



Research Article

ECOBIOLOGY OF CHINKARA (*GAZELLA BENNETTII*) IN BOTH CAPTIVE AND WILD HABITAT OF LALSUHANRA NATIONAL PARK, BAHWALPUR, PAKISTAN

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Abstract

Organisms, such as Chinkara (*Gazellabennettii*), which do not have adequate opportunities to express normal behaviour in captivity, exhibit more prominent morphology, feeding habits, and breeding behaviour in the wild than in captivity. The current study aimed to detect the alterations in behaviour patterns in both wild and confined settings in LalSuhadra National Park, Pakistan between August 2021 and February 2022. The criteria under investigation included morphological patterns, food and feeding habits, vigilance, resting, grooming, defecation/urination frequency, time spent together (Male-Female), grouping, being alone, affiliative interaction, agonistic activity, mounting frequency, and mounting number, amongst other factors. The results showed significant differences among the animals residing in captive and wild habitat. The wild habitat provided a variety of shrubs, herbs and trees for natural vegetation of Chinkara, while the captive Chinkra were feed by Park staff, that resulted in brighter color and wild animals were healthier in terms of height and weight. The level of vigilance in the captive population (11.2%) was greater than in the wild population (9.6%). Observations of resting were more common in the captive group (14.7%) than in the wild population (6.6%). Mounting happened considerably more often in the wild (1.5%) than in captivity (1%), and this difference was statistically significant. The grooming behaviour was less often seen in the wild population (4.1%) than captive population (7.4%). This research found that if a captive Chinkara population is housed in an enclosure with suitable gender relationships and environmental disturbance is kept to a bare minimum, the captive Chinkara population may be as prolific as the wild population in terms of health, behaviors, and reproduction.

Keywords: Chinkara, Deer, captive, wild, feeding, social, behavior.

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1. INTRODUCTION

Chinkara are shy animals that preferred to avoid human contact. They can go for long periods of time without water because they get adequate fluids from plants and dew drops that drop on the plant's surfaces at night. Although they are most often spotted alone, they may often be encountered in groups of up to four individuals (Mallon et al., 2001).

The Chinkara is the only gazelle species present in the Indian subcontinent, out of a total of 19 species found in Asia and Africa (Prakash, 1991). It has adapted to and is

common in the region's arid and semi-arid environments (IUCN, 2017). In nations like Iran, Pakistan, and Afghanistan, their population is rapidly dwindling. Chinkara was common in several regions of Balochistan in the early 1960s and 1970s, but human disturbances (such as significant poaching and livestock grazing) and land-use changes have severely harmed its status in the recent decade (Kumar et al., 2020).

Depending on the nature of the activity, the observer may only gather a small number of animals at a time, making direct observation very time-consuming. It is



common to utilize a combination of indirect and direct methods of nutrition analysis to get around the limitations of direct observation (Larter & Gates, 1991). The availability of food depends on season as well as the location (country) (Yarrow, 2009). While food may be abundant in one region during one season, it may be in short supply in another location at the same time (Yarrow, 2009).

Akbari et al. (2013) conducted a research in Dareh-Anjeer wildlife refuge in 2010-2011 that focused on the ecological preferences and social patterns of this species in the refuge. It was determined that Chinkara likes to live in foothill and hilly plain areas (Jacob's selectivity index of 0.31 for foothills and 0.03 for flat plains). When it comes to resources like shelter and water, Chinkara habitat in the region's foothills are the best, accounting for 25% of the area's habitat. Summer and autumn Chinkara are most active in the early morning hours, according to our research. Group size is 2.070.32 ($n=53$; $SE=1.17$), the sex ratio is 0.520.179, and there is no significant difference in the population's male-to-female ratio (Akbari et al., 2013).

The study of Chinkara's feeding ecology and population condition will help us better understand the species' ecological needs. The main objective of the study was to compare morphological, feeding, breeding, and socialization differences between the Chinkara species in captive and wild habitat.

2. Materials and Methods

2.1. Study Area

LalSuhanra National Park is located in the southeastern part of Punjab Province, 32 kilometres east of Bahawalpur city on the main Bahawalpur-Bahawalnagar highway. The region was classified as a Protected Area in 1972 due to the significant variety of animals, microhabitats, and sceneries. Forest plantations, animal enclosures, picnic areas, and fishing in the pond region make LalSuhanra National Park very valuable. The variety of habitat plays a vital role in conserving the area's biodiversity.

The natural vegetation inside the plantation is weedy, whilst the desert region supports xeric and semi-xeric flora. Submerged, floating, or marshy aquatic or semi-aquatic vegetation grows in the lake region (Hameed et al., 2002). Houbara Foundation International serves as wild habitat for Chinkara expanded over 16 square kilometers. The Foundation works in partnership with reputable conservation groups and law-enforcement agencies to reverse the trends of over-hunting, illegal trapping, and habitat degradation as a result of over-grazing, all of which contribute to the extinction of the species.

2.2. Study animal

The study animal in our study is chinkara. Slightly white ventral area distinguishes chinkara from other gerbil species with sand, yellow, and reddish hair, which is typical of the species. There is a distinct nose spot and a dark brown or black forehead to go along with the lighter-colored face. In winter chinkara have a prominent brown stripe along the white ventral portion of their bodies. The fur becomes a deeper brown throughout the summer.



Figure 1: Study Animal

2.3. Site selection

From September 2021 to February 2022, researchers observed two distinct populations: one in captivity and the other in the wild. A captive population of Chinkara was researched at the LalSuhanra National Park, Bahawalpur's Children Park. Experimental studies on the wild population were carried out in the gated free range sanctuary of the Houbara Foundation International Pakistan in the Cholistan Desert.

2.4. Collection of data

With naked eye, by using the Bioscope and Binoculars we recorded some behavioral aspects like vigilance, rest, grooming, defecation/urination, time spent with the male and female together, time in the group, and time alone were all recorded. Other behavioural traits recorded with the Bioscope and Binoculars included the number of mounts and the number of mountings as well as various other behaviours. The present research strategy necessitated the creation of an Ethogram (Aziz et al., 2018). For four distinct study periods, data on activity frequency and animal identification were combined in a table where columns represented activity, and rows represented animal identity (Schleidtet al., 1984). For animal welfare reasons, all observations were made at a

captive habitat, while Houbara Foundation International was observed as wild habitat for Chinkara.

3.1. Morphological characteristics

Chinkara (*Gazella bennettii*) show a distinct variety of morphological difference among male and female. However, there were little differences observed among captive and wild animals.

Different morphological parameters were observed with naked eye, captured with camera and data about the parameters like individual's height, weight, average length, horns length etc. were collected from the staff and management committee of the LalSuhanra National park. The observed and collected morphological characteristics are described in Table 1.

3.2. Habitat

Table 1: Comparison of morphological characteristics in captive and wild habitat of LalSuhanra National park

Physical description	Captive		Wild	
	Male	Female	Male	Female
Height (m)	0.6 to 0.7	0.5 to 0.6	0.7 to 0.9	0.5 to 0.7
Weight (kg)	20 to 25	19 to 21	20 to 27	20 to 22
Length (m)	0.8 to 1.2	0.8 to 1	1 to 1.2	0.8 to 1.1
Color	sandy, yellowish and red	No difference	Sharp and bright yellowish red	No difference

substantial unseen heightened place without disrupting the animals' typical activity.

Within the randomly chosen grids, the research area was split into four 4 km squares, each of which had 1.1 km line transects to assess the Chinkara population in its natural environment. During the research period, 80 line transects were examined (September 2021 to February 2022). At various times of the day, the surveys were carried out. There was a record kept of the species, the number of individuals of each sexes, the age-sex of the group and the sighting distance from the transect.

3. Results:

We observed ecobiological behavior of Chinkara (*Gazella bennettii*) in four different aspect including morphology, food and feeding behavior, breeding, and social behavior in two different habitats. Children Park LalSuhanra was taken as the

Captive area for Chinkara is about 2 acres which is fenced with iron grill. The base of fenced is about 2 feet cemented and 8 feet iron grill. It is plain area no dunes with little vegetations. The area is enriched with variety of plants. The plants include Kikar (*Vachellia nilotica*), daraikh (*Melia azedarach*) and java plum etc. In wild habitat, due to their ability to save metabolic water, Indian gazelles may go quite extended periods without needing to be resupplied with water. They drink water from tobas.

3.3. Food and Feeding Habits

The vegetation composition of the study area was determined, in terms of percentage of individual trees, shrubs and herbs. Three transects, each of one km long, were randomly placed within the intensive study sites for quantifying the habitat and vegetation parameters, in both study areas. At 100 m points on the each transect,

circular plots of 10 m radius were placed alternatively on left and right side. Since, hedges were sparsely distributed and found around all fields where gazelles live, supports a different type of vegetation structure, therefore a 3 x 10 m quadrat plot was laid separately, as and when encountered on the transects. Direct observation was employed to conduct the eating habit research, which has become a standard method for determining the feeding patterns of big herbivores (Wallmo& Neff, 1970; Jhala, 1997). Table 2 below shows the list of plants and food given to captive Chinkara.

Table 2: List of plants and other foods given in captive habitat:

Common Name	Scientific Name	Family
Jwar	<i>Sorgham bicolor</i>	Poaceae
Jantar	<i>Sesbania bispinosa</i>	Fabaceae
Cluster bean	<i>Cyamopsis tetragonoloba</i>	Fabaceae
Joe	<i>Avena fatua</i>	Poaceae
Mustard	<i>Brasicca compesteris</i>	Brassicaceae
Losen (Barseem)	<i>Trifolium alexandrinum</i>	Fabaceae
Alfalfa	<i>Medicago sativa</i>	Fabaceae
Corn	<i>Zea mays</i>	Poaceae
Kikar	<i>Acacia nilotica</i>	Fabaceae
Chana (gram)	<i>Cicer arietinum</i>	Fabaceae
Salt	Sodium chloride	-
Gurr	Jaggery	-

Meanings of short terms or abbreviations: Yt- Young twigs, R-Root, fp-Fallen pods or fruits, Dt-Dry twigs, W-Whole, F- Flowers, fl- Fallen leaves, L-Leaves, P- Pods

3.4. Socialization and Breeding

The observations for socialization and breeding were classified in to different patterns of behavior viz: vigilance, resting, grooming, urination, living alone or in group, mounting, affinitive and agonistic behaviors. From figure-2, it is determined that chinkara showed more vigilancy in captive habitat than wild, while resting was also observed more in captive habitat. The grooming and urination activities were also observed more in captive habitat. Grouping was observed more in captive habitat. Moreover, it was noted that Chinkara perform mounting actively in wild environment.

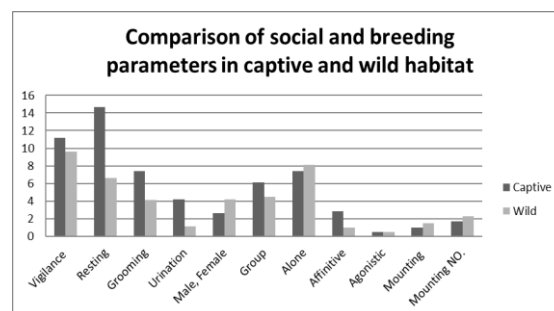


Figure 2: Comparison of social and breeding parameters in captive and wild habitat.

4. Discussion

The Chinkara has highly unique dietary habits and feeding preferences and its existence is entirely reliant on the availability of natural vegetative supplies in

its native environment. Previous research (Ghosh et al., 1987) had shown that Chinkara were mostly browsers and concentrate feeders, which was validated by our study. The wild breeding (WB) Chinkara and captive breeding (CB) Chinkara showed substantial differences in social behaviour like affinitive and agonistic behaviour, despite the fact that there were no noticeable variations in general behavioural characteristics like as eating, drinking, chasing, sniffing, etc. Affinity and agonistic behaviour were shown to be stronger in the WB Chinkara as compared to the CB Chinkara. Captive breeding individuals spend longer time eating than their wild counterparts, that may be because they are not subjected to predators in captivity situations, but in the

wild, the organisms must contend with such risks. Because of the limited sample size in this research, there was no evidence of an age impact. Taming and animal domestication that have been developed via human interaction and habit with these species; have been used for economic reasons. To assess the degree to which an animal has been domesticated, however, is a tough undertaking since the phenotype of an animal is influenced not only by its genetics, but also by the environment in which it has been nurtured, and so is difficult to determine (Idnanet al., 2020).

The total number of Mounds seen in captivity was higher than the total number of Mounds observed in the wild. In contrast to captivity, where interactions were more frequent due to individual approach being straightforward, this disparity might be explained by fewer possibilities for contact in the wild. In the wild, foraging and browsing were more frequent occurrences than the criterion-specific behaviours that were seen in captivity. Wild animals spend far more time browsing and foraging than caged animals that were used to the available forage. A lesser amount of effort was expended in caring for the captive animal, as well as a lesser amount of time was spent browsing and searching for food. Captive animals were utilized to provide fodder, and they were herded together at the feeding stations at the time of the feeding. It has been argued, however, that the variations between wild and domestic populations are quantitative in nature and are best described by reaction limitations or behavioural frequencies (Andersen et al., 2006). The same conclusions were drawn from our research, which found that captive stock behaved differently in qualities that were mostly quantitative in nature.

When comparing the Vigilance behaviour of males in the third category, it was found that they displayed more in the wild than in captivity, presumably due to greater competition in the wild. As previously noted, greater resting behaviour was seen in the captive population than in the wild

population. The parameter of defecation/urination was observed more frequently in captivity than in the wild, which may be due to the higher quality of feed available in captivity. The male and female spotted together were more common in captivity than in the wild. The frequency of grouping was higher in wild males than in caged males. Men spent more time alone than females, whereas females spent less time alone than males.

It was determined as a result of our research that, by replicating certain aspects of the natural environment in captivity, such as space allocation and correct sex ratio, breeding efficiency may be increased in captivity. The present research solely looked at the differences in behavioural observations between animals in the wild and those kept in captivity. The specific causes for these shifts are still a mystery to researchers. It is possible that future research will be conducted to investigate the physiological and hormonal changes that occur in captivity.

5. Conclusion

In conclusion, Chinkara showed significant variations in wild and captive habitat. Morphologically, the wild Chinakra were found healthier, bright in color and more active. The habitat in wild is very supportive including a variety of plants and trees. While in captive habitat they are only fed with seasonal and available food. It was noticed that Chinkara in captive habitat were more frightened and due to stress intensities their feeding was less and also less mounting. It was determined as a result of our research that, by replicating certain aspects of the natural environment in captivity, such as space allocation and correct sex ratio, breeding efficiency may be increased in captivity. The present research solely looked at the differences in behavioural observations between animals in the wild and those kept in captivity. The specific causes for these shifts are still a mystery to researchers. It is possible that future research will be conducted to

investigate the physiological and hormonal changes that occur in captivity.

6. Conflict of Interest

There is no conflict of interest among the authors.

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