

# The Attraction Value of Zoo Animal Species



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# The Attraction Value of Zoo Animal Species

## Final Thesis

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## Preface

The research which is described in this report has been carried out by order of the European Association of Zoos and Aquaria (EAZA) and within the framework of our bachelor degree 'Animal Management' at Van Hall Larenstein University of Applied Sciences (Leeuwarden, Netherlands). During this research we gained much understanding in human, and more specifically zoo visitors', psychology with regard to their preferences concerning animals in zoos. We are glad to conclude we may use this knowledge and experience to our advantage in our field of activity in the future.

There are a few parties we would like to thank for their role in the realization of this research.

The first is EAZA, and more specifically manager Danny de Man and assistant-manager William van Lint of EAZA's *Collection Coordination and Conservation*, for giving us the opportunity to carry out this research and for providing assistance when desired.

Furthermore, we would like to thank our Van Hall Larenstein tutors, Hetty van Dijk and Tine Griede, for providing guidance and assistance in the process of realization of this research report and our final thesis.

With the completion of this research report we hope and expect to have fulfilled the aforementioned parties' expectations and more. We hope that with this research report we are able to make a positive contribution to EAZA's goals concerning collection planning and species conservation. Secondly, with this research report we hope to have sufficiently completed one of our tasks within the framework of our final thesis.

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## Summary

The mission of the European Association of Zoos and Aquaria (EAZA) is to facilitate cooperation within the European zoo and aquarium community towards the goals of education, research and conservation. The reason people visit zoos does not necessarily match these goals. These differences between 'supply and demand' cause problems for zoos. Therefore, EAZA felt the need to collect and analyze research done on animal-related parameters and in what way these parameters influence visitors' attitudes towards animal species and the attraction value of those species, to be able to give more complete advice to its member institutions regarding their collection planning.

The animal-related parameters influencing attitudes and attraction value were found in published articles of different research projects. To find useful articles, several search criteria were used, among which were animal characteristics, perception of animals, attitude towards animals, attracting power and holding power. The relevant data found in articles were tagged and classified by relatedness into themes. Interrelations were detected and explained, after which an overview of all found data was given and a theory could be formulated.

When the popularity of animals and the attitudes towards them are known, the animal-related parameters causing popularity and attitudes, such as taxonomy, size, other physical characteristics and behavior, can be ascertained. These animal-related parameters influence the attraction value of an animal, consisting of attracting power and holding power, but the attraction value is also influenced by other parameters.

Monkeys were reported as the most popular animals. Other popular animals are mostly mammals, such as dogs, horses, bears and lions. When looking at unpopularity lists, these included spiders, crocodiles, rats and lions, while snakes scored highest.

The first step was to find out more about human attitudes towards different animals. Then the emotions causing these attitudes and the influences of anthropomorphism were further investigated. These steps were taken, because human attitudes towards animals are influenced by emotions and the tendency of people to anthropomorphize animals. Furthermore, it is believed that the emotions influencing attitudes, are in turn themselves influenced by animal-related parameters. Therefore, the next step was to determine the animal-related parameters responsible for evoking emotions and anthropomorphism. Thereafter, the attraction value (attracting power and holding power) and the animal-related parameters influencing it were ascertained. Ultimately a comparison between general popularity and attraction value of animals was made, in order to find out whether or not they show consensus on which animals are (un)popular and the animal-related parameters responsible for this.

Taxonomy was found to be of great influence. Mammals had the highest attraction value and mainly primates are perceived as similar to humans. Other animals perceived as similar are cats and dogs, because of them being pets. After mammals, birds are perceived as most similar to humans, but the attraction value of birds was the lowest of all groups taken into account. Invertebrates are perceived as least similar and were only mentioned among the most unpopular animals, together with reptiles and amphibians. Another important parameter which was found is size. The most popular animals were (generally) larger than humans and these animals were also found to have a relatively higher attracting and holding power, while most

unpopular animals were (generally) smaller than humans and had lower attracting and holding power. Other physical characteristics which may play a role in human attitudes towards animals are coloring, sounds and body proportions. However, (active) behavior was also found to be of influence on the attraction value. Animal activity significantly increases holding power, independent of the animal species concerned or the type of behavior.

In general a linearity between human attitudes and attraction value was found, with more popular animals representing high attraction value and less popular animals representing low attraction value. It is clear that anthropomorphism plays a very large role in human attitudes towards animals. In general it can be said that the more people (are able to) anthropomorphize a certain animal, the more they show a positive attitude towards this animal. If an animal is not easily anthropomorphized it should preferably evoke some degree of fear in order to retain a high attraction value.

Several recommendations are made based on this research, among which the most important are to further research the influences of anthropomorphism and its possible implications and to stimulate zoos and/or national zoo associations to research the preferences of their target market, taking cultural influences into account.

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## 1. Introduction

### Framework

The European Association of Zoos and Aquaria (EAZA) is an international cooperation of 340 (mainly) European zoos and aquaria spread across 36 countries. The organization's mission is to facilitate cooperation within the European zoo and aquarium community towards the goals of education, research and conservation. (EAZA, 2011a)

However, these goals do not necessarily match with the public's motivations to visit zoos and aquaria. Falk (2006) believes people to visit zoos for one or more out of five reasons, depending on the 'type of person'. An 'explorer' is curious and visits the zoo for learning. A 'facilitator' seeks social experiences and mainly focuses on others having a good time at the zoo (for example, parents with their children). A 'professional/hobbyist' visits the zoo to see animals, he or she feels a close bond with them due to work or hobby. An 'experience seeker' visits the zoo just to have experienced visiting it. A 'spiritual pilgrim' visits the zoo to find rest and relaxation.

These differences between 'supply and demand' cause problems for zoos. The animal species they keep do not necessarily represent a combination of fulfilling EAZA's goals and the visitors' preferences. However, for modern zoos it is important to be able to adequately balance both these factors. This is because on the one hand they have their educational, research and conservational goals, but on the other hand they have to 'please the crowd' to realize enough revenue to ensure the zoo's future.

The situation as described above has far-reaching implications for a zoo's so-called collection planning. EAZA views supporting zoos in their collection planning as one of its main tasks. Therefore, EAZA and its member institutions have established Taxon Advisory Groups (TAGs) for all the different groups of animals that are kept in zoos and aquariums. One of the main tasks of the TAGs is to develop Regional Collection Plans (RCPs) that describe which species are recommended to be kept and how these species should be managed. The RCPs also identify which management strategies, for example European Endangered Species Programmes (EEPs) and European Studbooks (ESBs) are needed for each species. (EAZA, 2011b)

From a conservation point of view, the conservation value of a certain species should be the most important factor for institutions to take into account, when deciding whether or not to keep a certain species. Yet there are other factors which play an important part, for example; whether a species is obtainable or not, the required/available amount of space and whether or not the institution has the required finances and knowledge to house and maintain the animal(s). (EAZA, 2011b)

One of EAZA's objectives, as stated in its statutes, is "to promote education, in particular environmental education". With this, EAZA wants to improve the quality and reach of environmental and conservation education in its member institutions. The eventual goal is the realization of an increased contribution to nature conservation. (EAZA, 2011c) The exhibition of live animals plays a key role in achieving these goals (EAZA, 2011d). Still, what animal species can contribute the most in achieving these goals is a question which mostly remains unanswered.

This is also the case for the attraction value of a species. Zoos need to earn enough money in order to (at least) maintain their animals and park(s). Therefore, the attracting and holding power of a certain animal is also a major factor in deciding whether to keep it or not.

The extent to which a certain animal species is able to fulfill EAZA's educational goal can be described as its 'educational value'. However, in this research the assumption is made that the educational value of a species is intrinsically linked to its popularity with visitors, because it is easier to promote learning through subjects in which people have a personal interest (Rennie & Johnston, 2004) or an emotional affinity (Ballantyne & Packer, 2005). This means that it is assumed that educational goals can only be accomplished by the display of, and the education on, animal species with sufficient attraction value towards visitors. Therefore, only the attraction value of animal species is attended in this research. EAZA feels the need to determine animal-related parameters which influence this attraction value, in order to thoroughly advise its member institutions on adequately balancing all relevant factors in their collection planning.

Research done on animal species' attraction values, and the parameters influencing these values, has not yet been thoroughly bundled and analyzed. Yet, these are relevant consideration for zoos when deciding whether or not to keep a certain animal species. EAZA feels the need to bundle and analyze research done on these parameters and its influences, in order to be able to give more complete advices to its member institutions concerning their collection planning. (William van Lint, personal communication, 2011)

### **Research goal**

The goal of this research is to have a collection and analysis of the relevant parameters to produce a format which enables EAZA members to objectively measure the attraction value of animal species kept in zoos.

### **Research questions**

In order to achieve this goal the following research question was developed:

*- What animal-related parameters influence human attitudes towards animal species and enhance the attraction value of those species?*

In order to adequately answer the research question, several subquestions require answering first. These subquestions are:

#### *1. What animal-related parameters influence human attitudes towards animal species?*

*1.1 In what way (positive or negative) are different animal species perceived?*

*1.2 What emotions cause animal species to be perceived this way?*

*1.3 What animal-related parameters cause these emotions?*

#### *2. What animal-related parameters enhance the attraction value of animal species?*

*2.1 What animal-related parameters enhance an animal's attracting power?*

*2.2 What animal-related parameters enhance an animal's holding power?*



## 2. Methods

The research was a qualitative exploring study (Baarda, De Goede & Teunissen, 2005). The main goal was to have a collection and analysis of parameters that influence the attraction value of animal species. The attraction value of an animal is measured as its attracting power and its holding power (see Definitions for explanation of the terms attraction value, attracting power and holding power). An animal's attracting power is considered to be of marketing value to zoos and an animal's holding power represents an educational value, although there exists some overlap between the two (see figure 1). Animals with great attracting power are supposed to draw people to zoos, while animals with great holding power offer zoos the opportunity to educate people about them (Moss & Esson, 2010; Ross & Gillespie, 2009). The relevant parameters are divided in animal-, human- and exhibit-related parameters. In this research the focus lies on animal-related parameters. To determine the animal-related parameters, it is important to consider how (potential) zoo visitors perceive animal species and why certain species are appealing. The animal-related parameters influencing these perceptions were found in published articles. The relevant parameters were collected and analyzed.

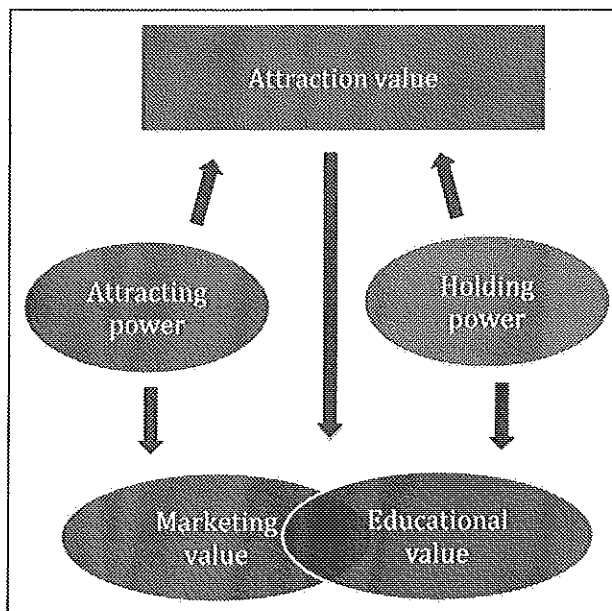


Figure 1. Visualization of attraction value and its relationship with attracting and holding power and marketing and education.

### Research population

The research population consisted of articles found by using search criteria. The stakeholders were EAZA and zoos. EAZA was the commissioning company and they wanted to know what the attraction value of animal species is. Before the parameters influencing the attraction value of animal species could be determined, a closer look at the zoo visitors' perception of animal species needed to be taken. This information was gathered by literature study. The literature study included all articles with information about parameters of animals, people's perceptions of animals, attracting power and holding power. Only articles from after the 1950s were used.

### Data collection

To find useful articles, search criteria were used. Table 1 shows what the search criteria were and what search terms were used, but also terms kept in mind for discussion points.

**Table 1. Search Criteria**

Search criteria	Search terms	Terms kept in mind for discussion
Zoo	Animal characteristics Anthropomorphism Visitors Marketing Education Emotion Popular animals Perception of animals Attitude towards nature and/or animals	Kind of visitors Personal preferences Personal experiences Visitor experience
Animal characteristics	Attracting power Holding power Emotion Animal size Animal activity Funny animals Cute animals Cuteness factor	Personal preferences Non-animal related factors influencing the species' attraction values Education
Anthropomorphism	Animal Characteristics Emotion Human-animal relation	Personal preferences

"Zoo" was a search criterion, because information about human attitudes towards zoo animals was needed to determine their attraction value. Therefore, the search terms were animal characteristics, which were used as parameters, and anthropomorphism, which may influence human attitudes towards animal species. Other search terms were visitors, marketing, education, emotion, popular animals, perception of animals and attitude towards nature and/or animals. Information was searched about certain parameters, to find out if these parameters contribute to the attraction value of animal species. Discussion points were the kind of visitors, personal preferences, personal experiences and visitor experience. Another criterion was "animal characteristics", especially when looking at the attracting power and holding power of an animal species in the exhibit. When it was known what the attracting power of animal species is, and what the holding power is, conclusions could be drawn on the attraction value of animal species. Other search terms were emotion, animal size, animal activity, funny animals, cute animals and cuteness factor. Discussion points were personal preferences, the non-animal related factors, which may influence the species' attraction values, and the quality of education, which is said to (potentially) enhance attracting and/or holding power (Arndt, Benusa, Bishop & Screven, 1993). "Anthropomorphism" was also a search criterion. Anthropomorphism is based on the level of physical comparison between a human and an animal species and the level to which a human has created an affective bond with a particular animal (Eddy, Gallup & Povinelli, 2010). The search terms were animal characteristics, emotion and human-animal relations. A discussion point to this search criterion was personal preferences. The reference lists of relevant articles were used to search and obtain more relevant articles.

The reliability of the articles was based on a few criteria (Baarda et al., 2005). If a method was shown in the article, it was generally seen as reliable, but also if the article was published or if it was available on scientific websites. For example, if the article did not conclude a method, but was published by a renowned university or researcher, then it was possible that the article was

used, if both researchers agreed. If the article was written by a scientific organization, the article was seen as reliable. In addition, the reliability of certain articles was deliberated and discussed by the researchers when needed.

The validity of the articles was also based on a few criteria (Baarda et al., 2005). If the author was a renowned researcher, the article was seen as valid, but also if the context was clear and relevant. Another criterion was the use of literature references in key articles. By checking the reliability and validity of the articles, the researchers were protected for misrepresentation and it was made possible to adequately judge the quality of the collected data.

### **Data analysis**

After collecting data from articles, the data were analyzed. The first step was to tag relevant data. Fragments from the articles that were found relevant to answer the research question needed to be tagged. The tags were determined when the fragments were sorted out. It was possible that different tags had the same fragment or just a little piece of a fragment, as long as one tag had all the relevant information from a fragment. Another possibility was that one fragment had variation. For example, one of the tags was behavior, but this tag was split in active behavior and non-active behavior. The tagging continued until no new tags could be thought of. In this case, the relevant fragments were printed and were literally cut and pasted with the right tags. The next step was to arrange the tags. The research questions and the subquestions were most important for arranging tags. A structure needed to come out of the arranged tags. The tags were arranged by relatedness, this was a process that needed a lot of discussion. When the tags were arranged, synonyms were combined under one new tag. The research question was a descriptive question and therefore the tags were classified into certain themes, based on the mutual kinship. In some cases these themes were split into another layer of themes, the core tags. When the core tags were found, it was necessary to define them. Since the research was an exploring study, it was not enough to only define the tags. They needed to be described; how important each tag was and in what way they were important. The context between the different tags was needed to be determined, because this research was looking for an explanation based on the data. This was done by the prototype-analysis, which means that tags needed to be combined. In some cases certain tags occurred more often in one of the themes. This way, it was even possible to come up with subthemes and prototypes. By comparing these subthemes or prototypes, it was possible to detect and explain interrelations. This gave a correct view of all the found data and gave the opportunity to formulate a valid theory.

### **Definitions**

#### *Educational value*

The researchers have defined this term as; the extent to which a certain animal species, when exhibited at a zoo, is expected to be able to contribute to a rise in understanding and/or support for nature and wildlife conservation among the zoo's visitors.

#### *Attraction value*

The researchers have defined this term as; the extent to which a certain animal species, when exhibited at a zoo, is able to contribute to a rise in visitor numbers and/or visitor satisfaction at that zoo.

#### *Attracting and holding power*

Attracting power is defined as the percentage of visitors stopping at an exhibit, while holding power is defined as the time visitors spend at an exhibit (Sandifer, 2003; Shettel, 1997). In this research 'an exhibit' is an animal enclosure in a zoo.

*Positive way*

The researchers define animal species to be perceived in a positive way when they rank high in popularity lists and/or are (generally perceived as) visually and/or behaviorally attractive.

*Negative way*

The researchers define animal species to be perceived in a negative way when they rank low in popularity lists and/or are (generally perceived as) visually and/or behaviorally unattractive.

### 3. Results

In this chapter the results of this research are outlined and analyzed in order to answer the research question: *What animal-related parameters influence human attitudes towards animal species and enhance the attraction value of those species?*

In order to do this several matters need clarification first (see figure 2). The first step was to find out more about human *attitudes* towards different animals (§ 3.1). Then the *emotions* causing these attitudes and the influences of *anthropomorphism* were further investigated (§ 3.2). These steps need to be taken, because human attitudes towards animals are influenced by emotions and the tendency of people to anthropomorphize animals. Furthermore, it is believed that the emotions influencing attitudes, are in turn themselves influenced by animal-related parameters. Therefore, the next step is to determine the *animal-related parameters* responsible for evoking emotions and anthropomorphism (§ 3.3). Thereafter, the *attraction value* (attracting power and holding power) and the animal-related parameters influencing it were ascertained (§ 3.4). Ultimately a comparison between general popularity and attraction value of animals was made, in order to find out whether or not they show a consensus on which animals are (un)popular and the animal-related parameters responsible for this (§ 3.5).

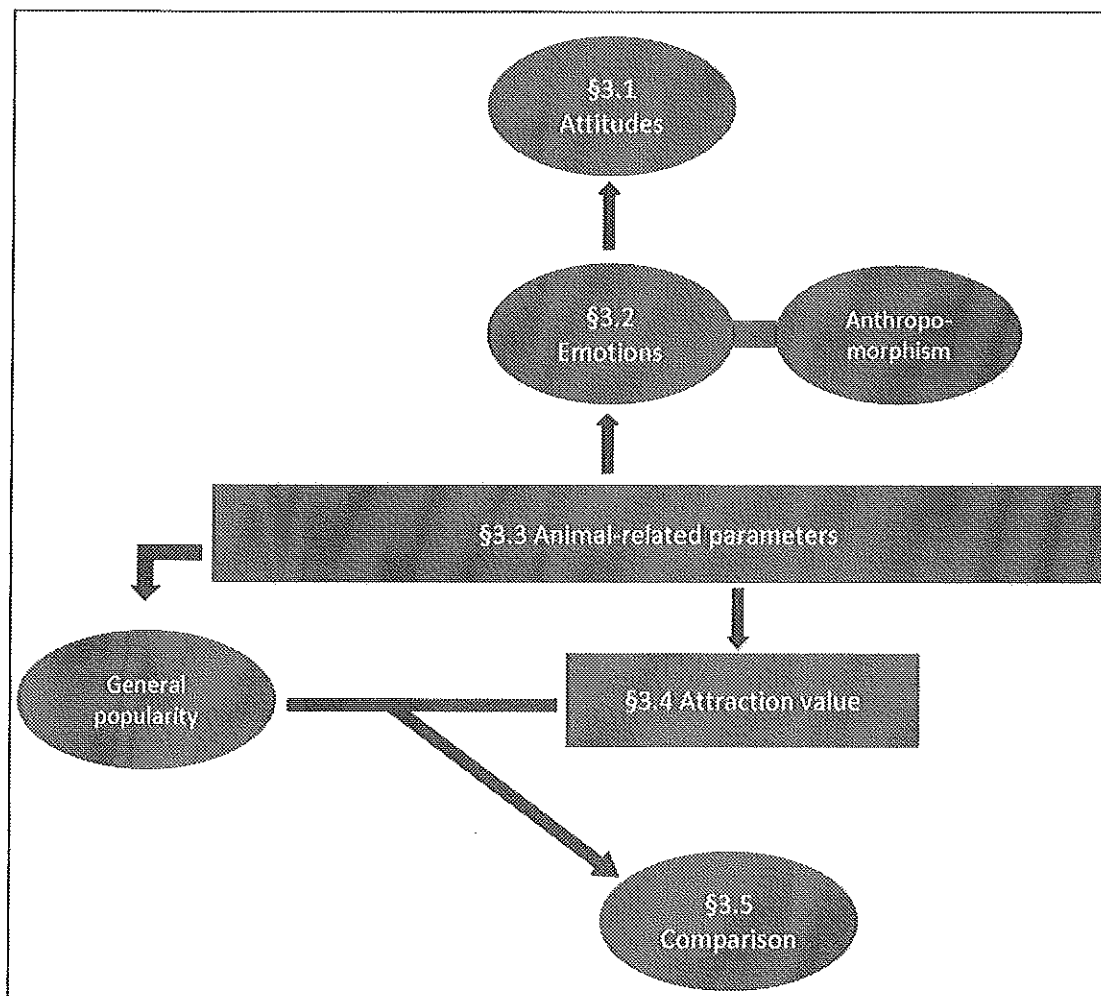


Figure 2. Structure of chapter 3, showing topics and their relationships.

### 3.1 Attitudes

This paragraph will summarize human *attitudes* towards different animals, more specifically which animals are popular and which are unpopular and in what way they are perceived.

#### Popular animals

When it comes to popular animal species the great popularity of monkeys<sup>1</sup> (see Appendix I for scientific names) is most notable; they are often reported as the most popular animals (Brennan, 1978; Gressner, 1963; Kawata & Hendy, 1978; Martin, 2000; Morris, 1960; Surinova, 1971). Both Morris (1960) and Surinova (1971) report the chimpanzee among the most popular animals. They both collected large numbers of samples in which children named the animal species they liked the most and the animal species they liked least. A similar research was carried out by Gressner (1963).

Furthermore Gressner (1963), Morris (1960) and Surinova (1971) all report lions, bears, dogs and horses among the ten most popular animals amongst children. Lions, surprisingly, are also reported among the ten most unpopular animals in the same researches.

Other animals repeatedly reported among the most popular are cats (Gressner, 1963; Surinova, 1971) and deer (as 'doe' by Gressner (1963); as both 'doe' and 'stag' by Surinova (1971)).

In research by Woods (2000), conducted in Australia, dogs ranked first as the most popular animal. Subjects were asked to rank their five most and least favorite animals and why they do or do not prefer those animals. Besides dogs, the other animals mentioned as a favorite animal by over 20% of the respondents (N=790) were dolphins, koalas, cats, birds, horses and tigers. Lions (11.4%), monkeys (9.3%) and to a lesser extent bears (5.5%) were ranked considerably lower than in aforementioned researches, but still among the (most) popular animals. In addition, some more unexpected animals were also listed; sharks (8.7%), crocodiles (7.8%), snakes (6%) and frogs (5.7%). Afterwards some animals, when appropriate, were categorized by Woods (2000) in order to gain a clearer view of their popularity. Dogs (48.2%) still ranked highest, now closely followed by large felines (tigers, lions, leopards and cheetahs, 43.9%). The other more popular animals were birds (35.1%), dolphins (33.2%), koalas (29%), fishes (all species included, 27.9%), (domestic) cats (24.2%), horses (21.4%), kangaroos and wallabies (20%), whales (17.1%), primates (15.3%), farm animals (sheep, cows, goats, pigs, 14.8%) and bears (polar bears, brown bears and giant pandas, 12%).

Morris (1960) also reports bushbabies, elephants, giant pandas and giraffes among the top ten of most popular species. From these, elephants and giraffes are especially favored among younger children, while their popularity rapidly drops past the age of six or seven. The popularity of bushbabies (ranking 4<sup>th</sup>) is suggested to be due to the species being included in television shows and being kept as an exotic pet. Also worth pointing out is that at the time of the research a giant panda at London Zoo (from where the research was conducted) was a very popular attraction and gained a lot of media attention (Good Zoos, 2012), which likely has had its effects on the results.

In addition Gressner (1963) reports parrots, camels and (aquarium) fishes in the top ten of popular animals. Parrots are also reported by Surinova (1971), ranking as the third most

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<sup>1</sup> It is unclear which species people refer to with the term 'monkeys' (monkeys and/or apes and/or other primates).

popular animal, which is partly explained by Bratislava Zoo (where the research was conducted) having a large collection of parrot species.

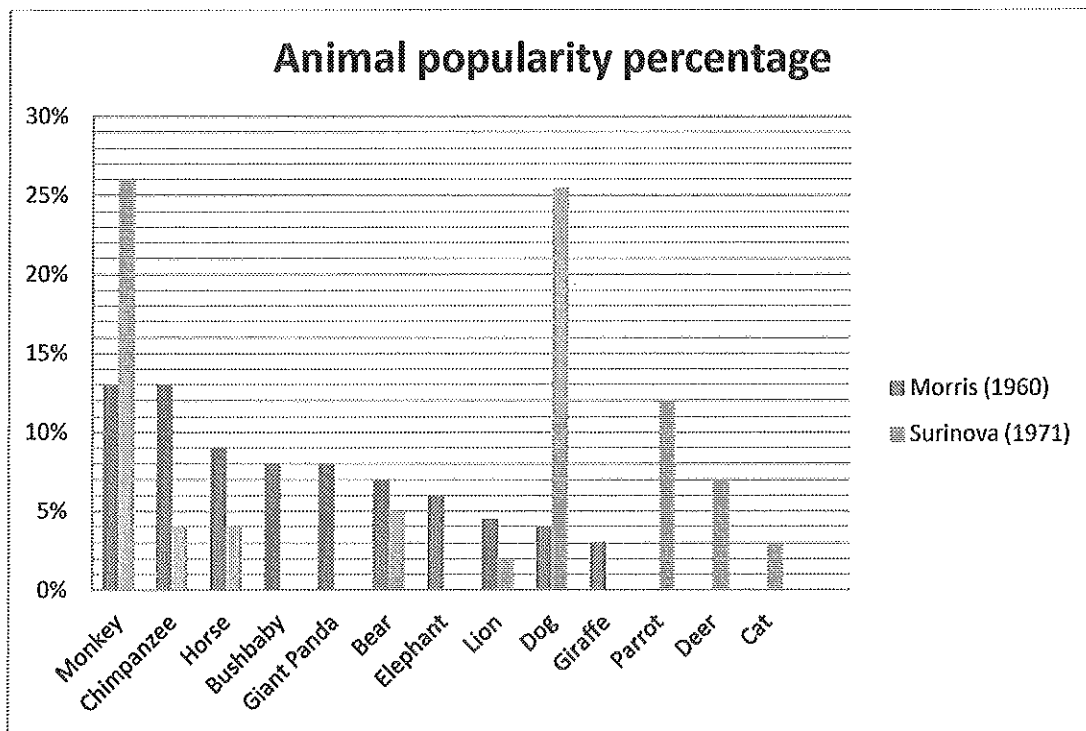


Figure 3. Percentage of research population naming certain animals as their favorite in research by Morris (1960) (N=2200) and Surinova (1971) (N=4123).

An overview of all animal categories (species and groups) found among the ten most popular by Morris (1960) and/or Surinova (1971) is presented in figure 3. These researches encompassed similar research methods and large numbers of respondents. Out of these researches the top ten of most popular animals and the percentages of respondents mentioning them are presented.

Interestingly, twelve out of thirteen categories represent mammals. Only one non-mammalian category was found; parrot. Also notable is that eight categories<sup>2</sup> represent animals which generally have a body mass similar to or larger than humans, although the largest animals (elephant and giraffe) do not rank particularly high. Only four categories<sup>3</sup> represent species which are generally smaller than humans (and one category<sup>4</sup> which represent species or individuals which can be both smaller, larger and similar in size when compared with humans). Monkeys and dogs are clearly the most popular animals.

### Unpopular animals

Snakes are often reported as the least popular animals, rating highest in unpopularity lists in several researches (Gressner, 1963; Morris, 1960; Surinova, 1971; Woods, 2000).

Morris (1960) found that 28% of children voted snakes as their least favorite animals, far more than any other unpopular species. Due to this he states; 'it seems almost as if there is something more fundamental about man's dislike of snakes', pointing out that a similar dislike of snakes

<sup>2</sup> Chimpanzee, horse, bear, deer, giant panda, lion, elephant, giraffe.

<sup>3</sup> Monkey, parrot, bushbaby, cat.

<sup>4</sup> Dog.

has been observed in chimpanzees, gorillas and orang-utans. In humans this disliking does not increase with age, but is already very strong at an early age. A decrease in disliking of snakes is observed in teenagers, but throughout all age classes snakes remain the most disliked animals (Morris, 1960). In spiders Morris (1960) observes a pattern similar to that of snakes; both humans and other great apes seem to dislike these animals, with humans (children) ranking spiders in second place as the least popular animals. In addition Woods (2000) also found spiders ranking second as the most unpopular animals. Other animals mentioned in all these researches' unpopularity lists are crocodiles and rats, while lions (as already discussed) are also frequently mentioned among the least favored animals (Gressner, 1963; Morris, 1960; Surinova, 1971).

Woods (2000) found of all respondents a relatively high percentage (12.2%) did not list any least favorite animal. Among those who did, snakes were by far the least favored animal (54%), followed by spiders (37.8%), cane toads (25.2%), cats (24.2%), crocodiles (23.2%), sharks (16%), rats (15%) and numerous other animal groups and species. In this case Woods (2000) again, when appropriate, categorized some animals in order to gain a clearer view of their unpopularity. This led to insects surpassing snakes as the least favorite animals (88.5%). The other (categorized) animals, mentioned by over 10% of all respondents and not yet mentioned, were farm animals<sup>5</sup> (19.1%), birds<sup>6</sup> (16.7%) and reptiles other than snakes and crocodiles (10.2%).

Morris (1960) found the following other animals ranking in the top ten of least popular animals: gorillas, hippopotamuses, rhinoceroses and tigers, although these species and the other species already mentioned generate much lower levels of dislike than both snakes and spiders. In addition, he points out that a disliked animal does not necessarily make an unattractive zoo exhibit. He suggests it is rather those species to which people show indifference (the species is liked, nor disliked) which make the most unattractive zoo exhibits. Gressner (1963) also reports hippopotamuses among the ten least popular species, along with two animals which are also mentioned by Woods (2000); insects and mice. Frogs, wolves and polecats are reported among the most unpopular animals by both Gressner (1963) and Surinova (1971) (both in Slovakia), but not by Morris (1960) (in England).

In addition to the overview of popular animals found by Morris (1960) and Surinova (1971) in figure 3, an overview of the unpopular animals they found is presented in figure 4. As stated before, all these researches encompassed similar research methods and a high number of respondents. Out of these researches the top ten of most unpopular animals and the percentages of respondents mentioning them were used. The percentage of mammals is lower than it is among the most popular species, but still eleven out of fifteen categories of unpopular animals represent mammals. All four non-mammalian categories encompassed coldblooded animals, which means no birds were among the most unpopular animals. When looking at size, which seemed to be a factor in determining popular animals, this effect is less clear when it comes to unpopular animals. Seven categories<sup>7</sup> represent animals which generally have a body mass

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<sup>5</sup> In this case: sheep, cows, goats, pigs, donkeys and mules.

<sup>6</sup> In this case: magpies, crows and pigeons.

<sup>7</sup> Lion, crocodile, wolf, tiger, gorilla, hippopotamus, rhinoceros.



similar to or larger than humans, while eight categories<sup>8</sup> represent species which are generally smaller than humans. The highest unpopularity score was -by far- generated by snakes.

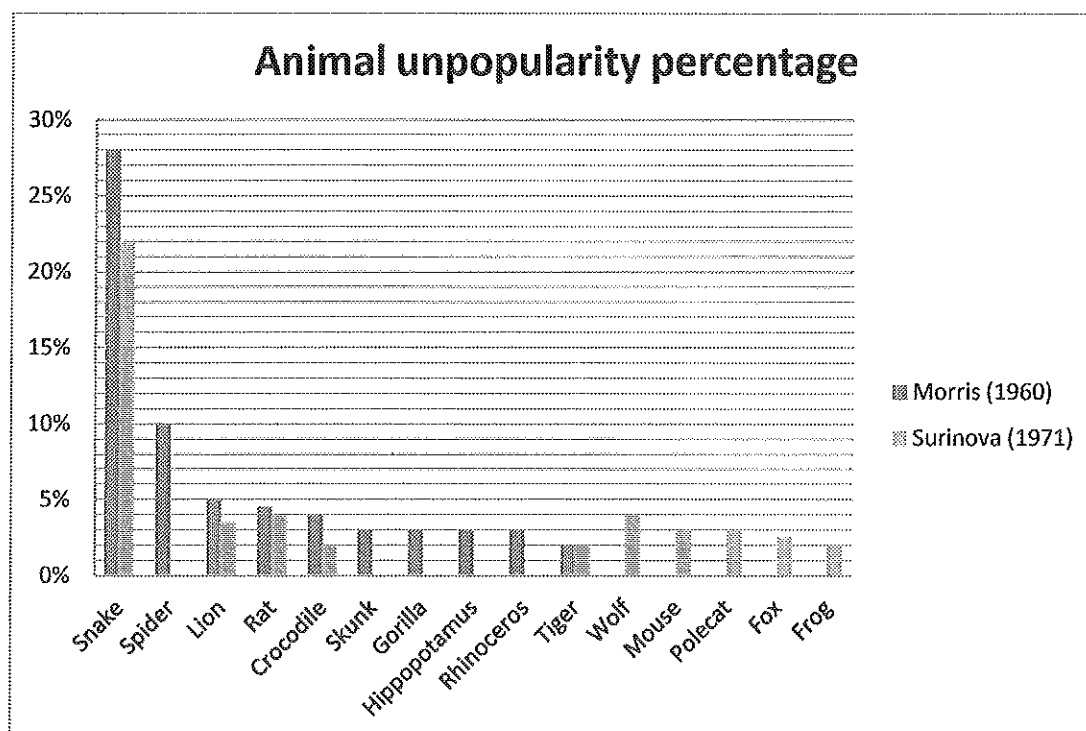


Figure 4. Percentage of research population naming certain animals as their favorite in research by Morris (1960) (N=2200) and Surinova (1971) (N=4123).

In addition to the factor size, it should be noted that Woods (2000) found a large number of additional 'smaller' animals<sup>9</sup> among the most unpopular, but no larger ones. In research by Woods (2000) people specifically mentioned several species of insects (among which were cockroach and mosquito) and when she combined all mentioned insect species and/or groups into one group this ranked highest of all groups in unpopularity.

### Anthropomorphism

According to Dutta (2005) and Kellert (1979) the attitudes of many people towards animals, and especially mammals, are anthropomorphic. Furthermore they found anthropomorphic behavior is especially abundant when people are attracted to animals. This is further supported by research conducted by Myers & Saunders (2002), which suggests that humans, even in very early age, instinctively perceive other animals as social subjects and perceive them to have human-like intelligence, desires, beliefs and intentions.

The extent to which such attributes are ascribed to an animal species is positively influenced by the species' (perceived) physical and/or behavioral similarity to humans (Eddy et al., 2010). Furthermore Eddy et al. (2010) asked subjects to rank several animal groups by the degree on which they felt those groups were similar to humans and experienced the world in a similar way (see table 2).

<sup>8</sup> Snake, rat, spider, mouse, polecat, fox, frog, skunk.

<sup>9</sup> Cane toad, cat, cockroach, mosquito, box jellyfish.

Table 2. Perceived similarity to humans of different animal groups based on Eddy, Gallup & Povinelli (2010).

#	Species or group
1	Dogs, cats and primates
2	Other mammals
3	Birds
4	Reptiles
5	Amphibians
6	Fish
7	Invertebrates

Interestingly, this (perceived) similarity seems to have, at least to some degree, an effect on an animal species' popularity. The great popularity of monkeys supports this claim; as already mentioned they are often reported as the most popular animals (Brennan, 1978; Gressner, 1963; Kawata & Hendy, 1978; Martin, 2000; Morris, 1960; Surinova, 1971). Furthermore, both Morris (1960) and Surinova (1971) report the chimpanzee, our genetically closest relative (The Chimpanzee Sequencing and Analysis Consortium, 2005), among the most popular animals.

The popularity of dogs and horses further supports the presumed causality between the extent to which an animal species is (perceived as) human-like and its popularity, because Eddy et al. (2010) report that pets, together with primates, are the animals most commonly anthropomorphized. Morris (1960) discusses the fact that zoos seldom exhibit dogs and horses, despite their popularity with children. From a conservation point of view exhibiting dogs and horses can hardly be justified (Born Free, 2012). However Morris (1960) mentions the possibility zoos have of using the popularity of dogs and horses to their advantage by displaying their wild ancestors or other related wild species.

To some extent the aforementioned, presumed causality between the extent to which an animal species is (perceived as) human-like and its popularity (Eddy et al., 2010) may also explain the popularity of bears, which may be highly anthropomorphized by children because of them having a teddy bear as a 'pet' (Sherman & Haidt, 2011). Cats, of course, are also pets and therefore their popularity is in line with the aforementioned popularity of dogs and horses.

### 3.2 Emotions and anthropomorphism

In this research it is assumed that an animal species' popularity is in line with its 'attractiveness' to people. Attractiveness is defined as "the quality of attracting attention, interest, affection, and other pleasurable emotion" (Murray, 1971). This supports the thought that an animal species' popularity and the way it is perceived by people is at least to some extent based on emotions. Therefore this paragraph summarizes what emotions cause an animal species' (un)popularity.

#### Emotions

According to Adams et al. (1991) people's reactions to (zoo) animals typically combine the following emotions; excitement, fear, awe, sadness, nostalgia and uneasiness (due to the animals' captivity). Therefore these 'emotion types' will be used to categorize the emotions which are mentioned in this paragraph.

#### Positive emotions

Of the typical emotions shown by humans towards (zoo) animals excitement, awe and nostalgia are 'positive emotions' (Adams et al., 1991), which means popular animals are expected to evoke at least one or more of these emotions.

As already stated in the previous paragraphs, monkeys are often reported as the most popular animals, because people tend to perceive them to have human-like intelligence, desires, beliefs and intentions. In addition, when keeping in mind the popularity of cats and dogs, it is argued that they "have perfected the art of releasing and exploiting our innate parental instincts – the so-called "*cute response*" (Gould, 1979; Archer, 1997; Budiansky, 2000). Surinova (1971) found some evidence for this *cute response* in the popularity of 'monkeys', suggesting children perceive them as suitable pet animals and thereby 'releasing' to some extent the will to care for them. It seems likely that the reaction towards animals which evoke the *cute response* will generally encompass excitement and awe. Lorenz (1981) found several physical characteristics responsible for evoking the *cute response* (see table 3) and a behavioral characteristic (clumsiness) which could also well be a factor in the perception and popularity of other animals.

Table 3. Physical factors evoking the cute response in humans based on Lorenz (1981).

Body part(s)	Characteristic(s)
Head	Large and thick (in proportion to the body)
Forehead	Large and protruding (in proportion to the rest of the face)
Eyes	Large and below the middle line of the head
Limbs	Short and thick
Feet and hands	Chubby
Body	Rounded and fat shape
Body surfaces	Soft and elastic
Cheeks	Rounded and chubby

When Woods (2000) asked people which (perceived) characteristics made them rank a particular animal among their favorites, most comments given are not considered 'emotions' (but 'animal-related parameters'). Seeing dogs as 'friends' is considered an emotional reaction, which is most likely caused due to anthropomorphism. Koalas were referred to as 'cuddly' and 'cute' which suggests its popularity may be based on excitement due to the *cute response*. When looking at koalas themselves it is clear they possess most of the characteristics said to evoke the *cute response*. Furthermore people commented on birds and dolphins as being 'beautiful', animals which possess at least some of these characteristics.

Table 4. Animals (perceived as) dangerous or harmful to humans.

Animal	Source(s)
Spider	Gerdes, Uhl & Alpers (2009); Wagener & Zettle (2011)
Wolf	Linnell et al. (2003)
Tiger	Nyhus & Tilson (2004)
Gorilla <sup>11</sup>	Gilbert (2010); Johnstone-Scott (2006)
Cane toad	Australian Museum (2012); Covacevich & Archer (1975)
Shark	Driscoll (1995)
Mosquito	Tripet, Aboagye-Antwi, & Hurd (2008); Sinden, Alavi, & Raine (2004)
Box jellyfish	Fenner (1998)

Other, less dangerous, animals which can evoke fear in humans are mice, frogs and cockroaches (Davey, 1994), while the negative emotions aroused by these animals (Davey, 1994) and also polecats (Packer & Birks, 1999), foxes (Meek & Kirwood, 2003) and cats (Woods, McDonald & Harris, 2003) could be due to them being regarded as 'pests'. The dislike of hippopotamus and rhinoceros is less easily explained.

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<sup>11</sup> Since 1986 the perception of gorillas changed dramatically from 'ferocious' to 'gentle' (Gilbert, 2010; Johnstone-Scott, 2006).

### 3.3 Animal-related parameters

Emotions and anthropomorphism influence, as already mentioned, human attitudes towards animals and are in turn themselves influenced by animal-related parameters. This paragraph will answer which animal-related parameters evoke emotions and anthropomorphism in people.

#### Taxonomy

As already discussed in the previous paragraphs, an animal's (perceived) similarity to humans plays, at least to some extent, a role in its popularity. This is expressed the clearest by the fact that most animals found to be popular are mammals, while all are warm-blooded (as seen in figure 3). The fact that Myers & Saunders (2002) suggest that humans instinctively perceive other animals as social subjects and perceive them to have a human-like psychology and that Eddy et al. (2010) found that the extent to which such attributes are ascribed to an animal is positively influenced by the animal's (perceived) physical and/or behavioral similarity to humans also indicates an influence of taxonomy on popularity. Research by Clucas, McHugh & Caro (2008) gives further support of this by finding taxonomy as a parameter for popularity. They collected magazine covers in the USA and distinguished taxonomic groups. Only covers with mammals and birds were subdivided. These groups were used most on magazine covers, while reptiles, amphibians, fish and invertebrates (and plants) were rarely used. Only a few species were used more than six times and, besides the bald eagle, these were all mammals. Worth mentioning is that the bald eagle is considered the USA's national animal (National Wildlife Federation, 2012). The top four consisted of the USA's largest resident carnivores; wolf, brown bear, polar bear and cougar. The other species (or groups) used more than six times were; tiger, giant panda, elephants, lion, cheetah, gorillas and orangutans. Of all 29 mammalian orders 14 were used on magazine covers, with carnivores, primates, even-toed ungulates and uneven-toed ungulates as the most featured orders. Out of all 28 bird orders 19 were represented on magazine covers with the (former) *Ciconiformes* order (including, among other; egrets, flamingos, vultures and condors), songbirds, owls, (diurnal) birds of prey and waterfowl. At least in one study people (children) confirm that they take a liking to monkeys due to their 'similarity to man' (Surinova, 1971).

Taxonomy as a parameter is further supported by the (aforementioned) fact that Morris (1960), Surinova (1971) and Woods (2000) found no reptiles, amphibians and invertebrates among the ten most popular animals, while at the same time nine out of twenty-one animals ranking in their top tens of most unpopular represent animals of one of these taxonomic groups. It should be noted though that among the most unpopular animals, more 'human-like' (mammalian) species and groups still represent the majority. As mentioned before, Woods (2000) found that a combination of all insects mentioned in her research, ranked highest of all groups in unpopularity.

#### Size

Besides taxonomy Clucas et al. (2008) also found animal size as a parameter for popularity. They found significantly more (relatively) large species than they expected in both mammals (> 100 kilograms) and birds (> 1 kilogram) in their aforementioned research.

These findings find support some support based on research by Morris (1960) and Surinova (1971) (see figure 3) and Woods (2000). As mentioned before they found that most highly popular animals are (generally) larger than humans, while Woods (2000) in addition found most unpopular animals are (generally) smaller than humans.

mane (Surinova, 1971). In addition Ridgway et al. (2005) noted that both lions and other large felines evoke emotions due to their colorings. Woods (2000) found that, in addition to koalas and lions, domestic cats were also appreciated because of their (soft) hide.

Concluding the above it is clear that in at least three (groups of) animals (large felines, koalas penguins and birds in general) their coloring plays a role in their popularity. In two animals (birds and lions) the sounds they make also influences emotions, although in the case of lions this is a negative emotion.

Also notable is that snakes are both cold-blooded and among the (relatively few) vertebrates who lack limbs (Cohn & Tickle, 1999) and are therefore among the vertebrates physically the least like humans, while at the same time they generated -by far- the highest unpopularity score (as seen in figure 4).

### **Social behavior**

When Woods (2000) asked people which (perceived) characteristics made them rank a particular animal among their favorites, most comments seem to be based on 'animal-related parameters'. Some of these are behavioral parameters. Domestic dog are liked because of their intelligence, faithfulness and loyalty and appreciated for their affection and companionship, which mostly are clear references to the dog's social nature. In contrast, people who like cats state that this is partly due to their independence, which is a clear reference to the cats solitary nature. On the other hand, they also mentioned playfulness and affectionate behavior as favorable parameters of (more social) domestic cats. Based on the aforementioned and on research by Morris (1960), Surinova (1971) and Woods (2000) it seems justified to conclude that humans tend to have a preference for social animals, as among the most popular animals they found, sixteen<sup>12</sup> out of nineteen (84%) are (more or less) social, while among the most unpopular animals only ten<sup>13</sup> out of twenty-one (48%) are (more or less) social. In addition, research by Woods (2002) found that people's best experiences with zoo animals commonly involve (social) interaction with the animals, especially when physical contact is possible.

According to Woods (2000) dolphins are preferred for their playfulness and serenity, which are also more or less social aspects (the dolphins relatively calm, yet active, social behavior).

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<sup>12</sup> Monkey, dog, bird, chimpanzee, horse, deer, bushbaby, lion, cat, elephant, dolphin, koala, giraffe, kangaroo, fish, whale.

<sup>13</sup> Rat, lion, crocodile, wolf, mouse, gorilla, hippopotamus, rhinoceros, cat, cockroach.

### 3.4 Attraction value

As mentioned before, the *attraction value* of an animal (exhibit) consists of its attracting power and its holding power. This paragraph gives an overview of several animals' attracting power and holding power and the animal-related parameters influencing them.

#### Taxonomy

As already mentioned, taxonomy is one of the parameters which influences to the popularity of an animal, but it is also an important parameter for attracting and holding power. Extensive research by Moss & Esson (2010) found taxonomy as the most significant animal-related parameter (positively) influencing attracting and holding power. In their research mammals had the greatest attracting power. After mammals, amphibians had the greatest attracting power, followed by fish, reptiles, invertebrates and lastly; birds. The low attracting power of birds is supported by Abrahamson, Gennaro & Heller (1983) and Foster et al. (1988). According to Moss & Esson (2010) exhibits containing mammals have a significantly higher holding power than those containing any other *class* of animals. Reptiles came second, followed by fish, amphibians, invertebrates and lastly; birds. Taxonomy accounted for 40.4% of the variation in holding power. Figure 5 gives an overview of the attracting and holding power of the different taxonomic groups from high (6) to low (1). This index was made based on the findings of Moss & Esson (2010).

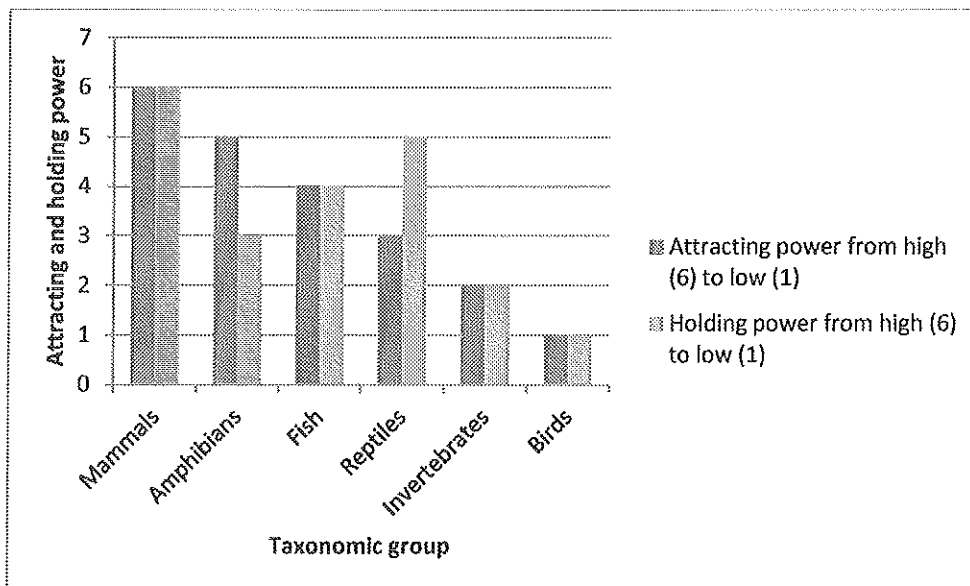


Figure 5: Attracting power and holding power scored from high (6) to low (1) based on Moss & Esson (2010).

#### Size

Another important parameter is size. Research by Marcellini & Jensen (1986), Bitgood, Patterson, Benefield & Landers (1986), Bitgood, Patterson & Benefield (1988), Ward, Mosberger, Kistler & Fischer (1998), Dutta (2005), Ridgway et al. (2005), Ross & Gillespie (2009) and Moss & Esson (2010) support the claim that people prefer larger animals over small sized animals, however research by Balmford, Mace & Leader-Williams (1996) and Balmford (2000) does not. Both these researches state that "there is as yet no evidence that addressing conservation goals by shifting emphasis to smaller animals would necessarily conflict with the need for zoos to operate profitably". Ward et al. (1998) observed 1718 adults and 1279 children as the popularity of 35 exhibits was measured. In a latter research however, Ward (2000) agrees with Balmford et al. (1996) and Balmford (2000), and states; "I agree with Balmford ... that his

new conclusion is correct: there was not a positive relationship between animal body mass and cost-corrected popularity".

In terms of attractiveness, Dutta (2005) found that visitors preferred larger animals over small sized animals, with tiger and orangutan as the most popular animals. Research by Ross & Gillespie (2008) affirms the preference of larger animals. The giraffe and African dwarf crocodile had the greatest attracting power, followed by pygmy hippopotamus, while meerkat and cockroach had the least attracting power. When looking at holding power, the pygmy hippopotamus, African dwarf crocodile and giraffe exhibits had the greatest, while the aardvark had the lowest holding power. This supports the statement that zoo visitors prefer larger species, or species perceived as dangerous. Also, attracting power and holding power of animal exhibits had a strong significant relationship. According to Moss & Esson (2010), there is a weak positive relationship between body length and holding power. Ridgway et al. (2005) found that holding power in an exhibit with underwater-viewing was more than two times greater for large animal species (black bear, hippopotamus, polar bear) than for small animal species (capybara, otter). Six exhibits with underwater viewing were used, each featuring a single species of mammals commonly kept at zoos. Most larger mammals in zoos are more attractive to visitors, because the curiosity of visitors is stimulated by wildlife documentaries and conservation initiatives who target those animals (Véras dos Santos, de Souza Martins, Guedes & Bicca-Marques, 2012).

When looking at reptiles, Marcellini & Jensen (1986) found a correlation between the attracting power of exhibits and the size (length) of the animals displayed in them. There were significant differences in the holding power of smaller (< 1 meter), mid-sized (1-3 meters) and larger (> 3 meters) species. The holding power of amphibians and lizards was significantly lower than that of snakes and turtles, which in turn had a significantly lower holding power than crocodiles. According to Bitgood et al. (1986) two species of large snake which are generally perceived as dangerous, reticulated python and boa constrictor, had a high attracting power.

#### **Other physical characteristics**

'Novelty' is an important factor in attracting visitors to an exhibit according to Bitgood et al. (1986); visitors tend to be more attracted to animals such as white tigers, koalas and pandas, than to more 'common' species. Dutta (2005) stated that the animals unusual characters probably were the cause of their popularity, such as the white color of tigers or the white peafowl. Exotic animals were also more popular than other animals, which is also supported by Véras dos Santos, de Souza Martins, Guedes & Bicca-Marques (2012).

#### **Infants**

Another parameter which increases attracting and holding power is the presence of infant animals (see table 5). Bitgood et al. (1986) stated that the attracting power was higher when an exhibit contained infant animals and Bitgood et al. (1988) found that the holding power of the hippopotamus and South American tapir exhibit were doubled when an infant was present. The holding power of the gorilla exhibit was approximately three times higher when an infant was present, which might be caused by the high activity level of the gorilla infant. Ridgway et al. (2005) found that holding power in a hippopotamus exhibit was significantly larger when an infant was present. According to Wickins-Dražilová (2006), certain new-born animals attract the media and increase public attendance. Unfortunately, Wickins-Dražilová did not mention which species. Véras dos Santos et al. (2012) do not support this claim. They state that there was no



significant difference in exhibit popularity if an infant animal was present, however the child-like behavior of infant chimpanzees does attract the attention of visitors.

Table 5: Overview of the attracting and holding power if an infant is present as found in the discussed articles.

Attracting power	Holding power	Comments	Research by
Higher	Not mentioned		Bitgood et al. (1986)
Not mentioned	Doubled or tripled	May be caused by high activity of infant	Bitgood et al. (1988)
Not mentioned	Longer		Ridgway et al. (2005)
Higher	Not mentioned	Attracts media and increases public attendance	Wickins-Dražilová (2006)
No significant difference	No significant difference	Child-like behavior of infant chimpanzees attracts visitors	Véras dos Santos et al. (2012)

### Animal activity

There seems to be a general consensus that holding power increases (Bitgood et al., 1986; Moss & Esson, 2010) or is nearly doubled (Bitgood et al., 1988; Johnston, 1998; Maple & Finlay, 1987; Shettel-Neuber, 1988) when there is animal activity in the exhibit concerned. In addition, Bitgood et al. (1988) found that this relationship is independent of the animal species concerned or the type of behavior (in their research). A similar effect was found in research at a tiger exhibit (Jackson, 1994). Ridgway et al. (2005) found a significant effect of animal activity on holding power in exhibits with underwater-viewing. Furthermore Ward, Mosberger, Kistler & Fischer (1998) found that children prefer watching larger groups of animals

### Marine life

When we take another look at marine life, Zwinkels et al. (2009) found that in Rotterdam Zoo the seahorses have a relatively low attracting power, although it is stated this may be caused by their exhibit being located in a small corner, leaving little room for people to watch, especially during crowded periods. Another mentioned possible reason is the close-by green moray exhibit, which was more popular. The green moray exhibit and live coral tank had the highest average attracting power (both 58%), followed by the coral tunnel (56%). The seahorse exhibit had the lowest average attracting power (27%), followed by the grouper aquarium (36%) and the deep reef aquarium (43%). The green moray exhibit had also the highest holding power (47.0 seconds) of all exhibits, followed by the coral tunnel (44.0 seconds) and live coral tank (37.8 seconds). The grouper exhibit had the lowest holding power (22.9 seconds), followed by the seahorse exhibit (23.4 seconds) and deep reef aquarium (23.9 seconds).

### 3.5 Comparison between attraction value and general popularity

Starting point of the comparison was that popular animals generally represent a higher, or at least average, attraction value and that unpopular animals generally represent a lower attraction value. Whether or not this is really the case, and if there is a 'match', is outlined in the righter column of table 6, where animals which were found among the most popular and/or most unpopular and which were also taken into account in research on attracting power and holding power by Moss & Esson (2010) are compared.

Animals are either classified as popular or unpopular, depending on the researches of Morris (1960), Surinova (1971) and Woods (2000). The attraction values, mentioned in table 6, are based on research by Moss & Esson (2010) and are classified as either; *low*, *average* or *high*. When an animal was found to have both an attracting power and holding power below average, it is classified as having a low attraction value. When an animal was found to have either an attracting power or holding power above average it was classified as having an average attraction value. Animals which have both an above average attracting power and holding power were classified as having a high attraction value. When a larger group of animals was concerned (in birds, fish, snakes and frogs) the attracting power and holding power of all species was combined into one attraction value for the entire group. The species concerned can be found in Appendix III, including their attracting and holding power, because it was found that there are, at least in some cases, high differences between the species concerned.

Table 6. Comparison between an animal's general popularity (Morris, 1960; Surinova, 1971; Woods, 2000) and attraction value (Moss & Esson, 2010).

Animal	Popular/unpopular	Attraction value	Match
Birds	Popular	Low	No
Chimpanzee	Popular	High	Yes
Elephant	Popular	High	Yes
Giraffe	Popular	High	Yes
Fish	Popular	Average	Yes
Tiger	Both	High	Yes and no
Snakes	Unpopular	Low	Yes
Spider	Unpopular	Low	Yes
Crocodile	Unpopular	High	No
Mouse	Unpopular	Low	Yes
Frogs	Unpopular	Low	Yes
Cockroach	Unpopular	Low	Yes

Birds are found among the more popular animals, but generally represent a low attraction value, while crocodiles are found among the unpopular animals and represent a high attraction value. At the same time, two out of three snake species were found to have an average attraction value, despite the high unpopularity of snakes in general. Tigers were found among both the popular and unpopular animals and were found to have a high attraction value. These findings indicate that there is, to some extent, a correspondence between an animal's general popularity and its attraction value. On the other hand, it is clear that in at least some animals general popularity or unpopularity do not match with the animal's popularity in zoos.

#### 4. Discussion

This research has provided more insight in the animal-related parameters influencing human attitudes towards animal species and the animal-related parameters influencing the attraction value of those species.

Concerning the perceptions and attitudes people show towards animals several important findings were done. Animals which are generally perceived as more positive by humans mainly include large mammals and pets, such as chimpanzees, bears, elephants, lions and horses, dogs and cats. More negative attitudes are generally shown towards (perceived) dangerous and/or harmful animals, such as snakes, spiders, rats, crocodiles and also lions.

The emotions responsible for at least a large part of positive perceptions of animals were found to be more or less based on a sense of connectedness (the *cute response* and anthropomorphism). The popularity of large mammals, such as lions, is because they are admired by people. The emotional causes of negative attitudes were also found. Negative attitudes are mainly caused by fear, while repulsion (for example due to an animal's smelliness) also plays a role.

Concerning which animal-related parameters evoke these emotions, the answer is more complex and several answers were found. A large role is played by whether or not animals are (perceived as) physically and/or behaviorally 'similar' to humans. Other important parameters evoking positive emotions are large size, a (soft) hairy fur, (bright/multiple/unusual) coloring, a social lifestyle and the parameters found by Lorenz (1981), such as a large head, large eyes and short, chubby limbs. If an animal species has more than four limbs or no limbs at all, this tends to evoke negative emotions. Animals being capable of causing harm to humans or human property and/or having no or relatively few body hair also evokes negative emotions.

The question of which animal-related parameters enhance the attraction value of animal species was also provided with several findings. Great differences were found between the attraction values of different taxonomic groups, with mammals generally having a significantly higher attraction value than any other class of animals. Although birds were, besides mammals, the only class of animals to which people show generally positive attitudes, they were found to have the lowest attraction value of all classes. The high attraction value of mammals is in accordance with their dominating position among the animals towards which people show positive attitudes. Another very important factor is animal activity, which increases or even doubles holding power. This indicates that animal species with an active lifestyle have a relatively higher attraction value. Furthermore rarity, unusual characteristics, exoticness and the presence of infant animals seems to enhance attraction value. One parameter which was found to negatively influence human attitudes towards animals, (perceived) dangerousness, has a positive influence on attraction value.

The question of which animal-related parameters influence human attitudes towards animal species and enhance the attraction value of those species is therewith answered. The animal-related parameters collected and analyzed in this research should therefore enable EAZA to produce a format which enables their members to objectively measure the attraction value of animal species kept in zoos. However, some other factors of influence which were also found should be taken into account.

### **Exhibit influences**

First of all, it should be noted that an unpopular animal does not necessarily make an unpopular zoo exhibit (which is, for example, the case with crocodiles), because negative emotions and perceptions, such as fear, can also have the ability to attract and hold the attention of people, if the cause of their fear (in this case an animal) is in some way controlled (in this case by being behind a physical barrier).

The limited attraction value of birds was unexpected and, without clear reasons given, remains a curious case. We argue that, besides being relatively hard to anthropomorphize, the influence of exhibit-related parameters may well take its toll on the attraction value of birds. Of all modern animal exhibits, those containing birds are most commonly still enclosed by netting, which means there is a greater visual barrier for visitors than there is when animals are enclosed by other barriers such as moats, rocks or glass walls.

Other exhibit influences are, among others, location, surroundings, educational features and furniture. The presence or absence of (large numbers of) other people may also influence the attraction value.

### **Human influences**

Demographic factors were found to influence human attitudes towards animals. This was shown by the differences in animal popularity between countries (Morris, 1960; Surinova, 1971; Woods, 2000). Age and gender also influence human attitude towards animals (Abrahamson et al., 1983; Marcellini & Jensen, 1986; Bitgood & Patterson, 1987; Herzog, Betchart & Pittman, 1991). Other demographic factors which might influence people's perception of animals are socioeconomic status and the level of education (Kellert & Berry, 1987).

Media were also shown to have clear influences on the popularity and attraction value of animals. If animals appear more often in media, this may influence their popularity, in either a positive or negative way. Therefore, it also potentially influences the animals' attraction value.

In some cases there seems to be a clear relation between cultural aspects and an animal's popularity. Wolves, for example, are relatively unpopular in European countries, while at the same time their domestic form, the dog, is highly popular. This indicates that the animal-related parameters of wolves are not the reason for their unpopularity. It is likely that cultural aspects are the main reasons for their unpopularity, as wolves are commonly portrayed as 'bad guys' in Western fairytales.

Cultural aspects also play a role in the popularity of lions, as people declare their liking of these animals because of its symbolism of strength and of it being perceived as 'the king of animals' (Surinova, 1971). Research by Gunnthorsdottir (2001) suggests that being (introduced as) an endangered species can positively influence the attractiveness of an animal otherwise perceived as unattractive.

Herzog & Burghardt (1988) suggest the widespread fear of snakes is a result of human evolution. They suggest early humans were not able to distinguish non-venomous (undangerous) snakes from venomous (dangerous) snakes, which could be the reason humans developed an intrinsic fear of snakes.

Interestingly, as mentioned in the results, it has already been proven that it is possible to change the general audience's attitude towards an animal. The attitude towards gorillas changed from 'ferocious' to 'gentle' in the last decades (Gilbert, 2010; Johnstone-Scott, 2006). This could possibly provide a starting point for improving the image of some other animals which are still, incorrectly, perceived in a negative way.

It should be pointed out though that indications were found that, at least on some animals, there is no general consensus in human attitudes towards them. Lions, for example, are a curious case as they are both highly popular and highly unpopular. Farm animals, such as sheep, cattle and goats, are also mentioned among both the popular and unpopular animals.

The findings of Woods (2002), which showed that people especially appreciate interaction and physical contact with (zoo) animals, suggest that animals with which these are possible, are of special interest when it comes to attraction value.

### **Results compared with parameters found by Whitworth (2012)**

To further analyze the findings within this research a comparison with the findings of Whitworth (2012) was made.

Whitworth (2012) generated a list of 53 animal-related parameters by asking 124 people in a pilot group to list ten animal characteristics they liked and ten which they did not like, followed by labeling the results. He then asked participants to choose whether they 'like', 'dislike' or 'do not mind' each particular of the 53 characteristics found. The highest scores were assigned to the characteristics 'active', 'easy to see' and 'intelligent', while the lowest scores were generated for 'slimy' and 'smelly'. For a complete overview of the found parameters see Appendix II.

Taxonomy, found as a highly influential factor in this research on both general popularity and attraction value, was not mentioned by visitors in research by Whitworth (2012) and neither was the presence of infant animals or the influence of culture. Parameters that were found by Whitworth (2012), but not directly in this research are, among others; *active during day time*, *fast*, *climbing*, *swimming*, *feeds on other animals*, *inactive*, *scaly*, *aggressive to each other* and *slimy* although several species mentioned in this research do possess one or more of these parameters.

The large influence of anthropomorphism and its relationship with the (perceived) intelligence of animals finds support in Whitworth (2012) finding *intelligent* as a parameter much more liked than *unintelligent*. Furthermore, this research indicates that highly anthropomorphized animals generally possess, at least to some extent, the *ability to hold objects*, another parameter found by Whitworth (2012).

Furthermore, he found both *smaller than man* and *larger than man* as a 'liked' parameter, with the first ranking higher than the latter. This is in contrast with the findings of this research, where large animals seem to be generally more popular than smaller ones, while larger animals also generated a greater attraction value. On the other hand the parameter *easy to see*, found by Whitworth (2012), could, to some extent, be influenced by an animal's size.

When it comes to coloring, the findings of both researches show greater similarities. Whitworth (2012) found that both *bright colors* and *patterned* ranked among the liked parameters. *Unpatterned* also ranked among the liked parameters, although lower than patterned, while *dull*

*colored* was mildly disliked. When comparing both researches, it is found that in this research bright colors were preferred. Additionally, high contrasts, such as black and white coloring, also seem to be highly favored, while no clear difference between monochromatic and multicolored animals was found.

A parameter found in this research to have a great influence on holding power is animal activity. This is in accordance with Whitworth (2012), who found *active* as the most 'liked' parameter. Another high scored 'liked' parameter is *active during day time*. In addition, Whitworth (2012) found both *living in groups* and *lives alone* to be liked parameters, with the first ranking higher than the latter. This also is in accordance with the findings of this research, as social animals tend to be more popular and children were found to prefer watching larger groups of animals (Ward et al., 1998).

In this research it was found that sounds of animals can have both a negative and a positive influence on their popularity, while Whitworth (2012) found the parameter *frequently vocal* ranking above *quiet* among the liked parameters.

The suggestion that the absence of limbs can at least to some extent explain the high unpopularity of snakes found in this research is in agreement with Whitworth (2012) finding *no legs* as a disliked parameter. In addition, he also found *more than four legs* to be disliked, which further supports the unpopularity of spiders and insects found in this research.

Some other parameters that were found by Whitworth (2012) and, in some form, in this research which are also of influence on the unpopularity of snakes, and some other species, are *dangerous to humans*, *venomous/poisonous* and *bites or stings*. In addition Whitworth (2012) also mentions *smelly* as a disliked parameter, which is in accordance with the unpopularity of skunks and the accompanying motivation, which was found in this research.

In this research a reference to an animal's hair was made several times, especially when it comes to soft and fluffy hair. Most animals which were found to have a high attraction value were mammals with much hair. This is in accordance with Whitworth (2012) who found *furry* ranking high as a liked parameter and *bald/little hair* ranking among the disliked parameters.

When it comes to body proportions this research found that people generally tend to like animals which possess several or all characteristics responsible for the cute response, as found by Lorenz (1981, see table 3). Whitworth (2012) provides further support for this by mentioning *big eyes*, *fat* and *furry*. The *ability to hold objects* can also be seen as a parameter more or less dependent on the characteristics found by Lorenz (1981).

Another agreement is found on the population statuses of animals. Whitworth (2012) found that while both *rare* as *common* were liked parameters, the first was liked much more and this research showed an increase in attractiveness when an animal is (presented as) endangered.

Summarizing, several animal-related parameters were found both in this research and by Whitworth (2012). Therefore, it is concluded that these parameters play the most important roles in people's perceptions of animals. An overview of these parameters is given in table 7.

**Table 7. Animal-related parameters on which consensus between this research and Whitworth (2012) exists.**

<b>Animal-related parameter</b>	<b>Positive/negative attitude</b>
Cute response parameters (i.e. large head, chubby limbs, round shapes)	Positive
Ability to hold objects	Positive
Coloring (unusual/multicolored/bright)	Positive
Hairy	Positive
Intelligent	Positive
Rare/endangered	Positive
Exotic	Positive
Active behavior	Positive
Social (lives in groups)	Positive
Sounds	Both
Bald/little hair	Negative
Dangerous/harmful to humans	Negative
No legs or more than four legs	Negative

## 5. Conclusions

The goal of this research was to have a collection and analysis of the relevant animal-related parameters to produce a format which enables EAZA members to objectively measure the attraction value of animal species kept in zoos. In order to achieve this goal the following research question was answered:

*- What animal-related parameters influence zoo visitors' perceptions of animal species and enhance the attraction value of those species?*

This research found that, both in general popularity and attraction value, taxonomy is an important deciding factor, with mammals being by far the most popular taxonomic group. Birds were found to rank second in general popularity, but represent a low attraction value as zoo exhibits. Reptiles, on the other hand, are generally not very popular, but were found to have a relatively high attraction value. In addition, it should be noted that some feared and therefore disliked animals, such as crocodiles, do represent a high attraction value, while other more liked animals, such as birds, generally represent a low attraction value. However, in general a linearity between human attitudes and attraction value was found, with more popular animals representing high attraction value and less popular animals representing low attraction value. Furthermore, it should be noted that human attitudes towards animals are (or at least can be) subject to change. Another notable factor is that people especially appreciate interaction and physical contact with (zoo) animals.

The 'cute response parameters' were found to be particularly important in both general popularity and attraction value. Whether or not an animal possesses the ability to hold objects is more or less linear with these parameters. The other animal-related parameters which were found to have a great positive influence on attitudes towards animals and their attraction value, include size, (unusual, multi- or bright) coloring, a great amount of hair (covering), intelligence, rareness, exoticness, activeness and social behavior. Sounds were also found to have an influence on both human attitudes and attraction value, although it differed whether or not this effect was positive or negative. The most important animal-related parameters towards which humans show negative attitudes are the absence of limbs or having more than four limbs. Dangerousness was found to have a negative influence on human attitudes towards animals, but at the same time it has a positive influence on attraction value.

The above mentioned animal-related parameters are all in accordance with Whitworth (2012). In addition to this, some other animal-related parameters were found to have a positive effect on attraction value, most importantly (large) size and the presence of infant animals.

An overview of the most important animal-related parameters is presented in table 8.

When taking the above into account it is clear that anthropomorphism plays a very large role in human attitudes towards animals. In general it can be said that the more people (are able to) anthropomorphize a certain animal, the more they show a positive attitude towards this animal. In most cases a positive attitude was found to be in accordance with a high attraction value. If an animal is not easily anthropomorphized it should preferably evoke some degree of fear in order to retain a high attraction value.



## **6. Recommendations**

Based on this research the following recommendations are submitted:

- Research the exact cause of the low attraction value of birds
- Research the impacts of non-animal-related parameters on attraction value
- Consider to emphasize on anthropomorphism, when justifiable, in order to try and enhance the attraction value of certain animals
- Test whether human attitudes towards unpopular animals can be improved, by education, media attention and/or anthropomorphism
- Stimulate zoos and/or national zoo associations to research the preferences of their target market, taking cultural influences into account
- Stimulate zoos and/or national zoos associations to do the above repeatedly, in order to be able to anticipate on changing human attitudes and media influences
- Stimulate zoos to replace popular, but non-endangered, species by closely-related and relatively less popular species which are endangered
- Stimulate zoos to decrease and/or remove (perceived) physical distance between animals and zoo visitors to enhance attraction value

## Reference list

### Books

- Baarda, D.B., De Goede, M.P.M., & Teunissen, J. 2005. *Basisboek kwalitatief onderzoek*. Houten: Noordhoff Uitgevers.
- Budiansky, S. 2000, *The truth about dogs: An inquiry into the ancestry, social conventions, mental habits, and moral fiber of canis familiaris*. New York: Viking.
- Davis, L. S., & Renner, M. 2003, *Penguins*. New Haven: Yale University Press.
- Kellert, S. (1979), *Public attitudes toward critical wildlife and natural habitat issues*. Washington, DC: United States Government Printing Office.
- Lorenz, K. 1981, *The Foundations of Ethology*. New York: Springer-Verlag.
- Murray, J.A.H. 1971, *The compact edition of the Oxford English dictionary (Volume I)*. New York: Oxford University Press Inc.
- Myers, O. E., & Saunders, C. D. 2002, Animals as links toward developing caring relationships with the natural world. In P. H. Kahn & S. R. Kellert (Eds.), *Children and nature: Psychological, sociocultural, and evolutionary investigations* (pp. 152-178). Cambridge: MIT Press.

### Journals

- Abrahamson, D., Gennaro, E., & Heller, P. (1983), *Animal exhibits: A naturalistic study*, Museum Education Roundtable: Roundtable Reports, 8 (2), 6-9
- Archer, J. (1997), Why do people love their pets. *Evolution and Human Behavior*, 18 (4), 237-59
- Arndt, M.A., Benusa, D., Bishop, T., & Screven, C. (1993), Behavior and learning in a zoo under different signage conditions. *Visitor Studies*, 5 (1), 245-253
- Ballantyne R. & Packer J. (2005), Promoting environmentally sustainable attitudes and behaviour through free choice learning experiences: What is the state of the game? *Environmental Education Research*, 11, 281-295
- Balmford, A. (2000), Separating fact from artifact in analyses of zoo visitor preferences. *Conservation Biology*, 14 (4), 1193-1195
- Balmford A., Mace G.M. & Leader-Williams N. (1996), Designing the ark: Setting priorities for captive breeding. *Conservation Biology*, 10 (3), 719-727.
- Bitgood, S., Patterson, D., Benefield, A., & Landers, A. (1986), Understanding your visitors: Ten factors that influence visitor behavior. *Proceedings of the American Association of Zoological Parks and Aquariums*, 726-743.
- Bitgood, S. & Patterson, D. (1987), Principles of exhibit design. *Visitor Behavior*, 2 (1), 4-6
- Bitgood, S., Patterson, D. & Benefield, A. (1988), Exhibit design and visitor behavior: empirical relationships. *Environment and Behavior*, 20 (4), 474-491.
- Brennan, T (1978), Visitor watching: What people do at the zoo. *Brookfield Bison*, Aug-Sep, 1-7
- Clucas, B., McHugh, K. & Caro, T. (2008), Flagship species on covers of US conservation and nature magazine. *Biodiversity Conservation*, 17 (6), 1517-1528

- Coe, J.C. (1985), Design and perception: Making the zoo experience real. *Zoo Biology*, 4 (2), 197–208
- Cohn, M.J. & Tickle, C. (1999), Developmental basis of limblessness and axial patterning in snakes. *Nature*, 399, 474–479
- Covacevich, J. & Archer, M. (1975) The distribution of the cane toad, *Bufo marinus*, in Australia and its effects on indigenous vertebrates. *Memoirs of the Queensland Museum*, 17 (2), 305–310
- Davey, G.C.L. (1994), Self-reported fears to common indigenous animals in an adult UK population: The role of disgust sensitivity. *British Journal of Psychology*, 85 (4), 541–554
- DeMares (2000), Human peak experience triggered by encounters with cetaceans. *Anthrozoos: A Multidisciplinary Journal of The Interactions of People & Animals*, 13 (2), 89–103
- Driscoll, J.W. (1995), Attitudes toward animals: species ratings. *Society and Animals*, 3 (2) 139–150
- Dutta, T. (2005), Visitor profile at Peshwe Zoo, Maharashtra. *Zoo's Print*, 20 (8), 13–16
- Eddy, T.J., Gallup, G.G., Jr., & Povinelli, D.J. (2010), Attribution of cognitive states to animals: Anthropomorphism in comparative perspective. *Journal of Social Issues*, 49 (1), 87–101
- Falk, J.H. (2006), The impact of visit motivation on learning: Using identity as a construct to understand the visitor experience. *Curator*, 49 (2), 151–166
- Fenner, P.J. (1998), Dangers in the Ocean: The Traveler and Marine Envenomation. I. Jellyfish. *Journal of Travel Medicine*, 5 (3) , 135–141
- Foster, J.S., Koran, J.J., Jr., Koran, M.L., Sark, S., Blackwood, A. & Landers, H. (1988), The effect of multispecies exhibits on visitor attention at the Jacksonville Zoological Park. *Visitor studies 1988*
- Gerdes, A.B.M., Uhl, G. & Alpers, G.W. (2009), Spiders are special: fear and disgust evoked by pictures of arthropods. *Evolution and Human Behavior*, 30, 66–73
- Gressner, J. (1963), *Svet Vedy*, 9
- Gould, S. J. (1979), Mickey Mouse meets Konrad Lorenz. *Natural History*, 88 (5), 30–36
- Gunnthorsdottir, A. (2001), Physical attractiveness of an animal species as a decision factor for its preservation. *Anthrozoos: A Multidisciplinary Journal of The Interactions of People & Animals*, 14 (4) 204–215
- Herzog, H.A., Jr. & Burghardt, G.M. (1988), Attitudes toward animals: Origins and diversity. *Anthrozoös*, 1 (4) 214–222
- Herzog, H.A., Jr., Betchart, N.S. & Pittman, R.B. (1991), Gender, sex role orientation, and attitudes toward animals. *Anthrozoos: A Multidisciplinary Journal of The Interactions of People & Animals*, 4 (3), 184–191
- Kellert, S.R. & Berry, J.K. (1987), Attitudes, knowledge, and behaviors toward wildlife as affected by gender. *Wildlife Society Bulletin*, 15 (3), 363–371
- Jackson, D. M., (1994), Animal activity and presence of docent interaction at Zoo Atlanta. *Visitor Behavior*, 9 (1), 16
- Johnston, R.J. (1998), Exogenous factors and visitor behavior: A regression analysis of exhibit viewing time. *Environment and Behavior*, 30 (3), 322–347

- Sinden, R.E., Alavi, Y. & Raine, J.D (2004), Mosquito-malaria interactions: a reappraisal of the concepts of susceptibility and refractoriness. *Insect Biochemistry and Molecular Biology*, 34 (7), 625-629
- Stanley, J.W. (2008), Snakes: objects of religion, fear, and myth. *Journal of Integrative Biology* 2 (2), 42-58.
- Stokes, D.L. (2007), Things we like: Human preferences among similar organisms and implications for conservation. *Human Ecology*, 35 (3), 361-369
- Surinova, M. (1971), An analysis of the popularity of animals. *International Zoo Yearbook*, 1, 165-167
- The Chimpanzee Sequencing and Analysis Consortium (2005), Initial sequence of the chimpanzee genome and comparison with the human genome. *Nature*, 437, 69-87
- Tripet, F., Aboagye-Antwi, F. & Hurd, H. (2008), Ecological immunology of mosquito-malaria interactions. *Trends in Parasitology*, 24 (5), 219-227
- Véras dos Santos, E., de Souza Martins, L., Guedes, D. & Bicca-Marques J.C. (2012), What makes a mammal attractive to the public at the Zoological Park of Sapucaia do Sul in southern Brazil? *Zoo's Print*, 27 (2), 6-11
- Wagener, A.L. & Zettle, R.D. (2011), Targeting fear of spiders with control-, acceptance-, and information-based approaches. *The Psychological Record*, 61 (1), article 5
- Ward, P., Mosberger, N., Kistler, C. & Fischer, O. (1998), The relationship between popularity and body size in zoo animals. *Conservation Biology*, 12 (6), 1408-1411
- Ward, P. (2000), Zoo visitor preferences: Reply to Balmford. *Conservation Biology*, 14 (4), 1196
- Whitworth, A.W. (2012), An investigation into the determining factors of zoo visitor attendances in UK zoos. *PLoS One*, 7 (1): e29839
- Wickins-Dražilová, D. (2006), Zoo animal welfare. *Journal of Agricultural and Environmental Ethics*, 19, 27-36
- Woods, B. (2000), Beauty and the beast: preferences for animals in Australia. *The Journal of Tourism Studies*, 11 (2), 25-35
- Woods, M., McDonald, R.A. & Harris, S. (2003), Predation of wildlife by domestic cats *Felis catus* in Great Britain. *Mammal Review*, 33 (2), 174-188
- Zwinkels, J., Oudegeest, T. & Laterveer, M. (2009) Using visitor observation to evaluate exhibits at the Rotterdam zoo aquarium. *Visitor studies*, 12 (1), 65-77

## On-line materials

Australian Museum (2012), Cane Toad  
Retrieved May 18, 2012, from  
<http://australianmuseum.net.au/Cane-Toad>

Born Free (2012), Conservation Commitment,  
Retrieved May 8, 2012, from  
<http://www.bornfree.org.uk/campaigns/zoo-check/zoos/euzoos/conservation-commitment>

Dirks, R. (2004), The Portland Mercury: The Bambi Effect,  
Retrieved May 15, 2012, from  
<http://www.portlandmercury.com/portland/Content?oid=32269&category=22127>

EAZA (2011a), About EAZA,  
Retrieved December 3, 2011, from  
<http://eaza.net/about/Pages/Introduction.aspx>

EAZA (2011b), EAZA Collection Planning,  
Retrieved December 3, 2011, from  
<http://eaza.net/activities/cp/Pages/Collection%20Planning.aspx>

EAZA (2011c), EAZA and Education,  
Retrieved December 3, 2011, from  
<http://eaza.net/activities/education/Pages/Education.aspx>

EAZA (2011d), EAZA Education Standards,  
Retrieved December 3, 2011, from  
[http://eaza.net/about/Documents/EAZA\\_Education\\_Standards\\_2008.pdf](http://eaza.net/about/Documents/EAZA_Education_Standards_2008.pdf)

Gilbert, N. (2010), King Kong: the effects of film, imagery and literature on perceptions of gorillas,  
Retrieved May 16, 2011, from  
[http://www.nataliegilbert.net/articles/NatalieGilbert\\_Thesis.pdf](http://www.nataliegilbert.net/articles/NatalieGilbert_Thesis.pdf)

Good Zoos (2012), London Zoo,  
Retrieved May 8, 2012, from  
<http://www.goodzoos.com/UK%20Zoos/london.htm>

Kaplan, M (2000), Herp Care Collection: Ethology, Ecology and Critical Anthropomorphism,  
Retrieved May 15, 2012, from  
<http://www.anapsid.org/ethology.html>

National Wildlife Federation (2012), Bald Eagle.  
Retrieved May 24, 2012, from  
<http://www.nwf.org/Wildlife/Wildlife-Library/Birds/Bald-Eagle.aspx>

## Other

Adams, G., Fisher, L., Le Blond, D., Mazur, N., McMahon, C., Peckover, T., Schmiechen, J. & Sharrad, N.  
(1991), Report prepared for the Royal Zoological Study of South Australia, Mawson Graduate  
Centre for Environmental Studies, The University of Adelaide. *The role of the Adelaide Zoo in  
conservation.*

Harrison, F.J. (1995), U.S. Army Center for Health Promotion and Preventive Medicine. *Prevention  
and Control of Plague. Technical Guide 103.*

## Cover photo

Tourisme Hautes Pyrénées (2012), A la rencontre des marmottes au Parc Animalier des Pyrénées,  
Retrieved June 16, 2012, from  
[http://www.tourisme-hautes-pyrenees.com/automne\\_modules\\_files/pthemes/public/r2892\\_67\\_marmottes-2.jpg](http://www.tourisme-hautes-pyrenees.com/automne_modules_files/pthemes/public/r2892_67_marmottes-2.jpg)

## **Appendix I: Scientific names of mentioned animal species and groups**

The English names are ranked in alphabetic order, with the scientific names behind. For animal species the singular is used, while for animal (taxonomic) groups plural is used.

Aardvark	<i>Orycteropus afer</i>
African dwarf crocodile	<i>Osteolaemus tetraspis</i>
Amazonian horned frog	<i>Ceratophrys cornuta</i>
Amphibians	<i>Amphibia spp.</i>
Ants	<i>Formicidae spp.</i>
Atlantic bottlenose dolphin	<i>Tursiops truncatus</i>
Australian lungfish	<i>Neoceratodus forsteri</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Bears	<i>Ursidae spp.</i>
Birds	<i>Aves spp.</i>
Birds of prey	<i>Falconiformes spp.</i>
Black bear	<i>Ursus americanus</i>
Boa constrictor	<i>Boa constrictor</i>
Box jellyfish	<i>Cubozoa spp.</i>
Brown bear	<i>Ursus arctos</i>
Bushbabies	<i>Galagidae spp.</i>
Camels	<i>Camelus spp.</i>
Cane toad	<i>Bufo marinus</i>
Capybara	<i>Hydrochoerus hydrochaeris</i>
Carnivores	<i>Carnivora spp.</i>
Cat	<i>Felis silvestris catus</i>
Cheetah	<i>Acinonyx jubatus</i>
Chimpanzee	<i>Pan troglodytes</i>
Cockroach	<i>Blattodea spp.</i>
Common clown fish	<i>Amphiprion ocellaris</i>
Condors	<i>Cathartidae spp.</i>

Cougar	<i>Puma concolor</i>
Cows	<i>Bos primigenius taurus</i>
Crocodiles	<i>Crocodilia spp.</i>
Crows	<i>Corvus spp.</i>
Deer	<i>Cervidae spp.</i>
Dog	<i>Canis lupus familiaris</i>
Dolphins	<i>Odontoceti spp.</i>
Donkey	<i>Equus africanus asinus</i>
Egrets	<i>Ardeidae spp.</i>
Elephants	<i>Elephantidae spp.</i>
Emerald tree boa	<i>Corallus caninus</i>
Even-toed ungulates	<i>Artiodactyla spp.</i>
Fish(es)	<i>Pisces spp.</i>
Flamingos	<i>Phoenicopteridae spp.</i>
Fox	<i>Vulpes spp.</i>
Frogs	<i>Anura spp.</i>
Giant panda	<i>Ailuropoda melanoleuca</i>
Giraffe	<i>Giraffa camelopardalis</i>
Goat	<i>Capra aegagrus hircus</i>
Gorillas	<i>Gorilla spp.</i>
Great apes	<i>Hominidae spp.</i>
Green and black poison dart frog	<i>Dendrobates auratus</i>
Green mamba	<i>Dendroaspis angusticeps</i>
Green moray	<i>Gymnothorax funebris</i>
Hippopotamuses	<i>Hippopotamidae spp. (mainly; Hippopotamus amphibius)</i>
Humboldt's penguin	<i>Spheniscus humboldti</i>
Horse	<i>Equus ferus caballus</i>
Human	<i>Homo sapiens</i>

Polecats	<i>Mustela eversmanii</i> and/or <i>Mustela putorius</i>
Primates	<i>Primates spp.</i>
Pygmy hippopotamus	<i>Choeropsis liberiensis</i>
Rats	<i>Rattus spp.</i>
Red-tailed catfish	<i>Phractocephalus hemioliopterus</i>
Reptiles	<i>Reptilia spp.</i>
Reticulated python	<i>Python reticulatus</i>
Rhinoceroses	<i>Rhinocerotidae spp.</i>
Rhinoceros hornbill	<i>Buceros rhinoceros</i>
Salamanders	<i>Caudata spp</i>
Scissor-billed starling	<i>Scissirostrum dubium</i>
Seahorses	<i>Hippocampus spp.</i>
Sharks	<i>Selachimorpha spp.</i>
Sheep	<i>Ovis aries aries</i>
Skunks	<i>Mephitidae spp.</i>
Snakes	<i>Serpentes spp.</i>
Songbirds	<i>Passeri spp.</i>
South American tapir	<i>Tapirus terrestris</i>
Spiders	<i>Araneae spp.</i>
Splendid leaf frog	<i>Cruziohyla calcarifer</i>
Tarctic hornbill	<i>Penelopides panini</i>
Tiger	<i>Panthera tigris</i>
Timor zebra finch	<i>Taeniopygia guttata guttata</i>
Toads	<i>Anura spp.</i>
Tortoises	<i>Testudinidae spp.</i>
Turtles	<i>Testudines spp.</i>
Uneven-toed ungulates	<i>Perissodactyla spp.</i>
Ungulates	<i>Ungulata spp.</i>



Vultures	<i>Aegypiinae spp.</i>
Wallabies	<i>Macropodidae spp.</i>
Waterfowl	<i>Aequornithes spp.</i>
Whales	<i>Cetacea spp.</i>
White whale	<i>Delphinapterus leucas</i>
Wolf	<i>Canis lupus</i> (excluding <i>Canis lupus familiaris</i> )
Zebra	<i>Equus quagga</i> , <i>Equus zebra</i> and <i>Equus grevyi</i>

## Appendix II: Animal-related parameters found by Whitworth (2012)

A complete overview of the 53 animal-related parameters found by Whitworth (2012), ranked from high to low (in terms of 'liked' or 'disliked').

'Liked' parameters	'Neutral' parameters	'Disliked' parameters
Active	Sharp claws and teeth	Dull colored
Easy to see		Feeds on other animals
Intelligent		Inactive
Bright colors		Scaly
Ability to hold objects		Dangerous to humans
Furry		More than four legs
Rare		No legs
Active during day time		Aggressive to each other
Fast		Venomous/poisonous
Exotic		Bald/little hair
Climbing		Bites or stings
Swimming		Slimy
Big eyes		Smelly
Patterned		
Small (smaller than a man)		
Lives mainly on ground		
Strong/powerful		
Tail		
Flying		
Lives in groups		
Frequently vocal		
Large ears		
Lives mainly in trees		
Quick/erratic movements		
Large (larger than a man)		
Common		
Lives in Britain		
Feeds on plants		
Lives alone		
Active during night time		
Feathers		
Slow		
Unintelligent		
Quiet		
Un-patterned		
Fat		
Ugly/unusual looking		
Secretive		
Thin		

### Appendix III: Species concerned in Moss & Esson (2010)

Species of birds, fish, snakes and frogs and their attracting power, holding power and attraction values as found by and based on Moss & Esson (2010).

Species	Group	Attracting power	Holding power	Attraction value
Scissor-billed starling	Birds	Low	Low	Low
Rhinoceros hornbill	Birds	High	Low	Average
Tarctic hornbill	Birds	Low	Low	Low
Timor zebra finch	Birds	Low	Low	Low
Milky eagle owl	Birds	Low	Low	Low
Humboldt's penguin	Birds	High	Low	Average
Reticulated python	Snakes	Low	High	Average
Green mamba	Snakes	High	Low	Average
Emerald tree boa	Snakes	Low	Low	Low
Isok barb	Fish	Low	Low	Low
Common clown fish	Fish	High	High	High
Australian lungfish	Fish	High	Low	Average
Red-tailed catfish	Fish	Low	High	Average
Lake Barombi cichlid	Fish	Low	Low	Low
Splendid leaf frog	Frogs	High	Low	Average
Green and black poison dart frog	Frogs	High	Low	Average
Amazonian horned frog	Frogs	Low	Low	Low