

Factors Affecting Popularity of Zoo Animals

Including Diet, Exoticness, Sociality and Body Size

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Abstract

The popularity of zoo animals is integral to the success of the zoo as a whole. This means that the factors affecting animals' popularity are of great interest to zoos in general. This paper investigates the significance of 4 different factors that affect an animal's popularity: large or small body size; carnivore or herbivore; social or solitary; and exotic or native to Canada. This was done by an observational study of 200 visitors to the Riverside Zoo in Peterborough. 9 different animals were chosen and people were counted and had time of their stay recorded during a 30 minute interval at each enclosure. Also a survey was given to every 10th person observed during the study. The survey gave very little data and was also a small sample size causing it to be less conclusive than the observational study. From the observational data all 4 factors were determined to be significant at predicting an animal's popularity. Carnivores had 30.5 visitors per animal and an average time per visitor of 195.3 seconds while herbivores had 15.6 visitors and an average time of 80.7 seconds. Exotic animals had 21.8 visitors per animal and an average time of 82.5 seconds while native animals had 22.75 visitors and an average time of 232.1 seconds. Solitary animals had 23 visitors per animal and an average time of 81.9 seconds while social animals had 22 visitors and an average time of 171.1 seconds. Finally small animals had 27.2 visitors per animal and an average time of 186.8 seconds while large animals had 16 visitors and an average time of 73.8 seconds.

Introduction

Zoos have been and remain a major way that many people are able to observe new and exotic animals. The first zoos on record date back over three thousand years with the earliest record being from over 1400bce in Egypt. (Mason 2010) The beginning of modern zoos started in the 18th and 19th centuries in Europe and then began to move around the world. By 1990 there were well over 10 000 zoos around the world with an increasing number in developing countries. (Mason 2010) Also zoos are being increasingly used as forms of ecotourism as well as for conservation practices of animals and to help inform the general population about foreign or exotic animals. (Ryan and Saward 2004) (Kreger and Mench 1995) (Moss and Esson 2010) While all of these aspects of zoos are of great importance it is also vital to know that they still must partially function as a business. Part of this business is to ensure that people attend the zoo and have interactions with the animals, and the best way to do this is to have popular animals. There have been many studies into what makes animals in a zoo popular to the general public and they have found a number of different factors.

In a number of these studies it has been found that generally an increase in body size correlates to an increase in popularity in animals. (Moss and Esson 2010) (Surinova 2007) (Ward, et al. 1998) This is generally shown to have a trade off though given that larger animals are more costly to maintain as well as they have a slower reproductive cycle and will produce less offspring. (Ward, et al. 1998) (Balmford 2000) This would mean that zoos could potentially be more successful by focusing on smaller animals even if they were less popular. (Balmford 2000) Another factor shown in studies to be significant is the interactivity of the animals and the amount of direct contact available. (Kreger and Mench 1995) (Surinova 2007) Also the educational component of animals that are not familiar to the general public has been shown to

be significant, with exotic animals showing a higher popularity than native ones. (Moss and Esson 2010) (Kreger and Mench 1995) (Surinova 2007)

The objective of this experiment is to determine what contributes to the popularity of various zoo animals and see where the most benefit for a given zoo would be since larger animals are generally thought to be more popular (Ward, et al. 1998) but are also more costly. (Balmford 2000) I would predict that other factors are more important to the popularity than body size. These could include exoticness, carnivores compared to herbivores and solitary compared to social to name a few factors.

Materials and Methods

All data points were gathered at the Riverview Zoo in Peterborough. The data points were collected on 4 different days and at different times. This helped to prevent the time of day or the day of the week from being prevalent variables. The major data points for this are firstly the total number of visitors present at each exhibit for an intermediate amount of time (30min); also the amount of time spent by each visitor looking at the exhibit were recorded. A random selection of the visitors were also be given a short survey, every 10th person.(Fig.1) This survey was about which animals they were there to see and how they decided in which they were most interested. This survey will be kept short, less than a page, and will involve ranking different animals based on the level of interest that they inspire. Also it will include a section in which the participant ranks the different factors as to which are the most to least important to making an animal interesting at the zoo. Sex and ages of the respondents will be recorded as well to look for patterns there.

Next the different animals were categorized based on a number of different characteristics, not only size, to see which are most important to the popularity.(Table 3) These characteristics will include the differentiation between carnivore and herbivore; the exotic versus the animals native to Canada; the number of individuals in the enclosure, which could be an example of social versus solitary animals; and of course the body size will be taken into account. 9 different species were chosen which differ in these different categories and will help to determine which are the most important to be a popular zoo attraction.

These characteristics can generally be divided into 2 categories for each so a standard t test will be able to be done for each characteristic. This will be able to say if there is any significant difference between the 2 groups of each of the characteristics. This will determine which characteristics are most important in terms of visitor popularity.

It is important to note that for one of the days when data was being collected the otters were absent and so no data on them was collected at this time.

Results

Over the course of the investigation a total of 200 different visitors were observed. Each person was then timed to see how long they observed each animal. These data points were then grouped based on the characteristics by which the animals were differentiated. This raw data can be found in the appendix(Table 4). The different categories of the characteristics then had the values averaged, as well as the total number of visitors to each set of animals were recorded. From this the number of visitors per animal in the data set was determined for each category. Finally the 2 tailed t test values were also done to determine if any of the characteristics showed a significant difference between the 2 types. (Table 1)

Table 1

Table 1 shows the different characteristics into which the animals were separated. Also include are the average times visitors spent with the animals in the categories, the total number of visitors and the visitors per animal. Finally the 2 tailed t test values for each of the 4 sets of 2 characteristics. The value of significance is 0.05.

Grouping	Average Time (in sec)	Number of Visitors	Visitors per Animal	T Test 2 Tail
Herbivore	80.7	78	15.60	1.97194E-07
Carnivore	195.3	122	30.50	
Exotic	82.5	109	21.80	5.18334E-08
Native	232.1	91	22.75	
Social	171.1	154	22.00	1.56652E-06
Solitary	81.9	46	23.00	
Big	73.8	64	16.00	5.78324E-08
Small	186.8	136	27.20	

Using the values from the 2 tailed t test shown it can be seen that each of the sets of categories have significant differences (Table 1). The t test value correlating to a significant difference is 0.05 and all of the numbers from this experiment are considerably smaller than that, the highest being 1.56652×10^{-6} for the difference between social and solitary, which is approximately 32 000x smaller than the threshold of significance. Also the lowest value, 5.18334×10^{-8} for the difference between exotic and native to Canada, is nearly 1 000 000x smaller than the threshold of significance. This shows that all four characteristics had a very significant difference between the differentiations.

Of the 200 people observed a small selection, every 10th person, was given a small survey to fill out in order to help find any patterns in which animals were considered popular as well as the factors affecting this.(fig.1) (Tables 6 and7)The survey also included two ranking questions in which the visitors were asked to rank a set of seven animals in order of interest as well as a similar question about the factors influencing what makes an animal interesting. These rankings were averaged in order to see how the overall population seemed to rank the different factors and animals.(Table 2)

Table 2

Table 2 shows the different rankings of the animals and factors from the survey done of 20 random people. The factors and animals are ordered from highest ranking to the lowest ranking.

Factors	Average Ranking	Animals	Average Ranking
Cuteness	2.15	Lion	2.46
Interactivity	3.15	Otter	2.77
Exotic/Native	3.23	Bobcat	3.69
Social/Solitary	3.69	Camel	3.77
Size	4.69	Meerkat	3.85
Number of animals	5.08	Goat	5.69
Herbivore/Carnivore	6.00	Yak	5.77

Discussion

Using the data from the observational study of the visitors the differences between the categories can be seen to be significant.(Table 1) All of the t test values are significantly less than 0.05 meaning that we reject the null hypothesis and meaning that there is a difference between each of the data sets for the characteristics tested.

The otters being absent the one day should not have affected the significance of the differences in the data sets given that the otters were included in all of the larger categories and the otters also had the highest average time and visitors of the animals observed.(Table 5)

Firstly looking at the differences between the herbivores and the carnivores it can be seen that the values are significant from the t test, however since it is a 2 tailed t test it does not specify which is larger. This is the same for all of the categories. From the average time each visitor spent at the exhibits it can be seen that people spent far more time with the carnivores than the herbivores, 195.3s compared to 80.7s. This means people stayed at the carnivore enclosures roughly 2.4x as long as herbivore enclosures. Also looking at the number of visitors per animal shows a similar trend, with carnivores having 30.5 visitors per animal while herbivores only had 15.6 making the carnivores nearly double the herbivores values again. This shows a strong correlation between the carnivores and the popularity of an animal.

Looking at the average time that people stayed at the enclosures of the exotic and the native animals shows a significant difference. The average time spent looking at the native animals was nearly 3x longer than the exotic species, 232.1s compared to 82.5s. This is the largest relative difference between the average times of the data sets within a characteristic. Also while the visitors per animal value is slightly larger for the native species compared to the exotic ones as well, 22.75 versus 21.8, this seems to be a very small difference of little significance. This seems to show that the native animals are considered more popular than exotic ones and will have people stay longer but no more people actually watching. This seems to contradict much of the literature about this topic which discusses how zoos are most commonly used by people to interact with exotic and unfamiliar animals. (Kreger and Mench 1995) (Ryan and Seward 2004)

The average time of the social and solitary animals also showed a significant difference. The average time people spent looking at the social animals was 171.1s which is over double the length of time people spent with the solitary ones, being 81.9s. This is the smallest difference between the relative differences of the average times of the different characteristics. This is also interesting given that the number of visitors per animal is actually slightly higher for the solitary animals, 23 compared to 22. This is very similar and seems to be an insignificant difference between the 2 sets of data. From this it can be suggested that an animal's social nature will result in people staying longer but will not result in more people watching it.

The average time spent at the big animals' enclosures was significantly smaller than the time spent at the smaller animals' enclosures, 73.8s compared to 186.8s. This is over 2.5x more time spent with the smaller animals compared to the larger ones. Also when looking at the visitors per animal it shows a similar trend. The visitors per small animal enclosure were 27.2 compared to 16 visitors for each of the large animals, which is a difference of 1.7x. This seems to show that the smaller animals are more popular than the larger ones and not only have more people to attend their exhibits but also have people stay for longer. This again is in stark contrast to the literature found on popularity of zoo animals which tends to say that smaller animals are less desired by general people and will be less popular. (Ward, et al. 1998) (Moss and Esson 2010) (Balmford 2000)

From the survey and the data associated with it there can be some patterns found. (Tables 2, 6 and 7) Very little if nothing of note came from the first and second question. Very few people had similar animals that they were going to the zoo to see. (tables 6 and 7) This is shown by how the highest value for any animal was 3 for both the monkeys and the otters, while four animals had 2 people suggest them and the remaining six animals were only suggested once. This section

also included four animals that are not present in the enclosures at the zoo, however “dog” could still be a valid answer considering some might be in the zoo with owners. Similar things happened with the second question, where 18 different factors were suggested. These suggested factors included several that only appeared once, like “jumping” or “males getting along with cubs” or “rodents swimming”, and seemed to show the huge amount that the suggestions varied. The only 2 factors that seemed to be significantly higher than the rest were “cuteness” and “cuddliness” both being over twice that of the average, 8 and 7 respectively as compared to an average of 3.33.

The data from the ranking questions seems to be far less varied and seems to show a more consistent pattern. (Table 2) From these values it can be seen that the lion and the otters were considered by many to be the most interesting and consistently ranked among the highest, average rankings being 2.46 and 2.77 for the lion and otters respectively. Also the goat and the yak consistently were ranked the lowest by people, with average rankings of 5.69 and 5.77 for the goat and yak respectively. The other three animals, meerkat, bobcat and camel, were all within a quarter of a rank of each other and were generally in the middle of the rankings. This seems to support some of the results found from the observation of the visitors as the large herbivores tended to be the least interesting while the carnivores ranked higher. The lion ranking so high does contradict some of the results of this experiment given that the smaller animals seemed to be more popular from the raw data collected and the lion would be considered large. This could potentially be explained away though by the fact that all of the carnivores used in this study were classified as small animals since no large predators are present at the Riverside Zoo. This could show that the feature of being a carnivore is favourable and some of the results

showing that the small animals were more popular than the larger animals were correlation instead of causation.

The ranking of the factors influencing popularity had very interesting results. The highest ranked factor was cuteness, being ranked 2.15. Next highest were interactivity, the difference between social and solitary and the difference between exotic and native to Canada, average rankings being 3.15, 3.69 and 3.23, followed by size and then the number of animals in the enclosure, average rankings of 4.69 and 5.08. The consistently lowest ranked feature affecting popularity of the animals was whether it was an herbivore or a carnivore, average ranking of 6.00. Some of this data matches up with the results from the rest of the survey, especially cuteness being ranked so highly when in question 2 “cuteness” and “cuddliness” were the only 2 factors suggested more than 4 times. However the four factors used in the observational part of the investigation, solitary or social, exotic or native, carnivore or herbivore and body size, didn't seem to show the same pattern from the experimental data compared to the survey data. From the experimental data the greatest difference in terms of number of people visiting an animal as well as a sharp increase in the amount of time that they stayed were found between the herbivores and carnivores. This is in stark contrast to the data from the survey where this factor was consistently ranked the lowest in terms of its influence on an animal's popularity.

Conclusions

In conclusion it can be seen from the observational data collected during this experiment that all 4 of the factors looked at have a significant impact on the popularity of an animal at the zoo. This is shown through all of the 2 tailed t tests having p values between 32 000x and 1 000 000x smaller than the significance threshold of 0.05. This showed that there was a significant

difference but not in any particular direction. However looking at the visitors per animal and the average time people spent with the animals the direction can be seen. From the data collected the carnivores had nearly twice as many people enter their enclosures as well as those people stayed 2.4x longer than for the herbivores. For both the exotic and native set along with the solitary and social sets of data showed that neither characteristic caused a significant increase in the number of visitors but did show an increase in the time they stayed. The native animals had people stay 2.8x longer than for the exotic ones, which is the largest difference, and the social animals had people stay for 2.1x longer than solitary animals. Finally the small animals had 1.7x more people attend their enclosures and stay for 2.5x longer compared to the larger animals. These values disagree with the literature already done, which tends to show that larger animals are more popular than smaller ones and also that exotic animals are more popular than native ones. Few studies have explored the effect of diet on an animal's popularity, which was shown to have the greatest impact on the number of visitors an animal had, meaning the values from this study cannot be compared easily to literature in terms of the carnivore and herbivore data sets.

These values disagree with the survey results where some of these factors, like herbivore versus carnivore or size, were consistently ranked very low and were considered by many to be insignificant to the popularity of an animal at the zoo. This was not the case from the empirical data and could be showing that general people do not consciously know what makes an animal interesting to them or that some of these factors are side effects of another factor not included.

Overall from this study it can be seen that the most popular animals should be small, social carnivores that are native to Canada, an example of which is the otter, *lutra canadensis*. This also suggests that zoos should have more small animals than large ones given that they are also more cost effective to maintain and were shown to be more popular.

Works Cited

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Appendix

Table 3

Table 3 shows the different animals observed in this experiment as well as the species name for each. Also included are the different categories each belong to for the differentiations: Herbivore or carnivore; exotic or native to Canada; solitary or social; and the average body size in kg of an adult male as well as the differentiation of if this is considered big or small for the t test.

Animals	Species Name	Herb/Carn	Exotic/Native	Solitary/Social	Body Size (in kg)	Big/Small
Otter	Lontra canadensis	Carnivore	Native	Social	14	Small
Goat	Capra aegagrus	Herbivore	Native	Social	140	Big
Bobcat	Lynx rufus	Carnivore	Native	Solitary	18	Small
Serval	Leptailurus serval	Carnivore	Exotic	Solitary	12	Small
Wallaby	Macropus rufogriseus	Herbivore	Exotic	Social	18	Small
Yak	Bos grunniens	Herbivore	Exotic	Social	580	Big
Camel	Camelus bactrianus	Herbivore	Exotic	Social	480	Big
Meerkat	Suricata suricatta	Carnivore	Exotic	Social	0.73	Small
Reindeer	Rangifer tarandus	Herbivore	Native	Social	180	Big

Table 4

Table 4 shows the raw data collected from the different visitors. All values are in time in seconds for each person viewed at the different animals enclosures. Datum number 7 for the otter is highlighted because it exceeded the maximum amount of time that I stayed, 30 min. This one person was present at the otters' enclosure for the entire 30 min of my study and left after I had so the time is only marked as 1800seconds and not the actual time.

Data Point	Times for Animals (in seconds)								
	Otter	Goat	Bobcat	Serval	Wallaby	Yak	Camel	Meerkat	Reindeer
1	280	340	13	45	154	5	103	120	12
2	280	340	133	61	154	5	103	120	12
3	266	97	133	57	154	15	103	127	17
4	615	97	133	56	124	15	51	127	22
5	198	97	133	58	124	17	51	35	22
6	133	42	133	22	127	32	51	35	22
7	1800	42	163	22	127	32	137	30	17
8	163	42	163	95	102	47	137	34	15
9	163	42	77	90	102	47	137	298	16
10	197	158	77	123	102	3	137	298	
11	197	158	122	123	43	21	152	283	
12	197	158	122	42	43	8	152	283	
13	458	99	176	42	108	17	197	243	
14	458	99	176	197	108	17	197	303	
15	458	99	22	192		22	197	12	
16	38		22	47		22	161	12	
17	38		22	47		7	161	12	
18	264			63		7		12	
19	264			63		24		27	
20	264			63		24		27	
21	378			92		24		49	
22	378			92		10		49	
23	540			83		10		49	
24	540			7				78	
25	540			7				78	
26	617			52				78	

27	617			52					
28	617			27					
29	468			27					
30	468								
31	468								
32	318								
33	263								
34	263								
35	263								
36	392								
37	392								
38	187								
39	187								
40	187								
41	187								
42	187								
43	198								
44	198								
45	198								
46	302								
47	302								
48	302								
49	276								
50	276								

Table 5

Table 5 shows all of the animals observed as well as the total number of visitors and the average time each visitor spent at each of the animals' enclosures

	Animals								
	Otter	Goat	Bobcat	Serval	Wallaby	Yak	Camel	Meerkat	Reindeer
Total Number of Visitors	50	15	17	29	14	23	17	26	9
Average time of Visit (in Seconds)	344.8	127.3	107.1	67.1	112.3	18.7	131.0	108.4	17.2

Figure 1

Figure 1 shows the survey given to every 10th person observed during the study

Gender: Male/Female

Age: _____

Animal most interested in seeing today: _____

Factors affecting animals' interest: 1. _____

2. _____

3. _____

Rank factors from 1-7, least to most important in determining the popularity of an animal

Size___

Either Exotic or Native to Canada___

Carnivore or Herbivore_____

Interactivity___

Solitary or social_____

Number of Animals in Enclosure_____

Cuteness_____

Rank animals from 1-7 ,least to most interesting,

Otter_____

Goat_____

Lion_____

Camel_____

Bobcat_____

Meerkat_____

Yak_____

Table 6

Table 6 shows the different animals that were suggested for the animal that people were most interested in seeing on the given day. Also included are the total number of people to say each animal.

Animal	Number of People
Monkey	3
Otter	3
Camel	2
Meerkat	2
Lynx	2
Serval	2
Capybara	1
Takin	1
Tiger	1
Polar Bear	1
Leopard	1
Dog	1

Table 7

Table 7 shows the different factors that were suggested for the reasons why a given animal can be considered interesting as found from the survey. Also included are the total number of people that suggested each factor.

Factor suggested	Number of Entries
Cuteness	8
Cuddliness	7
Feeding Times	4
Funniness	4
Behaviour	4
Size	4
Rareness	4
Fun	4
Cool	4
Commercialization(appearing in Disney movies)	3
Interactivity	3
Babies	3
Activity	3
Curiosity	1
Availability	1
Rodents swimming	1
Males getting along with cubs	1
Jumping	1