

## ORIGINAL ARTICLE

# A Study on Social Structures and Conservation Strategies for Blackbuck (*Antilope Cervicapra*)

Meenakshi Meena\*

\* Associate professor, Department of Zoology, Jai Narain Vyas University, Jodhpur, Rajasthan.

### ABSTRACT

The Blackbuck (*Antilope cervicapra*), a native antelope species of the Indian subcontinent, exhibits distinctive social structures and sexual dimorphism, with males featuring long, spiraled horns and striking coloration. Despite their historical abundance, Blackbuck populations have experienced significant declines due to habitat loss, poaching, and agricultural expansion. Blackbucks display a complex social system, including territorial males, female herds, and bachelor groups, which influences their ecology, resource distribution, mating patterns, and predator-prey interactions. Understanding these social dynamics is crucial for effective conservation strategies, as behaviour directly impacts their vulnerability to threats and adaptability to fragmented habitats. Integrating behavioural ecology with habitat management, anti-poaching measures, and community engagement is essential for successfully conserving this species.

**Index Terms-** Blackbuck, Social Behavior, Territoriality, Diet and Foraging, Conservation.

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### INTRODUCTION

The Blackbuck (*Antilope cervicapra*), a strikingly graceful antelope species native to the Indian subcontinent, is renowned for its unique social structures and striking sexual dimorphism [1]. Blackbucks exhibit a complex social system characterized by territorial males, female herds, and bachelor groups [2]. Territorial males establish and defend territories that attract females, particularly during the breeding season, while females and juveniles form stable herds for better protection against predators (Moehlman, 1998). These social dynamics influence various aspects of Blackbuck ecology, including resource distribution, mating patterns, and predator-prey interactions [3]. Effective conservation of Blackbucks necessitates a thorough understanding of their behavioural ecology, as social behaviour directly impacts their vulnerability to threats and their ability to thrive in fragmented habitats [4]. Conservation efforts must therefore integrate knowledge of Blackbuck social structures with habitat management, anti-poaching measures, and community engagement [5].

This study explores the social behaviour of Blackbucks and its implications for conservation efforts, and synthesizes current research on Blackbuck social behaviour, providing a comprehensive overview of the interplay between behaviour and survival in this iconic species.



Fig.1: Juvenile and Adult Male Blackbuck

## SYSTEMATIC POSITION

Class: Mammalia  
Order: Artiodactyla  
Family: Bovidae  
Subfamily: Antelopinae  
Genus: *Antilope*  
Species: *Antilope cervicapra*

## MATERIAL AND METHODS

**Study Area:** This study was conducted in the Jodhpur region of Rajasthan, India, located approximately between 26.0° N latitude and 73.0° E longitude. The area was chosen for its significant blackbuck (*Antilope cervicapra*) population and its diverse habitats, which include both arid and semi-arid environments. The region's unique ecological conditions, such as sparse vegetation and varying water availability, provide a critical context for understanding blackbuck behavior and distribution. Additionally, the area's varied topography and climate contribute to a complex interplay of factors influencing blackbuck populations, making it an ideal location for in-depth ecological research.

### Data Collection:

- **Photographic Documentation:** Detailed digital photographs were taken of blackbucks from multiple angles to facilitate a thorough morphological analysis and document physical features.
- **Age and Sex Determination:** Age was estimated based on horn development and secondary sexual characteristics, while sex was determined by examining reproductive organs and secondary features.

**Population Calculation:** To estimate the blackbuck population, the study employed a combination of direct counts, and head count methods:

- **Direct Counts:** During observation periods, the total number of blackbucks present in each sighting was recorded.
- **Head Count Method:** Individual blackbucks were identified and counted based on distinctive physical features observed in the photographs. This method helped to avoid double counting and provided a more accurate head count of the blackbuck population.

**OBSERVATIONS:** Observations were systematically conducted on an hourly basis, split evenly between two shifts—6:00 am to 8:00 am and 6:00 pm to 8:00 pm. Utilizing the focal animal sampling technique, both male and female blackbucks were repeatedly observed at different times of the day to ensure a robust and accurate data set.



Fig.2: Herd of blackbuck in open grassland

## RESULT AND DISCUSSION ABOUT BLACKBUCK

Native to the entirety of the Indian subcontinent, the Blackbuck (*Antilope cervicapra*)—a medium-sized ungulate species of antelope—has become regionally extirpated in Bangladesh, Nepal, and Pakistan [6]. Despite being fully protected under Indian law, it is classified as Near Threatened (NT) by the International Union for Conservation of Nature (IUCN) [7]. Within the thirteen Indian states where it persists, a significant proportion of its population is predominantly concentrated in the arid regions of western Rajasthan, which constitute its principal habitat [8-11].

## **SOCIAL BEHAVIOUR**

Blackbucks (*Antelope cervicapra*) manifest an intricate social architecture, delineated by the establishment of distinct social units, encompassing territorial males, female cohorts, and bachelor assemblages. This social organization is pivotal for their survival and reproductive success. Various forms of social behaviour, encompassing territoriality, mating strategies, parental care, and other interactions, will be expounded upon in the subsequent sections.

## **SOCIAL STRUCTURES: GROUP CO-HABITATION**

Blackbuck typically exhibit group behaviours with variable sizes, primarily categorized into

- female groups (adult females and juveniles of both sexes),
- all-male groups (adult and immature males),
- and mixed-sex groups (adults and juveniles of both sexes).

Notable deviations from this social structure include territorial males—though these territories are frequently spatially clustered—and females who temporarily isolate themselves for parturition and remain solitary while their offspring are in the early stages of development [11, 7, 5,12]. These groups do not maintain exclusive home ranges and exhibit considerable instability, often merging, dividing, and reassembling multiple times within a single day.

Blackbuck demonstrate considerable variability in group size both between and within populations. The costs and benefits associated with group living are contingent upon varying ecological conditions, leading to fluctuations in the optimal and evolutionarily stable group sizes. Group sizes range from 2 to 36 individuals at Mudmal [14], 2 to 129 at Point Calimere [13], and exceed 2500 at Velavadar [3]. This pronounced variation among populations is likely attributable to disparities in ecological factors, such as habitat structure and resource availability [6]. Herd size has been profoundly impacted by seasonal variations and foraging dynamics [14]. The social behaviour of species manifests in the aggregation of male and female blackbucks into herds, facilitating enhanced defence, foraging efficiency, and other critical functions [4, 15, 16].

## **TERRITORIALITY IN MALES**

Territoriality is a salient feature of male Blackbucks. Mature males establish and tenaciously defend territories to attract females, particularly during the breeding season. These territories are demarcated by conspicuous physical displays and olfactory markers [5]. Territorial males exhibit aggressive behaviours to safeguard their domains from rival males, engaging in head-to-head clashes and chasing intruders away [11]. The size and quality of a territory significantly influence a male's reproductive success, as females preferentially mate with males possessing prime territories [5].

## **FEMALE HERDS**

Female Blackbucks and their offspring form stable herds that confer protection against predators and enhance foraging efficiency [16]. These herds typically range in size from a few individuals to large aggregations, depending on resource availability and predation pressure [17]. Female herds exhibit less aggression and greater cohesion compared to male groups, displaying strong social bonds that are crucial for the rearing of young and overall herd stability [18].

## **BACHELOR GROUP**

Young and non-dominant males usually form bachelor groups. These groups comprise individuals who are not currently defending territories or engaging in mating activities [19]. Bachelor groups provide a social milieu where young males can develop the necessary skills and strength to challenge for territories in the future. This social setting also minimizes aggressive encounters with dominant territorial males [5].

## **MATING AND BREEDING BEHAVIOUR**

Mating in Blackbucks is significantly influenced by the lek system, where males display in specific areas to attract females [5]. Females visit these leks to select mates, often preferring males with the most impressive displays and well-maintained territories. This selective behaviour ensures that only the fittest males propagate their genes, contributing to the population's health and vigour [11].

## **COMMUNICATION STRATEGIES**

Blackbucks employ a combination of visual signals, vocalizations, and scent markings for communication. Visual signals, such as the display of horns and specific body postures, are pivotal in both territorial defence and courtship displays. Vocalizations play a critical role in maintaining herd cohesion and alerting members to potential threats [16]. Scent marking, primarily through urine and glandular

secretions, is predominantly used by males to delineate territories and signal reproductive status [20, 13].

**FORAGING BEHAVIOR OF BLACKBUCKS**

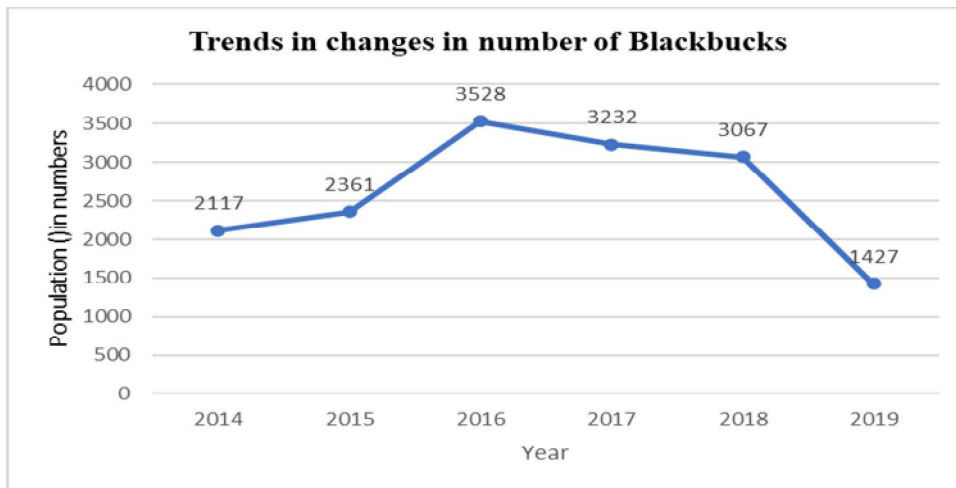
The foraging behaviour of Blackbucks (*Antelope cervicapra*) is highly adapted to their grassland habitats, reflecting a complex interplay of dietary preferences, environmental conditions, and social structures. These antelopes primarily graze on grasses, although they also consume a variety of other plant materials depending on seasonal availability and habitat type [21-23].

**POPULATION**

The population of Blackbucks in the study area has been experiencing a consistent decline. Interviews with local residents, including numerous farmers, reveal a notable reduction in Blackbuck sightings. “We had seen herds of Blackbuck that constituted of around 60-70 individuals, and nowadays we hardly see groups of 15-20 individuals”, said an elderly farmer.

Year	No. of Blackbuck in Jodhpur (outside Protected Area)
2014	2117
2015	2361
2016	3528
2017	3232
2018	3067
2019	1427

**Table.1.** Number of Blackbuck (Year-wise)



**Graph 1.** Trends in Population of Blackbucks (Year-wise)

This observation by the locals aligns with the data provided by the Rajasthan Forest Department, which shows a similar downward trend in Blackbuck numbers. The data and graphical representations underscore a sharp decline in the Blackbuck population over time. Therefore, urgent measures are required to protect and conserve the Blackbuck population in the study area.

**IMPLICATIONS FOR CONSERVATION**

The complex social behaviour of Blackbucks has significant implications for conservation strategies. Understanding these behaviours is paramount for developing effective management practices that ensure the species' long-term survival. The implications of this study for blackbuck conservation are multifaceted and involve enhancing management practices, strengthening anti-poaching efforts, engaging local communities, developing robust policies, adapting strategies based on ongoing research, and leveraging eco-tourism. Addressing these areas will contribute to the long-term survival of the blackbuck and the preservation of their habitats.

**Conservation Measures**

**1. Habitat Preservation and Restoration**

- Protected Areas: Establish and maintain protected areas such as national parks and wildlife sanctuaries specifically for blackbucks. Ensure these areas are large enough to support viable populations and have adequate habitat diversity.

- Habitat Connectivity: Create wildlife corridors to connect fragmented habitats, allowing blackbucks to migrate, disperse, and maintain genetic diversity.
- Restoration Projects: Restore degraded habitats by reintroducing native vegetation, removing invasive species, and improving water sources.

## 2. Anti-Poaching Measures

- Surveillance and Patrolling: Increase the frequency and effectiveness of patrols in protected areas to deter poaching and illegal hunting. Use technology such as drones, camera traps, and GPS tracking to monitor activities.
- Community Involvement: Engage local communities in anti-poaching efforts by providing training and incentives for reporting illegal activities. Promote alternative livelihoods to reduce dependence on poaching.
- Legal Framework: Strengthen and enforce laws related to wildlife protection and ensure that poachers face significant penalties.

## 3. Population Management

- Monitoring and Research: Regularly monitor blackbuck populations to assess their health, genetic diversity, and distribution. Use this data to inform management decisions and address emerging threats.
- Captive Breeding: Establish and manage captive breeding programs to boost population numbers and genetic diversity, especially if wild populations are critically low.
- Translocation: If necessary, translocate individuals to reintroduce them into suitable habitats where populations have declined or to establish new populations.

## 4. Human-Wildlife Conflict Mitigation

- Fencing and Barriers: Implement fencing and barriers to protect blackbucks from encroachment and reduce conflict with livestock.
- Compensation Schemes: Develop compensation schemes for farmers and communities who suffer losses due to blackbuck depredation, ensuring they are fairly reimbursed.
- Education and Awareness: Educate local communities about the ecological importance of blackbucks and promote coexistence strategies to minimize conflict.

## 5. Community Engagement and Education

- Local Involvement: Involve local communities in conservation efforts by integrating traditional knowledge and practices with modern conservation strategies. Support community-based conservation initiatives.
- Awareness Campaigns: Conduct awareness campaigns to highlight the importance of blackbucks in the ecosystem and foster a conservation ethic among local populations.
- Eco-tourism: Develop eco-tourism programs that provide economic benefits to local communities while promoting blackbuck conservation and raising public awareness.

## 6. Policy and Governance

- Integrated Management Plans: Develop and implement comprehensive management plans that address habitat, population, and conflict issues. Ensure these plans are adaptive and based on the best available science.
- Interagency Collaboration: Foster collaboration between governmental agencies, non-governmental organizations (NGOs), and other stakeholders to coordinate conservation efforts and share resources.
- Funding and Resources: Secure funding and resources for blackbuck conservation through government budgets, international grants, and private donations.

## 7. Research and Data Collection

- Ecological Studies: Conduct research on blackbuck behavior, ecology, and genetics to inform conservation strategies and improve understanding of their needs and threats.
- Impact Assessments: Evaluate the impact of human activities such as agriculture, development, and tourism on blackbuck populations and habitats.

Implementing these strategies requires a multi-faceted approach, integrating scientific research, community involvement, and strong governance to ensure the long-term conservation of the blackbuck.

## CONCLUSION

In conclusion, the social behaviour of Blackbucks is intricately linked to their ecological success and conservation. Territoriality, female herd dynamics, and bachelor groups all play pivotal roles in their survival and reproductive strategies. Conservation efforts must integrate this behavioural knowledge to

address threats such as habitat fragmentation, poaching, and human-wildlife conflict. By fostering community engagement, implementing sustainable practices, and conducting ongoing research, we can ensure the long-term preservation of this iconic species.

By understanding and addressing the multifaceted social behaviour of Blackbucks, conservationists can devise more effective strategies to protect and sustain this species.

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