to published literature. Results of similar studies found that children showed a significant preference for larger groups of mammals (Ward *et al.* 1998) which is a similar trend as to what our study observed. However, their results also found that exhibits of larger mammals were preferred by adults and children (Ward *et al.* 1998), which is the opposite of what we observed in our study. Another study found that the popularity of exhibits is independent of the size of animals they contain (Balmford *et al.* 1996). This leads us to believe that there are unforeseen factors that account for the differences in our results to published work.

One possible reason as to why small mammals were favoured over large is the ability to have more individuals. If a species of mammal is small enough, it can mean having more individuals able to coexist in an exhibit. More individuals in an exhibit can give more opportunities for visitors to view the animals. As well more individuals can mean more interactions between members; which can catch a visitor's interest and entice them to stay longer. This can also explain the differences in social vs. solitary animals as social animals are more likely to have interactions with other members, or sometimes with the visitors themselves.

Another reason for the preference of small mammals over large animals is the level of activity in an exhibit. Generally, large mammals are more stationary as their size means lower metabolic rates (Glazier, 2008) and more effort to move about their enclosure. A mammalian species that is stationary or inactive in their exhibit is not interesting to visitors and they will often not stay very long. The only exception to this at the Riverview Zoo is the Bactrian camel.

Of the top five mammalian species that were most popular in figure 1, the Bactrian camel is the only large mammal. Although relatively inactive, Bactrian camels are one of the more

popular animals at the zoo because of how foreign it is to Canada. Domestic Yaks and Reindeer at the zoo are also exotic to Canada; but being species native to cold, northern climates, they are somewhat familiar to visitors. Bactrian camels however are native to Northern China and Southern Mongolia, and come from a climate much different than Canada's. This makes them unfamiliar to visitors and therefore more interesting for visitors to watch.

### **Conclusion**

The results of this study were enlightening as they show which mammals were the favourites at Riverview Zoo, and by whom. Although general trends have been outlined by our data, there are many factors that determine a favourite mammal to a person as every person is different. We know that the size and social levels in zoo mammals has an effect on its popularity but there are other underlying factors that may attribute to these results. If this study were to be repeated, we would like to collect more data from more days at the zoo and test new factors affecting popularity such as the exhibit distance from entrance as well as enclosure size.

## **References**

- 1) Balmford, A., G. M. Mace and N. Leader-Williams. 1996. Designing the Ark: Setting Priorities for Captive Breeding. *Conservation Biology*, 10:719-727.
- 2) Bjerke, T and T. Østdahl. 2004. Animal-related attitudes and activities in an urban population, *Anthrozoös*, 17:109-129.
- 3) Glazier, D. S. 2008. Effects of metabolic level on the body size scaling of metabolic rate in birds and mammals. *Proceedings of the Royal Society of London B: Biological Sciences*, 275:1405-1410.
- 4) Surinova, M. 1971. An analysis of the popularity of animals. *International Zoo Yearbook*, 11:165-167.
- 5) Ward, P. I., N. Mosberger, C. Kistler, and Fischer, O. 1998. The relationship between popularity and body size in zoo animals. *Conservation Biology*, 12:1408-1411.

## Appendix

**Table 2.** Size ordering, total length and weight of mammal species at the Riverview Zoo included in study.

Order	Species	Length (cm)	Weight (lb)
1	Squirrel Monkey	78	2.2
2	Slender-tailed Meerkat	75	5.5
3	Black & White Ruffled Lemur	120	9
4	Two-toed Sloth	70	17.6
5	River Otter	105	30.9
6	Bobcat	125	40
7	Red-Necked Wallaby	100	44.1
8	Serval	102	45
9	Capybara	134	146
10	Barbary Sheep	100	309
11	Reindeer	210	396.8
12	Sichuan Takin	183	770
13	Domestic Yak	330	1280
14	Bactrian Camel	300	2204

**Table 3.** Observational data on number of visitors and average visit length for three, 10 minute periods at Riverview Zoo. Some enclosures shared.

	Number of Visitors	Average Visit Length (min)
Otter	25	4.12
Camel	28	3.49
S. Monkey/Sloth	31	3.00
Lemur/Capybara	35	2.96
Meerkat	38	2.21
Serval	41	2.04
Wallaby	28	1.72
Takin	18	1.58
Bobcat	38	1.54
Yak	19	1.41
Reindeer	52	1.25
Sheep	8	1.00

**Table 4.** Survey data on number of votes for favourite mammal by gender and age range. Results collected at Riverview Zoo

	Otter	Camel	Meerkat	Bobcat	S.Monkey	Capybara	Lemur	Takin	Yak	Reindeer	Serval	Wallaby
Male	11	6	1	2	4	1	1	1	1	0	1	0
Female	9	7	6	4	1	2	2	1	1	1	0	1
Ages 1 to 20	8	2	4	2	3	2	0	0	0	1	0	0
Ages 20+	12	11	3	4	2	1	3	2	2	0	1	1