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An Overview of Declining Population of Blackbuck in Bihar and other States of India

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ABSTRACT:
Antelope cervicapra, is an Indian antelope species known for its distinctive black and white colour with males possessing spiraled horns. According to the Red Data Book of the International Union for the Conservation of Nature (IUCN), the *Antelope cervicapra* (Blackbuck) species is categorized as least concern. The research paper explores how blackbuck interacts with the environment and its contribution in shaping ecosystem. The survival of the blackbuck is threatened by several factors including the invasion of exotic species, habitat destruction, overgrazing, urbanization, industrialization, and agricultural expansion. Illegal hunting, poaching, road accidents, and habitat destruction have led to a significant decline in blackbuck population. In this article, a concise review of the literature is covered on the decreasing population of blackbucks in India especially in Bihar due to various natural and anthropogenic reasons, which subsequently would identify the need to conserve the blackbuck population and gather scientific evidence at the smaller level to help in making policies and strategies by the government agencies for the conservation of biodiversity, in the participative of Sustainable Development Goals suggested and adopted by the United Nations in 2017. In view of the above, if any area is been covered under the protected area it would be helpful in the conservation of the species. To increase the population of the species and ensure their survival, it is crucial to study genetic variation and create a specialized rescue center for the species. Such measures can contribute to the population growth and preservation of species' genetics and population.

Keywords:
Antilope cervicapra, Population, Conservation, Bihar, IUCN

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INTRODUCTION

There are six species of antelope in India out of which *Antelope cervicapra* (Blackbuck) is endemic to the Indian subcontinent as mentioned by Jhala & Isvaran (2016). This is a member of the Bovidae family and is often found in open forests and converted cultivated lands. According to Menon, 2000 they are easily distinguished by the length, appearance, and colour of their horns. Blackbuck is also observed in various regions of Nepal and the Indian subcontinent. However, their distribution has significantly reduced, and they are now confined to Rajasthan's western region of India Meena & Kumar (2020).

Antelope cervicapra is having the status of least concerned animal according to The International Union for the Conservation of Nature (IUCN), Red Data Book and listed in Appendix III under the Convention on International Trade for Endangered Species of Wild Fauna and Flora (CITES). Whereas, it is classified under Schedule I of the Wildlife Protection Act of 1972 in India prohibits the shooting and poaching of Blackbuck as it is listed as a threatened animal and is struggling for its existence.

As Blackbuck is an integral part of its ecosystem and plays a significant role in maintaining ecological balance. If the number of blackbuck populations goes down, this could disrupt the food chain, leading to significant environmental imbalance. As primary consumers, blackbucks graze on grasses, shrubs, and other vegetation, thereby they help to regulate plant growth. Furthermore, blackbucks serve as an important prey source for several predators, including wolves (*Canis lupus*), and feral dogs *(Cuon alpinus)* in the existing area of study. These predators depend on blackbucks as a key source of food, and a decline in blackbuck numbers could lead to a decrease in predator populations as well, disrupting the existing food chain.

MATERIAL AND METHODS

Approximately fifty to sixty literature and papers from different sources were reviewed for the multiple databases to find out the gaps for the concerned research work while writing this paper. Initially, Google Scholar was used to establish a list of research articles that were primary sources and peer-reviewed journals followed by reading books and literature about blackbuck in the library of Patliputra University, Patna, Bihar, India.

Further, to establish the gaps found while going through the literature review, the authors conducted preliminary visits to Buxar, Bihar, India on 22nd March 2023 to identify blackbucks' status and factors affecting the population of the species in that ecoregion. During the visits, the author spotted only six female blackbucks within the area located at latitude 25.622994 and longitude 84.189158. On that day, no male blackbuck was sighted in the above-mentioned area. Additionally, the author also visited the Department of Forest, Buxar, Bihar and interacted with the concerned staff to gather the concerned information about blackbucks. Thus, the author was able to gain a deeper understanding about the challenges and threats related to blackbuck conservation in that ecological area.

GEOGRAPHICAL DISTRIBUTION OF BLACKBUCK IN BIHAR AND OTHER STATES OF INDIA

Historically, *Antelope cervicapra* were distributed across the Indian subcontinent, yet due to habitat loss and fragmentation, their range has become more limited. This beautiful and elegant animal is also found in some areas of Bihar, especially in districts of Buxar and Kaimur, but has received limited attention from biologists due to its harsh climate, difficult-to-access habitats, and most importantly lack of awareness among the locals. Hence very little research work has been done for the species *Antelope cervicapra* in Bihar. However, various works by different researchers have been conducted in other parts of India such as Rajasthan, Haryana, Odissa, etc.

A research work has been conducted by Prasad & Ahmed (2021) on *Antelope cervicapra* in Bihar and they reported that there has been a significant change in the landscape of Bihar during the last century, especially in the Shahabad ecoregion (Buxar, Bhojpur, Kaimur and Rohtas). They have

reported that no documents are available regarding the availability and distribution of *Antelope cervicapra* in the areas of Buxar and Kaimur. Whereas as The Kaimur Wildlife Sanctuary, located in the Kaimur district of Bihar, India, is a crucial protected area that plays a significant role in conserving Blackbucks. However, the area surrounding the sanctuary and the Buxar region have not been declared as protected areas, leading to several ecological and conservation challenges for the blackbucks.

In their study, Prashanth et al., (2016) reported that persistent challenge is faced during the conservation of the species due to the limited availability of suitable habitat which is grassland for thriving of the species. However, the conservation of *Antilope cervicapra* must be done as many scientists have identified various significance of the animal and its products are useful in human life in many ways which are documented in the forthcoming paragraphs.

Meena & Saran (2018) reported that, presently, a significant population of the species exists in Andhra Pradesh, Maharashtra, Rajasthan, Punjab, Tamil Nadu, Gujarat, Madhya Pradesh, Haryana, Karnataka, and Uttar Pradesh. However, the population in Bihar and Odisha is relatively smaller as shown on the map of India in figure 1, hence, attention is needed for the conservation of the species in the scattered areas due to their high vulnerability.

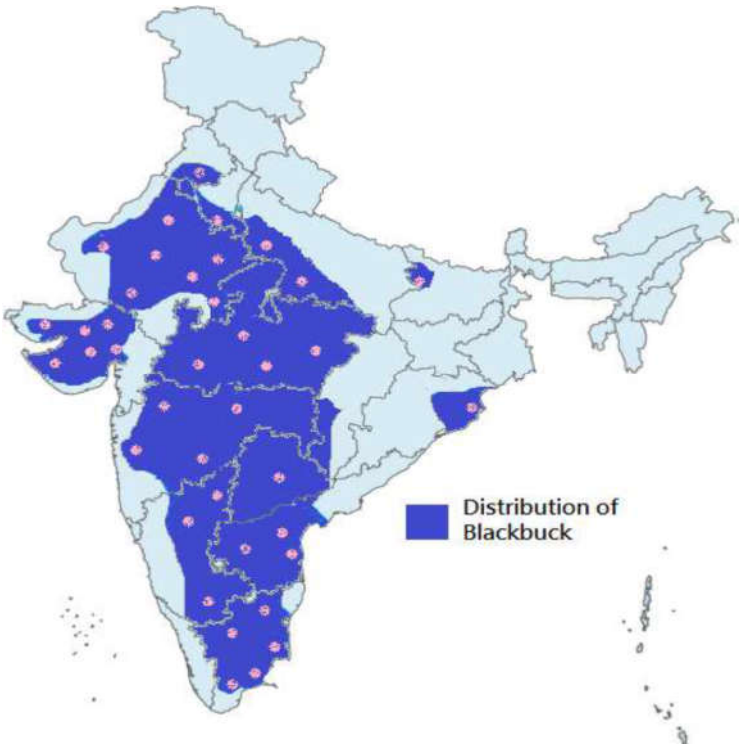

Figure 1: Distribution of blackbuck on the map of India, Bihar and district Buxar

While comparing the blackbuck population in Bihar and other states of India, it was found that there are significant variations in conservation efforts and population trends of blackbucks in different states. In India, blackbuck population faces various threats including habitat loss, poaching, and human-wildlife conflict, including the establishment of protected areas. Nevertheless, challenges continue across all regions, highlighting the importance of continued monitoring and conservation to ensure the long-term survival of the species.

MORPHOLOGICAL CHARACTERISTICS OF BLACKBUCK

Meena & Saran (2018) found a resemblance between Blackbuck and Gazelles in the Arabian Peninsula while considering the morphological features, with the main distinction being their colouration. The dorsal parts of Gazelle are brown, whereas those of blackbucks are dark brown or black colour.

Figure 2: Gazelle Male

Figure 3: Gazelle Female

Further, Meena & Saran (2018) have reported on the general characteristics and appearances of male and female blackbucks in Rajasthan shown in the Table 1. It may help in the comparative analysis of the general characteristics and appearances of male and female blackbucks found in different areas and locations of India as well as in Bihar, the present research area.

Table 1: General characteristics of blackbuck

Characteristics	Male	Female
Body length	100-150 cm	100-150 cm
Shoulder height	70-80 cm	70-80 cm
Tail length	10-18 cm	NA
Adult weight	35-55 kg	30-40 kg
Horns	45-70 cm	NA
Coat colour	Dark head and back with white underside	Yellow to fawn head and back with white underside
Images		

Mungall, (1978) reported that blackbucks are characteristically found in groups with two main exceptions which are territorial males and females with very young calves. It has also been observed that calves typically have very small daily ranges in their first few weeks of life. Further, it has also been reported by Mungall (1978) that the main kinds of grouping associations seen are all-male groups, female groups which contain females of all ages, and juvenile males and mixed-sex groups with females and males of all ages.

Jhala & Isvaran (2016) reported, *Antelope cervicapra* have adapted to survive in low-quality grassland but their distribution is controlled by the presence of surface water, which is essential for their survival. Whereas, Bhatta (2008) mentioned tall grass is not preferred as a habitat for blackbuck, so it is necessary to maintain the grassland at an optimal level. This ensures that the habitat meets the specific requirements of Blackbucks and supports their population effectively.

ANTHROPOGENIC IMPACT ON BLACKBUCK IN CONSERVATION AREA

Kunwar (2015), reported about the various reasons for conflicts in the blackbuck Conservation Area (CA) in Bardia, Nepal which highlights habitat loss/destruction/shrinkage and scarcity of food as the major reasons and scarcity of drinking water, search for palatable food, poor fencing along the certain boundaries, fodder harvesting, and the grazing of domestic animals are some other reasons shown in the graph 1 plotted on the data found during the survey.

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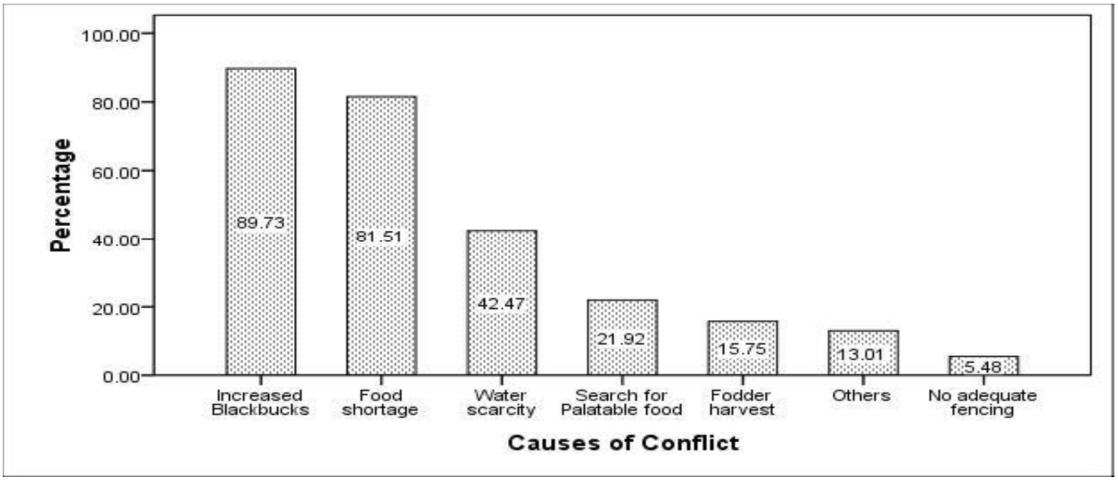
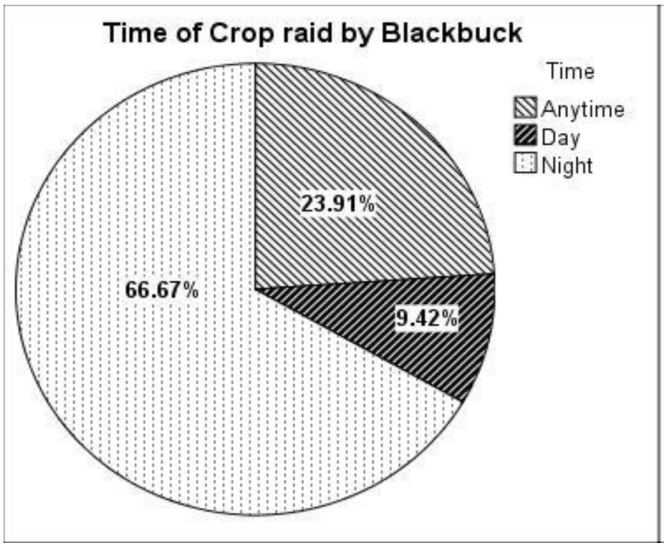


Graph 1: Causes of conflict in Blackbuck Conservation Area

Kunwar (2015), reported about the time of the attack/raid in the croplands within the conservation area. As crop raiding is a habituated behaviour of the blackbucks as crops are easily available inside their habitat, especially, by the beginning of winter (November-February), the food plants available in the fields dry up and become less nutritive to fulfil their nutritional needs. So, blackbucks switch their feeding to easily available and palatable crops. Based on the survey performed among the farmers residing there reported about the time of the raid by the blackbucks. The majority 66.67% of farmers reported encounters with blackbuck during the night, while a smaller proportion 9.42% observed them during the day and 23.91% mentioned the same at any time of the day as shown in the below mentioned graph 2 based on the survey data.



Graph 2: Time of visit of Blackbucks in the croplands within the Conservation Area

ECOLOGICAL AND MEDICINAL SIGNIFICANCE OF BLACKBUCK

While going through various literature it was found that blackbuck also has many ecological and medicinal significance in our lives. Many scientists reported their findings in respective articles published by them.

Kunwar (2015) has mentioned about scientific, medical, and a few aesthetic values of *Antilope cervicapra* and he emphasized that the horns and skin of Blackbucks have been traditionally used for the treatment of liver and heart disorders.
Similarly, Chandru et al., (2020) mentioned that blackbuck plays a crucial role in seed dispersal for various medicinal plants that thrive in its habitat. Through the Blackbuck's digestive system, a large number of seeds are dispersed and naturally deposited on the ground, helping in the regeneration of the seeds.

THREATS AND CONSERVATION ISSUES REGARDING BLACKBUCK

Kumar & Rahmani (2008) mentioned that wolves possess the remarkable ability to hunt and take down prey that is significantly larger than their body size. Their rapid running capability serves as an important defensive factor for Blackbuck.

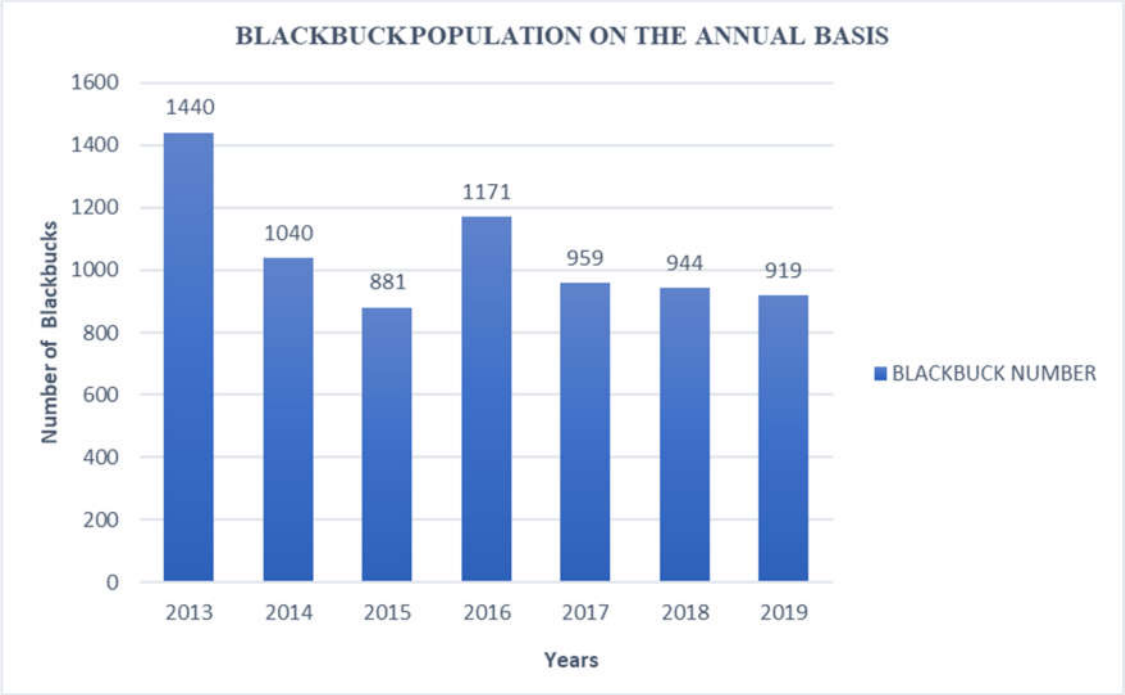
Kumar et al., (2018) mentioned that in Haryana, India the population of the species has significantly declined, pushing the species to the brink of extinction due to factors such as habitat destruction and other wildlife crime.

Meena & Jaipal (2020) also reported about the declining population of Blackbucks. During their research work, it was observed that predators, particularly feral dogs, were responsible for the majority of deaths among wild animals. In particular, during the rainy season, there were numerous cases of Blackbuck's mortality. The soft and slippery ground conditions during this season make it difficult for Blackbucks to run and escape from feral dogs' predation.

Similar findings were reported by Meena & Jaipal (2020) in Rajasthan, India the Blackbucks population density was significantly higher in the past compared to the present. Currently, the distribution of the species is limited to sanctuaries and closed areas with very low population densities.

According to the observed data in Marwar region of Rajasthan, India shown in the graph 3, the Blackbuck population peaked in 2013, with 1,440 the highest number within the observed period. Then, a considerable decline in the Blackbuck population was noted in 2014, with the count dropping to 1,040. Due to the continued

downward trend, the population had decreased to 881 by 2015. A slight recovery was observed in 2016, as the population rose to 1,171. However, despite this temporary increase, the decline continued, with the blackbuck population dropping to 959 in 2017. A further decline marked 2018 and 2019, with the populations recorded at 944 and 919, respectively.



Graph 3: Blackbuck population of Marwar region, Rajasthan, India on the annual basis

Similarly, in Bihar, India as reported by Prasad et al., (2021) the district of Buxar and its bordering area, including Dumraon, Rohtas, and Kaimur, have been identified as important sites for Blackbuck sightings and are currently in danger of extinction. The main reason for extinction is the absence of protected areas where the Blackbuck population can easily flourish. Tragically, male blackbucks are frequently hunted and killed by humans and poachers who covet their magnificent horns and other valuable body parts, which are then smuggled for various purposes. Furthermore, due to increased human activities in Chakki village, Dumraon, which is located in Buxar district, Bihar, India, their habitat has been disrupted, resulting in a decline in the blackbuck population. However, in the past, blackbucks were commonly seen in this area.

Data on carrying capacity has been researched at the best of the capacities but, no data is available for the present area of study or any other area of study also and conducting the same is not easy at the level of Ph. D. research work as no at par facilities and official permissions are available. The time limit is also an issue to conduct the same and it can only be conducted under a long project work that too after developing the best facilities and skilled and trained workforce required for the same. But it might be a good idea to generate and analyse the data on carrying capacity in the area of existing research work which might be helpful for the conservation of the target species.

Despite the challenges, understanding the distribution pattern of Blackbuck is crucial for effective conservation and management strategies. Above mentioned factors reported by the authors have provided valuable knowledge on the distribution of blackbuck which might serve as a foundation for evidence-based conservation efforts and inform future researchers in the field of wildlife ecology.

The conservation of animals has become an urgent global concern due to the escalating threats they face in today's rapidly changing world. In this research paper, we probe into the critical issues of threats to Blackbucks especially in Bihar, India.

In relation to the previously described general characteristics, the animal's habitat plays a crucial role in shaping its adaptation. By examining the current and historical distribution of Blackbuck, including any recent changes or local extinction, we can establish a foundation for understanding their distribution. By understanding the characteristics and morphology of *Antelope cervicapra*, this research paper provides valuable insights into the adaptations that allow them to survive and thrive in their respective habitats. For their protection, one needs a more profound concern for the fate of the species as well as a thorough knowledge of the ecological factors affecting their population. It contributes to our knowledge of how species have diversified over time and provides a foundation for further research in the field.

WAY FORWARD

In order to answer these questions, despite previous studies and existing research on *Antelope cervicapra*, several notable factors need to be addressed to deepen our understanding of the species and contribute to its conservation efforts. As we reflect on the threats facing and ongoing conservation efforts, it becomes evident that our individual and collective choices have a direct impact on their survival. We must embrace a conservation mindset, heightening public awareness, promoting sustainable practices, and some initiatives dedicated to wildlife preservation along with policy changes that prioritize the protection of *Antelope cervicapra.*

Further, for the effective implementation of the aforesaid conservation efforts it is important to investigate behavioural ecology, population density, herd characteristics, and species reproduction concerning diverse ecological factors to ensure the preservation and prevent further decline of the *Antelope cervicapra* species in Bihar, India as no proper and standard data is available for the same.

By addressing these gaps, a study on *Antelope cervicapra* can significantly contribute to the scientific knowledge base, inform conservation policies, and help in the long-term survival of the species in a particular area of Bihar, India.

CONCLUSIONS

According to above mentioned the importance of the species, it is certain that they hold great ecological and conservation importance due to their role in maintaining a balanced ecosystem. Also monitoring the movement pattern of blackbucks in their habitat gives us a significant understanding of their ecological system.

According to the analysis conducted on various research articles, it is evident that *Antilope cervicapra* faces several challenges to its survival. However, through ongoing research efforts and conservation initiatives, a comprehensive understanding of the species ecology and behaviour has been achieved. The conclusion drawn from these studies emphasizes the urgency of implementing targeted conservation measures to safeguard blackbuck populations and their habitats. Continued research, monitoring, and collaboration between researchers, conservation organizations, and local communities are vital for the long-term survival and sustainable management of *Antilope cervicapra*.

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Declaration of Interest

The authors declare that there are no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

It is confirmed by the authors that the data supporting the findings of this study are available within the manuscript and referenced in the reference section.

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Author Contribution Statement

S.S., a Ph.D. research scholar, contributed to finding the idea of the research work including the selection of the topic with many helpful suggestions from his supervisor S.S. Review of literature is conducted by research scholar S.S. to identify relevant studies, articles, and sources of similar research works. Eventually, both the authors discussed and agreed with the idea of writing a research paper about the same.

S.S., the research supervisor, provided valuable guidance during the entire process of writing the research paper. This included regular meetings to discuss the progress, offering insights, and helping to refine the related research questions.

Both the authors, S.S. and S.S., collaborated closely in the development and finalization of the research paper. This collaborative effort resulted in the creation of the comprehensive and well-structured research paper presented here. Both the authors read and approved the final manuscript.

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