



A REVIEW: STATUS OF CAPTIVE WILD ANIMALS IN SAFARI PARK, KARACHI

M Zaheer Khan¹, *Uzma Imdad¹, Syed Ali Ghalib¹, Kazim Hussain², Salman Zubair³,
Tayyab Raza Fraz⁴, M Usman A Hashmi¹, Amtyaz Safi¹, Nasir Iqbal⁵ and Tahira Lateef¹

¹Wildlife Section, Department of Zoology, University of Karachi-75270, Pakistan

²Safari Park, Karachi

³Department of Geography, University of Karachi, Karachi

⁴Department of Statistics, University of Karachi, Karachi

⁵Adamjee Government Science College, Karachi.

ABSTRACT

Captive breeding is the process of wild animal breeding in controlled condition in zoological gardens, wildlife areas, and other similar wildlife conservation centres like safari park Karachi. In this study, the status of captive animals was studied at the Safari Park. The objective of this study was to evaluate the status of vertebrate fauna and find the key issues for their captive breeding, conservation and management. This study suggested mitigation measures can be used as future planning for development of conservation and management. Since the first induction of captive animals in 1993, the population status of some Endangered species show remarkable increase, which is the breeding success with suitable habitat. Out of total 407 acres of area, about 132 acres of Safari area conserve native threatened mammalian species. Population of Black buck and Spotted deer show enormous increase since their induction. Migratory birds, which also arrived in safari park lake in October and November and stay here till March, 11 migratory species recorded in the year 2016 including White pelican, Dalmatian pelican and Great cormorant. During the study 14 mammalian, 14 birds, two Reptiles and two species of amphibian were observed in the safari park.

Keywords: Captive, mitigation measures, conservation, management.

INTRODUCTION

Globally, captive breeding in zoological gardens, wildlife parks and others similar centres like safari parks, has been undertaken as major tool for conservation of critically endangered, endangered and vulnerable wild animals species. Successful captive breeding practices are continued in Pakistan too and several captive breeding centres are working in different areas of the country under the wildlife departments and local government (Bibi *et al.*, 2011).

Captive breeding can play a crucial role in recovery of some species for which effective alternatives are not available in the short term. However, it should not displace habitat and ecosystem protection nor should it be invoked in the absence of comprehensive efforts to maintain or restore population in wild habitats (Synder *et al.*, 1996).

Despite behavioural defects and physiological stress, the captive animals have significant reproductive success. So

the population size of endangered species increases large enough to allow them to be reintroduced into the wild or exchanged to other private zoos. Wild animals have evolved complex behavioural repertoires which are flexible and extensive enough to cope with the diversity of their natural environments (Barash, 1977).

Collaborative strategies between protected areas (Parks and Reserves) authorities, public, private and non-profit sectors, and indigenous /community stakeholders are consequently perceived to be very important for effective conservation (Akama *et al.*, 2011). The IUCN, Conservation Breeding Specialist Group (CBSG) has recently generated a series of Conservation Assessment and Management Plans (CAMPs) that call for long term captive breeding of numerous taxa (Synder *et al.*, 1996).

Captive breeding at safari's is one of the Ex-situ conservation technique, maintaining the genetic diversity and viable populations of animals. The Black buck, which has become locally Extinct in the wild in Pakistan, was first re-introduced in Lal Suharna National Park, Bahawalpur and successfully bred in captivity.

*Corresponding author e-mail: uzma_imdad@hotmail.com

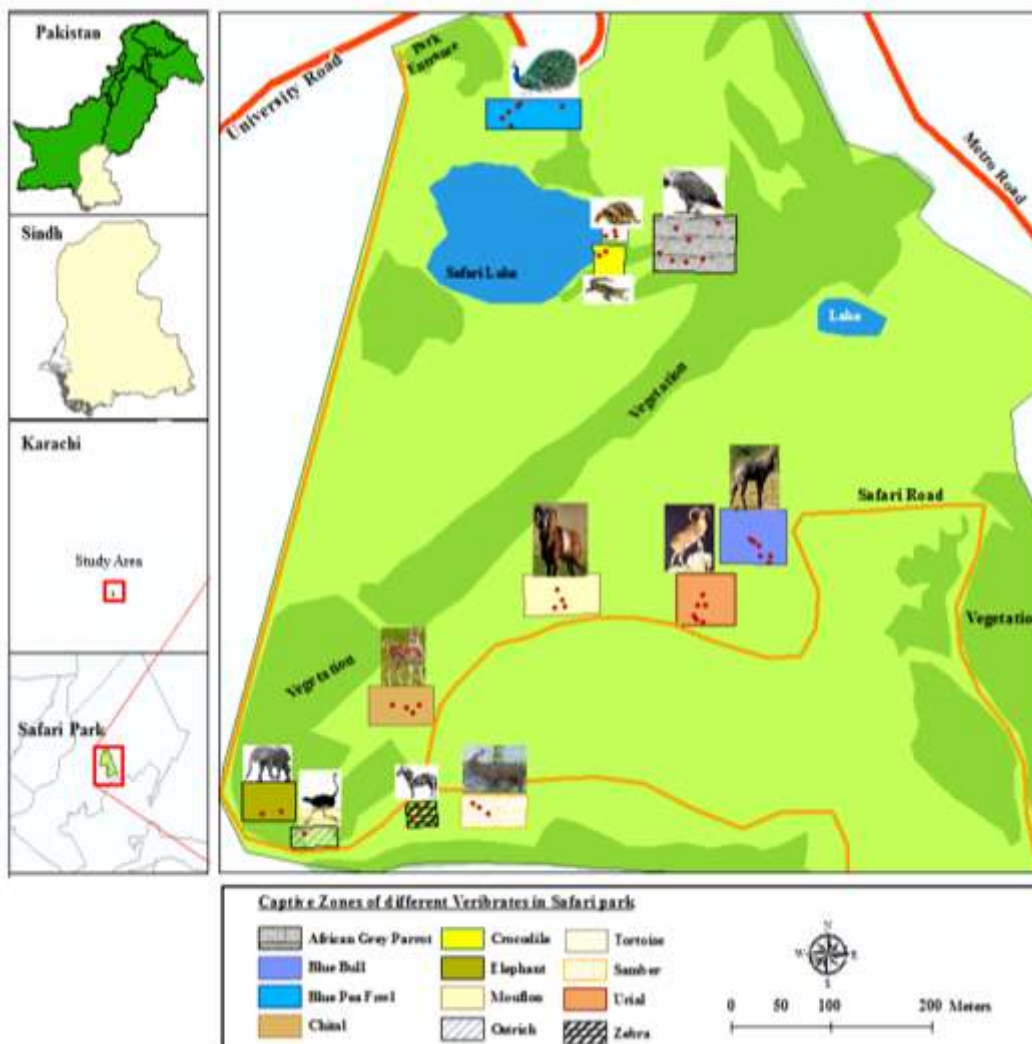


Fig. 1. Map showing Vertebrate Fauna in Safari Park, Karachi.

About 52 private zoos exist in the Sindh province. The Safari Park Karachi (24.92614 N, 067.10883 E) at elevation of 178m is situated in University Road, Karachi. It was inaugurated in 1970 by the Lieutenant General Atiq-ur Rehman and designated as a family park. Now, Safari Park is running as a family park with captive breeding facilities and is managed by the Karachi Metropolitan Corporation. The objective of this study was to review the status of vertebrate fauna and find the rate of successful breeding, key issues for their conservation and management.

MATERIALS AND METHODS

The Safari Park Karachi was selected as the present study site during the period of March 2016 to March 2017. Observations were carried out with the help of binocular and taking photographs and using field guide (Ali and

Ripley, 1983; Grimmett *et al.*, 2008). Important morphological characters like colour of Plumage, legs and shape of the bill were noted. Identification of these water birds was done using standard taxonomic keys (Ali and Ripley, 1987; Bibi *et al.*, 2011).

The animals were observed on monthly basis and their population, general health, natality and mortality were determined. The study area was divided into five sites. Site (i) is front entrance area, Site (ii) safari lake area, Site (iii), Avifauna in captivity, Site (iv), Reptiles in captivity and Site (v), Mammals in Safari area (Fig. 1).

RESULTS AND DISCUSSION

Pakistan has 109 species of small mammals and 65 species of large mammals (Roberts, 2005a, b), 185 reptile species (Khan, 2006; Minton, 1966), 22 species and 4

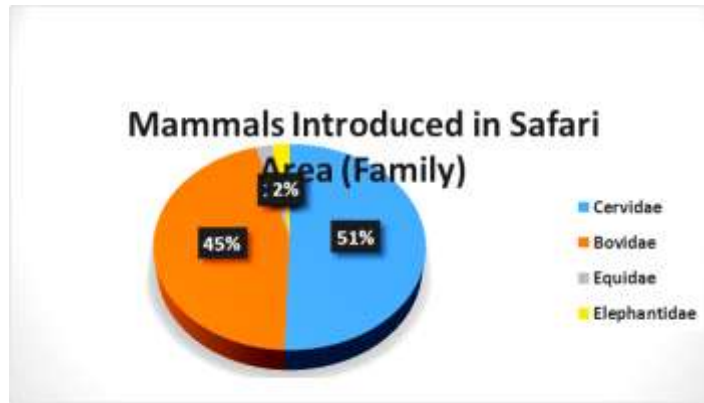


Fig. 2. Population of 14 mammalian species in Safari Area.



Fig. 3. Spotted Deer or Chital.



Fig. 4. Sind Ibex well adapted in hilly area of Safari park.

subspecies of amphibians (Khan, 2006) and 670 species of birds (Roberts 1997; Mirza, 1998; Minton, 1966; Grimmett *et al.*, 2008).

Based on field survey, the dominant vegetation of Safari area included; *Acacia nilotica*, *Acacia senegal*, *Acrotropis procera*, *Azadirachta indica*, *Bauhinia variegata*,

Table 1. Check List of Mammals Introduced in Safari Area of Safari Park.

S. No.	Order/ Family	Common Name	Scientific Name	IUCN RL Status	Year Induct	No. of animals
Order: Artiodactyla						
Family: Cervidae						
1.		Fallow deer	<i>Dama dama</i>	LC	1993	09
2.		Red Deer	<i>Cervus elaphus</i>	RE	1993	07
3.		Sambar Deer	<i>Rusa unicolor</i>	VU	1993	02
4.		Hog Deer or Para	<i>Axis porcinus</i>	VU	1993	03
5.		White Fallow Deer	<i>Cervus dama</i>	LC	1995	14
6.		Spotted Deer or Cheetal	<i>Axis axis</i>	LC	1996	11
Family: Bovidae						
7.		Mouflon	<i>Ovis aries orientalis</i>	VU	1993	04
8.		Chinkara or gazella	<i>Gazella bennetti</i>	VU	1993	06
9.		Blue bull or Nilgai	<i>Boselaphus tragocamelus</i>	EN	1995	06
10.		Black buck	<i>Antilope cervicapra</i>	RE	1996	15
11.		Urial	<i>Ovis orientalis vignei</i>	EN	2012	06
12.		Sind Ibex	<i>Capra aegagrus blythi</i>	NT	2012	04
Order: Perissodactyla						
Family: Equidae						
13		Zebra	<i>Burchelli burchelli</i>	VU	2006	02
Order: Proboscidea						
Family: Elephantidae						
14		African Elephant	<i>Loxodonta Africana</i>	LC	2009	02

Bougainvillea glabra, *Carica papaya*, *Capparis decidua*, *Clerodendrum indicum*, *Cocos nucifera*, *Cactus species*, *Delonix regia*, *Eucalyptus*, *Euphorbia* sp., *Ficus* sp., *Guaiacum officinale*, *Hibiscus rosa sinensis*, *Psidium guajava*, *Polyalthia longifolia*, *Morus* sp., *Syzygium cumini*, *Thespesia populnea*, *Thuja* sp., *Zizyphus nummularia*, *Zizyphus jujuba*, and *Zizyphus malaria*.

In this park first time animals were introduced for captive breeding in 1993 and last Urial and Sind Ibex in 2012. Earlier study, Khan *et al.* (2014) reported that total numbers of animals were 583, of which 372 are mammals, 206 birds and five reptiles. In this study, 14 species of mammals belonging to 3 orders and four families were recorded (Table 1, Fig. 2 and 3).

By observing animals closely, we came to know about their morphological differences and some fascinating facts about these animals. Like Cheetal is so shy and sensitive animal to touch and Cud chewing Artiodactyles, shows they eat quickly and then chew food at safer place. The social behaviour of Artiodactyl shows great herds, maternal family unit, as living in aggregation gives them protection. The hilly safari area provide suitable habitat to Artiodactyles and helps in their breeding (Fig. 4).

It was observed that because of shortage of enclosures some different species were present in the same enclosures. The reason behind keeping them together is the different chromosome number, so they can't have cross breeding.

- Red Deer and White fallow deer together (Fig. 5 and 6)
- Fallow deer and Urial.
- In 1995 the pair of Sambar was introduced and currently only three females of Sambar were living with a single Water buck male and they were so well adjusted and adapted to live together.

The population trends of these captive animals at safari area, the enormous increase in population observed in Spotted Deer (135), Black buck (120) (see Fig. 7, 8 and 9).

Some other animals also show increased breeding rate, like Blue bull (30), Red Deer (20) and Fallow Deer (20) (See Table 2, Figs. 10, 11, 12). The Surplus animals of safari park exchanged to different private and public zoos by the approval of the competent authority. Safari Park also received Chinkara, Urial, and Sind Ibex through animal exchange program.



Fig. 5. Red Deer and White fallow deer fawns in the same enclosure.



Fig. 6. Mutual fights in male species is the main cause of injuries especially during breeding. Red Deer and White fallow deer.

In the gender distribution, male Spotted deer and Black buck show dominant ratio (Fig. 13). While observing the animals nutrition, it was found that a 'Pre mixed feed' is prepared daily in the presence of technical experts. The feed contains grains like Barley (chopped) and compressed, gram, wheat bran and wheat straw, crushed jaggery and supplements which include vitamins, minerals, some essential amino acids, and hormones to enhance the animal's growth and breeding rate. This diet was given once a day in afternoon only. In the morning the animals were given green fodder and Lucerne grass. Green fodder seasonally mixed with corn, millet, barley and sorghum. This dry fodder enhances the digestion and nutritional value of animals. Fresh drinking water is in daily cages and enclosures.

Nilgai (Fig. 14) was found to be resting from 4.00-6.00 pm in the evening, while the Black buck and Chital were

mostly found feeding, moving or running most of the time. Hog deer was found mostly resting all the time but actively feeding in the morning (Khan *et al.*, 2014).

Safari coaches carry visitors into Safari area for watching wild animals from close quarters, to see animals live in an environment closer to their natural habitat (Fig. 15).

The nine year old Pair of Elephants (Fig. 16) at Safari Park, which were imported from Tanzania in 2009. Elephant enclave of about 65,000 square include resting and bathing area.

In 2006, the Pepsi Cola company donated a pair of Zebras to safari park. The female died and currently there is living male with a baby zebra, the foal (Fig. 17).

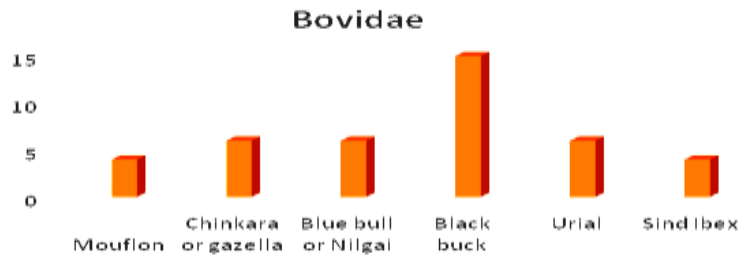


Fig. 7. Status of species of family Bovidae.

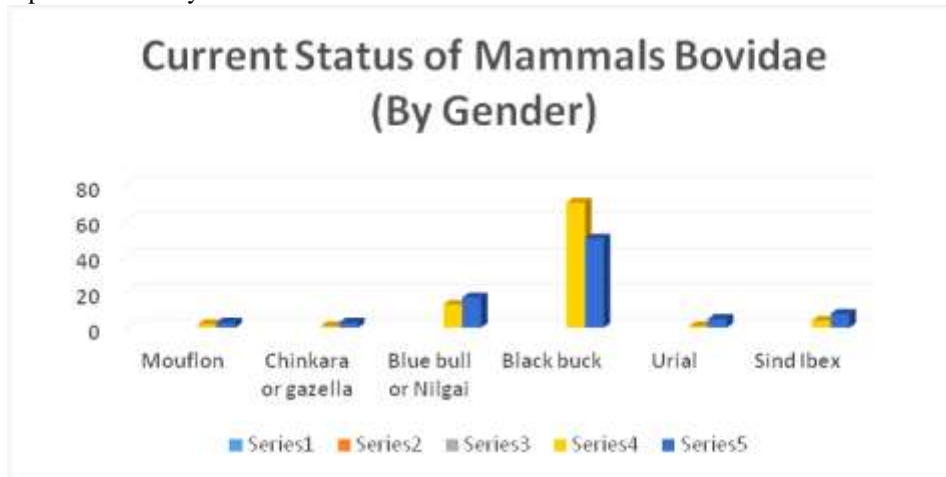


Fig. 8. Status of Mammals Bovidae by gender.



Fig. 9. Regionally Extinct Black buck population showing successful breeding in Safari hilly habitat.

During the study, Near threatened species Marsh Crocodile and vulnerable African spurred tortoises were observed in captivity (Table 3, Fig. 18). The threats of habitat destruction and unregulated hunting for skin has declined their population in the wild areas. So captive

breeding and rearing of these endangered species is a sign of successful conservation.

In Amphibian two common species, Skittering Frog and Marbled Toad were observed (Table 4). Amphibians

Table 2. Status of Mammals in Safari Area in the year of 2016.

S. No.	Order/ Family	Common Name	Scientific Name	Current No. of animals	Ratio M/F	Birth in 2016
Order: Artiodactyla						
Family: Cervidae						
1		Fallow deer	<i>Dama dama</i>	20	4:16	02
2		Red Deer	<i>Cervus elaphus</i>	20	6:14	01
3		Samber Deer	<i>Rusa unicolor</i>	03	0:3	-----
4		Hog Deer or Para	<i>Axis porcinus</i>	06	1:5	-----
5		White Fallow Deer	<i>Cervus dama</i>	14	6:8	04
6		Spotted Deer or Cheetal	<i>Axis axis</i>	135	70:65	22
Family: Bovidae						
7		Mouflon	<i>Ovis aries orientalis</i>	05	2:3	01
8		Chinkara or gazella	<i>Gazella bennetti</i>	04	1:3	----
9		Blue bull or Nilgai	<i>Boselaphus tragocamelus</i>	30	13:17	06
10		Black buck	<i>Antilope cervicapra</i>	120	70:50	19
11		Urial	<i>Ovis orientalis vignei</i>	06	1:5	02
12		Sind Ibex	<i>Capra aegagrus blythil</i>	12	4:8	05
Order: Perissodactyla						
Family: Equidae						
13		Zebra	<i>Burchelli burchelli</i>	02	1:1	-----
Order: Proboscidea						
Family: Elephantidae						
14		African Elephant	<i>Loxodonta Africana</i>	02	1:1	----

being the important source of food for different organisms are a vital link for food Web. They are also bioindicator of environment and reduce a algal bloom.

Safari Avifauna well protected in their enclosures (Table 5). To prevent animals from harsh environmental conditions, some precautionary measures were taken like:

- The birds cages were covered by jute sheath in winter.
- Plastic sheet and bags were also used to cover them.
- In extreme weather, vitamins, electrolytes and minerals were also given to birds to regulate their body temperature.
- Antibiotics were also given when required.
- Dry grass was also kept on the surface of cages in cold environment.

Proper fencing was observed in enclosures (Fig. 19 and 20), which facilities the negative interaction of the viewers in terms of giving food and teasing of animals. Zoonoses is the transmission of disease between animals and humans, so proper fencing covered enclosures also prevent the spread of zoonotic diseases.

The avifauna in safari lake contains Wild ducks (65), Geese (45), Pelicans (26) (Table 6, Fig. 21).

In winter the migratory birds came in safari lake from Siberia. They start coming in the October/ November and stay here till to March. Most of these migratory species are listed in the Convention on International Trade in Endangered species (CITES) (Table 7, Fig. 22).

The avifauna in safari lake contains Wild ducks (65), Geese (45), Pelicans (26) (Table 6, Fig. 21).

It has been observed that the wetland is mostly visited by the winter migratory fauna (Table 7). It is because of the severe cold and non availability of food for their survival in Siberia and other cold areas in Europe (Dar and Dar, 2009). Pelican (Fig. 23 and 24) is the migratory bird visited to safari park every year and stay here between Oct/November to March. The safari park administration provided about 30 kg fish per day to pelicans for diet. The winter visitors are mainly water birds which migrate to Pakistan along the central Asian/ Indus flyway No. 4 during the migratory season. January is the peak season for these birds (Ghalib *et al.*, 2013). On a Spatial scale, it was observed as a general trend that the birds, preferred sites with ample, food and least human disturbance (Vyas and Veerwal., 2014), similar observation noted in the present study.

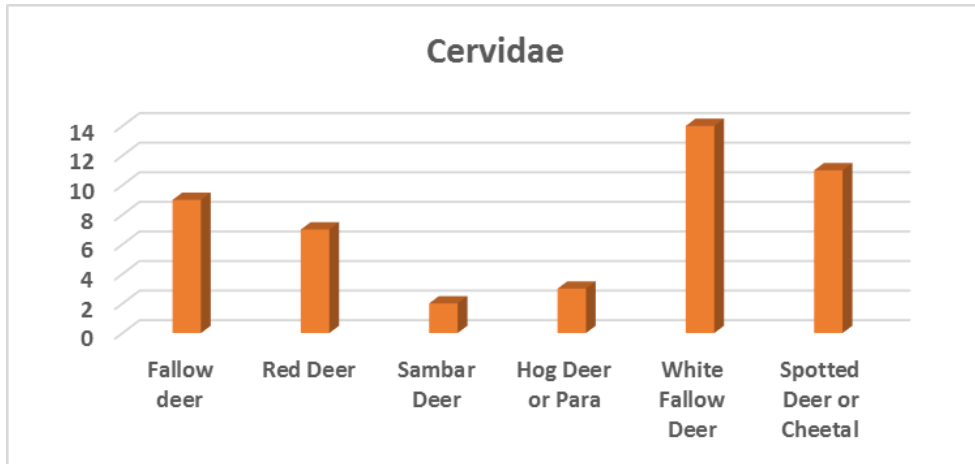


Fig. 10. Status of species of family Cervidae.

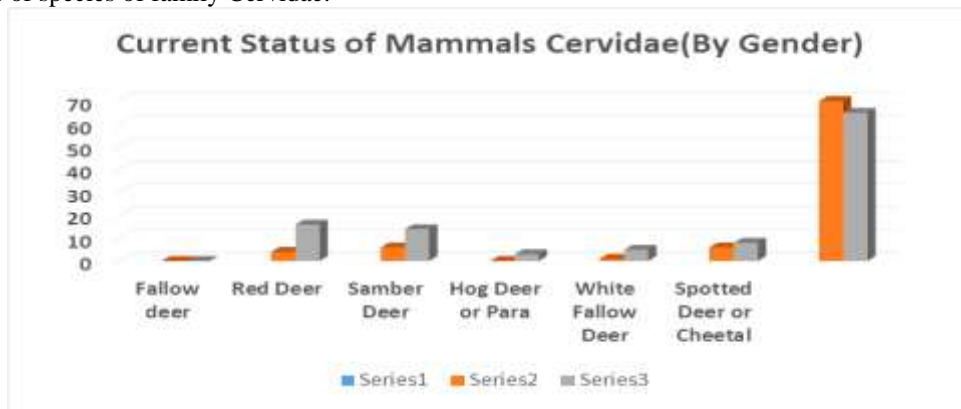


Fig. 11. Status of Mammals of Family Cervidae by gender.



Fig. 12. Red Deer in Safari hilly Area.

The frequently seen waterbirds in Safari Lake are Mallard, White Pelicans, Cattle egret, Gadwall, Ruddy Shelduck including some other common birds (Table 8). In the Safari Park some threatened species were also observed in captivity (Table 9).

Key Issues

The present study revealed the following key issues:

- Lack of emphasis on research, education and animal welfare sciences.
- No information booklet available for visitors.
- Huge unutilized barren safari area.

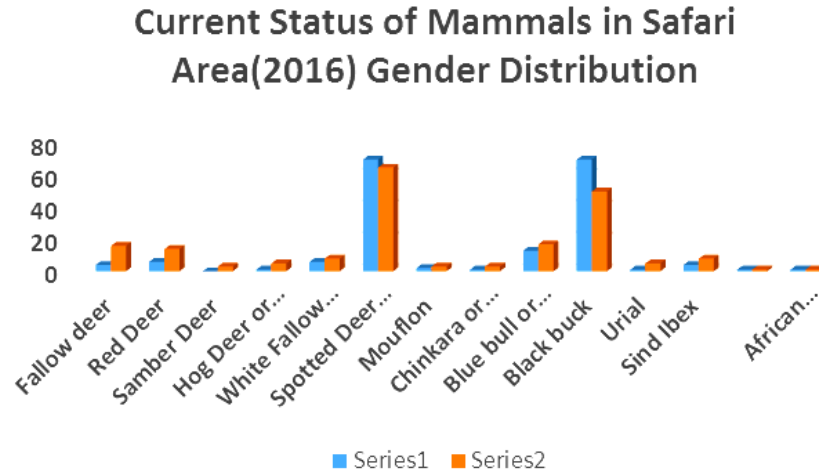


Fig. 13. Status of Mammals in Safari Area with gender distribution.



Fig. 14. The bluish -grey male Blue bull or Nilgai.

- Lack of vegetation and environment closer to wild habitat in safari area.
- Shortage of trained, skilled staff and experts.
- Excessive number of kites and crows in Safari area.
- Different species living in same enclosures.
- Unavailability of the partners of some species.
- Maximum vegetation in front area, like that of *Conocarpus erectus* which is not environment healthy.

Mitigation Measures/ Recommendations

1. Safari park for Educational/ Entertainment Purpose

Visitors especially children should get ample opportunities to learn about different animals. Fun and

interactive educational knowledge to visitors, multimedia educational displays and educational themes can be interactive elements which can provide great learning for kinesthetic learners.

2. Safari Park as Wildlife Conservation Research Centre

By developing In-situ conservation programs, there can be a focus on limited gene pool of captive animals. These conservation research programs should be used to protect the threatened species with particular emphasis on Critical Endangered species, Behavioural husbandry, Ecology and for animal's welfare.

3. Wildlife Expert Guides

To make watching wildlife a recreational outdoor activity, there should be trained guides in Safari buses, to provide



Fig. 15. A view of Safar Park Entrance Gate.



Fig. 16. African Elephant in Safari Park.

detailed information to visitors about wild animals with scientific background.

4. Utilization of huge barren Safari Area

In future with the collaboration of government and private stake holders, the huge unutilized safari area can be used for making Natural History Museum, Dolphin watching safaris etc.

5. Providing Dense Vegetation near to the Natural Habitat

By focusing on topographic study of safari hilly area, it can be converted to grassy hills with dense vegetation. This will enhance the environment and general health of captive animals. Modifications in water supply regimes can also enhance vegetation. Tree guards in road side areas are also required but it needs financial assistance.



Fig. 17. Zebra in Safari area.

Table 3. List of Reptiles in Captivity.

S. No.	Order	Family	Common Name	Scientific Name	IUCN RL Status	No. of animals
1.	Crocodylia	Crocodylidae	Mugger crocodile	<i>Crocodylus palustris</i>	NT	02
2.	Testudines	Testudinidae	African Spurred Tortoise	<i>Geochelone sulcata</i>	VU	05

6. Skilled and Trained Education Officers and Experts

For Educational programs there is a need of qualified Zoologist as education officer. For the proper care of animals on scientific basis, as urgent basis more veterinarian and skilled care takers are required according to number of animals.

7. Enclosure Designing

The animal enclosures should provide animals their natural environment along with providing the visual detail to visitors. Keen emphasis and focus is required in this regard, as animal's housing and husbandry also stimulate the animals physically and psychologically.

8. Avoidance of Stereotype behaviour

Among captive animals, the stereotype behaviour in the form of pacing, swaying and even self mutilation are common. Providing opposite gender and keeping same

species together will not only give out come in the form of successful breeding, but will also improve the animals well being.

9. Eradications of Excessive Kites and Crows

Excessive kites and crows in Safari area are threats to animals in open enclosures. These avifauna sit on the back of animals and while trying to remove ticks, causes persistent bleeding and wounds. It cause entrance of pathogens in animal's body and thus results infections.

So by proper eradication measures, can minimize this issue.

10. Planting Indigenous species to restore Ecological balance

The dominant vegetation in the front of safari area, *Conocarpus erectus*, is not environment and avifauna



Fig. 18. The Land dwelling African Spurred Tortoises.



Fig. 19. Guinea Fowl in Captivity.

Table 4. List of Amphibian in Safari Lake.

S. No.	Order	Family	Common Name	Scientific Name	IUCN RL Status
1	Anura	Ranidae	Skittering Frog	<i>Euphlyctis cyanophlyctis</i>	NE
2	Anura	Bufoidea	Marbled Toad	<i>Duttaphrynus stomaticus</i>	NE

friendly as it blocks the growth of other plants. It needs quite a lot of water and causes allergy.

So planting indigenous species can restore the ecological balance and improve the avian biodiversity.

11. Reinforcement of Security Measures

Strict security measures are required to make safari park a safe recreational educational place. So that educated

people may develop interest and have access without any hesitation. Being a family park, teenagers in school, college uniforms should not be allowed to enter in order to maintain the good reputation of the park.

CONCLUSION

Captive breeding is one of the best tool to ensure future wild animals existence, and safari park Karachi plays

Table 5. Birds in Captivity in Safari Park.

S. No.	Order/ Family	Common Name	Scientific Name	No. of Birds	Ratio M/F
Order: Galliformes					
Family: Phasianidae					
1		Wild Turkey	<i>Meleagris gallopavo</i>	10	3:7
2		Blue Pea Fowl	<i>Pavo cristatus</i>	06	4:2
3		Black shoulder Peacock	<i>Pavo cristatus</i>	06	4:2
Order: Phoenicopteriformes					
Family : Phoenicopteridae					
4		Greater Flamingo	<i>Phoenicopterus ruber</i>	04	2:2
Family: Gruidae					
5		Demoiselle Crane	<i>Grus virgo</i>	02	1:1
6		Black crowned crane	<i>Balearica pavonina</i>	02	1:1
Family: Numididae					
7		Guinea Fowl	<i>Numida meleagris</i>	04	2:2
Order: Anseriformes					
Family : Anatidae					
8		Black Swan	<i>Cygnus atratus</i>	02	1:1
Order: Struthioniformes					
Family : Struthionidae					
9		Ostrich	<i>Struthio camelus</i>	01	0:1
Order: Psittaciformes					
Family : Psittacidae					
10		African Grey Parrot	<i>Psittacus erithacus</i>	07	-----
11.		Budgerigar	<i>Melopsittacus undulatus</i>	30	-----



Fig. 20. Captive Avifauna of Safari Park, Black crowned Crane.

important role as captive breeding centre for the conservation of native species in the province of Sindh. Presently, safari park Karachi has 14 Mammalian, 14

Birds, two Reptiles and two species of Amphibian, and successfully supports captive breeding of Spotted Deer, Black buck, Blue bull, Red Deer and Fallow Deer.

Table 6. List of Avifauna in Safari Lake.

S. No.	Order	Family	Common Name	Scientific Name	No. of Birds
1	Anseriformes	Anatidae	Wild Duck	<i>Anas sp</i>	65
2	Anseriformes	Anatidae	Goose	<i>Anser</i>	45
3	Pelecaniformes	Pelecanidae	White or Rosy Pink Pelican	<i>Pelicanus onocrotalus</i>	26

Table 7. List of Migratory Birds in Safari Lake.

S. No.	Order/Family	Common Name	Scientific Name	IUCN RL Status
Order: Pelcaniformes				
Family: Pelecanidae				
1.		White Pelican	<i>Pelicanus onocrotalus</i>	LC
2.		Delmatian Pelican	<i>Pelicanus crispus</i>	VU
Family: Phalacrocoracidae				
3.		Great Cormorant	<i>Phalacrocorax carbo</i>	LC
Order: Ciconiformes				
Family: Ardeidae				
4.		Cattle egret	<i>Bubulcus ibis</i>	LC
Order: Anseriformes				
Family: Anatidae				
5.		Pintail	<i>Anas acuta</i>	LC
6.		Mallard	<i>Anas platyrhynchos</i>	LC
7.		Gadwall	<i>Anas strepera</i>	LC
8.		Ruddy Shelduck	<i>Tadorna ferruginea</i>	LC
9.		Common Shelduck	<i>Tadorna tadorna</i>	LC
10.		Common Pochard	<i>Aythya ferina</i>	VU
11.		Common Teal	<i>Anas crecca</i>	LC

Avifauna in Safari Lake

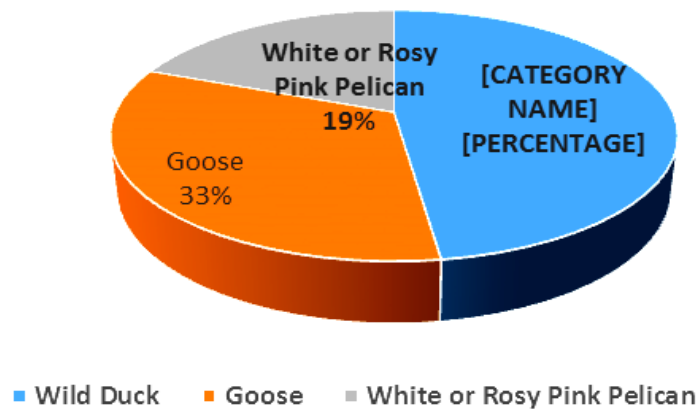


Fig. 21. Composition of Avifauna in Safari Lake.



Fig. 22. Safari lake with Ducks and Geese is site for Migratory birds.



Fig. 23. Dalmatian Pelicans are common winter migratory birds of Safari Lake.



24. Another view White or Rosy pink pelican at Safari Lake

Table 9. List of Threatened Species in Safari Park.

S. No.	Animal Group	IUCN Red List Status
	Mammals	
1	Red Deer	(RE)
2	Samber Deer	(VU)
3	Hog Deer	(VU)
4	Mouflon	(VU)
5	Chinkara	(VU)
6	Blue Bul or Nilgai	(EN)
7	Black Buck	(RE)
8	Sind Ibex	(NT)
9	Zebra	(VU)

Continued...

S. No.	Animal Group	IUCN Red List Status
	Birds	
1.	Delmatian Pelican	(VU)
2.	Common Pochard	(VU)
	Reptiles	
1	Marsh Crocodile	(NT)
2.	Spurred Tortoise	(VU)

Legend:

RE-Regionally Extinct, VU- Vulnerable, EN- Endangered, NT- Near Threatened.

ACKNOWLEDGMENTS

This work could not have been done without the assistance of the Safari Park Administration. We want to thank Dr. Kazim Hussain, Additional Director, Safari Park, Karachi and everyone who helped and made necessary arrangements in this study.

REFERENCES

- Akama, JS., Maingi, S. and Camargo, BA. 2011. Wild life conservation, Safari Tourism and the role of Tourism Certification in Kenya: A postcolonial critique. *Tourism Recreation Research*. 36(3):281-291.
- Ali, S. and Ripley, SW. 1983. *Hand book of Birds of India and Pakistan*. Oxford University Press, Karachi.
- Ali, S. and Ripley, SS. 1987. *Compact Handbook of the Birds of India and Pakistan*. Oxford University Press, Delhi, Oxford, New York. pp737.
- Barash, D. 1977. *Sociobiology and Behaviour*. Elsevier, New York, USA.
- Bibi, ZAF, Mahel, AQ., Firdous, F. and Zamaan, SU. 2011. Captive Breeding Practices in Pakistan. *The Journal of Animal and Plant Sciences*. 21(2 Suppl.):368-371.
- Dar, AI., Dar, AM. 2009. Seasonal Variations of Avifauna of Shallabug Wetland, Kashmir. *Journal of Wetland Ecology*. 2:20-34.
- Grimmett, R., Roberts, T. and Inskipp, T. 2008. *Birds of Pakistan*. Christopher Helm, London.
- Ghalib, SA., Hussain, SE., Khan, MZ., Damhoureyeh, SA., Yasmeen, R., Zehra, A., Fatima, F., Hussain, B., Siddiqui, S., Abbas, D., Tabbassum, F., Samrean, N., Khan, AR., Jabeen, T., Hashmi, MUA. and Hasnain, SA. 2013. An overview of occurrence, distribution and status of the Birds of Khirthar Protected Area Complex. (KPAC). *Canadian Journal of Pure and Applied Sciences*. 7(3):2515-2532.
- Khan, MS. 2006. *Amphibian and Reptiles of Pakistan*. Krieger Publishing Company. Krieger drive Malabar, Florida, USA. 42-242.
- Khan, MZ., Samrean N., Ghalib, SA., Zehra, A., Hussain, B., Tabbassum, F., Begum, A. and Latif, TA. 2014. Biology and Behaviour Study of Chinkara, Cheetal, Nilgai, Black buck and Hog deer in captivity in Karachi Zoo and Safari Park. *International Journal of Biology and Biotechnology*. 11(2-3):341-349.
- Minton, SA. 1966. A Contribution to the Herpetology of West Pakistan. *Bull. Amer. Mus. Nat. Hist.* 134:24-184.
- Mirza, ZB. 1998. *Illustrated hand book of Animal Biodiversity of Pakistan*. Centre for Environmental Research and Conservation, Islamabad. pp99.
- Roberts, TJ. 1997. *The Mammals of Pakistan*. (Revised edi.). Oxford University Press, Karachi.
- Roberts, TJ. 2005^a. *Field guide to the small mammals of Pakistan*. Oxford University Press, Karachi, Pakistan. pp280.
- Roberts, TJ. 2005^b. *Field guide to the large and medium-sized mammals of Pakistan*. Oxford University Press, Karachi, Pakistan. pp260.
- Synder, NFR., Derrickson, SR., Beissinger, SR., Wiley, JW., Smith, TB., Toone, WD. and Miller, B. 1996. Limitations of Captive Breeding in Endangered Species Recovery. *Conservation Biology*. 10(2):338-348.
- Vyas, V. and Veerwal, H. 2014. Spatial variations of Water bird Diversity at UPPER Lake, a Ramsar Site in Bhopal, M.P., India. *Journal of Natural Sciences Research*. 4(23):123-130.

Received: March 11, 2017; Revised: May 31, 2017;
Accepted: June 2, 2017

Copyright©2017. This is an open access article distributed under the Creative Commons Attribution Non Commercial License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

The full text of all published articles published in Canadian Journal of Pure and Applied Sciences is also deposited in Library and Archives Canada which means all articles are preserved in the repository and accessible around the world that ensures long term digital preservation.