

Tibetan Gazelle (*Procapra picticaudata*) in Indian Trans-Himalayan region: Current Status, Threats, Conservation Strategies and Human Perspective

Priyankar Sanphui^{1*}, Rupam Mandal²

¹Department of Zoology, Sree Chaitanya College, Habra, North 24 Parganas, West Bengal 743223, India

²Department of Botany, Sree Chaitanya College, Habra, North 24 Parganas, West Bengal 743223, India

*Corresponding Author's Email: sanphuip@gmail.com

Abstract

Many endemic species, including the Tibetan gazelle (*Procapra picticaudata*), inhabit the Himalayan region, one of the world's biodiversity hotspots. It is a high-altitude antelope endemic to the Tibetan Plateau. In India, it is mostly found in the Changthang region around Hanle in Ladakh. Its population has gone down drastically due to anthropogenic reasons and is on the verge of local extinction in India. The present study investigates the distribution, ecology, population, conservation status, threats, and conservation initiatives of Tibetan gazelle in Ladakh, India, along with assessing the perception of the local people regarding the gazelles. Field observations in the Changthang wildlife sanctuary near Hanle recorded multiple sightings, which confirm the restricted distribution and small group size. Hunting in earlier times, extensive grazing of livestock, harsh weather conditions, and a very small population size were identified as the major threats to the Indian population of Tibetan gazelle. Conservation initiatives like the establishment of protected areas, regulation of overgrazing and awareness programs have resulted in limited but encouraging results. A survey among the locals revealed that though the locals are familiar with the Tibetan gazelle and hold a positive attitude toward conservation of these animals, they are not well aware of the critical conservation status of the animal. The study emphasizes the necessity of integrated conservation strategies, monitoring, and long-term scientific research, as well as habitat management and dynamic community engagement to prevent the local extinction of this high-altitude endemic ungulate.

Keywords: Changthang; Conservation; Hanle; Local extinction; Tibetan Gazelle

Introduction

The Himalayas, spreading across 2400 km from Kashmir in the northwest to Arunachal Pradesh in the east, are one of the 36 biodiversity hotspots of the world (Wanjari *et al.*, 2026). Several unique and endemic species inhabit the western and Trans-Himalayan regions of India.

The Tibetan gazelle is a small, high-altitude antelope endemic to this region of India. The Tibetan gazelle, *Procapra picticaudata*, belongs to the family Bovidae, subfamily Antilopinae and tribe Antilopini. The Tibetan gazelle belongs to the genus *Procapra* which is a primitive lineage of antelopes quite different from the African gazelle (*Gazella*). The genus *Procapra* includes three closely related species of Asian gazelle: *Procapra picticaudata* (Tibetan gazelle), *Procapra gutturosa* (Mongolian gazelle) and *Procapra przewalskii* (Przewalski's gazelle), all of which are found in high-altitude cold arid environments. The Tibetan gazelle is endemic to the Tibetan Plateau. They are mainly found in the Qinghai, Tibet, Gansu, Xinjiang and Sichuan regions of China. A small population of Tibetan gazelles lives in Ladakh and North Sikkim, India (Jiang *et al.*, 2019).

Reports suggest that the number of Tibetan Gazelles in the wild and their habitat have decreased significantly since 1970 (Zhang & Jiang, 2006). Several factors contribute to this decline, with human

activities being the most significant. Habitat loss, grassland fragmentation, hunting and overgrazing have been reported to be the main threats to the survival of the gazelles. According to the International Union for Conservation of Nature and Natural Resources (IUCN) Red List, the Tibetan gazelle is listed as near threatened (NT) globally (IUCN SSC Antelope Specialist Group, 2016). The animal is protected in India and China under the Wildlife Protection Act (Anon, 2023).

Presently a small but major population of Tibetan gazelles in India is found in Ladakh, more specifically in the Hanle region in the southeastern part of the Changthang Plateau. Ladakh is a union territory in the northernmost part of the Republic of India. It is a high-altitude cold desert, experiencing extreme temperatures, very low rainfall and severe solar radiation (Singh *et al.*, 2011). Ladakh is marked by rugged barren mountains, vast plateaus and sparse vegetation, making it a unique ecosystem with harsh climatic conditions (Sahana *et al.*, 2023). Hanle is a remote village in the Union territory of Ladakh. Hanle is known for having the Indian Astronomical Observatory, which is one of the highest observatories in the world and also for the Changthang wildlife sanctuary, which is home to many rare and endemic flora and fauna, including the Tibetan gazelle.

Regardless of its ecological significance, the Tibetan gazelle is one of the least studied ungulates of the Indian Trans-Himalayas. The present study is an account of the Tibetan gazelle with respect to its distribution, habitat preference, population, conservation status, threats and conservation initiatives, focusing mainly on the Ladakh population. A semi-structured survey was also conducted to understand the perspective of the local people towards the Tibetan gazelle and its conservation.

Methodology

Study Site and Time

The study was conducted in Hanle Village and the southeastern part of the Changthang wildlife sanctuary located near Hanle Village. Hanle is a high-altitude remote village within the union territory of Ladakh with the coordinates 32°47'N 79°00'E. It is approximately 260 km from Leh, the summer capital of Ladakh. Situated at an altitude of 4500 m (~14760 ft) above sea level (Bhatnagar *et al.*, 2006a). Hanle is known for its clear sky, stargazing and wildlife. The study was conducted during September 2019.

Data Collection and Survey

Primary data was collected as described earlier by Jiang *et al.* (2019) from Hanle Village and by visiting different parts of the Changthang Wildlife Sanctuary located near Hanle. Photographs were taken by a mobile phone camera. For gathering information and understanding the perception of local peoples, a small survey was conducted using a semi-structured questionnaire with closed and open-ended questions among the locals of Hanley and nomads living nearby following Dash *et al.* (2025). A random sampling method (Browne-Nuñez & Jonker, 2008; Hasan & Csányi, 2023) was used to select the respondents. Secondary data were gathered from the very few published papers and documents that are available in the public domain.

Results and Discussion

Local Name and General Morphology of Tibetan Gazelle

The Tibetan gazelle (*Procapra picticaudata*) is locally known by its Tibetan name “Gua” or “Goa” (sometimes also written as “Gowa”) in the Hanle region. Local communities use the Tibetan and related Himalayan dialects to derive the word “Goa.” These animals form a natural part of the traditional ecological knowledge of the people of the Changthang region. Most of the locals recognize the animal as Gua and are unaware of the English name.

The Tibetan gazelles are small-sized antelopes who have compact bodies with relatively short limbs and weigh about 13–16 kg. (Schaller, 2000; IUCN SSC Antelope Specialist Group, 2016). They have a light

fawn to greyish brown coat color on the dorsal side and white on the ventral side. The males possess cylindrical, ringed, pointed, backward-curved horns (about 20-30 cm in length). The females are usually hornless. Both sexes have a very distinct heart-shaped white rump patch, which acts as a visual signal for group cohesion.

Habit and Habitat Preference

The Tibetan gazelles live in high-altitude environments between 3500 m and 5500 m above sea level in cold desert conditions with winter temperatures as low as -20°C and very low precipitation (Michel, 2024; Bhasin *et al.*, 2024). The Tibetan gazelle prefers to stay in open plains and gentle slopes with sparse vegetation of grasses and sedges (Schaller, 2000; IUCN SSC Antelope Specialist Group, 2016). They avoid dense vegetation, steep slopes and rugged terrain. They avoid areas with high human and livestock presence. Though they can coexist with other wild ungulates, they compete with domestic livestock (Qiao *et al.*, 2024; Yan *et al.*, 2024).

They feed on grasses, forbs and sedges and can survive with minimum water, deriving moisture from the plants and grasses they feed on. They generally live in small groups, though solitary males can also be seen. They follow a polygynous mating system, with females usually giving birth to one fawn at a time (Schaller, 2000).

They are among the very few ungulates adapted to live in extreme hypoxic conditions. They have increased lung capacity, resulting in efficient oxygen utilization and higher hemoglobin affinity for oxygen (IUCN SSC Antelope Specialist Group, 2016).

Distribution

The Tibetan gazelles are endemic to the Tibetan Plateau and majorly found in China (housing the primary population) and India (with a marginal population). However, some sources also mention the presence of a very small population in Nepal.

In India, they are primarily found in eastern Ladakh, especially the Hanle Valley of the Changthang region, and very rarely in North Sikkim, near Gurudongmar and Tso Lhamo (Qiao *et al.*, 2024).

Previously, they had a much wider distribution, ranging over 20000 sq. km in the early 20th century (Bhatnagar *et al.*, 2007), which reduced to about 1000 sq. km by the late 1980s (Bhatnagar *et al.*, 2006a; Fox *et al.*, 1991). Presently they are restricted to 100 to 150 sq km in the Kalak-Tartar plateau of the Hanle region.

Population Status

The Tibetan gazelle is one of the rarest large mammals in India. Though globally listed as near threatened (IUCN), it is critically endangered in India.

The last and probably the only documented survey of the gazelle, in 2000 by Bhatnagar *et al.* (2006a), revealed the occurrence of this species only in Hanle, Eastern Ladakh. It is on the verge of local extinction with only about 50 individuals in Ladakh (Namgail *et al.*, 2008). The two populations reported previously (Fox *et al.*, 1991) near Dungti and Tso Kar in the 1980s were found to be extinct during the survey done in 2000.

The other populations seem to be declining. The population at Kalak Tartar region of Hanle Valley was estimated to be 30 animals in 2000 (Bhatnagar *et al.*, 2006b), which was at least 68 individuals in 1997 and at least 36 seen in one group in 1998 (Bhatnagar *et al.*, 2006a).

According to the previous red list assessments of the IUCN, the Tibetan gazelle has been listed as least concerned since 2003. From the subsequent red list assessments in 2007, 2008, and 2016 (latest), the

animal has been assessed as near threatened globally. The current population trend is declining according to IUCN (IUCN SSC Antelope Specialist Group, 2016).

Tibetan gazelles are protected under Indian wildlife laws and are listed under Schedule I of Indian wildlife (Protection) Act 1972 (Bhatnagar *et al.*, 2006a).

Sighting During Field Visit

A field visit was conducted in the Changthang wildlife sanctuary (Figure 1) by vehicle for about 4 hours along with an experienced guide. It was found that the driver and the guide were very well aware of the habitat of the gazelle. During the study, 5 sightings at 5 different places (Figure 2) were recorded. The details are given below:

Table 1: Field Visit Sightings of Tibetan gazelle in Changchang Wildlife Sanctuary

Sighting	Number	Details
1	4	1 male, 2 female and 1 fawn
2	2	1male and 1 female
3	1	1 male
4	3	1 male and 2 female
5	3	1 female 2 fawn

As the gazelles live in a range of a very small area, spotting them becomes very easy if someone is aware of their habitat, making hunting relatively simple, which definitely raises concern. But the guides and drivers were aware of the animals' dwindling population and wildlife laws. They strictly abide by the rules and regulations of the forest department and never take tourists very close to the gazelles. As the land has no large vegetation, observing these animals even from quite a distance is possible for the tourists.



Figure1: Changthang Wildlife Sanctuary, Hanle, Ladakh



Figure 2: Two of the Sightings of Tibetan Gazelle in Changthang Wildlife Sanctuary. A: A Group of Two Gazelles, B: A Solitary Male Gazelle

Major Threats to Indian Population

Hunting in Historical Times:

One of the major causes for the massive decline in the population is due to the extensive hunting in the 20th century during the 1962 Sino-Indian War and other socio-political disturbances. Reports indicate that such disturbances affected ration supplies, prompting the hunting of gazelles as an alternate food source (Bhatnagar *et al.*, 2006b). The local interviews revealed that hunters found the gazelles to be easy targets, as they could approach the animals easily in vehicles. As the animals live in an almost flat area without any large vegetation, hideouts are not available, making hunting even easier. Although legal protection for these animals has reduced hunting in recent times after the 1980s, the historical impact is severe.

Overgrazing of Domestic Livestock:

As mentioned previously, the Tibetan gazelle can coexist with other wild ungulates, but the domesticated livestock compete with the gazelles. Overgrazing of the domestic livestock in the area, particularly the *pashmina* goats, reduces the forage availability.

The sudden increase in the livestock grazing resulted due to the infiltration of Tibetan refugees in this area who were also pastoral. Additionally, the government implemented measures to boost *pashmina* production in the region. Reports suggest that the domesticated goats of the Changthang region produce the finest cashmere or *pashmina* in the world (Namgail *et al.*, 2007). This resulted in a huge increase in farming of *pashmina* goats and, in turn, intensified the grazing cycle.



Figure 3: Grazing of Livestock within Changthang Wildlife Sanctuary

As the vegetation on which the gazelles feed is limited in such cold deserts, livestock removes a significant amount of plant biomass, directly affecting the survival of Tibetan gazelles (Hagalia 2004). In the current study, two large herds of goats were observed grazing very close to one of the locations where Tibetan gazelles were spotted (Figure 3). Even in present times, the livestock grazing is occurring in almost the same area where the gazelles are present. This certainly raises concern.

Small Population Size:

Extremely low population (about 50 individuals) in the entire Ladakh region raises the risk of a genetic bottleneck and inbreeding, which poses a severe threat to the Indian population of Tibetan gazelles.

Forage Scarcity During Severe Winter:

Tibetan gazelles inhabit very high altitudes with harsh weather conditions and prolonged winters. Reports suggest that during 1998-99, heavy snowfall in the area covered the sparse and dry forage, resulting in the death of a large number of Tibetan gazelles.

Conservation and Management

Establishment of Protected Area (only for Insitu Conservation):

The Changthang Wildlife Sanctuary, established in 1985, is a high-altitude protected area at about 14600 ft. This sanctuary is the only major habitat of the Tibetan gazelles in India.

It is to be noted that Tibetan gazelles are exclusively conserved in the wild. None of the zoos in India house these animals and therefore there is no possibility of captive breeding programs like other Antilopes. None of the Indian zoos can house Tibetan gazelles, as replicating the extreme habitat conditions of the gazelles are not possible. The three high-altitude zoos of India (Padmaja Naidu Himalayan Zoological Park in Darjeeling, Himalayan Zoological Park in Gantok and Pt. G.B. Pant High Altitude Zoo in Nainital) are below the altitude of 7000 ft., whereas the Tibetan gazelles are adapted to live at an altitude of ~ 14000 ft.

Conservation Initiatives:

A conservation initiative was undertaken in 2000 jointly by the Jammu and Kashmir Department of Wildlife Protection (JKDWP), the Nature Conservation Foundation, Mysore (NCF) and the International Snow Leopard Trust-India (ISLT) for the Tibetan gazelles. As an outcome of the initiative, a workshop was held on August 22, 2005, in Hanley, Ladakh, to formulate strategies for the conservation of Tibetan gazelles based on their research. A number of suggestions, like the establishment of a grazing-free area, posting of guards (gazelle guards), putting up of informative sign boards, initiation of a separate project on gazelle recovery, were put forward. Following this, a meeting of conservationists, the wildlife department and village leaders in Hanle Valley was held on 25th August 2005 at Tashi Choeling monastery, Hanle, to inform the locals regarding the findings and discuss the conservation strategies and seek their active participation (Bhatnagar *et al.*, 2006b).

Supplemental Winter Feeding:

Probability of winter starvation of the gazelles due to heavy snow covering the forage needs to be taken care of. Despite efforts to provide winter supplementary feed to gazelles, none were successful. Large amounts of alfalfa brought from different parts of Ladakh were provided by the wildlife department for the 2004-2005 winters but were not accepted by the gazelles. Similar efforts were successful with Tibetan wild asses (kiangs) inhabiting the same place (Bhatnagar *et al.*, 2006b). An alternative can also be providing supplementary fodder to local livestock to reduce the grazing pressure.

Establishment of 'Grazing Free' Areas:

Creating 'grazing-free' areas as suggested in the workshop of NCF-ISLT in 2005, in the areas inhabited by the Tibetan gazelles through community participation, can be an effective step towards the conservation of the gazelles. NCF, along with pastoral communities (Changpas and Tibetan refugees), has set up a small grazing-free reserve in the area and has maintained it for the past few years (Trivedi, 2012).

Community Awareness and Involvement:

Awareness of the local community is needed regarding the conservation of Tibetan gazelles. Local peoples can also be involved in the conservation of the gazelle or sustainable tourism centered on the Tibetan gazelle.

The study revealed a gradual increase in awareness about these animals among the locals of Hanley. The locals are now finding an alternative livelihood by serving as driver-cum-guides for the tourists who intend to see the Tibetan gazelle. The locals now comprehend those numerous tourists flock to this remote village to catch a glimpse of the Tibetan gazelle. This has resulted in an increase of homestays and a source of income for the locals. In fact, some of the homestays are named after this rare endemic gazelle (Figure 4). Locals are slowly acknowledging the importance of the conservation of these animals and sometimes taking part in such initiatives directly or indirectly.

Apart from the locals, the Changpa, a semi-nomadic community of Buddhist pastoralists inhabiting the high-altitude areas of Changthang and the personnel from the armed forces need to be made aware of the present situation and status of the Tibetan gazelle and the importance of their conservation in Hanle. Some informative hoardings and posters focusing on the Tibetan gazelle and their last refuge in Ladakh could be a beneficial step to increase awareness.

During this study, researchers found a board from the J&K wildlife protection department that displayed the name of the Changthung wildlife sanctuary and the animals present (Figure 5), probably following the suggestion of the NCF-ISLT workshop in 2005. The board was not in a very satisfactory condition due to lack of maintenance and harsh weather conditions. Very few banners or posters were observed in the public areas. However, many of the homestays in Hanle display images and posters of Tibetan gazelles.



Figure 4: Home Stay in Hanle, Named after Tibetan Gazelle



Figure 5: A Board Near the Entry of the Changthang Wildlife Sanctuary

Continuous Research and Monitoring:

Despite some initiatives, the research and information regarding Tibetan gazelles is limited and more research is needed to understand the ecology and behavior of these animals. A monitoring program for the gazelles and land use should be undertaken. To understand the population dynamics, need to closely monitor the population and conduct regular censuses of the Tibetan gazelle.

Human Perception on Tibetan Gazelle and its Conservation:

A small survey was conducted among the local people of Hanle to understand the attitude of the people towards the Tibetan gazelle and its conservation. All the respondents were above 18 years of age. The respondents comprised 57.5% male and 42.5% female (n=73). The respondents included homestay owners, their family members and staff, local drivers and guides, Buddhist monks, monastery staff, students, housewives and nomads. The survey's findings are presented in table 2.

The survey data indicates that the locals are quite well aware of the Tibetan gazelle (though they were more familiar with the local name, Goa). The majority of the respondents (84.9%) have heard about the animal and its presence in the Changthang area. Quite a good percentage (63.01%) of respondents have also seen the animal, indicating its visible presence in the landscape.

However, a very small percentage of the respondents were aware that this is the last major population in India and about the conservation status, indicating a significant knowledge gap in conservation-specific aspects. This study shows that though the locals recognize the animal, they are not fully aware of its ecological vulnerability.

73.9% of respondents were aware of the species being legally protected, reflecting some success of the awareness and outreach programs. The majority of the respondents show a positive attitude towards the conservation of the Tibetan gazelle, which is definitely a good sign.

The survey also revealed that tourists mainly visit Hanle for the astronomical observatory, stargazing and Umling La. Tourism here is not wildlife-oriented and awareness about the Tibetan gazelles is still low among tourists. Only a small percentage of tourists visiting Hanle engage in gazelle sightings, which is

probably good from the conservation point of view, as too much tourist attention may affect the animals in a negative way.

Table 2: Survey Findings on Local People's Awareness and Attitudes toward Tibetan Gazelle Conservation in Hanle

Questions		Response		
Close Ended Questions		Percentage of Respondent Answering		
		Yes	No	Indifferent
1	Whether they have heard of Tibetan gazelle or Goa/Gowa?	84.93	15.07	0
2	Whether they have seen Tibetan gazelle (physically)?	63.01	36.99	0
3	Whether they seen Tibetan gazelle in images, paintings etc?	82.19	17.81	0
4	Whether they are aware that Tibetan gazelle lives in Changthang wildlife sanctuary near Hanle?	84.93	15.07	0
5	Whether they are aware that this population is the last surviving population in India?	30.14	69.86	0
6	Whether they are aware of the conservational status of TibetanGazelle?	15.07	84.93	0
7	Whether they are aware that these animals are protected under law and cannot be captured or killed?	73.97	26.03	0
8	Whether these animals need to be conserved?	69.86	0	30.14
9	Will conservation of Tibetan gazelle have any good effect on their livelihood (directly or indirectly)?	69.86	0	30.14
10	Has awareness about Tibetan gazelle and its conservation increased among the locals?	78.08	2.74	19.18
Open Ended Questions				
11	Main tourist attraction of Hanle?	According to most of the respondent the major attraction of Hanle is the Astronomical Observatory, clear sky for stargazing and a stopover for Umlingla, the highest motorable pass in the world		
12	Are tourists aware of Tibetan gazelle?	According to the respondent majority of the tourists are not aware of the Tibetan gazelle and its conservation status in Hanle		
13	Does tourists go for Tibetan gazelle sighting?	According to the respondent, very few tourists go for gazelle sighting, hough this number is increasing.		

Conclusion

The Tibetan gazelle represents one of the most fragile but ecologically important ungulate species that lives in the high-altitude, harsh, cold desert of the Trans-Himalayan region. Presently, their population in India is extremely precarious with only very few living individuals in small pockets of Changthang Wildlife Sanctuary in Ladakh and in Sikkim.

During the last century, the population of the species has drastically reduced due to anthropogenic pressures, including extensive hunting, overgrazing and habitat degradation. Moreover, the critically small population size and the resulting genetic bottleneck bring the species on the verge of local extinction in India.

Despite these challenges, the present study documents several conservation measures, including the establishment of protected areas, community-based grazing managements and awareness programs, which definitely provides a degree of optimism. The survey indicates a gradual but noticeable improvement in the attitudes of the locals toward the species. People are recognizing the gazelle's ecological and economic value, especially in the context of sustainable tourism. The present study also identifies certain gaps in terms of detailed scientific research and long-term monitoring for better understanding and effective implementation of the conservation policies.

In summary, the future of the Tibetan gazelle in India depends on holistic and integrated conservation strategies combining scientific management with active participation from local communities. Sustainable efforts on an urgent basis are crucial to prevent the local extinction of this unique, endemic, high-altitude species and preserve the ecological balance of the Trans-Himalayan environment.

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