Original Article

The Importance of Recreation Carrying Capacity to Acquaint People with Wildlife, case study: Darabad Nature and Wildlife Museum, Tehran, Iran

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ABSTRACT

The main purpose of this study is the estimating of recreation carrying capacity of Drabad nature and wildlife museum as visitor management tool for museum management to achieve its aim, connects people with wildlife to inspire responsibility and respect for the natural world we share. Based on the recreation carrying capacity, this study attempts to assess the optimum number of people that should be allowed without jeopardizing the surrounding ecological, social and cultural environments. Results showed that the carrying capacity should be 1605 visitors/day. Because the maximum number of daily visitors of Darabad museum during three years is less than calculated recreation carrying capacity, this study suggests that Darabad museum not only has an appropriate condition but also can support more visitors.

KEYWORDS: Carrying capacity, Drabad nature and wildlife museum, Tehran, visitor management, Wildlife.

INTRODUCTION

The Union of Great Britain Museum (1989), defines a museum as "an institution which collects, documents, preserves, exhibits and interprets material evidence and associated information for public benefit". Therefore the success of any museum is only in achieving the objectives of its formation. Accordingly, a suitable museum is defined by the ability and success as shown by the activities carried out by independent objective functions and lines (UNESCO and Organisation 1973; Beirne 2003; UK Museum Association 2008; U.S. Department of Education and Institute of Education Sciences 2009; UK Standard 2010). And recently museums have not only a place to display or store collections, but museums have also become cultural centers and place for education. More and more, museums' interior design are seen as the prologue to the museum experience that extends beyond the galleries into restaurants, shops, theatres, conference rooms, scientific center, school and research area (Black, 2005). Since a museum's functions can include conservation, education, and entertainment or enjoyment, it can be one of the most spectacular places in a community, and play an important role in urban tourism. In fact museums are man-made structures where can be considered as recreational resources in cities (Saghaee et al., 2011). Wildlife museum is one of the natural history museums that indicate genetic and biological diversity of different animals of every country. Visit of such a museum can be useful to visitors to increase their environmental knowledge especially about animals (Amini and Dorabi, 2011). Today managing

museums entails understanding both the custodial role and the need to attract visitors. As museums are typically part of the not-for-profit sector, depending on government funding for up to 70 percent of their income, they must be seen to offer value to a government by attracting increasing visitor numbers (Gilmore and Rentschler, 2002). Tourism management, defined as "strategies and operational programs which control and regulate the relationship between tourism supply and visitor demand by using appropriate method to reaching goals and policies" (Midelton, 1994), is part of museum management. Three factors should be considered in tourism management, including visitors, local community and environment (ETB, 1991). Over the past two decades, museums have increasingly moved the needs and expectations of their visitors up to the top of their agenda. This concern and the effort to offer a range of quality visitor experiences have arisen from a number of factors. First, visitors, both local and international, themselves have become more sophisticated and selective about where they wish to spend their money and limited leisure time. The expectation of being given value for money has increased the expectation of having a good day out. Even if admission is free, visitors wish to be assured that the time and effort they put into a visit will be rewarded through being entertained, learning something new and feeling welcome and comfortable in the surroundings. There is now plenty of competition to attract visitors away from museums. Museums therefore need to keep their current visitors and encourage new ones, as they have found that the additional income generated from the

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shop, events and from refreshment sales, provides much needed additional financial resources. The rise in visitor figures is a crude but emphatic measure of success and, if sustained, demonstrates clear visitor satisfaction. But also at a deeper level there needs to be a commitment to social responsibility, nation building and cultural identity (Woollard, 2004).In other words, in creating a sustainable future for museums it is evident that adopting a service centric approach has the potential to enhance visitor experience and thus the long term success of museum (Alcaraz et al.,2009). Despite the severe limitations associated with the carrying capacity concept, it remains "a useful concept for environmental management, especially in providing insights about the interaction of human activities with the environment" (Papageorgiou and Brotherton, 1999). Defined as the "maximum number of people that may visit a tourism destination at the same time, without causing destruction of the physical, economic and socio-cultural environment and an unacceptable decrease in the quality of the visitor' satisfaction" (WTO, 1981). Carrying capacity can be an appropriate tool for visitor management in museums. The main objective of this study is to assess the recreational carrying capacity of Darabad museum of Iran as nature and wildlife museum. To meet this objective, 2 major research questions were developed: (1) what is the maximum number of people that should be allowed at Darabad museum? (2) Has the recreation carrying capacity in the museum been exceeded or is it still in the optimum range?

MATERIALS AND METHODS

Study area

The Iran wildlife and nature museum, located in the northeast of Tehran, Darabad area, is one of the Tehran city museums. Darabad museum has an important function across different scales, including urban, province, country, and even beyond the country. In 1993, Darabad museum was established by Tehran municipality with the purpose of introducing natural and cultural heritage of Iran to people, and advance environment conservation. Four years later, in 1997, it was accepted as member of ICOM and IUCN CEC, also in this year it entered to the world Internet. The museum area is about 27950 m[2,] including center saloon in which mammals, reptiles, and amphibian and also valuable stones and minerals are kept, butterfly salon, taxidermy workshop, library, mosque, administrative building, coffee shop and restaurant and finally an outdoor area that is equipped for visitors. There are also cages for keeping alive animals in the outdoor area (Darabad Museum, 2011).

In this study two steps were followed. The first step was gathering information through interview and questionnaire and the second step was estimating the recreation carrying capacity based on the earned information.

Step 1
The number of visitors which was recorded by department of public relations of museum during 2008-2010 was used as primary data. Museum manager, experts, and workers

were interviewed about museum management, their conditions and problems, and also future planning. A total of 103 questionnaires were completed by visitors during week days in July 2012. Visitors were asked about their personal information, group size, visiting time, perception of facilities and sufficient space, and other information.

Step 2
Following first step, by using data that are resulted from questionnaires, research field and interview, the recreation carrying capacity of Darabad museum was estimated. This concept attempts to establish the maximum number of visits that an area can have based on the physical, biological and management conditions of the area. This process takes into consideration three main levels: the physical carrying capacity (the maximum number of visitors that can physically fit into a defined area over a particular time), the real carrying capacity (the maximum permissible number of visits to a specific site, once correction factors derived from the particular characteristics of the site have been applied to the PCC) and the effective or permissible carrying capacity (the maximum number of visits that a site can sustain considering the RCC and the management capacity) (Cifuentes et al., 1999). To apply this method, it is important to consider tourist flows, the size of the area, the optimum space available for each tourist to move freely and the visiting time (Cifuentes, 1992). Based in this model, the physical carrying capacity was determined by the Equation

$$P_{CC} = A*V/a*Rf \qquad (1)$$

(Equation (1)) where PCC is the physical carrying capacity, A is the size of the study/visited area, V/a is the area available per user (its normal number is 1m^2 per user, but depends on recreation area condition is determined by tour leader) R$_f$ is the rotation factor or number of visits per day.

$$Rf = \frac{\text{Opening hours}}{\text{The average length of stay at museum}} \qquad (2)$$

The real carrying capacity was determined using Equation

$$R_{cc} = P_{cc} * \frac{100-cf_1}{100} * \frac{100-cf_2}{100} * \frac{100-cf_x}{100} \qquad (3)$$

(Equation (3)), where RCC is the real carrying capacity, PCC is the physical carrying capacity and cf are the correction factors, determined using the Equation

$$CF_x = \frac{m_x}{M_x} * 100 \qquad (4)$$

(Equation (4)), where CF is the correction factor of variable x, m is the limiting magnitude of variable x and M is the total magnitude of variable x. Considering that Darabad

museum tourism is dependent upon space limitation and some environmental attributes, five correction factors were considered for this study: unavailable area for visitors, greatest daily of perception, number of frost days, number of days with thunder storm, and number of days with snow or sleet, all selected because of their limiting power in the tourism activity, facility of analysis and because of enabling the measurement of the sustainability level of a tourist destination (Cifuentes, 1992; Cifuentes et al., 1999). Data for these parameters was obtained from Iran meteorological organization (2012). Correction factors as follows:

Unavailable area for visitors
The areas which are available for users are including 70 percent of center saloon (1750m^2), 70 percent of butterfly saloon (75.201 m^2), 30 percent of taxidermy workshop (93.942 m^2), 50 percent of library (38 m^2), 100 percent of mosque (47.42 m^2), Trails of outdoor area (5443.78 m^2).Thus, the correction factor for unavailable area was determined as 26.64%.

Number of days with greatest daily precipitation
Run-off is one of the most important problems in the area where Drabad museum is located. The number of days with greatest daily of precipitation can affect mainly the visitor's transportation. The limiting magnitude for this parameter was determined as 12 days/ year with 37 mm on average (IMO,2012), while the total magnitude was the total days of the year (assumed as 365). Therefore, the correction factor for it was determined as 96.71%.

Number of days with minimum temperature equal 0^0 and below
This can be the most important factor for Darabad museum tourism as frost days few people go to the museum. Considering museum location (high elevation and steep slope), frost days cause a great limitation in visitors' access to the museum. The limiting magnitude for this factor was determined as 55 days (IMO,2012) and as a result, the correction factor of this parameter was determined as 85%.

Number of days with snow or sleet
This factor was included as it can largely influence the recreational satisfaction of people in the museum by disturbing their transportation and usage of museum outdoor space. The limiting magnitude was determined as 24 days/year (IMO,2012) with the total magnitude remaining all days of the year (365 days). The corrective factor for this parameter was 93.42%.

Number of days with thunder storm
Thunder storm is another factor that can cause a problem for users who move in the outdoor area and visit animal cages. The limiting magnitude for this parameter was determined as 19 days/ year (IMO,2012). Thus the correction factor of this parameter was calculated 94.8%.

The effective carrying capacity is a result of the combination of the real carrying capacity with the management capacity of the area, as described by the Equation

$$E_{cc} = R_{cc} * \frac{100 - FM}{100} \tag{5}$$

$$FM = \frac{\mathrm{Im}c - Amc}{\mathrm{Im}c} * 100 \tag{6}$$

(Equation (5)), where ECC is the effective carrying capacity, RCC is the real carrying capacity.

(Equation (6)), I$_{mc}$ is the Ideal Management Capacity and A$_{mc}$ is the Actual Management Capacity.
These two last parameters were determined using infrastructure and equipments available, assessed by means of existence condition and ideal condition which should be provided for greatest daily of museum visitor number (851). According to Woollard (2004), when planning and managing visitor services managers must ensure that a strong commitment to effective visitor services is embedded into the organization at all levels. The museum can establish a number of ways in which staff can coordinate, communicate, share expertise, plan and deliver services to the public. In particular it is necessary to involve at least three groups: the Director and other senior management staff, the visitor services team and the museum's communications group. Also, there are some specific areas for attention including inquiries/reception point, cloakrooms for umbrellas, coats and bags/buggies, toilets, cafe or restaurant, the shop, and outdoor area with some equipment. In this study, three factors are considered. The number of benches, toilets and parking lot of museum that support users in comparison with such factors which should support the greatest daily of museum visitor number.

Parking lot
The current capacity of parking space at Darabad museum is 150, which is sufficient for an average of 600 people. While the necessary capacity for 851 people is 213, therefore the correction factor of parking lot is 70%.

Toilet
Drabad museum has 16 toilets for users. According to Maygooni (2001), two toilets are needed for 50 visitors per day. Thus, 34 toilets were calculated for 851 people and the correction factor of 47%.

Bench
There are 102 benches in the outdoor area of museum which are for 306 people. If the capacity of each bench is three, 284 benches will need for 851 people. Thereupon, the correction factor for this parameter is 36%.

RESULT AND DISCUSSION
According to recorded data, the maximum number of Darabad museum visitors per day during three years are shown in figures 1 to 3. The results of questionnaires showed that the majority of visitors were men who were 33 years old from Tehran city, had an M.S. Degree and governmental job with average income between 140 to 270 $ per month. They came as family with average size 3

people in group and personal vehicle. Their aim was more for recreation and learning about wildlife. The average of their visiting time was 2 hours. User's perception about sufficient space for different parts is given in table1. Moreover, their satisfaction of museum parts is showed in table2. Most respondents believed that the outdoor area has sufficient space for users and also were satisfied with it. To assess the recreation carrying capacity of Darabad museum, the three types of carrying capacity were used and the calculations are presented below:

According to data, the Darabad museum covers 27950 m², with visitors flows concentrated in the spring and summer seasons. Considering the area of the museum and its different parts, an optimum area available per user (2 m²) and a rotation factor of 5 (the museum is open daily from 9 a.m. to 7:30 p.m.), the physical carrying capacity was estimated at 69875 visits/day, meaning that the maximum number of people at the museum should never exceed this number. This numbers is only theoretical and incorporating the correction factors is the way used to correct PCC to obtain RCC. Considering the correction factors and after application of Equation (2), the real

carrying capacity was estimated at 13552 visitors/ day, meaning that although a certain amount of visitors can fit in the museum, reality shows a different situation, because as the number of museum visitors increases, visitors feel that the destination is losing quality, the capacity to recover the museum is costly and the environmental quality smoothly decreases its natural properties. Although the carrying capacity has significantly decreased, an important aspect should be included: the management capacity of the museum. The effective carrying capacity (Equation (3)) was calculated as 1605 visitors/day. As suggested by Cifuentes (1992), Cifuentes et al., (1999), Arangunen et al., (2008) and Segrado et al., (2008), these results should not be accepted easily, as interpretation can assume several forms. The 1605 visits/day indicates the number of people that should be allowed in the museum with existing conditions and management capacity, but, during three years (2008-2010) there are not days with much more people in the museum. Generally, tourism as a vehicle of culture, prosperity and peace (Patil & Patil, 2008) must conserve without damaging, protect without plundering and create without destroying.
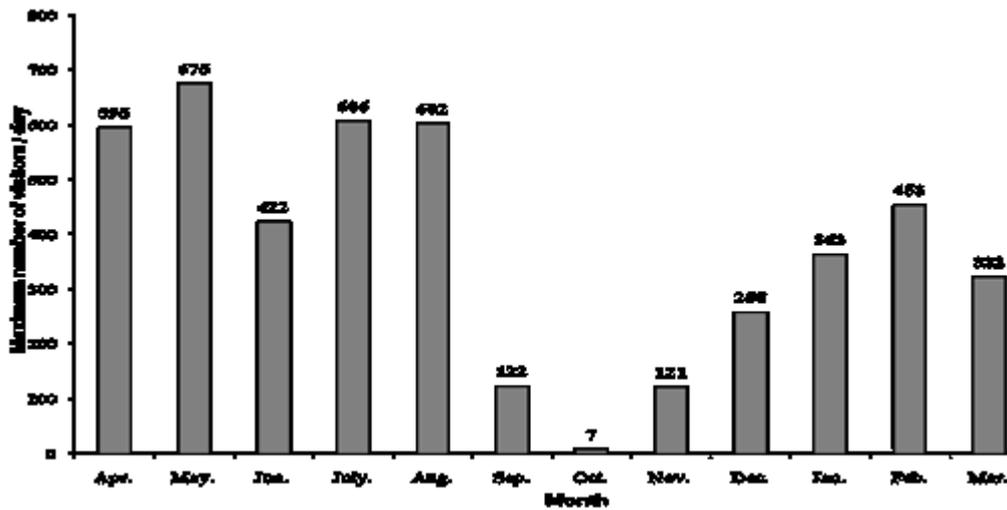

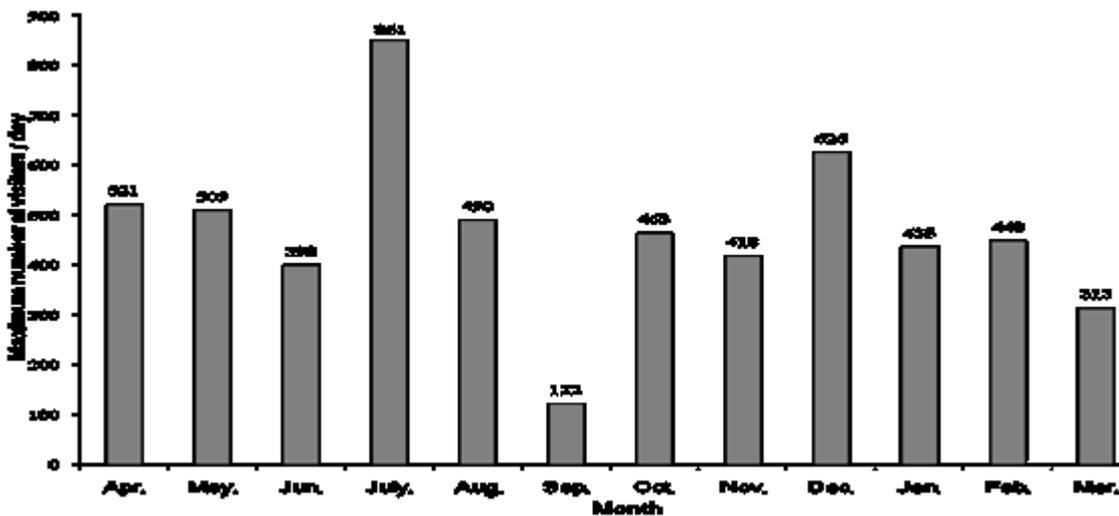Fig1. The maximum number of daily visitors of Darabad museum in 2008

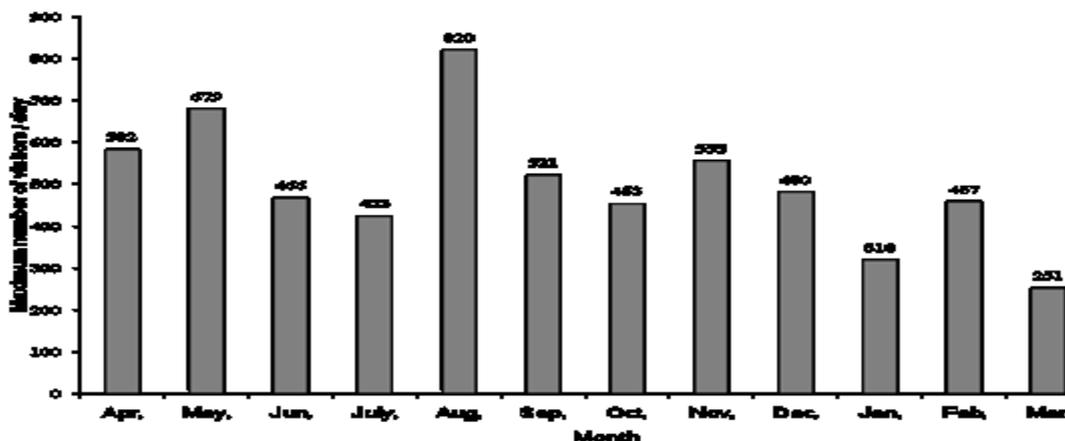Fig2.The maximum number of daily visitors of Darabad museum in daily

Fig3. The maximum number of daily visitors of Darabad museum in 2010

Table1 .Visitors' perception on the sufficient space in different parts

Visited part	M.	SD.	CV.	Yes	somewhat	No	priority
				Amount of sufficient space (%)			**priority**
Outdoor area	2.72	0.531	0.19	76.2	19.8	4.00	1
center saloon	2.61	0.531	0.20	62.9	35.1	2.1	2
Butterfly saloon	2.37	0.658	0.27	46.7	43.5	9.8	3
Taxidermy workshop	2.15	0.691	0.32	32.1	50.6	17.3	4

Table2. Visitors' satisfaction on the visited parts

Visited part	M.	SD.	CV.	Very satisfied	satisfied	Neutral	unsatisfied	Very unsatisfied	priority
				Level of Satisfaction (%)					priority
Outdoor area	4.35	0.737	0.16	45.6	48.5	1.0	4.9	-	1
Mammals, reptiles and amphibian saloon	3.87	0.853	0.22	16.2	66.7	7.1	8.1	2.0	2
Geology saloon	3.87	0.767	0.19	17.8	56.7	20.0	5.6	-	3
Butterfly saloon	3.85	0.773	0.20	13.2	65.9	15.4	3.3	2.2	4
Birds cages	3.51	0.984	0.28	11.3	52.1	12.7	23.9	-	5
Taxidermy workshop	3.46	0.899	0.26	6.2	53.8	21.2	17.5	1.2	6
library	3.29	0.859	0.26	4.2	37.5	45.8	8.3	4.2	7
Animal cages	3.09	1.148	0.37	6.9	44.6	7.9	31.7	8.9	8

CONCLUSION

Both national policy makers and individual staff throughout the museum need to place the visitor at the center of the museum, its services and resources. Visitor management is a great challenge for museum managers and the issue of ascertaining the optimum usage levels of

resources is a great task to be performed. As tourism flows are ever growing, the probability of decreasing the rate of quality of visitor's experience is also increasing and sustainable approaches need to be implemented. Among several approaches, carrying capacity assessment remains one of the most useful and applied techniques. At Darabad museum, the recreation carrying capacity is reported as 1605 visitors/day. This value in comparison with the greatest daily of museum visitor number during three years showed that Darabad museum not only has an appropriate condition but also can support more visitors. However,

1605 visitors/day is not a fixed value and changes over time. For instance, enhancing of management capacity helps managers to support more visitors who are satisfied with their visits. According to the visitors' satisfaction ratings, they believe that outdoor area of museum is a place in which they move freely and enjoy scenes (tables 1 and 2).Thus, density in other parts should be controlled in the acceptable level for visitors. In general, this result showed that the Darabad nature and wildlife museum has been successfully achieved its purpose to connect people with wildlife and enhance their knowledge related to animals.

AKNOLEDGMENT

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