Building evidence for conservation globally

Journal of Threatened Taxa

10.11609/jott.2025.17.10.27551-27786
www.threatenedtaxa.org

26 October 2025 (Online & Print)
17(10): 27551-27786
ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

Open Access

40 Years zoOreach Zoo Outreach Organisation

ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

Publisher
Wildlife Information Liaison Development Society
www.wild.zooreach.org

Host
Zoo Outreach Organization
www.zooreach.org

Srivari Illam, No. 61, Karthik Nagar, 10th Street, Saravanampatti, Coimbatore, Tamil Nadu 641035, India
Registered Office: 3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore, Tamil Nadu 641006, India
Ph: +91 9385339863 | www.threatenedtaxa.org
Email: sanjay@threatenedtaxa.org

For Focus, Scope, Aims, and Policies, visit https://threatenedtaxa.org/index.php/JoTT/aims_scope
For Article Submission Guidelines, visit https://threatenedtaxa.org/index.php/JoTT/about/submissions
For Policies against Scientific Misconduct, visit https://threatenedtaxa.org/index.php/JoTT/policies_various

continued on the back inside cover

Cover: A Warty Hammer Orchid *Drakaea livida* gets pollinated by a male thynnine wasp through 'sexual deception' — a colour pencil reproduction of photos by ron_n_beths (flickr.com) and Rod Peakall; Water colour reproduction of Flame Lily *Gloriosa superba* -- photo by Passakoran_14; and a bag worm and its architectural genius (source unknown). Art work by Pannagasri G.

Journal of Threatened Taxa | www.threatenedtaxa.org | 26 October 2025 | 17(10): 27584–27593
ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)
https://doi.org/10.11609/jott.8038.17.10.27584-27593
#8038 | Received 06 June 2022 | Final received 21 August 2025 | Finally accepted 10 September 2025
OPEN ACCESS
ARTICLE

Wildlife management and conservation implications for Blackbuck corresponding with Tal Chhapar Wildlife Sanctuary, Rajasthan, India

Ulhas Gondhali [1], Yogendra Singh Rathore [2], Sandeep Kumar Gupta [3] & Kanti Prakash Sharma [4]

[1] John Jay College of Criminal Justice, City University of New York, 524 West 59th Street, New York, NY, 10019, USA.
[2] Department of Forest, Government of Rajasthan, Rajasthan 302004, India.
[3] Wildlife Institute of India, Dehradun, Uttarakhand 248171, India.
[4] Central University of Haryana, SH 17, Jaat, Haryana 123031, India.
[1] ugondhali@jjay.cuny.edu (corresponding author), [2] ysrathore2016@gmail.com, [3] skg@wii.gov.in, [4] kantipsharma@gmail.com

Abstract: Blackbuck *Antilope cervicapra are* native to the Indian subcontinent. Pressures from anthropogenic activities, including hunting, agriculture, urbanization, and deforestation, have led to the encroachment, and destruction of natural Blackbuck habitats. As a result, this species, once abundant, and often found close to human settlements, declined drastically in the 20th century. It almost became extinct in Bangladesh, Nepal, and Pakistan, leading to the Blackbuck being added to the IUCN Red List of Species. Nevertheless, many Blackbuck populations are still at risk owing to habitat loss, poaching, and threats from invasive species. This study addressed the issues related to Blackbuck conservation and management by examining conservation challenges in Tal Chhapar Wildlife Sanctuary as a case study. We describe protective measures and approaches for stakeholders in habitat management, and the mitigation of other conservation issues.

Keywords: Anthropogenic pressures, grassland ecosystems, habitat loss, habitat management, poaching threats, wildlife conservation, wildlife forensics.

Editor: Orus Ilyas, Aligarh Muslim University, Aligarh, India. **Date of publication:** 26 October 2025 (online & print)

Citation: Gondhali, U., Y.S. Rathore, S.K. Gupta & K.P. Sharma (2025). Wildlife management and conservation implications for Blackbuck corresponding with Tal Chhapar Wildlife Sanctuary, Rajasthan, India. *Journal of Threatened Taxa* 17(10): 27584–27593. https://doi.org/10.11609/jott.8038.17.10.27584-27593

Funding: This research is not funded by any agency/ organization.

Competing interests: The authors declare no competing interests.

Author details: Ulhas Gondhali is a wildlife crime researcher and currently working as an adjunct lecturer (Criminal Justice) and a PhD fellow at John Jay College of Criminal Justice, City University of New York. Dr. Yogendra Singh Rathore is currently working as forest ranger at Rajasthan Forest Department. He is former visiting Fulbright-Nehru doctoral and professional research fellow Perlman School of Medicine, University of Pennsylvania. He received his PhD from CSIR-Institute of Microbial Technology, G.N. Ramachandran Advanced Protein Research Centre. Dr. Kanti Prakash Sharma is currently working as professor at Central University of Haryana, India. He obtained his PhD in Biocatalysis and Biotranformations from University of Rajasthan, Jaipur, India His main area of interest related to Biocatalysis and Biotransformation. Dr. Sandeep Kumar Gupta's group is working on forensics, conservation and evolutionary genetics. His research interest is on basic and applied research for the conservation of rare and endangered species and strengthening the wildlife forensics capability in India. He is also leading the teaching modules on wildlife forensics, control of illegal wildlife trade, conservation and evolutionary genetics.

Author contributions: UG, YSR, KPS, SKG: conceptualization, methodology. UG, YSR: writing - original draft preparation. KPS, SKG: supervision. KPS, SKG: reviewing and editing.

INTRODUCTION

Growing human populations are a primary cause of the loss and fragmentation of natural habitats (Didenko et al. 2017), which threaten the survival of wildlife populations. These populations are often forced to adapt to altered and patchy habitats. Animals like the Blackbuck, with significant habitat and quality food requirements due to their large size, have been among the most affected animals. The Blackbuck *Antilope cervicapra* is an antelope endemic to the Indian subcontinent. The Blackbuck is the finest representative of arid and semi-arid grasslands, characterized by short grasses, and is considered the epitome of grassland habitat. It is a denizen of open short grasslands and avoids dense forest, and hilly areas. It prefers to graze on short to mid-length grasses, but the foraging behaviour primarily depends on food availability. It may switch to shrub species and even to crops depending on availability.

The Blackbuck is the only species under the genus *Antilope*. It is a medium-sized animal closely related to the gazelle (Hassanin & Douzery 1999). They are mainly found in the Indian subcontinent and distributed in various grasslands and open areas. In Nepal and Pakistan, they are limited to protected conservation habitats (Ranjitsinh 1989). The IUCN (International Union for Conservation of Nature and Natural Resources) has listed Blackbuck as 'Least Concern'. It is protected under Schedule I of the Wildlife (Protection) Act, 1972 (WPA) of India.

Tal Chhapar Wildlife Sanctuary is a small but diverse wildlife refuge located in Rajasthan's Churu District (Image 1). It is known for its enchanting natural beauty as well as its unique and imperilled habitat. The Tal Chhapar Sanctuary is well-known for its large population of Blackbucks. It is also known for attracting a lot of migratory birds. It's a flat saline basin with a unique and vulnerable ecosystem. Initially, it was kept as a private hunting reserve for the Maharaja of Bikaner. Later, it was designated a sanctuary in 1962. The sanctuary's landscape is largely flat, with wide grasslands in places. The grasslands are populated mainly by *Vachellia nilotica* (formerly *Acacia nilotica*), which is native to the Indian subcontinent, and *Prosopis juliflora*, an invasive species. The Tal Chhapar Wildlife Sanctuary's unique variety of grass is known as 'mothiya'. The grass has a pleasant flavour, and the seeds are pearl-shaped (Moti), preferred among Blackbucks.

Several researchers have studied blackbuck with a focus on understanding behaviour, ecology, threats, evolutionary biology, molecular composition, and identification of Blackbucks in an Indian context. This study gives special consideration to the Blackbuck population in Tal Chhapar Wildlife Sanctuary and reviews past, and present conservation activities, addresses the long-pending conservation issues, risks, and proposes recommendations, and a management strategy.

Distribution of blackbuck in the Indian subcontinent

Blackbucks are found in varied habitats, but the most suitable habitat is open and semi-arid grasslands (Bellis et al. 2003; Bell & Setchell 2017). In India, Blackbucks show growth in protected areas, especially in Gujarat, Rajasthan, and Haryana. Here, Blackbucks are distributed in 13 states in northern, northwestern, central, and peninsular India. The highest population density is found in Rajasthan, Gujarat, Maharashtra, and Haryana. During the late 1970s, Ranjitsinh (1989) estimated the total blackbuck population in India to be between 29,000–38,000. At present, its population could be more than 80,000. The recent wildlife census of Rajasthan (2019) has reported 25,298 Blackbucks in wildlife control areas and territorial control areas of Rajasthan (Rajasthan State Forest Department 2019). The total count of 2019 has come down from the state census of 2018, which was 29,458. In Gujarat, the state forest department has reported 1,428 in the 2015 census (Gujarat Forest Statistics 2019). India has designated areas for Blackbuck conservation; some of the notable areas are Tal Chhapar Wildlife Sanctuary (719 ha) in Rajasthan, Velavadar National Park (3,000 ha) in Gujarat, Ranebennur Wildlife Sanctuary (12,500 ha) in Karnataka, and Great Indian Bustard Wildlife Sanctuary (122,200 ha) in Maharashtra.

In Pakistan, Blackbucks were a common sight along the borders with India before their extinction in the wild. Especially on the edge of the Thar desert area. The most populated area of the Blackbuck was in the northern part of Cholistan (locally known as 'Rohi'). It is an extensive desert in the southern part of the Punjab province of Pakistan (Mirza & Waiz 1973). The Blackbuck count went down drastically in the 1950s. Later, Blackbucks from Texas were reintroduced in Pakistan in Lal Suhanra Sanctuary in April 1970 (Mirza & Waiz 1973). The reintroduction effort was a captive-breeding program under the auspices of the Worldwide Fund for Nature (WWF) and the government of Punjab.

Once on the brink of extinction in Nepal, Blackbucks have recovered well at the protected sites of Khairapur and Hirapur Phanta in Nepal. Owing to joint efforts of the state forest department and various public, and private stakeholders, there has been success in growing

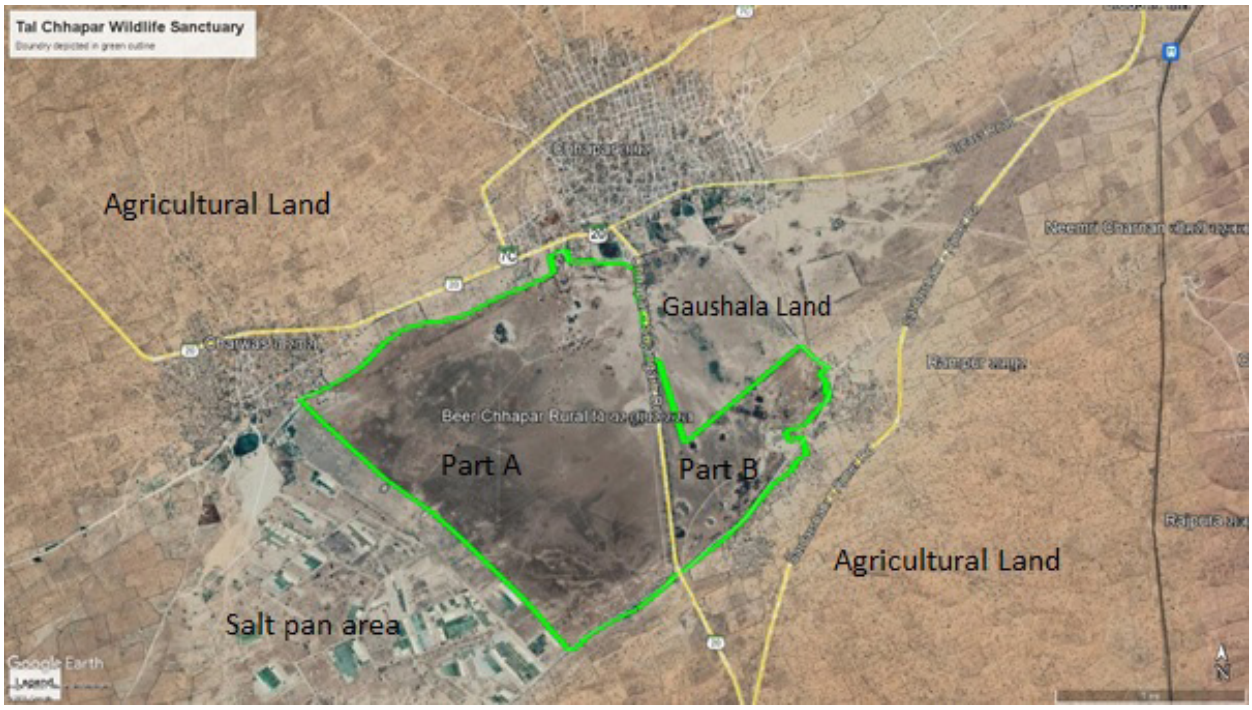

Image 1. Map of Tal Chhapar Wildlife Sanctuary in Rajasthan.

free-ranging Blackbuck in Nepal (Bist et al. 2021).

Threats

Poaching

Poaching has been a major threat to Blackbucks; protection at the national and international levels is provided to mitigate this threat. The Indian government declared Nilgai an agricultural pest in 1996 as a result of common crop depredation incidents, and it allowed retaliatory hunting of crop-raiding nilgais. This change also motivated retaliatory hunting of Blackbuck. Traditionally, some communities like Ban Bawri and Bhil in Rajasthan were engaged in illegal hunting of Blackbucks. People from these communities were also likely to be hired for their special hunting skills as 'Field guard' by land owners to protect their crops from Blackbucks. Crop-raiding Blackbucks have been hunted by such field guards in many instances in Rajasthan (Sinha & Singh 2020). In present times, poachers hunt Blackbucks for trophy hunting (PTI 2018), skin, antlers, and bushmeat.

Feral dogs

Dogs are the most abundant carnivores globally; they are cosmopolitan because of their relationship with humans. Negative interactions with wildlife involving dogs have been cited as a serious problem for wildlife conservation (Young et al. 2011; Hughes & Macdonald 2013; Sepúlveda et al. 2015; Lessa et al. 2016). Their presence around protected habitats has led to the hunting of native protected species by feral dogs (Bergman et al. 2009; Bell & Setchell 2017), altered activity patterns, and reduced abundance of native mammals (Zapata-Ríos & Branch 2016).

The Blackbucks are most vulnerable to these free-roaming dogs during their breeding season. The fawns are very susceptible to feral dogs. Porous fences offer a chance for feral dogs to enter Blackbuck protected areas and kill them. In certain Blackbuck sanctuaries, such loose fencing is even a requirement for the blackbucks. For example, the Tal Chhapar Blackbuck Sanctuary has only 719 ha reserved for the Blackbucks. The management plan suggests that one Blackbuck needs at least one hectare of area for freely roaming and stressless grazing. The Blackbuck population has been increasing in Tal Chhapar Sanctuary and has reached approximately 4,000. Secondly, a public road passes through this sanctuary, which has divided it into two parts across the road. Therefore, the sanctuary has loose-fencing around the enclosure, allowing the Blackbucks to pass in and out through this fencing to avoid intra-species competition for food and reproduction. On the other hand, it has become an opportunity for the feral dogs to enter the sanctuary and kill the Blackbucks.

Habitat loss

Blackbucks are endemic to grasslands and were once distributed across India (Ranjitsinh 1989). Similarly, the Tal Chhapar Wildlife Sanctuary has very little area (719 ha) for the amount of population of Blackbucks inhabiting it. The open grassland habitat is only developed within the sanctuary, and the surrounding areas are either invaded by *Prosopis juliflora* or stressed due to human constructions. A public road passing through this sanctuary is also a big trouble, resulting in habitat fragmentation [Part A and B are two fragments of the sanctuary, they are indicated in the image 1]. Due to this public road, the B part of the sanctuary is underutilized by Blackbucks and therefore underdeveloped. Additionally, the villagers of Rampur and Dewani villages had been given cremation rights in the B part during the settlement of rights before the declaration of this area as a sanctuary. Both of these factors are resulting in the habitat loss of B part of the Tal Chhapar Wildlife Sanctuary.

Human-wildlife interaction

Over-habituation and food conditioning of Blackbucks, through selective conservation efforts, have led to the origin of several human-wildlife negative interactions. The easiest way for authorities from past examples is to declare the species vermin and terminate them through the vermin extermination programme. Section 62 of the WPA allows the Indian government to declare animals other than rare and endangered species as vermin. Such actions may cheer a large portion of the population, as most people in India have their livelihoods dependent upon agriculture. However, it will be detrimental to their conservation.

The Blackbucks are herbivorous with high forage consumption during the monsoon and winter seasons. The abundance of crops in farming lands is also high during the monsoon season in the arid and semi-arid regions. This becomes the Blackbucks' temptation to enter the nearby crop fields for foraging. To prevent this, farmers use barbed-wire fencing around their agricultural lands (Image 2). During local migration to nearby agro-fields, the Blackbucks get stuck in the wire fencing and get injured.

Isolation of the Blackbuck population

Tal Chhapar is a 719 ha protected wildlife sanctuary occupied by the largest population of Blackbucks in Rajasthan. The area of the sanctuary is confined with loose fencing to allow local migratory movements of the Blackbucks. The Blackbucks have seasonal dispersal movement to nearby agricultural lands and can be seen even up to 10 km away from the sanctuary. The protected land under the Tal Chhapar Wildlife Sanctuary is insufficient to hold the present population, which is roughly four times the capacity of the sanctuary. Geographical isolation for a longer period of time can cause genetic isolation due to inbreeding. There is not enough evidence to prove genetic isolation yet; the authors are also involved with an ongoing study on the genetic diversity of the Blackbuck population in Tal Chhapar. This study will yield sufficient evidence to further understand the genetic isolation of the group.

Wildlife Management

Wildlife management is an integrated and interdisciplinary approach for conserving wild species, which includes several activities like administration, community participation, law enforcement, education, and research. It is guided by ecological principles such as carrying capacity, disturbance, succession, and environmental conditions to prevent the ongoing loss of the Earth's biodiversity. Wildlife management is a triad between wildlife, their habitat, and humans. Human control is an indispensable part of wildlife management.

Image 2. Barbed wire fencing near Tal Chhapar. © Ulhas. G (2022).

It has two basic types, namely: a) manipulative management and b) custodial management. In India, wildlife management is more or less wildlife conservation, which is primarily based on a custodial management approach. This approach is implemented in India mainly by setting up national parks (NPs) and wildlife sanctuaries (WSs), and to a lesser extent by conservation reserves and community reserves, where suitable environmental conditions are safeguarded and wildlife species are conserved by law.

The wildlife management of the Blackbuck is also implemented using this custodial management approach under the Centrally Sponsored Umbrella Scheme of Integrated Development of Wildlife Habitats (CSS-IDWH). In addition to the protection provided to Blackbuck by the Wildlife (Protection) Act, 1972, this umbrella scheme plays an important role by extending central help to the states for Blackbuck conservation. A pre-approved management plan is a prime requisite for the successful implementation of this umbrella scheme. Therefore, the management plan is the guiding document for the management or conservation of wildlife and, for that matter, for Blackbuck in the defined protected areas. Based on the management plan, the following components are involved for the effective management of Blackbuck in PAs/RAs: -

Protection Measures

(a) Construction of boundary wall and fencing

To effectively manage the wild population, the central and state government have to declare certain land as PAs or RAs within the ambit of the State Forest Act and further declare it as NP, WS, a conservation reserve, or community reserve by WPA. This helps the manager to exercise stringent law enforcement for the protection of the wild population in and near such areas. Such areas are then protected by raising walls, wire fences, and ditch fencings to minimize the human-animal interactions and biotic interference with wildlife habitats. The feral dogs and stray cattle are the most common biotic interference to the Blackbuck habitat. Stray cattle enter the protected lands for grazing and further disturb the grassland habitat of Blackbucks. Similarly, feral dogs have been a menace these days, killing fawns, and young Blackbucks. Therefore, walls and fencing prevent such stray cattle and feral dogs from entering the protected forest lands.

(b) Construction of guard chowkies

A continuous watch on the Blackbuck habitat is an essential part of the wildlife management of this species. Historically, game hunting was the most common reason for the sharp decline of this species in India. Hunting and poaching continue in some parts of the Thar Desert area. The guard chowkies are constructed around the periphery of protected lands to keep a continuous watch on any illegal activities. Additionally, the forest staff deployed in these chowkies keep observing the Blackbuck habitat for any adverse effects. Such observations help the manager to make decisions on various kinds of interventions in the Blackbuck habitat.

(c) Management against climate-induced disasters

Natural disasters are unpredictable and unavoidable events. Generally, Blackbucks are very sensitive to environmental shocks. In May 2009 and June 2010, high-velocity windstorms converted into hailstorms, and continued for 3–4 days in Tal Chhapar Wildlife Sanctuary, which resulted in the death of around 75 and 50 Blackbucks, respectively. A waterlogging situation had arisen in the sanctuary due to its flat tract with a moderate slope, and the Blackbucks got stuck in it to the death. Therefore, artificial earthen mounds have been created to cope with such climate-induced disasters in this sanctuary. These artificial mounds act as shelter for the wildlife during such adverse climatic conditions of heavy rainfall and storms.

(d) Development of an eco-sensitive zone

The blackbuck is a nomadic wild species, and thus it has a large foraging area. The protection is not only needed within the protected lands, but it is also required for the ecologically fragile areas around the PAs. Therefore, ESZs are notified by the MoEFCC, Government of India, under the Environment Protection Act, 1986, to minimise the negative impacts of certain activities on the fragile ecosystem encompassing the protected areas. It acts as a “shock absorber” or “transition zone” to minimize the impact of urbanisation on wildlife habitats.

(e) Fire control

Mostly, the blackbuck habitat in the country is arid or semi-arid grasslands with thinly forested areas. The grassy plains remain green during the monsoon season and turn into the ‘yellow carpet’ during the summer. Such dry, yellow grasslands are very prone to fire incidents, which are both natural, and anthropogenic. Therefore, fire lines are created in the grassy habitats of Blackbucks to prevent the fire from spreading. Maintenance of such fire lines is a recurring activity in the protected grassland areas.

(f) Animal disease control

During the summers, the arid and semi-arid grassland habitats of Blackbucks become devoid of grasses, which induces their local peripheral migration into the nearby crop fields. The chances of exposure to domestic animals increase during such local migration, and hence, exposure to many parasitic diseases also increases. The fawns and pregnant Blackbucks are more susceptible to such pathogens. Therefore, annual vaccination is required to prevent the spread of diseases from domestic animals to Blackbucks. Every year, such immunization camps are organized by the managing staff of the sanctuary in the surrounding villages to vaccinate their livestock. It helps in minimizing the chances of the spread of various infectious diseases to the Blackbuck population.

(g) Construction of rescue centres and rescue wards

Rescue centres and rescue wards are an integral part of wildlife management in the Blackbuck sanctuaries. The blackbucks are very sensitive to shocks, and urgent medical care is a prime requisite to save their lives. Various cases of dog bites, road accidents, dominance fights, and rescues come to the management staff requiring immediate care in rescue centres and wards.

Habitat Improvement

(a) Pasture development

Open grasslands with scattered trees are the most preferred habitat of the Blackbuck. It is important to manage the grasslands to ensure the availability of sufficient food for Blackbucks throughout the year. The selection of nutritious grass species is essential for the healthy growth of individuals. To improve this herbivore species, pasture development activities are executed annually. Every year, the patches of grasslands are identified, cleared off due to high grazing pressure in the sanctuary, and included in the annual plan of operation (APO). These patches are then ploughed with nutritious species of fodder grasses, resulting in the development of fresh grass patches in the habitation (Image 3). This recurrent activity ensures the optimum availability of food for the growing population in the sanctuary every year.

(b) Eradication of invasive species from the habitat

Invasive alien species, often exotic, get introduced into the natural habitats intentionally or unintentionally. During 1970–80, *Prosopis juliflora* and other hardy tree species were introduced worldwide to combat deforestation, desertification, and fuel wood shortage. These invading species are now becoming a severe threat to biodiversity and adversely affecting the natural habitats of many wild species, including blackbucks (Rajput et al. 2019). Blackbucks are less attracted to the *P. juliflora*-affected lands because it reduces the fodder availability during the pinch period. *Lantana camara* is another invasive species that has been proven to be a menace to natural wildlife habitats. All possible measures have been taken to eradicate such invasive species from the grassland habitats. Unfortunately, sometimes the

Image 3. Ploughed patches for pasture development in Tal Chhapar. © Ulhas G. (2022).

pods of *P. juliflora* are consumed by the Blackbucks from the periphery of the sanctuary, which results in their unintentional dispersion through their dung pile. Therefore, eradication of such invasive alien species is included as a recurrent activity in the management plan of the sanctuary to protect Blackbuck habitats from their spread and adverse effects.

(c) Water and soil moisture conservation and water management

Soil moisture conservation is an essential practice in arid and semi-arid grassland habitats. The area with scant rainfall faces drought-like conditions during the summer. The soil moisture conservation activities also help in habitat improvement by enhancing the growth of green grasses in the sanctuary area. Under SMC, V-ditches, and contour bunds are created in the sanctuary area to increase soil moisture. Additionally, rainwater is harvested by digging ponds, constructing tanks, and storing water for drinking during the pinch period. Artificial water holes are also constructed to ensure year-round water availability in the sanctuary. It is observed that the rainwater harvesting is not sufficient to cater to the drinking water needs of such a large Blackbuck population, and therefore, water pipelines are installed to pump water into these water points during the summer.

(d) Patch plantation/gap plantation and plantation grooves

Blackbucks prefer open grassland with intermittent tall grass and require scattered patches of trees for shelter, fawn nursing, and protection against predators, as well as rain, and heavy winds (Image 4). During summer, the herds of Blackbuck rest under the shade of trees and thus acquire tolerance against high temperatures. Interestingly, a stringent balance is required between open grassland and tree patches, as very dense tree growth negatively impacts the grassland development, and thus the availability of nutritious food. Therefore, patch plantation activities are carried out in the sanctuary by selecting tree species of *Ziziphus nummularia*, *Prosopis cineraria*, *Vachellia nilotica*, and *Dalbergia sissoo*, which offer both shelter & food in the form of pods, and leaves.

Image 4. A tree patch in Tal Chhapar. © Ulhas G. (2020).

Research and population estimation

Routine research activities in protected areas are vital for various reasons that can equally benefit a forest department and the scientific community. Action research targeting concerns on several problems associated with Blackbuck conservation, such as genetic diversity, and human-wildlife negative interactions, is highly warranted. Research activities are allowed in the protected areas after scrutinizing the research proposals at higher levels. Outputs of such research could help make policies of wildlife management sounder and species-specific. Additionally, population estimation is another important factor of wildlife management that tells us about the outcomes of human interventions on the habitats. A population estimate is a numerical estimation of the population size calculated from sample census data. Various direct and indirect methods of population estimation are available; a preferred method depends on the animal and the type of habitat. Positive human intervention always leads to the strengthening of the ecosystem and hence an increase in the number of resident wild species.

Community Involvement

Community participation is essential in wildlife conservation and ecological management of forest and non-forest areas. It ensures the involvement of locals in wildlife conservation and the protection of natural resources from external organized crime groups. The constitution of a Joint Forest Management Committee or Eco-Development Committee is a way forward to enable local stakeholders in the collective development and protection of the land. Such initiatives have been a helping hand to the forest departments' acute staff crunch problem. The development of guidelines is important to ensure uniformity of practice. The Tal Chhapar Wildlife Sanctuary is surrounded by at least four villages and a town that are situated within the boundaries of this sanctuary. The villagers are involved in various developmental activities, and the forest department ensures that it generates sustainable livelihood opportunities for the locals. As a result, a feeling of forest protection, and wildlife conservation develops in the villagers, and locals, which cumulatively improves the departmental efforts to save wildlife.

Recommendations

Wildlife managers must analyse the health and balance of the ecosystem periodically and promptly to include other positive factors in wildlife conservation. As described earlier, many Blackbucks' protected lands are not big enough to sustain the growing population with assured protection. The Tal Chhapar Wildlife Sanctuary has only 719 ha land for the Blackbucks, which is almost four times less than required. The population in this sanctuary has increased way beyond the carrying capacity of this area, and is expanding continuously. However, the western boundary of the sanctuary has been extended further to include 78 ha. Wasteland in the sanctuary was developed by the forest department in 2019–20. This is still not enough to sustain this big number, and therefore, further extension of the sanctuary is the prime concern at present.

Currently, the private land of the gaushala and the revenue lands of the salt pan area have great potential for the extension of the Sanctuary. The private land of gaushala is being managed under trust for the well-being of stray cattle, and therefore, the acquisition of this entire private land of gaushala is a little difficult. Attempts had been made by the forest department to acquire this land, but they failed. Temporary acquisition of some proximal part of this gaushala land for grazing has also been attempted on a rental basis. Additionally, the salt pan area on the western boundary can be utilized for the extension of the sanctuary. This saltpan land area is highly invaded by *Juliflora* and has many leases for salt manufacturing. On this side an area of 78 ha has already been acquired by the forest department for the proposed extension of the main sanctuary. Many leases are not operational at present, and therefore, this area has many open wells where Blackbucks accidentally fall in and get injured. Only a few salt leases are operational in this vast area. Therefore, a proposal can be made to the state government to acquire this revenue land for the extension. Acquisition of private lands on lease is a good option for the time being until a translocation or extension plan is achieved. This immediate intervention will reduce the grazing pressure in the sanctuary and will also generate income for the nearby local farmers who are not growing crops on their lands due to crop damage by these blackbucks. This will also help in minimizing the human-animal interaction in the area. Alternatively, procuring dry fodder is an essential practice due to the erratic rainfall situation in Rajasthan. Interestingly, the members of EDC and other locals come forward to donate fodder after their crop harvesting if drought-like conditions occur in the sanctuary. It is necessary to maintain a good harmony between wildlife and the local public for the conservation efforts to be successful, where the wildlife managers play a key role.

Translocation is another option to reduce the population pressure, where individuals will be removed

Image 5. Proposed translocation site Jaswantgarh (Red box) and present protected site Tal Chhapar (Green box).

in large numbers from the sanctuary and introduced to some other places with adequate protection and favourable habitat conditions. In this direction, the forest divisional office of the district of Churu acquired 278 ha. Area in Jaswantgarh Village in Nagaur District, which is located on the borders of Sujangarh tahsil. This land is around 12 km away (aerial distance) from the Tal Chhapar Wildlife Sanctuary (Image 5). Between this acquired land and the sanctuary, many agricultural lands are well fenced. Apart from this, there are major and minor roads present between these two areas. Therefore, translocation by simply luring these blackbucks is not a feasible option, as it happens with the African Boma technique. Villagers are not willing to allow the removal of their fencing around their farmland. Sardarshahar-Ajmer Road has very heavy traffic and therefore cannot be blocked to assist such translocation. Any translocation from Tal Chhapar would be conditional on prior restoration and governance at Jaswantgarh, considering ongoing grassland degradation and barrier-rich landscapes. Otherwise, it risks merely relocating Human-Blackbuck interactions rather than reducing them.

We must accept that conservation of wildlife and the environment is a shared responsibility between the governments and the public, and we must fulfil our parts to make it happen.

CONCLUSION

As the human population grows, demand for natural resources increases, which leads to the shrinking of wildlife habitats. This calls for long-term management plans for the conservation of Blackbucks. A conservation requirement may vary as per the situation and site. Hence, site-specific or micro-level management is required. The role of local communities and government has been proven essential for any conservation project; their inclusion must be for such conservation efforts (Kelly 2004; Ancrenaz et al. 2007).

REFERENCES

Ancrenaz, M., L. Dabek & S. O'Neil (2007). The costs of exclusion: recognizing a role for local communities in biodiversity conservation. *PLoS Biology* 5(11): e289. https://doi.org/10.1371/journal.pbio.0050289

Bell, S. & J.M. Setchell (2017). Dogs disrupting wildlife: domestic dogs harass and kill Barbary macaques in Bouhachem Forest, Northern Morocco. *African Primates* 12: 55–58.

Bergman, D., S.W. Breck & S. Bender (2009). Dogs gone wild: feral dog damage in the United States. USDA APHIS Wildlife Services, National Wildlife Research Center Resource Publication.

Bist, B.S., P. Ghimire, L.P. Poudyal, C.P. Pokharel, P. Sharma & K. Pathak (2021). From extinction to recovery: the case of blackbuck Antilope cervicapra from Nepal. *Mammal Research* 66(3): 519–523.

Didenko, N.I., D.F. Skripnuk & K.N. Kikkas (2017). Analysis of demographic pressure on nature, pp. 126–131. In: *International Conference on Trends of Technologies and Innovations in Economic and Social Studies 2017*. Atlantis Press. https://doi.org/10.2991/ttiess-17.2017.22

Groves, C. (2000). Phylogenetic relationships within recent Antilopini (Bovidae), pp. 223–229. In: Vrba, E. (ed.). *Antelopes, Deer and Relatives*. Yale University Press, New Haven, 348 pp.

Gujarat State Forest Department (2019). Gujarat Forest Statistics (Statistics report). Gujarat State Forest Department, 129 pp.

Gulati, S., K.K. Karanth, N.A. Le & F. Noack (2021). Human casualties are the dominant cost of human–wildlife conflict in India. *Proceedings of the National Academy of Sciences* 118(8): e1921338118. https://doi.org/10.1073/pnas.1921338118

Hajibabaei, M., G.A.C. Singer, P.D.N. Hebert & D.A. Hickey (2007). DNA barcoding: how it complements taxonomy, molecular phylogenetics and population genetics. *Trends in Genetics* 23(4): 167–172. https://doi.org/10.1016/j.tig.2007.02.001

Hassanin, A. & E.J.P. Douzery (1999). The tribal radiation of the family Bovidae (Artiodactyla) and the evolution of the mitochondrial cytochrome b gene. *Molecular Phylogenetics and Evolution* 13(2): 227–243. https://doi.org/10.1006/mpev.1999.0619

Hassanin, A., F. Delsuc, A. Ropiquet, C. Hammer, B.J. van Vuuren, C. Matthee, M. Ruiz-Garcia, F. Catzeflis, V. Areskoug & T.T. Nguyen (2012). Pattern and timing of diversification of Cetartiodactyla (Mammalia, Laurasiatheria), as revealed by a comprehensive analysis of mitochondrial genomes. *Comptes Rendus Biologies* 335(1): 32–50. https://doi.org/10.1016/j.crvi.2011.11.002

Hsieh, H.M., H.L. Chiang, L.C. Tsai, S.Y. Lai, N.E. Huang, A. Linacre & J.C.I. Lee (2001). Cytochrome b gene for species identification of the conservation animals. *Forensic Science International* 122(1): 7–18. https://doi.org/10.1016/S0379-0738(01)00403-0

Hughes, J. & D.W. Macdonald (2013). A review of the interactions between free-roaming domestic dogs and wildlife. *Biological Conservation* 157: 341–351. https://doi.org/10.1016/j.biocon.2012.07.005

IUCN (1993). Nature Reserves of the Himalaya and Central Asia. IUCN, Gland, Switzerland and Cambridge, UK, xxiv + 458 pp.

Jhala, Y.V. & K. Isvaran (2016). Behavioural ecology of a grassland antelope, the blackbuck Antilope cervicapra: linking habitat, ecology and behaviour, pp. 151–167. In: Ahrestani, S. & M. Sankaran (eds.). *The Ecology of Large Herbivores in South and Southeast Asia*. VIII Springer, Berlin, 257 pp.

Joly, S. & A. Bruneau (2006). Incorporating allelic variation for reconstructing the evolutionary history of organisms from multiple genes: an example from Rosa in North America. *Systematic Biology* 55(4): 623–636. https://doi.org/10.1080/10635150600863109

Shagun (2019). *Desertification in India: How a faulty government scheme degraded Gujarat's Banni grasslands*. Down To Earth. Published 6 September 2019. https://www.downtoearth.org.in/climate-change/desertification-in-india-how-a-faulty-government-scheme-degraded-gujarat-s-banni-grasslands-66572

Karanth, K.K., L. Naughton-Treves, R. DeFries & A.M. Gopalaswamy (2013). Living with wildlife and mitigating conflicts around three Indian protected areas. *Environmental Management* 52(6): 1320–1332. https://doi.org/10.1007/s00267-013-0162-1

Karanth, K.K., L. Naughton-Treves, R. DeFries & A.M. Gopalaswamy (2013). Living with wildlife and mitigating conflicts around three Indian protected areas. *Environmental Management* 52: 1320–1332.

Kelly, A.H.H. (2004). The role of local government in the conservation of biodiversity. A thesis of doctor of philosophy, submitted to University of Wollongong, xvi + 504 pp.

Kocher, T.D., W.K. Thomas, A. Meyer, S.V. Edwards, S. Pääbo, F.X. Villablanca & A.C. Wilson (1989). Dynamics of mitochondrial DNA evolution in animals: amplification and sequencing with conserved primers. *Proceedings of the National Academy of Sciences* 86(16): 6196–6200. https://doi.org/10.1073/pnas.86.16.6196

Kumar, V., N. Sharma & A. Sharma (2017). DNA barcoding of the Indian blackbuck (Antilope cervicapra) and their correlation with other closely related species. *Egyptian Journal of Forensic Sciences* 7: 31.

Kumar, V., N. Sharma, A. Sharma, K. Verma, K. Singal & M. Kumar (2018). A data-based study in support of Blackbuck related cases from Haryana. *Data in Brief* 17: 1196–1200. https://doi.org/10.1016/j.dib.2018.02.034

Lessa, I., T.C.S. Guimarães, H. de G. Bergallo, A. Cunha & E.M. Vieira (2016). Domestic dogs in protected areas: a threat to Brazilian mammals? *Natureza & Conservação* 14: 46–56. https://doi.org/10.1016/j.ncon.2016.05.001

Mallon, D. & S. Kingswood (2001). Antelopes. Part 4: North Africa, the Middle East, and Asia. Global Survey and Regional Action Plans. SSC Antelope Specialist Group, P. 260, IUCN, Gland, Switzerland and Cambridge, England.

Menon, R. (2000). Nature watch. *Resonance* 5: 69–79.

Mirza, Z.B. & A. Waiz (1973). Food availability for blackbuck (Antilope cervicapra) at Lal Suhanra Sanctuary, Pakistan. *Biological Conservation* 5: 119–122. https://doi.org/10.1016/0006-3207(73)90091-8

Naha, D., S.K. Dash, A. Chettri, A. Roy & S. Sathyakumar (2020). Elephants in the neighborhood: patterns of crop-raiding by Asian Elephants within a fragmented landscape of eastern India. *PeerJ* 8: e9399. https://doi.org/10.7717/peerj.9399

Nei, M. & S. Kumar (2000). *Molecular Evolution and Phylogenetics*. Oxford University Press, Oxford 352 pp.

Pandey, K. (2019). *India lost 31% of grasslands in a decade.* Down To Earth. Published 10 September 2019. https://www.downtoearth.org.in/agriculture/india-lost-31-of-grasslands-in-a-decade-66643

Prashanth, M., A. Saravanan, M. Mathivanan & T. Ganesh (2016). Conservation of a fragmented population of blackbuck (*Antilope cervicapra*). *Current Science* 110: 543–549.

PTI (2018). From being hunting trophies to protected species, the lure of Blackbuck. The Hindu.

Rajasthan State Forest Department (2019). Wildlife Population Estimation by Waterhole Method 2019 (Wildlife census report). Rajasthan State Forest Department, 5 pp.

Rajput, N., K. Baranidharan, M. Vijayabhama & A. Sawant (2019). Ecological impact of *Prosopis juliflora* on the habitat conditions of blackbuck in Sathyamangalam Tiger Reserve, Tamil Nadu, India. Methods (preprint/short communication).

Ranjitsinh, M. (1989). *The Indian Blackbuck*. Natraj Publishers, Dehradun, 155 pp.

Sepúlveda, M., K. Pelican, P.C. Cross, A. Eguren & R.S. Singer (2015). Fine-scale movements of rural free-ranging dogs in conservation areas in the temperate rainforest of the coastal range of southern Chile. *Mammalian Biology* 80: 290–297. https://doi.org/10.1016/j.mambio.2015.03.001

Sinha, B.L. & A. Singh (2020). Embodying a preparedness to die: Why Bishnois of Western Rajasthan rise in defence of the blackbuck and the chinkara? *Sociological Bulletin* 69: 34–50. https://doi.org/10.1177/0038022919899002

Young, J.K., K.A. Olson, R.P. Reading, S. Amgalanbaatar & J. Berger (2011). Is wildlife going to the dogs? Impacts of feral and free-roaming dogs on wildlife populations. *BioScience* 61(2): 125–132. https://doi.org/10.1525/bio.2011.61.2.7

Zapata-Ríos, G. & L.C. Branch (2016). Altered activity patterns and reduced abundance of native mammals in sites with feral dogs in the high Andes. *Biological Conservation* 193: 9–16. https://doi.org/10.1016/j.biocon.2015.10.016

Journal of Threatened Taxa is indexed/abstracted in Bibliography of Systematic Mycology, Biological Abstracts, BIOSIS Previews, CAB Abstracts, EBSCO, Google Scholar, Index Copernicus, Index Fungorum, JournalSeek, National Academy of Agricultural Sciences, NewJour, OCLC WorldCat, SCOPUS, Stanford University Libraries, Virtual Library of Biology, Zoological Records.

NAAS rating (India) 5.64

Print copies of the Journal are available at cost. Write to:
The Managing Editor, JoTT,
c/o Wildlife Information Liaison Development Society,
3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore,
Tamil Nadu 641006, India
ravi@threatenedtaxa.org & ravi@zooreach.org

Journal of Threatened Taxa

www.threatenedtaxa.org

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

October 2025 | Vol. 17 | No. 10 | Pages: 27551–27786
Date of Publication: 26 October 2025 (Online & Print)
DOI: 10.11609/jott.2025.17.10.27551-27786

Publisher & Host

WILD zoo reach
Zoo Outreach Organisation

Threatened Taxa