VISITOR'S USE OF SPACE AND BEHAVIOR AS INDICATOR OF ZOOS OPEN SPACES PERFORMANCE

USO DO ESPAÇO E COMPORTAMENTO DOS VISITANTES COMO INDICADOR DE DESEMPENHO DOS ESPAÇOS ABERTOS DE JARDINS ZOOLÓGICOS

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ABSTRACT

Providing a qualified space is considered essential for the fulfillment of the education and entertainment functions of zoological gardens. However, there is a shortage of studies that address spatial quality in these institutions, based on assessments involving people. Therefore, this research aims to verify how the open spaces of zoological gardens are apprehended and experienced, identifying which physical-spatial elements of these environments intensify the use of space and can be related to the perception of environmental quality. The work adopts a qualitative and quantitative methodological approach and is conducted from a case study, the Zoological Park of the FZB/RS. The use and preferences of visitors are considered as environmental performance measures.

Keywords: Zoological gardens. Open spaces. Environmental quality.

Resumo

Proporcionar um espaço qualificado é considerado essencial para o cumprimento das funções de educação e entretenimento dos jardins zoológicos. No entanto, há carência de estudos que abordem a qualidade espacial nessas instituições, baseados em avaliações envolvendo indivíduos. Assim, esta investigação tem como objetivo verificar como os espaços abertos dos jardins zoológicos são apreendidos e vivenciados, identificando quais elementos físicos-espaciais desses ambientes intensificam o uso do espaço e podem estar relacionados a percepção de qualidade ambiental. O trabalho adota uma abordagem metodológica qualitativa e quantitativa e é conduzido a partir de um estudo de caso, o Parque Zoológico da FZB/RS. O uso e as preferências dos visitantes são considerados como medida de desempenho ambiental.

Palavras-chave: Jardins zoológicos. Espaços abertos. Qualidade ambiental.

1 THE PERFORMANCE OF THE ZOOLOGICAL GARDENS OPEN SPACES

Contemporary zoological gardens have as main purposes the education and entertainment of the public, the conservation of species and the carrying out of researches (HANCOCKS, 2003). The education and entertainment of visitors are usually attributed to personal encounters with animals, where are offered for visitors the opportunity to learn about endangered species of wildlife and their habitats, showing the importance of biodiversity and leading to a conservation behavior.

Animals are considered important resources for conservation awareness programs because they sensitize the population about the risks not only of their extinction but also of their habitats (FIORAVANTI, 2011). Ebenhöh (1992) points out that although animals are an important part of the experience, the open areas between the exhibitions and convenient places to enjoy the environment are highly significant for people and as important as the exhibits themselves. Attractive places, with spatial quality, tend to attract more individuals than low-qualified places because people are able to recognize the most advantageous places for themselves (HAAS, 2000). It is understood that the quality of the visitation should be one of the fundamental items in the zoological gardens planning because when well qualified with dynamic and pleasant environments, they can enable a better absorption of educational information by the visitor (JONES et al., 1976).

However, it has been shown that the literature hardly describes how to design such spaces, taking into account the perception of their visitors. Thus, this study addresses the need to identify aspects that influence the performance of zoological gardens open spaces and its recognition as a qualified place from the perception of their visitors. In the research area of Environment-Behavior Relations the satisfaction measure is usually used to evaluate environmental performance. Nonetheless, several researchers, among them Reis & Lay (2006), suggest that it may not be a sufficient measure to identify the elements that influence the individual's perception. To determine which physical and symbolic components present in the zoological gardens open spaces that affect perception and influence the evaluation of the environmental quality it is necessary to verify through the behavioral observation, the effective use of spaces. Several authors recognize the *use* as a performance indicator for open spaces (FRANCIS, 2003; REIS & LAY, 2006).

Therefore, this study aims to verify how the open spaces of zoological gardens are apprehended and experienced considering the visitor's behavior and their preferences. It is identify which physical-spatial design elements are present in these environments and how they intensify the use of space and may be related to the perception of quality, orienting in the definition of planning criteria for future interventions in these environments in order to create qualified, educational and memorable spaces.

1.1 The evaluation process of the environment by individuals

The Environmental Psychology and Environment-Behavior Relations study areas - which this study is based - focuses on the investigation of the processes of interaction between the physical-spatial characteristics of the environment and the responses of the individuals who use it. To designate these processes is used the term *environmental perception*. The process of environmental perception as a whole involves several steps and sequential experiences in which two stand out: the perception and the cognition. Perceptual experiences are understood as a sensory-motor activity. They refer to the appreciation of the external world as a stimulus witnessed at the moment, something immediately observed or felt through the basic senses. They occur independently of internal operations such as memory, recognition, and imagination. Already, the cognitive experiences are considered complementary to the perception and understood as the way the perceived object is encoded, stored, and organized in the mind of the observer according to its accumulated knowledge and values. According to Weber (1995) cognition is understood as the stage in which what was perceived acquires a value for the individual, becoming a significant image associated with memory and the recognition of something and thus, related to learning.

The process of environmental perception in zoological gardens follows a defined pattern: people enter a new environment, immediately perceive it and then try to make sense of it evaluating its characteristics. The next step is the desire to transform information into knowledge (GAGNE 1985; GRAETZ, 1995). However, empirical studies indicate that people may or may not be visiting the zoo with the intention of learning, and this understanding is the first step in successfully planning the education of visitors.

The Information Processing Model developed by Gagné (1985) is considered by several authors as the more appropriate for the learning process study (cognitive process) in the zoological gardens (EBENHÖH, 1995; PLOUTZ, 2012). From this model Falk (2000, 2006) developed a new theory called Visitor Identity, which prognoses how people can behave during the visit. Falk's theory uses the concept of affordances, developed by James Gibson (1986) because of his ability to show the connection between the constructed environment and human behavior. Gibson, based on the Gestalt psychology, recognized that the meaning or value of an object is perceived immediately and that "each thing says what it is [...] a fruit says 'Eat me,' the water says 'Drink me' and thunder says 'Fear me' ". Identities identify how people perceive the affordances the zoo provides, resulting in their perspectives on the visit (FALK, 2009).

Currently, zoos are seen as places to conduct studies of environmental perception, behavior, landscape assessment, among others (GRAETZ, 1995). In this study, are use the perceptive and cognitive approach to evaluate the performance of zoological gardens open spaces based on the morphological elements present in these environments. The evaluation made by the individuals is analyzed in order to understand which environmental attributes contributed to this evaluation.

1.2 ELEMENTS OF THE ZOOLOGICAL GARDENS OPEN SPACES

Over the time, zoological gardens have undergone many changes, not only in the physical sense, but also in their concepts. Transcending from simple spaces, without naturalness, to real wildlife conservation parks, with an infrastructure developed for the welfare of the animal's species that live there as also for its visitors. Since the 1970's ecology and nature conservation have become the basic principles for the zoological gardens planning, giving rise to a new concept called landscape immersion. The strategies of design and planning that support this concept have as one of the main intentions to reach the emotional side of the public and only then in their intellectual side making him immerse both physically and psychologically in space (COE, 2011). Currently the concept of landscape immersion is called immersive design (COE, 2012).

According to this line of thought, the space in this study is not considered only from the physical-spatial point of view, but also with the individuals that interact with it. With this in mind and also that zoological gardens are mainly made up of open spaces, it is essential that the space be planned in its entirety for the visitor feels involved in the environment (EBENHÖH, 1992; COE, 2000; 2011; 2012; HANCOCKS, 2003). According to Jones et al., (1976) it is indicated that the zoological gardens planning should be carried out with the intention of making them attractive. People have specific expectations when they visit a zoological garden. Some of them are aware, others are unconscious but basically, the visitor wants a pleasant, fun and educational experience (EBENHÖH, 1992). The challenge is create an environment where learning is fun.

In the planning of the zoological gardens open spaces seven categories of landscape elements are highlighted as influential in space performance: (1) structures and facilities to support visitors; (2) elements of the enclosures/exhibitions; (3) naturalness; (4) furniture; (5) recreational resources; (6) circulation elements; e, (7) spatial orientation devices (JONES et al., 1976; BITGOOD, 1988; EBENHÖH, 1992; GRAETZ, 1995).

In order to make pleasant the zoological garden visit it is necessary to provide the space of *structures and facilities to support visitors*. These structures are translated into spaces such as exhibition areas, rest areas, parking lots, restaurants, picnic areas, restrooms, information kiosks, souvenir shops, environmental education building and children's playgrounds. The zoological garden exhibition areas occupy an average of 60-70% of the territory. The structures classified as *exhibitions physical elements* are the metallic mesh structures (rigid or flexible), moats, handrails, vegetation and environmental enrichment elements. Wire mesh is used as a relatively transparent barrier between the public and animals (Figure 1a). The moats are excavations on the ground, with or without water (Figure 1b), and has the function of restraining the animals, without the visitor being aware of this.

The *naturalness* is one of the zoological gardens fundamental factors and is related to vegetation and water. The vegetation can help increase the use of the spaces, especially if the vegetation arrangements have variety and quality of texture, color, mass, fluidity and olfactory effects. Lawns can determine where people can sit, play and picnic or just rest and sunbath, and thus influence the use of space. The trees provide shade and can serve as a recreational element for children. The water is among the aspects that most visitors enjoy in zoological gardens, and can be used in a wide variety of combinations. It can be found in the form of lakes and water fountains or as unusual fountains with fun sculptures. In addition to the aesthetic qualities of water bodies, there is a possibility of displaying some types of animals that can be attractive.

In order to make the zoological garden visit pleasant, it is necessary to provide *furniture* in the space. The most frequently found in zoos are benches, trashcans, lamps and fountains. This furniture can be simple or with some theme that contributes to the visitor environmental education. *Recreational resources* are the entertainment and learning devices that offer the possibility of interaction. They consist of passive or active devices that always make the visitor act or react. The recreational resources that can be found in zoological gardens are panels and paintings, elements and games of educational entertainment, sculptures (Figure 2) and also small squares for children. The playground can be designed as simple, colorful or with some theme.

The *circulation* can be thought according to the sensory effects that one wishes to obtain in the space and of the lines of visas that it is intended to provide to the visitors. Can be created var-



a)



b)

Figure 1: Barriers in zoological gardens exhibitions: a) enclosure with flexible wire mesh barrier; b) enclosure with moat barrier with water. Source: photos of the authors, 2014.





Figure 2: Animals sculptures as recreational resources in zoological gardens. Source: photos of the authors, 2014.

ious effects, such as mystery and surprise. Visual clarity can also influence the ease of locomotion and visual direction. As greater are the visibility of an object or space more attention it can receive. Aspects such as width of the roads, type of pavement, accessibility, need for the implementation of bridges, stairs and observatories should be considered.

Space orientation devices are also important in these locations because they allow people to locate themselves. When people get lost, they do not absorb all the educational and recreational information provided by the space. The spatial orientation devices more common in zoological gardens are directional signs, identification and educational, maps you-are-here and hand maps.

2 METHODOLOGY

It was considered as a more appropriate fundamental strategy the case study (YIN, 2001). As a study object, we selected the Zoological Park of the Foundation Zoobotânica do Rio Grande do Sul (FZB/RS), located in Sapucaia do Sul, State of Rio Grande do Sul, Brazil, with an visitation area of 50 hectares (Figure 3). The criteria used to select the study object were: A) *location*: the object of study should be located in the State of Rio Grande do Sul for ease of the research; be an urban zoological garden. B) features: be a contemporary zoological garden; offer environmental education programs; possess a large visitation area and varied of animals; have a large flow of visitors. In addition, C) availability: zoological garden interest in participating the study.

The study use four methods of data collection: (1) Physical survey, where physical measurements and photographic record of the formal characteristics and physical elements of the design present in the open space of the zoo were made to complement the previously available data. (2) Behavioral observation, where the use of space was identified. Moreover, (3) questionnaire and (4) interview, in which visitors satisfaction and preference data were identified. The sample of people who answered the questionnaire and participated in the interview referred to visitors to the zoo, and is characterized as a sample of opportunity, composed of people who were willing to participate in the study (Table 1).

In the physical survey, the physical characteristics of the Zoological Park of the FZB/RS were evidenced and was produced the General Map of the space. The Zoological Park was characterized according to the zoological gardens open spaces elements.

As for the *structures and facilities to support visitors*, the physical environment, open to the public, has a ticket office, parking lot, a restaurant (Figure 4a), food information and marketing kiosks, toilets, environmental education center, rest and picnic areas. It presents diverse types of *enclosures/expositions*, including some of iron railings, still of the decade of 1960. The most common barriers are those of metallic wire mesh (Figure 4b), but dry and water moats can be found (Figure 4c). Elements of environmental enrichment for animals are also present in all enclosures.

In relation to *natural resources*, the space is characterized by the presence of a lot of native vegetation, trails and totally preserved

areas. Ornamental vegetation is present in most areas (Figure 4d). There is a large, prominent lake (Figure 4e), in addition there are lakes within animal enclosures. *Furniture* like benches and bins are common and well laid out. There is a wide design variety of these elements, which demonstrates that they were deployed in the environment at different times. As a recreational resource there is a children's plaza/playground and a little train for taking photos (Figure 4f).

As for the *circulation* elements, there are varied types of roads, with different types of pavement, but most of it is of beaten earth (Figure 4g). Lack demarcations limits in the area of enclosures and signaling, as some roads lead the visitor to the tracks or the exit. Many paths do not have accessibility. Bridges, staircases and a footbridge (Figure 4h) are present elements. *Spatial orientation devices* such as directional signage and maps you-are-here (Figure 4i) are found in various parts of the zoological garden. Educational signs are present in all exhibitions of animals.



Figure 3: Location of the FZB/RS Zoological Park. Source: of the authors - adapted from Google Earth, 2017.

METHOD	GENDER		AGE GROUP				TOTAL
	Female	Male	Child	Teenager	Adult	Senior	TOTAL
Behavioral observation	3671	3444	1767	707	4237	404	7115
Questionnaire	48	48	-	3	93	-	96
Interview	12	13	-	-	15	10	25
TOTAL OF PARTICIPANTS							7236

TABLE 1: SAMPLE OF PARTICIPANTS IN EACH METHOD OF DATA COLLECTION.

Source: of the authors, 2017.

For the analysis of the physical space, the area of visitation of the Zoological Park was divided into 11 smaller areas: 01 - Farm, 02 - Rhinos, 03 - Monkeys, 04 - Birds, 05 - Carnivorous, 06 - Camels, 07 - Parking, 08 - Picnic, 09 - Playground, 10 - Lake and 11 - Feeding (Figure 5). The areas delimitation was defined according to their characteristics.

Behavioral observation was performed with the *behavioral maps* technique of recording, in the Zoo on April 29 and 30, and on May 2, 2017, during each day shift (morning and afternoon). For more standardization, the observations were made from four pre-established routes. The applying technique of the evaluation methods (questionnaire and interview) was done personally and individually, in the study site itself. The questionnaire was applied on October 14 and 15, 2017. Their content included questions about satisfaction, preference between exhibition areas and favorite animal, as well as other questions about design elements, path settings and naturalness aspects. The interview was applied on February 24 and 25, 2018, and its contents referred to aspects of deepening the data raised by the questionnaire.

3 Results

The data collected on the six behavioral maps (corresponding to days and observation shifts) were digitized and overlapped, forming a synthesis map of use (Figure 6). Through the behavioral observations was verified that Area 03 - Monkeys is the most frequented area by the visitors and Area 06 - Camels, is the less frequented area.

The Area 03 - Monkeys occupies a central position in the Zoological Park and has 1822.23m² of area subject to access and visitation. Most of the exhibits present are monkey enclosures: howler monkeys, baboon-sacred, spider monkey, marmoset, golden lion tamarin and night monkey. The other two exhibitions refer to the enclosures of hippos and ferrets. The hippopotamus enclosure has a metal fence barrier, and is at a lower level of visitors. The hippopotamus enclosure has a metal fence barrier, and is at a lower level of visitors. The area is characterized by large trees, which form a framing of the path, and by the presence of large quantity and variety of ornamental vegetation. The ornamental vegetation is present in almost all the space and in the central building site - which divides the two paths of the area - this vegetation is more intense. An information kiosk, two food kiosks, four benches and three dumpsters are available in the area. There is also a pergola covered with climbing plants. The paths are narrow and straight, paved with stone cobblestones and totally surrounded by vegetation, making impossible to visualize the spaces outside the area. There are few directional signs, but there is available a map you-are-here. The space sensation is of compactness and envelopment, provided by the closed lines of vision. Area with high visual richness.

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Figure 4: Getting to know the Zoological Park: a) restaurant; b) enclosures of metal wire mesh; c) enclosure with lake; d) ornamental vegetation; e) lake; f) little train; g) paths of clay; h) lake footbridge; i) map you-are-here. Source: photos of the authors, 2016.



Figure 5: Division of the Zoological Park visitation area in areas of analysis. Source: of the authors, 2017.

It was verified in Area 03 a large numbers of visitors in static activity in several points of the space as well as a considerable amount of people transiting in the narrower path, where are located the large monkeys exhibitions. Percebe-se que as pessoas em fluxo não estão apenas utilizando o espaço como passagem. People move to observe the next exhibit, to enjoy the landscape and ornamental vegetation or to continue to observe the top of the large trees where there are often birds singing. All the exhibitions in the area receive attention from visitors and in them are the points of greatest intensity of use. Visitors often occupy the benches located in the back of the food kiosk.

The Area 06 - Camels is located on the eastern outskirts of the Zoological Park and has 10,338.40 m² of area accessible and able to visit. There are five exhibits at this area: waterfowl (geese, swans, ducks and mallards) along with the chimpanzees - which stand on an island in the middle of the lake - camels, deer and harts. The exhibits are large and very distant from each other. In the camel's enclosure the barrier is made of wood, and in the





deer and harts enclosures, the barrier is made of metallic wire mesh. The area is characterized by the presence of large native trees, an orchard, located in front of the deer enclosure and by the absence of ornamental vegetation. There is a footbridge on the lake of monkeys and a recreational train. There are no toilets or food kiosks in the area. The water is present in the enclosures of monkeys and waterfowl. There are eight benches and six dumpsters. The paths are straight and paved with asphalt bike lane to the fullest extent. There are few directional signs and just one map you-are-here. The space passes feeling of amplitude and monotony. There are few elements and low visual richness.

It has been found few people visiting the Area 06 and most of them are in flux activity, which shows that space is used mostly as a passageway. People standing watching animals or other nonmotor activity are scarce. The visitors in static activity concentrate mainly in the lake footbridge where are the monkeys enclosures and also on the train, which is used as a recreational means by children and where are taken family photos. It is also perceived the use of the benches located on the camels enclosure side and a small concentration of people watching the camels.

3.1 PREFERENCE FOR VISITING AREA

Considering the results obtained through the questionnaires, it is stated that the zoological garden visitor's under study are very satisfied or satisfied (84.4%) with the open spaces experienced. They stand out the same more and less frequented areas as the more and less preferred areas. As preferred, the Area 03 -Monkeys was highlighted, with a 39.6% indication (Table 2). In this area are the animals cited as favorites by only 17.6% of the visitors (Table 3). These data indicate that the presence of the favorite animal did not interfere with visitors' preferences, but that the area settings contributed to the choice. Negative highlights were areas 02 - Rhino and 06 - Camels, less frequently indicated by visitors with 1% and 8.3%, respectively. In these areas there are the animals cited as preferred of 15.6% (Area 02) and 13.5% (Area 06) of the visitors.

In the interviews were collected data referring to the characteristics that make the areas more and less preferred, in this case Area 03 - Monkeys and Area 06 - Camels. Area 06 - Camels and not Area 02 - Rhinoceroses were used in the study because although it is the second less preferred, and not the first one, it is the area of least activity of visitors.

It has been identified that the main feature that makes the *Area 03 - Monkeys* more preferred is the *diversity of animals*. This area provides the possibility of observing a greater amount of animals with a shorter time because it is mainly composed of large metal wire mesh cages positioned side-by-side forming a sequence unit (Figure 7a) and this allows several animals to be placed close together. Metallic wire mesh barriers also allow greater proximity between animals and visitors, and thus, their better visualization. Both, *proximity* and *visualization* of the

animals are pointed by the visitors as aspects that make it the most preferred area.

It is also mentioned the question of the *organization of space*, which is related to its *planning* (understood as order) and its *maintenance* as aspects that make it the most preferred area. There is a relationship between the spatial organizations with preferably the same. The uniformity of space and its physical elements and paved paths that demonstrate greater planning focused on the need of the visitors, are factors of influence in the preference of this area by the visitors.

The visual richness and the vegetation are also aspects strongly pointed as contributors to the preference for the area. The Area 03 - Monkeys is a compact space, with a lot more stimuli than the other areas of the Zoological Park and that there is a feeling of being surrounded by their closed lines of vision. It is also characterized by large trees (Figure 7b) (which form a path framing and provide vertical scale, intimacy, and warmth), by the presence of variety of ornamental vegetation and by a pergola of climbing plants. The large trees have proved to be an important

AREA	FREQUENCY	GRAPHIC
(1) ZEBRAS (farm)	18 (18,8%)	
(2) RHINOS	1 (1,0%)	zebras
(3) MONKEYS	38 (39,6%)	rhinos monkeys
(4) BIRDS	22 (22,9%)	birds
(5) CARNIVOROUS	9 (9,4%)	camels
(6) CAMELS	8 (8,3%)	0 5 10 15 20 25 30 35 40
TOTAL	96 (100%)	

TABLE 2: ANSWERS COMPILATION OF THE QUESTION ABOUT THE PREFERENCE BETWEEN THE EXHIBITION AREAS.

Source: of the authors, 2017.



Tabela 3: Compilação das respostas da pergunta sobre o animal favorito dos visitantes.

Source: of the authors, 2017.

element in this area, as well as contributing to the visual richness due to their varied shapes and leaf textures, they also provide shade, creating adequate thermal comfort. In addition, this makes the space where benches and food kiosks are located pleasant for people to rest.

It is interesting to highlight the relationship between the favorite area and preference for types of barriers between people and animals. In the general context of the park, among all the types of barriers mentioned, the visitors showed preference for the metallic wire mesh (29.2%), typical of large cages. This is the barrier type of 86.7% of the favorite area enclosures, Area 03 - Monkeys. Through the interviews, it was perceived that this is due to the visibility and proximity with the animals already exposed previously. Being closer to animals is important to visitors, and this type of barrier allows such closeness, providing a more intimate relationship (Figure 8).

As for Area 06 - Camels, it was identified that the main aspect that makes it less preferred by visitors is the distance to be covered. This area is at the eastern end of the Zoological Park, away from the parking lot and other exhibition areas, which makes the visitor have to walk a lot to get there. The area also has no possibility of different routes for round trips (interconnected alternative circuits) since it is composed of only one route, and thus, visitors have to go through the same exhibitions twice.

The absence of space visual stimuli and lack of activities is also pointed out as a negative aspect. It was cited by the visitors as influential aspects in the non-preference for the area the *low animals diversity* and the *visual poverty* of the environment. Visitors report that due to all these aspects, the area becomes uninteresting and monotonous, and thus, they lose the will to go and to be in that area (Figure 9). There is no ornamental vegetation or fun design and benches are sparse. Thus, the *lack of infrastructure* is also pointed out as an aspect that causes low preference.

3.2 INFLUENCE OF NATURALNESS AND PATHS IN THE USE OF SPACE

Through the behavioral maps was possible to verify an intense use in practically all the Zoological Park areas. However, was also observed a greater differentiation of the individual's number in the sites (within the mentioned areas) according to the presence of naturalness and with the paths configurations.

As for the presence of *naturalness* (vegetation and water sources), it was verified that the areas near the water were very attractive for the public, although some do not have exhibitions of animals. Even in the less preferred areas, there is a concentration of people along the lakes. And they are the places where most of the activities of photography are directed to other visitors (members of the group) and not to animals. This event is also observed in the exhibits. The exhibits that contain water are attractive for visitors, being the densest points of people in the exhibition areas in which they are located.

In relation to the vegetation, it is verified that it has great influence in the intensity of use, contributing to the permanence of the people in the space. It is stated, from the







Figure 7: Area 03 - Monkeys, most preferred: a) sequenced unit of cages; b) paved paths with ornamental and surrounding vegetation. Source: photos of the authors, 2016.



Figure 8: Visitors in metallic wire mesh enclosures of Area 03 - Monkeys. Source: photos of the authors, 2016.



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data collected, that the visitors prefer the surrounding and ornamental vegetation not only by its appearance, but also due to the planning sensation that it passes to the space. That the vegetation is there fulfilling a purpose previously defined and not that it is placed there by chance. The care with the spaces is considered a factor of influence in the preference for areas and in the use of them. The ornamental vegetation, which attracts visitor's attention and has good appearance, and the large trees that provide shade and a pleasant environment on hot days, provide the feeling of pleasantness encouraging the people to stay in the spaces. These data are confirmed in the interviews, were was pointed out as aspects that the visitors most liked the *naturalness* of the environment, followed by the *shade* and the *lake*, provided by the naturalness itself. It is emphasized that naturalness receives more positive value than the animals themselves.

Regarding *path configurations*, some considerations can be made about preferences for their *width* and *length*. As for width, Area

03 - Monkeys has narrow paths and a high density of visitors, forming agglomerations and yet is considered the preferred area of visitors. Area 04 - Birds is the second most preferred, with half the percentage of choice of the most preferred area, and also has narrow paths. In contrast, the two less preferred areas 02 - Rhinoceroses and 06 - Camels, which also have low density of visitors (mainly permanently) have wide paths, which pass an exaggerated sensation of amplitude. All this, coupled with the lack of visual stimuli and activities planned along the way contribute to the negative evaluation. It is found in the zoological garden under study that it is not the width of the path itself that interferes with the space use, but what that path has in it and around it. If a path is considered too wide, passing an exaggerated sense of amplitude and not presenting visual stimuli, it will be less preferred by visitors and will have less use. At the same time, if the path is considered too wide and has a large variety of visual stimuli and different activities for visitors, it will be more preferred and will be more widely used by visitors. Regarding the length, the need for long walks to get from one





Figure 9: Area 06 - Camels, less preferred: visual poverty and little diversity. Source: photos of the authors, 2016.

place to another is considered as a negative factor space, and indeed, is one of the determining factors for the Area 06 - Camels have been considered the least preferred. It is verified that the length of the paths contributes in the use of the spaces of the Zoological Park. Very long paths can make the visit very tiring and discourage the use of the space by the visitors.

It was also identified that the *paving of paths* contributes to the use of space, but is not a factor of great importance. By analyzing the two most preferred visitors areas, the Area 03 -Monkeys, which has paths with stone cobbled paving and Area 04 - Birds, which has unpaved paths, there is a big difference in its use, and this is partly due to the type of paving. The unpaved ground of Area 04 restricted its more intense use, although this area presents many of the aspects that the visitors pointed out as positive, such as standardization of the enclosures, variety of animals and visual richness. Visitors do not take the nonpaving of an area into consideration when there are animals of great interest. This is perceived in area 05 - Carnivorous, which, although not having pavement and having several accessibility problems, is a much visited area due to the fact that the respondents' favorite animals are in this exhibit area. The same happens in the exhibit area 01 - Farm, where the visitors transit through the unpaved path until reaching the elephant (animal of main interest) and do not follow the way to meet and observe the other animals.

In relation to the lines of visas provided by the space, it is verified that straight paths, with visual clarity (open lines of sight), that allow the individual to visualize all the possibilities of route and identify the most interesting points for itself are more used than paths that pass the sense of mystery and require exploitation.

4 FINAL CONSIDERATIONS

This study sought to identify which landscape elements of the zoological gardens open spaces intensify the preference and use of the environment by their visitors.

It is concluded that the preference for open spaces is influenced mainly by its visual richness and naturalness (vegetation and water). This information is in line with Ebenhöh's (1992) claims that scenes containing natural stimuli, such as water sources, lakes, trees, shrubs and flowers, which provide variety, are preferred by visitors. It is necessary to emphasize that zoos are places of immersive design, being the environment naturalness seen as an important evaluation factor.

It was also found that in the Zoological Park's environment visitors preferred spaces that demonstrate greater planning when compared to occasional (unplanned) spaces. The ornamental vegetation and paving paths increases the sense of planning, and thus increases the use of the environment. Paving is not taken into account for the use of a certain area only when there are animals of great interest to visitors. The maintenance of the environment was also an important factor for visitors' preference for spaces. This information is in agreement with Ebenhöh (1992), that the appearance of the environment is important for the public.

Thus, the landscape aspects that most influence the use of spaces by visitors are revealed. It is now necessary, through self-relative methods supplement the behavioral map data and correlate responses with the actual use of space. It is hoped that the results obtained in this study from the research area of Environment-Behavior Relations will contribute to the qualification of zoological gardens environments.

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