

BIOLOGY AND BEHAVIOUR STUDY OF CHINKARA, CHEETAL, NILGAI, BLACKBUCK AND HOG DEER IN CAPTIVITY IN KARACHI ZOO AND SAFARI PARK

M. Zaheer Khan, Naseem Samreen, Syed Ali Ghalib, Afsheen Zehra, Babar Hussain, Fozia Tabbassum, Abeda Begum and Tahira Abdul Latif

Department of Zoology (Wildlife Section), University of Karachi, Karachi-75270, Pakistan.
E-mail: zaheerk2k@yahoo.com

ABSTRACT

In this study, biology and behavior of Nilgai (*Boselaphus tragocamelus*), Chinkara (*Gazella bennettii*), Hog Deer (*Axis porcinus*), Blackbuck (*Antelope cervicapra*) and Chital (*Axis axis*) was studied at the Safari Park and Karachi Zoo. During the four year period from 2009-2012, the overall breeding success in target species was studied which in Karachi Zoo was from 03 to 06 in case of Hog Deer, from 09 to 13 in Nilgai, from 14 to 18 in Blackbuck and in Chital from 05 to 09. In Safari Park, the overall increase in the number of Hog Deer was from 14 to 21, in Nilgai it was from 31 to 36, in Blackbuck, it was from 44 to 65, in Chital from 64 to 86, and in Chinkara from 07 in 2011 to 08 in 2012. It was also observed that captive animals develop different kind of behaviour depending upon the environment provided. In Zoo, where space is small, they develop repetitive and purposeless behavior like wandering to and fro and self grooming but in the Safari Park due to enough space and better living conditions they are more active in comparison to the Zoo where they are less responsive and mostly resting. Safari Parks and Zoos have a capability to become centers for animal behavioral.

Keywords: Biology and Behaviour, Captivity, Karachi Zoo, Safari Park.

INTRODUCTION

Animals are very important part of our biodiversity. They are the living part of our colorful nature and have always fascinated human imaginations and figure abundantly in literature and art and craft. Pakistan has 188 species of mammals (Roberts, 1997), 670 species of birds (Roberts, 1991-1992; Khan, 2006), 185 species of reptiles, and 22 species of amphibians (Khan, 2006).

Those mammalian species which have become extinct in Pakistan due to overhunting, industrialization, climate change, habitat loss, competition from other species, deforestation, increasing human population include; Asiatic Lion (*Panthera leo*), Indian Tiger (*Panthera tigris*), Swamp Deer (*Cervus duvauceli*), Kashmir Stag (*Cervus hanglu*), Asiatic Rhinoceros (*Rhinoceros unicornis*), Asiatic Cheetah (*Acinonyx jubatus*), and Wild Ass (*Equus hemionus*) (Roberts, 1997).

Safari Parks and Zoological gardens are the places where a number of animals are kept. Mostly people think about zoos and safari parks as places for relaxation and entertainment, but now these have become places for wildlife conservation. Zoos and Safari Parks are playing a vital role to increase animal numbers through captive breeding. Zoos generally contain caged animals, while Safari Park is an enclosed park in which large animals are kept encaged in the open and these can be viewed by the public from car etc. The Safaris contain large enclosures and provide natural environment for the animals.

Globally, in order to save the threatened species from extinction, two conservation techniques are used, viz. In-situ conservation and Ex-situ conservation. In In-situ technique, animals are conserved, while they remain in their natural habitat. In the Ex-situ technique, animals are removed from the natural habitat and kept in zoos, and Safaris etc for their captive breeding. There are variety of techniques used in Ex-situ conservation, for example seed bank, sperm bank, gene bank, and captive breeding programs.

In Zoos, captive breeding programs are introduced to provide safe and secure environment to endangered animals to mate, reproduce and increase their population. Captive population is established for: conservation education, exhibition of exotic species, scientific research, saving the threatened species from extinction and reintroduction of animals back into the wild areas.

The aim of captive breeding program for Endangered Species is to produce captive populations big enough to be demographically stable and genetically healthy. This means maintaining healthy age structure and ensuring that reproduction is successful for protecting the population against disease and preserving the gene pool to avoid the problems of inbreeding (National Zoo, 2012). In this context, there are some success stories. Blackbuck, which was once plentiful in Pakistan but became Extinct in the wild, has been successfully bred in captivity in USA. The Arabian Oryx, *Oryx leucoryx* which extremely declined in numbers in Arabian Peninsula was successfully bred in

captivity in Phoenix Zoo, USA. Houbara Bustard declining in Pakistan has been successfully bred in captivity in UAE. Recently, Blackbuck and Nilgai have successfully bred in captivity in Safari Park, Karachi and Marsh Crocodile has bred in Karachi Zoo and Haleji Lake. The other premium associated with captive breeding is to raise the benefit of some fast breeding species for human consumption. This has been successfully done in some species of ducks, parrots, pigeons and others small birds. It has also improved the number of wild species of carnivores that can breed in captivity.

Some work has been done on Zoos and captive breeding in Pakistan by Ali *et al.* (2011), and Ayaz *et al.* (2012). A number of Zoos, Safari Parks and Wildlife Parks have been established in Pakistan. In Sindh, the Karachi Zoo and the Safari Park, Karachi and the Soofi Anwar Shah Safari Park, Mirpur Mathelo are the main areas established as the captive breeding centers. As regards the present study, the following two study sites were selected for the study of biology and behavior of five mammalian species.

Karachi Zoological Garden

The site is situated on Nishter Road, Karachi, located at 24.87622° N, 67.023203° E (Fig. 1). It covers an area of 33 acres and was established in 1878. There are more than 150 cages for animals. It also contains reptile house, aquarium, veterinary hospital, and zoological museum. Karachi Zoo has 29 species of mammals, 23 species of birds, 09 species of reptiles, 12 species of fishes and 13 species of plants. It is the 2nd oldest Zoo in the country after the Lahore Zoo.

Safari Park, Karachi

Safari Park is situated at the main University Road, Karachi, at 24.92°N and 67.11°E (Fig.1). It occupies an area of 407 acres and it was inaugurated in 1970. It has been designed as a family park. Safari Park remains overcrowded all the year round especially on weekends and during summer and winter vacations. The total numbers of animals present is 583, of which 372 are mammals, 206 birds and 05 reptiles. There are 19 species of mammals (Table 1), 11 of birds (Table 2) and 02 of reptiles (Table 3), and 15,000 plants are present there. The Safari area consists of gardens, Zoo, Adventure Park, Amusement area, Kids Play Land and artificial lake. Safari Park has a nice, well maintained safari area. The safari area covers an area of 30 to 53 acres. The land of Safari Park is rocky and sandy. Basically it is a hilly area.

MATERIAL AND METHODS

The Karachi Zoological Garden (KZG) and Safari Park, Karachi (SPK) were selected as the study sites during the year 2009 - 2012. Information was collected from the animal incharge, curators, zoologists and veterinary doctors in Zoo and Safari Park. The mean annual maximum and minimum temperatures were noted along with annual rainfall data. Site maps of Zoo and Safari Park guided to locate the enclosures and the cages of various animals. For study, the animals were observed in the enclosures from a distance of 10-15 m. The animals were observed from outside of the cages in the Zoo but in the Safari from within the enclosures. The behavior of the species was thus noted and some times, the animal behavior was also noted through binoculars from the nearby hilly area / slope present at the back of the Safari area. The quality and quantity of diet given to the animals was also noted. The total area of the enclosure and habitat was also noted. Visits were made to both the sites at least once a month but during the breeding season of the animals, fortnightly visits were made to collect the data about the breeding biology of the animals. Animals were noted, while feeding and drinking water, from 10.00 to 11:00 am in the morning and from 4:00 to 6:00 pm in the evening. Field work was done mostly during summer season (May-July) in view of the breeding season of most of the species. The animal behavior in captivity was observed particularly during those days and at times when visitors were present.

RESULTS AND DISCUSSION

Average temperature in Zoo and Safari Park during summer is 27.8° to 32°C and during winter 14°to 20°C. Average humidity in Zoo and Safari is 60 to 80% in summer and 40 to 50% in winter. Average rain fall during summer is 22 to 66mm and during winter 1 to 6mm.

During the study period, the bioecology, feeding, habits, survival rate and conservation of Zoo and Safari mammals in captivity was noted in Hog Deer, Nilgai, Blackbuck, Chital and Chinkara. About 261 captive mammals were studied, which included 85 Chital in Safari Park, and 09 in Zoo, 65 Blackbuck in Safari Park and 18 in Zoo, 36 Nilgai in Safari Park and 13 in Zoo, 21 Hog Deer in Safari Park and 06 in Zoo, and 08 Chinkara in Safari Park. It was noted that the animals often remain in artificial shade/ manmade shade on hot day. Sometimes animals run

towards the shade whenever any person or curator enters the enclosures. The supervision by the curators plays a vital role for the better growth and development of animals in captivity because curator is like a family member. The presence of an animal keeper can influence the behavior and location of captive animals. The animals feel any disturbance or danger due to the presence of Zoo staff. The animal behavior was noted during different times of the day in Zoo and Safari Park. It was noted that

Table 1. Checklist of Mammals in Safari Pak.

S. No.	Common Name	Scientific Name
1	Blackbuck	<i>Antilope cervicapra</i>
2	Nilgai	<i>Boselaphus tragocamelus</i>
3	Mouflon	<i>Ovis aries orientalis</i>
4	Chinkara	<i>Gazella benettii</i>
5	Water Buck	<i>Deffasa deffasa</i>
6	Eland	<i>Taurotragus oryx</i>
7	Urial	<i>Ovis orientalis</i>
8	Sindh Ibex	<i>Capra aegagrus</i>
9	Camel	<i>Camelus dromedaries</i>
10	Llama	<i>Gunaco sp.</i>
11	Fallow Deer	<i>Dama dama</i>
12	Red Deer	<i>Cervus elaphus</i>
13	Hog Deer	<i>Axis porcinus</i>
14	Sambar Deer	<i>Rusa unicolor</i>
15	White Fallow Deer	<i>Dama alba</i>
16	Elephant	<i>Loxodonta africana</i>
17	Zebra	<i>Burchelli burchelli</i>
18	Pony	<i>Equus ferus caballus</i>
19	Horse	<i>Equus equus</i>

Table 2. Checklist of Birds in Safari Pak.

S. No.	Common Name	Scientific Name
1	Ostrich	<i>Struthio camelus</i>
2	Ring Dove	<i>Streptopelia decaocto</i>
3	Black Shoulder Peacock	<i>Pavo cristatus</i>
4	Blue Peacock	<i>Pavo cristatus</i>
5	White Peacock	<i>Pavo cristatus</i>
6	Houbara Bustard	<i>Chlamydotis undulata</i>
7	Grey Parrot	<i>Psittacus erithacus</i>
8	Black Swan	<i>Cygnus atratus</i>
9	Demoiselle Crane	<i>Grus virgo</i>
10	Falcon	<i>Falco sp.</i>
11	Wild Duck	<i>Anas sp.</i>

Nilgai was found to be resting from 4:00-6:00 pm in the evening, while the Blackbuck 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.

Table 3. Checklist of Reptiles in Safari Pak.

S. No.	Common Name	Scientific Name
1	Tortoise	<i>Geochelone sulcata</i>
2	Crocodile	<i>Crocodylus palustris</i>

Table 4. Checklist of Mammals in Karachi Zoo.

S. No.	Common Name	Scientific Name
1	Asiatic Black Bear	<i>Ursus thibetanus</i>
2	Bengal Tiger	<i>Panthera tigris</i>
3	Monkey	<i>Macaca mulatta</i>
4	Zebra	<i>Equus burechelli</i>
5	Lama	<i>Lama gunaca</i>
6	Sika Deer	<i>Cervus Nippon</i>
7	Black Buck	<i>Antilope cervicapra</i>
8	Wild Cat	<i>Felis chaus</i>
9	Hog Deer	<i>Axis porcinus</i>
10	Chital	<i>Axis axis</i>
11	Elephant	<i>Loxodonta africana</i>
12	Lion	<i>Panthera leo</i>
13	Chimpanzee	<i>Pan troglodytes</i>
14	Golden Langur	<i>Samnopithecus entellus</i>
15	Leopard	<i>Panthera pardus</i>
16	Wallaby	<i>Wallabia bicolor</i>
17	Olive Baboon	<i>Papio Anubis</i>
18	Indian Jackal	<i>Canis aureus</i>
19	Raccon	<i>Procyon totor</i>
20	Red Fox	<i>Vulpes vulpes</i>
21	Nilgai	<i>Boselaphus tragocamelus</i>
22	Arabian Oryx	<i>Oryx sp</i>
23	Camel	<i>Camelus dromedaries</i>
24	Giraffe	<i>Giraffa camelopardalis</i>
25	Porcupine	<i>Hystrix indica</i>
26	Mouflon	<i>Ovis orientalis</i>
27	Red Deer	<i>Cervus elaphus</i>
28	Striped Hyena	<i>Hyaena hyaena</i>
29	Sind Ibex	<i>Capra aegagrus</i>

In the morning, water tankers fill all the pools in the enclosures and also water the plants. Vegetation in Safari Park is scarce. Most of the enclosure are barren, therefore trees have been planted (cover with wire gauzes) to give shade in Blackbuck and Chital enclosure, while in the enclosures of Nilgai, Chinkara, and Hog Deer lot of natural vegetation is present. In Safari Park, the feed given to the animals consists of Lucern, Grains, Chaff, Wheat Straw in the morning (9:00-11:00 am). All subject animals eat food during the morning and evening time. How much food an individual ruminant ingests per day depends on the time spent in feeding. The time available for feeding may limit an individual's daily forage intake and therefore affect its body condition, reproductive success and survival (Bruno and Lovari, 1989). On the basis of published behavior pattern of Musk Deer (Sheng and Ohtaishi, 1993; Zhang,

1979; Aryal, 2005; Meng *et al.*, 2010), behavior observations were made to establish the ethogram and behavior of the captive animals (Table 7).

Table 5. Checklist of Birds in Karachi Zoo.

S. No	Common Name	Scientific Name
1	Golden Blue Macaw	<i>Ara macao</i>
2	Mealy Amazon	<i>Amazone forinosa</i>
3	Orange Amazon	<i>Amazone amazone</i>
4	Pantagonian Concore	<i>Cyaolises pantagonus</i>
5	Alexandrine Parakeet	<i>Pisttacula eupatria</i>
6	Roseringed Parakeet	<i>Pisttacula krameri</i>
7	Blue Peacock	<i>Pavo cristatus</i>
8	White Peacock	<i>Pavo cristatus alba</i>
9	Green Peacock	<i>Pavo cristatus</i>
10	Ring Dove	<i>Streptopelia decaocto</i>
11	Ostrich	<i>Struthio camelus</i>
12	Turkey	<i>Meleagris gallopau</i>
13	Crowned Crane	<i>Balearica regulorum</i>
14	Ring Necked Pheasant	<i>Phasianus colchicus</i>
15	Silver Pheasant	<i>Chrysolophus sp</i>
16	Common Crane	<i>Grus grus</i>
17	Rosy Pelican	<i>Pelecanus onocrotalus</i>
18	Emu	<i>Dromaius novaehollandiae</i>
19	Cassowary	<i>Casuarius casuarius</i>
21	Great Flamingo	<i>Phoenicopterus roseus</i>
22	Mute Swan	<i>Cygnus olor</i>
23	Rock Pigeon	<i>Columba livia</i>

Table 6. Checklist of Reptiles in Karachi Zoo.

S. No.	Common Name	Scientific Name
1	Python	<i>Python molurus</i>
2	Coral Snake	<i>Micrurus fuvius</i>
3	Water Snake	<i>Natrix natrix</i>
4	Sand Boa	<i>Eryx conicus</i>
5	Russell's viper	<i>Vipera resseli</i>
6	Marsh Crocodile	<i>Crocodylus palustris</i>
7	Indian Cobra	<i>Naja naja</i>
8	Yellow Monitor	<i>Varanus salvator</i>
9	Gavial	<i>Gavialis gangeticus</i>

Breeding Record of the subject four species in Karachi Zoo and Safari Park

During the study period from 2009 – 2012, the four selected species of captive animals viz. Hog Deer, Nilgai, Blackbuck and Chital were studied in Karachi Zoo. Breeding success of these species has been detailed out (Table 8), while Chinkara, Nilgai, Hog Deer, Chital, and Blackbuck were studied in Safari Park and their breeding success has been detailed out (Table 9).

In Karachi Zoo, the population of Hog Deer was recorded to be three in 2009, four in 2010, five in 2011 and six in 2012. The population of Nilgai was recorded to be nine in 2009, ten in 2010, eleven in 2011 and thirteen in 2012. The population of Blackbuck was recorded fourteen in 2009, sixteen in 2010, seventeen in 2011 and eighteen in 2012. The population of Chital was recorded to be five in 2009; seven in 2010; eight in 2011 and nine in 2012. In the Safari Park, the population of Hog Deer was recorded to be fourteen in 2009, sixteen in 2010, eighteen in 2011 and twenty one in 2012. The population of Nilgai was recorded to be thirty one in 2009, thirty two in 2010, thirty five in 2011 and thirty six in 2012. The population of Blackbuck was recorded to be forty four in 2009, forty eight in 2010, fifty seven in 2011 and sixty five in 2012. The population of Chital was recorded to be sixty four in 2009, sixty seven in 2010, seventy eight in 2011 and eighty five in 2012. The population of Chinkara was recorded to be seven in 2011, eight in 2012. It was determined that the increase in the number of animals was due to successful captive breeding in Karachi Zoo and Safari Park.

Table 7. The explanation of behavioral actions of Captive Animals.

Behavior	Explanation
Affinitive interaction	Direct body-touching activities such as mutual grooming, nursing and licking.
Ano-genital sniffing	Animal sniffs or licks the ano-genital region of another animal partner
Feeding/Drinking or Ruminating	Animal feeding or drinking or regurgitating, chewing and swallowing.
Environmental sniffing	Animal explores the wall or ground with its nose.
Locomotion	Animal obviously moving.
Resting	Animal lying or sitting on the ground and in inactive or in relaxed state.
Self-directed behavior	Animal expresses activities including self-grooming with mouth, self-scratching etc.
Standing-alert,	Animal still, alert and gazing at stimuli or potential stimuli.
Tail-pasting,	Animal rubbing its tail and scent-marking on the surfaces of the wall of door frame.
Urinating/defecating	Animal exhibits a series of activities such as earth-scratching, urinating and pellet covering.

Recommendations

A. Karachi Zoo

1. Visit to Animal enclosures helps to view and observe the animal behavior in captivity. Ideal enclosures should be designed for animals which may resemble their natural environment. Optimal designing of enclosures provide appropriate holding conditions for animals in captivity.
2. Information regarding the behavior and biology of the animals such as pamphlets and Zoo guide-books etc. should be provided to the visitors and students. A guide line map should be available at the entrances showing the location of mammals, birds, reptiles, Adventure Park and gardens.
3. Management of Safari and Zoo should be in link with national and international conservation organizations, conservation community, research institutes and wildlife agencies that assist in maintaining the record and protection of the species.
4. Animal conservation programs (study of the threats, natural history, behavior and status etc.) should be arranged in Zoo and Safari Park, encouraging visitors and students to attend and participate in such activities.
5. An advisory committee should be established both for Zoo and Safari Park. The Committee should comprise of zoologists, academia, NGOs, veterinary doctors and curators. They should work for the development of the zoo/Safari and well-being of animals.
6. The main cause of death in zoo animals is due to eating garbage and shopping bags etc. Visitors throw various eatables like popcorns and chips and they also throw wrappers in the enclosures. Animals eat these things and

get sick. Some visitors give unhygienic food to the animals which causes disease in animals such as flu, T.B, lung infection, allergies and fungus in feet. This practice may be discouraged.

B. Safari Park, Karachi

1. Most of the area in Safari Park is the barren land without greenery. Green area should be developed to increase oxygen level.
2. Absence of opposite sex (partner) also disturbs the animals. In Safari Park, some animal species such as Eland, Sambar Deer and Water Buck face the same problem. Animals should be in pairs to develop social and natural behavior among the species.
3. To keep the animals clean and tidy, there should be a pond for animals for bath and clean up.
4. Proper information related to biology, behavior, and distribution of the species must be provided about each species. The main problem is the lack of awareness about the importance of Safari Park, so pamphlets or brochures should be provided for the awareness of visitors.
5. People should be instructed not to feed the animals or throw garbage in the animal enclosures which causes disease and death of animals.
6. In holidays, (summer and winter vacations and Eid holidays) the number of visitors increases from 100-150 to 200-300. This increased number causes disturbance to the animals. Therefore, the flow of people should be properly managed to avoid large scale disturbance to animals.
7. The area provided to elephants is very small. This area should be increased and their hygiene should be taken care of.
8. Other popular animal species like lions, tigers, giraffe etc should be introduced in the Safari Park.
9. In rainy season, a lot of water accumulates in the enclosures. Therefore, there should be some high ground therein where animals may take refuge.

Table 8. Population of Subjected Mammals in Karachi Zoo 2009 – 2012.

Years	Sex	Chinkara	Hog Deer	Nilgai	Blackbuck	Chital
2009	Male	-	1	4	5	2
	Female	-	2	3	6	3
	Kids	-		2	3	-
	Total	-	3	9	14	5
2010	Male	-	1	4	7	2
	Female	-	2	5	7	4
	Kids	-	1	1	2	1
	Total	-	4	10	16	7
2011	Male	-	2	5	8	3
	Female	-	2	5	8	4
	Kids	-	1	1	1	1
	Total	-	5	11	17	8
2012	Male	-	2	5	8	4
	Female	-	3	6	8	3
	Kids	-	1	2	2	2
	Total	-	6	13	18	9

Table 9. Population of Selected Mammals in Safari Park, Karachi 2009 – 2012.

Years	Sex	Chinkara	Hog Deer	Nilgai	Blackbuck	Chital
2009	Male	-	2	14	27	31
	Female	-	9	15	11	25
	Kids	-	3	2	6	8
	Total	-	14	31	44	64
2010	Male	-	2	15	31	34
	Female	-	12	16	13	30
	Kids	-	2	1	4	3
	Total	-	16	32	48	67
2011	Male	2	3	17	35	37
	Female	5	13	15	14	32
	Kids	-	2	3	8	9
	Total	7	18	35	57	78
2012	Male	2	4	17	39	40
	Female	3	14	18	18	39
	Kids	3	3	1	8	6
	Total	8	21	36	65	85



Fig. 1. Location of Safari Park and Zoological Garden in Karachi.

CONCLUSION

The increase in the numbers of all subject species in Karachi Zoo and the Safari Park is due to successful captive breeding program. The environmental conditions at both places are being improved by radical changes. Animals are flourishing, but there is still a need to adopt better management practices. The Natural History Museum in the Zoological Garden needs further improvement in respect of display of animals, quality of taxidermy and proper signage and description of various species.

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