PARKS & WILDLIFE
Gilgit Baltistan

RUT SEASON SURVEY REPORT

ASTOR MARKHOR & LADAKH URIAL IN GILGIT-BALTISTAN 2024-25

Parks & Wildlife Department
Government of Gilgit-Baltistan

RUT SEASON SURVEY REPORT 2024-25

ASTOR MARKHOR *(Capra falconeri falconeri)* & LADAKH URIAL *(Ovis vignei vignei)*

IN GILGIT-BALTISTAN, PAKISTAN

Published by:

Parks & Wildlife Department, Gilgit-Baltistan.

With Kind Support of Our Partners:

SNOW LEOPARD FOUNDATION

PAKISTAN ENVIRONMENT TRUST

Available from: Office of the Chief Conservator
Parks & Wildlife Department,
River View Road, Chinar Bagh, Gilgit, Gilgit-Baltistan, Pakistan
Tel: +92 5811-920939
Website: https://fwegb.gov.pk

RUT SEASON SURVEY REPORT 2024-25

ASTOR MARKHOR *(Capra falconeri falconeri)* & LADAKH URIAL *(Ovis vignei vignei)*

IN GILGIT-BALTISTAN, PAKISTAN

Report Authors: Dr. Hussain Ali, Faizan Dukhi and Khadim Abbas

Data Curators: Centre For Ecological Research (Pvt) Ltd, team

Surveyors: Field Staff of Parks & Wildlife Department, Gilgit-Baltistan.

Logistic Support in Field: Mubashir Ali, Noor Ud Din, Muhammad Tayyab, and Basit Ali.

Central Logistic Support: Faizan Dukhi and Ali Munawar.

Supervision: Dr. Zakir Hussain, Khadim Abbas, Muhammad Essa, Muhammad Jaffar, Sajjad Ahmad Khan and Shah Nawaz.

Spatial and Analytical Analysis: Dr. Hussain Ali

Report Design: Centre For Ecological Research (Pvt) Ltd.

Acknowledgment

The survey was conducted through a joint effort by the Forest, Parks and Wildlife Department, Gilgit-Baltistan along with the communities of Community-Controlled Hunting Areas (CCHAs). We extend our gratitude to the entire hierarchy of the Parks and Wildlife Department, Gilgit-Baltistan, for their logistic support. The Snow Leopard Foundation (SLF) for donating GPS and binoculars to Parks & Wildlife Department, Gilgit-Baltistan and Pakistan Environment Trust (PET) for its support in the Ladakh urial surveys.

Table of Contents

List of Tables

List of Figures

List of Plates

REPORT SUMMARY

Pakistan is home to as many as 198 species of mammals, including 13 subspecies. This remarkable diversity spans from the towering peaks of the Himalayas, Karakoram, and Hindu Kush to the coastal mangroves in the south. Among these are iconic and ecologically significant animals such as the Ladakh urial and the markhor the latter also being the national animal.

Plate 1.Astor markhor most coveted trophy in Pakistan.

The Ladakh urial and markhor have a highly restricted distribution, unlike the more widespread Himalayan ibex. Their limited range, coupled with rampant poaching in the past, along with the disease outbreaks, impacts of climate change and habitat fragmentation, pushed both species to the brink of extinction. Recognizing the dire situation, a trophy hunting program was initiated in 1990.

Plate 2.Astor markhor in its habitat.

Since then, the population of markhor has gradually increased. However, because Ladakh urial is not included in the trophy hunting program, its population has declined significantly. It has been extirpated from many of its former strongholds and is now reported in only three Community Controlled Hunting Areas (CCHAs) among 63 CCHAs across the Gilgit-Baltistan (GB).

The trophy hunting program in GB follows scientific recommendations, with hunting quotas based on annual rut surveys of wild ungulates.

Accordingly, the Parks and Wildlife Department of Gilgit-Baltistan conducts annual surveys for markhor and Ladakh urial using the Double Observer Survey Method (DOSM).

This year's survey estimated a population of 1,693 Astor markhor, ranging from 1,470 to 1,899 individuals at a 95% confidence interval (CI). The estimated population of Ladakh urial was 229, with a CI ranging from 153 to 301. The observed sex ratio was 0.98 males to 1 female for markhor, and 1.04 to 1 for Ladakh urial. Among the estimated 1,693 markhor, 34.79% were males (31.06% of whom were trophy-sized), 35.20% were females, 17.12% were young, and 12.87% were yearlings. The Ladakh urial population comprised 32.31% males (25.67% of whom were trophy-sized), 31.00% females, 15.28% young, and 21.39% yearlings.

Based on the current year's survey data, the Parks & Wildlife Department may issue permits for 45 Astor markhor if the '25% of trophy-sized males' rule is applied. Alternatively, using the '2% of total population' rule, 34 markhors can be harvested. In contrast, for Ladakh urial, five trophies can be

issued based on the 25% rule. However, applying the 2% of total population rule allows for the harvest of 4 Ladakh urial. It is pertinent to note that trophy hunting is typically permitted only for species with a viable population (at least 500 individuals), which is not applicable in the case of the Ladakh urial.

Therefore, to foster community commitment toward Ladakh urial conservation, the Parks & Wildlife Department should establish a Conservation Award and allocate approximately PKR 1 million every three years, based on reliable population estimates of the Ladakh urial.

Plate 3.Astor markhor herd in Rahim Abad Valley, Gilgit.

1. INTRODUCTION

Gilgit-Baltistan (GB) is characterized by rugged high mountain ranges primarily the Himalayas, Hindu Kush, and Karakoram. Although much of the land in GB is barren, a significant portion is covered by forests and pastures, alongside various other land use types. This diverse landscape provides vital habitat for numerous wildlife species, including the Astor markhor (*Capra falconeri falconeri*) and Ladakh urial (*Ovis vignei vignei*).

Astor markhors are commonly found in forested regions with sparsely distributed juniper, while Ladakh urial are typically associated with open, barren valleys. Both species were once widely distributed across GB. However, following the political transition in 1967, hunting pressure increased significantly. In the previous system, local communities generally did not possess firearms, and the region's Mir royalty held ownership over wildlife-rich *Nullahs* in the princely states of Hunza-Nagar and other vessel states of Kashmir. After the transition, wildlife poaching escalated due to greater access and diminished regulation.

Plate 4.Gilgit-Baltistan, landscape.

Rampant poaching led to severe declines in many wildlife populations, including Astor markhor and Ladakh urial, until the trophy hunting program was established. Since its inception, the markhor population has rebounded considerably, and today a size-able population exists in GB while Ladakh urial, listed under CITES *Appendix I*, remains at risk. The Parks & Wildlife Department of Gilgit-Baltistan after approval from Wildlife Management Board (WLMB) is in the process of submitting a request for special permission to initiate its trophy hunting to Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Secretariat through the Ministry of Climate Change and Environmental Coordination (MCC&E), Pakistan.

1.1 Astor markhor

The Astor markhor (*Capra falconeri falconeri*), (Figure 1) also known as the flare-horned markhor, is a striking wild goat distinguished by its massive, spiraled horns that flare outward and upward. Males are particularly impressive, with horns reaching up to 1.5 meters, a shaggy coat ranging from brown to blackish, and a prominent beard. Females are smaller, with shorter, less twisted horns. Adapted to rugged terrain, the Astor markhor is an agile climber, often navigating steep cliffs and rocky outcrops with ease. It primarily feeds on grass, leaves, and shrubs, shifting from grazing in summer to browsing in winter (Roberts, 1997; Schaller, 1980, 1977)

Plate 5.A male and female Astor markhor.

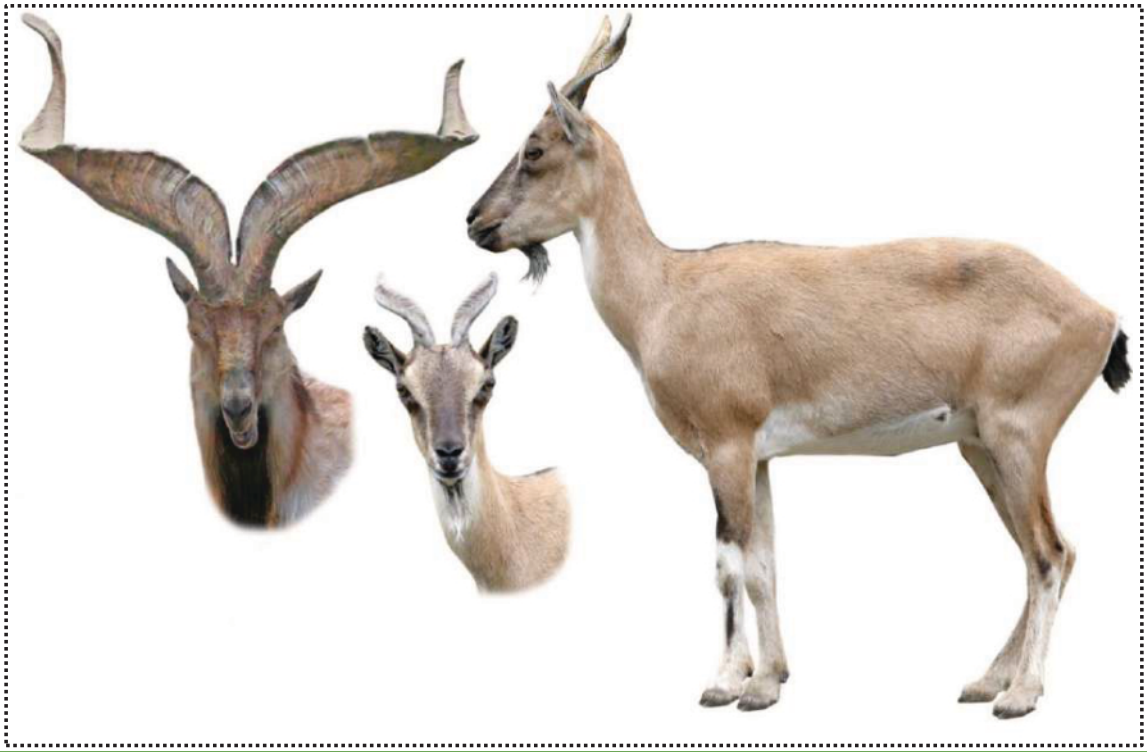


Figure 1.Demographic categories of Astor markhor adopted from (Castello, 2016)

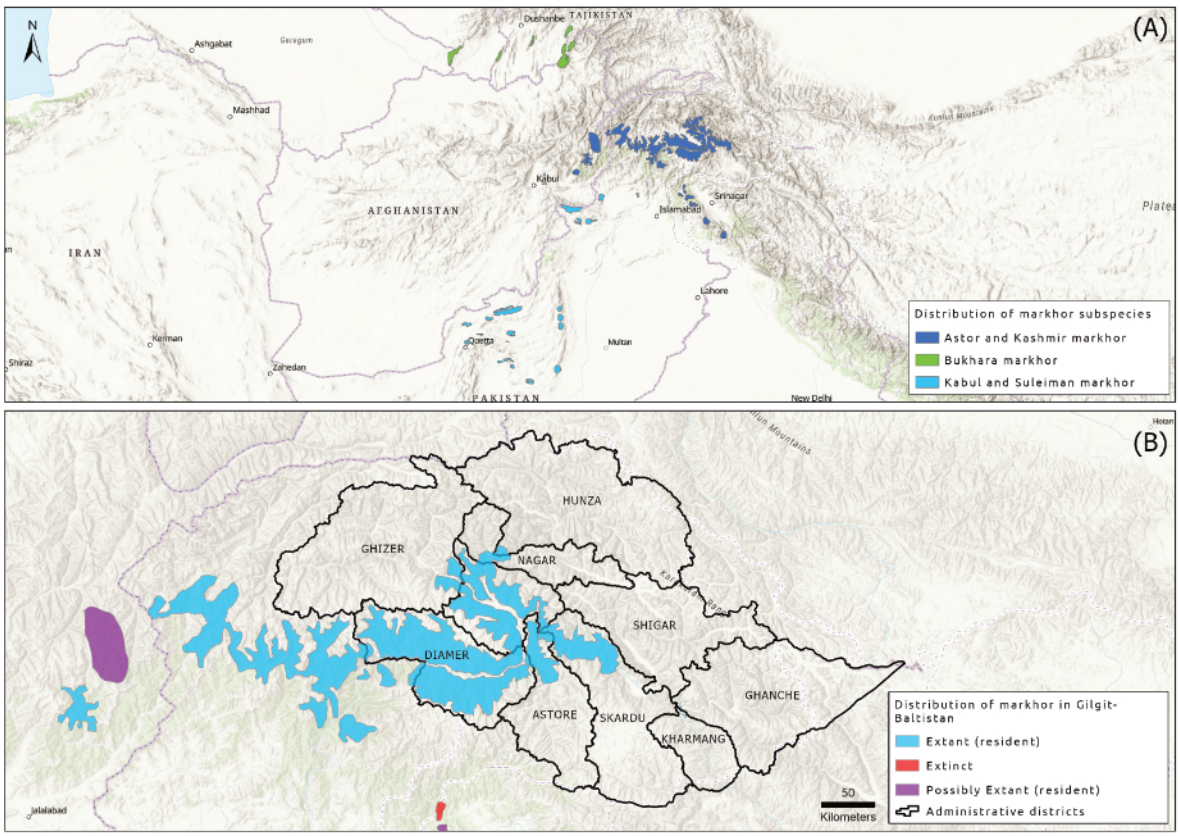


Figure 2.(A) Global distribution and (B) distribution in Gilgit-Baltistan of Astor markhor.

1.2 Ladakh urial

The Ladakh urial (*Ovis vignei vignei*), also known locally as Shapu (Figure 3), is a medium-sized wild sheep distinguished by its reddish-grey coat, white underparts, and striking semi-circular horns in males that can reach up to 73 cm in length. Males typically weigh between 70–90 kg and stand about 91 cm at the shoulder, while females are smaller and often hornless.

Figure 3. Dimorphic Sketch of urial (Adopted from (Castelló, 2016)

This subspecies is adapted to high-altitude, arid environments and is primarily a grazer, feeding on grasses, forbs, and shrubs. It is listed as *Vulnerable* on the IUCN Red List due to habitat loss, illegal hunting, and competition with livestock (Roberts, 1997; Schaller, 1980, 1977) while Sheikh and Molur (2004) listed Ladakh urial as Endangered in Pakistan.

Ladakh urial inhabit open, rolling hills and semi-desert terrain between 3,000- and 4,250-meters elevation, favoring gentle slopes and valley floors over steep cliffs. In Pakistan, their distribution is now restricted to fragmented populations in Gilgit-Baltistan and parts of Chitral, having been extirpated from many former strongholds along the Indus River.

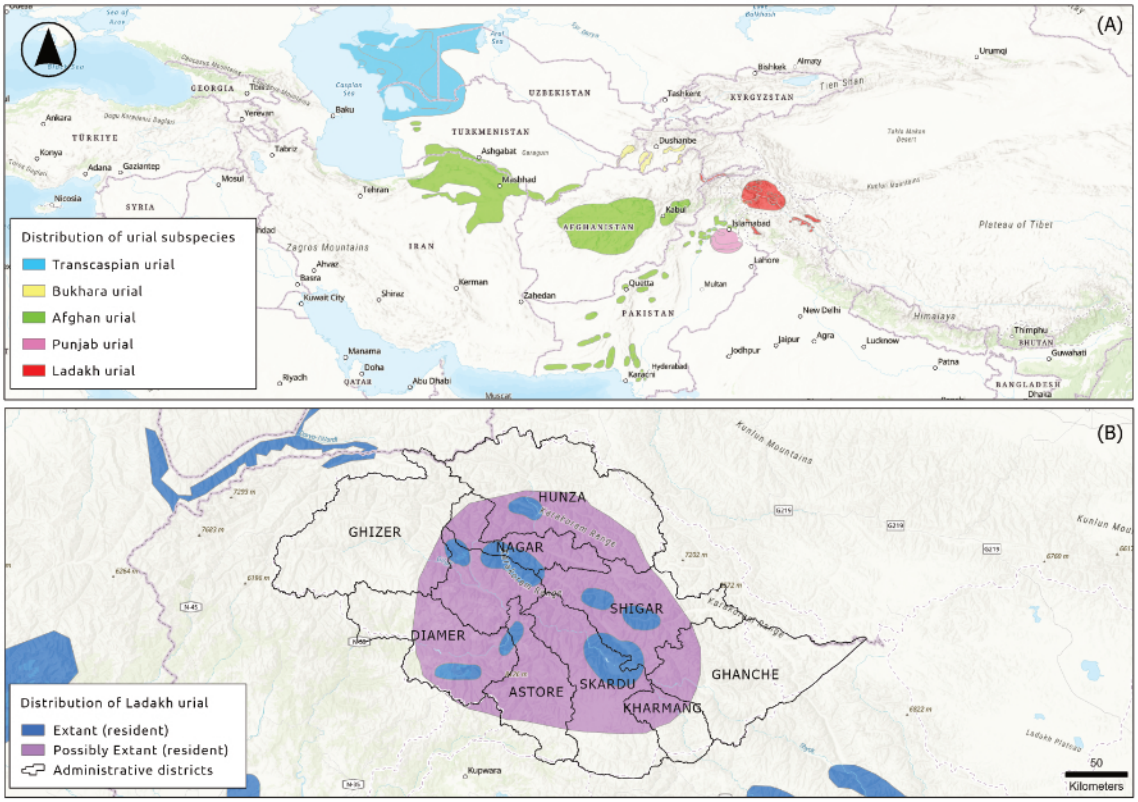


Figure 4.Distribution of Ladakh urial (A) Global distribution (B) distribution in Gilgit-Baltistan.

1.3 Objectives of Study

The Astor markhor is the most coveted trophy species in Gilgit-Baltistan's trophy hunting program. Currently, the Parks & Wildlife Department, Gilgit-Baltistan, allocates four trophies for markhor based on annual wildlife surveys. These surveys play a crucial role in monitoring the effectiveness of trophy hunting as a conservation tool and are conducted with the following objectives:

1. To document the current distribution of Astor markhor and Ladakh urial in Gilgit-Baltistan.
2. To estimate the number of trophy-sized animals available for the 2025–2026 trophy hunting season.
3. To apply Bayesian statistical methods to predict the population estimates of Astor markhor and Ladakh urial.
4. To track annual population trends of Astor markhor and Ladakh urial to inform long-term conservation and management strategies.

2.MATERIAL AND METHODS

2.1 Pre-Survey Training Sessions

As the annual wild ungulate surveys require a substantial number of surveyors, it is essential to ensure that all participants receive proper training prior to fieldwork. Each surveyor is trained in identifying wild ungulates by sex and age classes, including adult males, females, juveniles, yearlings, and trophy-sized individuals. In addition, to ensure data accuracy and consistency, surveyors are also trained in the use of Global Positioning System (GPS) devices, binoculars, spotting scopes, and, most importantly, in completing the field data collection form (Annexure I). These training sessions were facilitated by Dr. Hussain Ali, Senior Regional Program Manager at the Snow Leopard Foundation (SLF) (Figure 5).

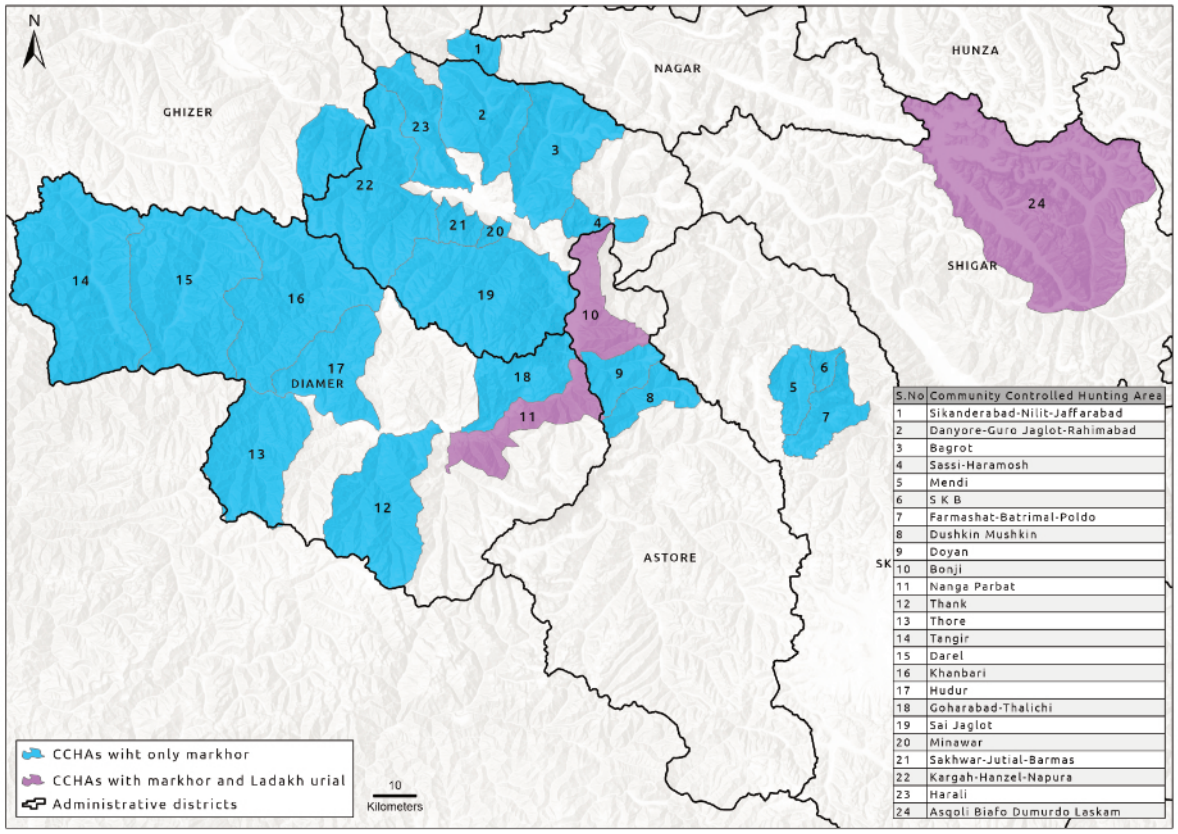
Figure 5.Lecture session of pre-survey training.

2.2 Study Area

The survey was conducted in 63 Community-Controlled Hunting Areas (CCHA) and potential valleys for its future notification as CCHAs across Gilgit-Baltistan (Figure 6) from 15th December 2024 – 31st January 2025.

2.3 Double Observer Method

The Double Observer Method (DOM), grounded in the principles of mark-recapture, was employed in this study. Originally developed to estimate detection probabilities in aerial wildlife surveys (Caughley, 1977), the method was later refined by Magnusson *et al*. (1978) to account for



S.No	Community Controlled Hunting Area
1	Sikanderabad-Nilit-Jaffarabad
2	Danyore-Guro Jaglot-Rahimabad
3	Bagrot
4	Sassi-Haramosh
5	Mendi
6	S K B
7	Farmashat-Batrimal-Poldo
8	Dushkin Mushkin
9	Doyan
10	Bonji
11	Nanga Parbat
12	Thank
13	Thore
14	Tengir
15	Darel
16	Khanbari
17	Hudur
18	Goharabad-Thalichi
19	Sai Jaglot
20	Minawar
21	Sakhwar-Jutial-Barmas
22	Kargah-Hanzel-Napura
23	Harali
24	Asgoli Biafo Dumurdo Laskam

Figure 6.Study area surveyed Community-Controlled Hunting Areas.

differences in detection rates between observers. Forsyth and Hickling (1997) were the first to apply the DOM to ground-based surveys, using it to estimate populations of Himalayan Thar in New Zealand.

The DOM involves two observers independently scanning and counting animals, either simultaneously from different vantage points or sequentially over time. Surveys are conducted within blocks that do not exceed the typical daily movement range of the target species or surveyors. These blocks are delineated using prominent physical features such as rivers or high ridgelines—that limit animal movement between blocks.

2.4 Delineation of Survey Blocks

Survey maps were created by subdividing each Community Controlled Hunting Area (CCHA) into smaller blocks ranging from 25 to 40 km^2 using ArcGIS Pro version 3.5.1 (Esri, Redlands, California, USA).

2.5 Scanning for Animals

Mountain ungulates are typically crepuscular in nature (Roberts, 1997; Schaller, 1977, 1980), so observations were conducted during dawn and dusk hours. Scanning was aided by spotting scopes (Swarovski 30×70) and binoculars (Nikon 10×50). When a herd was sighted, relevant information such as group size, type, demographic composition, location, and elevation was recorded on a standardized field data sheet. A Global Positioning System (GPS) device (e.g.,

Garmin 64S, 66S, or 66ST) was used to mark the observer's position, while the herd's location was noted and later delineated on the survey map.

2.6 Demographic Classification

The Capture-Recapture method can be accurately applied to wild ungulates only if the species is sexually dimorphic and individuals can be identified based on age classes (Suryawanshi *et al*., 2012). Herds were classified using the demographic categories proposed by Schaller (1977), as outlined in (Table 1). The composition of each herd—female herds (females with young), male herds (males only), and mixed herds (males, females, and young)—was recorded to help distinguish between repeated and single captures. Additionally, the number of trophy-sized animals were recorded separately.

Table 1.Demographic classification proposed by Schaller (1977) for mountain ungulates.

Female Classification	Kids Classification		Males Classification				
Female > 2	Young < 1	Yearlings > 1 <2	Class I ($2^{1/2}$) years	Class II ($3^{1/2}$) years	Class III ($4^{1/2}$) years	Class IV ($5^{1/2}$) years	Trophy Size

2.7 Topography of Herd Locations

To distinguish between herds observed by both observers, habitat features such as snow, bare rock, glacier, rangeland, shrubs, mixed forest, and slope orientation (north, south, east, or west)—were recorded. The behavior of the herd at the time of sighting (e.g., feeding, walking, running, or resting) was also documented to ensure that the animals remain visible long enough for accurate counting.

2.8 Post Survey Discussion

The total number of Himalayan ibex and blue sheep groups was estimated using a two-survey mark-recapture approach implemented in the "BBRecapture" package, which operates within a Bayesian framework in the R statistical programming environment (Fegatelli & Tardella, 2013) version 4.4.3, R Core Team, 2025.

Group size was analyzed following the methodology of (Ahmad *et a*l., 2022; Khanyari *et al*., 2021; Suryawanshi *et a*l., 2012). Age-sex composition and sighting locations were used to determine whether each group was observed by one or both observers. Groups observed by both observers were coded as "11," those seen only by the first observer as "10," and those seen only by the second team as "01".

The detections of the two observers were separately modelled using the "mt" model. To estimate the number of ibex and blue sheep groups ($\hat{G}$) in the study areas, using the "BBRecap" function with a uniform prior for each species. The "mt" model was selected because detection probabilities were expected to vary between the two observers (Suryawanshi *et al.,* 2012). The model was run for 10,000 MCMC iterations with a burn-in of 1,000 (Fegatelli & Tardella, 2013).

The "mt" model estimated detection probabilities for observers one and two across the survey occasions. To calculate the total population size (Nest) for each ungulate species, we multiplied the estimated number of groups ($\hat{G}$) by the estimated mean group size (μ). Confidence intervals for population estimates were derived by generating a distribution of mean group sizes through 10,000 resampling iterations with replacement.

This distribution was then combined with 10,000 random draws of estimated group numbers ($\hat{G}$), weighted by their posterior probabilities, to produce a distribution of total population estimates. The median of this distribution was taken as the estimated population (Nest), with the 2.5th and 97.5th percentiles serving as the 95% confidence intervals.

To estimate the 95% confidence intervals for the proportion of individuals in different age-sex classes (adult male, adult female, and young), we performed 10,000 bootstrap iterations using the herd as the sampling unit. Median values were reported as the estimates, and the 2.5th and 97.5th percentiles were used to define the confidence intervals.

Population densities were calculated by dividing the estimated abundance by the total surveyed area. This area was determined by summing the sizes of all survey blocks, which were delineated based on visible regions within each block using ArcGIS Pro version 3.5.1 by the survey team after fieldwork was completed.

Plate 6.Parks & Wildlife Department survey team in the field.

3.RESULTS

3.1 Population of Astor markhor

Using the DOSM in the field, a total of 1,693 Astor markhor were counted. The estimated population reported by the model was also 1,693, with a 95% confidence interval (CI) ranging from 1,470 to 1,899 (Table 2). These markhors were observed in 123 herds (Figure 7), with herd sizes ranging from 1 to 60 individuals. The mean herd size was 13.76, and the median was 11 markhors. The largest population of Astor markhor was found in Astore District (656), followed by Diamer and Gilgit districts with 433 individuals each (Table 3 and Figure 8). The markhor herds were sighted an elevation range from 1,200 – 3,300 meters (Figure 9).

3.2 Population of Ladakh urial

During the field surveys, a total of 299 Ladakh urial were counted across three Community-Controlled Hunting Areas (CCHAs) in three districts (Figure 6). The estimated population predicted by the model was also 299, with a 95% confidence interval (CI) ranging from 153 to 301 individuals. These urial were observed in 17 groups, with herd sizes ranging from 3 to 37. The mean herd size was 13.47, and the median was 8 individuals (Table 2). The largest population of Ladakh urial was found in Bonji Valley of Astore District, followed by the Nanga Parbat CCHA in Diamer District (Table 4 and Figure 10).

Plate 7.A female markhor guarding the herd.

Table 2.Summary of Statistical Analysis for Astor markhor and Ladakh urial.

Statistics	Astor markhor	Ladakh urial
Number of CCHAs Surveyed	24	3
Detection Probability of Observer ONE	0.99	0.94
Detection Probability of Observer TWO	0.99	0.94
Observer ONE total	1,693	229
Groups Only Sighted by Observer ONE	0	0
Observer TWO total	1,693	229
Groups Only Sighted by Observer TWO	0	0
Groups Sighted by Both Observers	123	17
Total groups	123	17
Mean group size	13.76	13.47
Median group size	11	8
Group range	1 - 60	3 - 37
Counted population	**1,693**	**229**
Estimated population	**1,693**	**229**
Estimated population at +95% confidence interval	**1,470 – 1,899**	**153 - 301**
Percentage of male	34.79	32.31
Percentage of trophy hunting males within males	31.06	25.67
Percentage of mature males within males	51.10	48.64
Percentage of female	35.20	31.00
Percentage of young	17.12	15.28
Percentage of yearlings	12.87	21.39
Ratio (Male: Female)	0.98:1	1.04:1
Ratio (Female: Young)	1:0.48	2.02:1
Ratio (Young: Yearlings)	1.33:1	0.17:1
Ratio (Female: mature male)	1.98:1	0.50:1

Table 3.Population structure of Astor markhor in different CCHAs.

District	CCHA	Female	Young	Yearling	Class 1	Class 2	Class 3	Class 4	Trophy	Total
Astore	Bonji	122	89	54	21	17	26	22	39	390
	D M T	60	15	13	7	8	8	14	16	141
	Doyan	47	11	33	7	7	5	9	6	125
	District total	**229**	**115**	**100**	**35**	**32**	**39**	**45**	**61**	**656**
Diamer	Darel	20	3	5	2	1	0	0	5	36
	Goherabad-Thalichi	10	9	6	2	2	1	8	9	38
	Hudur	7	4	1	1	1	1	4	1	20
	Khanbari	19	0	5	5	5	2	2	6	44
	Nanga Parbat	9	8	4	3	3	1	13	8	49
	Tangir	74	23	45	13	14	8	33	36	246
	District total	**139**	**38**	**66**	**26**	**26**	**13**	**60**	**65**	**433**
Gilgit	Bagrot	10	7	3	2	2	1	0	0	25
	Danyore GuroJaglot Rahimabad	56	22	13	6	8	3	1	8	117
	Harali	9	0	5	0	4	2	0	4	24
	Kargah-Hanzel-Napura	29	25	1	1	2	4	1	2	65
	Minawar	11	1	2	3	0	4	0	6	27
	Sai Jaglot	3	3	1	0	0	0	0	0	7
	Sakwar-Jutial-Barmas	7	19	4	8	12	8	7	18	83
	Sassi, Haramosh	35	29	0	16	0	0	0	5	85
	District total	**160**	**106**	**29**	**36**	**28**	**22**	**9**	**43**	**433**
Skardu	Furmashot-Butimal-Poldo (Pro)	1	0	1	1	0	0	0	0	3
	Mendi	18	6	5	3	2	0	0	4	38
	S K B	47	25	16	10	6	4	3	9	120
	District total	**66**	**31**	**22**	**14**	**8**	**4**	**3**	**13**	**161**
Nagar	Sikandarabad-Jaffarabad-Nilt	2	0	1	0	3	2	1	1	10
	District total	**2**	**0**	**1**	**0**	**3**	**2**	**1**	**1**	**10**
GB	**Grand Total**	**596**	**290**	**218**	**111**	**97**	**80**	**118**	**183**	**1,693**

Table 4.The population structure of Ladakh urial in Gilgit-Baltistan.

District	CCHA	Female	Young	Yearling	Class 1	Class 2	Class 3	Class 4	Trophy	Total
Astore	Bonji	59	33	44	14	12	9	13	15	199
	District total	**59**	**33**	**44**	**14**	**12**	**9**	**13**	**15**	**199**
Diamer	Nanga Parbat	7	0	4	0	2	0	2	3	18
	District total	**7**	**0**	**4**	**0**	**2**	**0**	**2**	**3**	**18**
Shigar	Asqoli-Biafo-Dumurdo-Laskam	5	2	1	0	1	0	2	1	12
	District total	**5**	**2**	**1**	**0**	**1**	**0**	**2**	**1**	**12**
GB	**Grand Total**	**71**	**35**	**49**	**14**	**15**	**9**	**17**	**19**	**229**

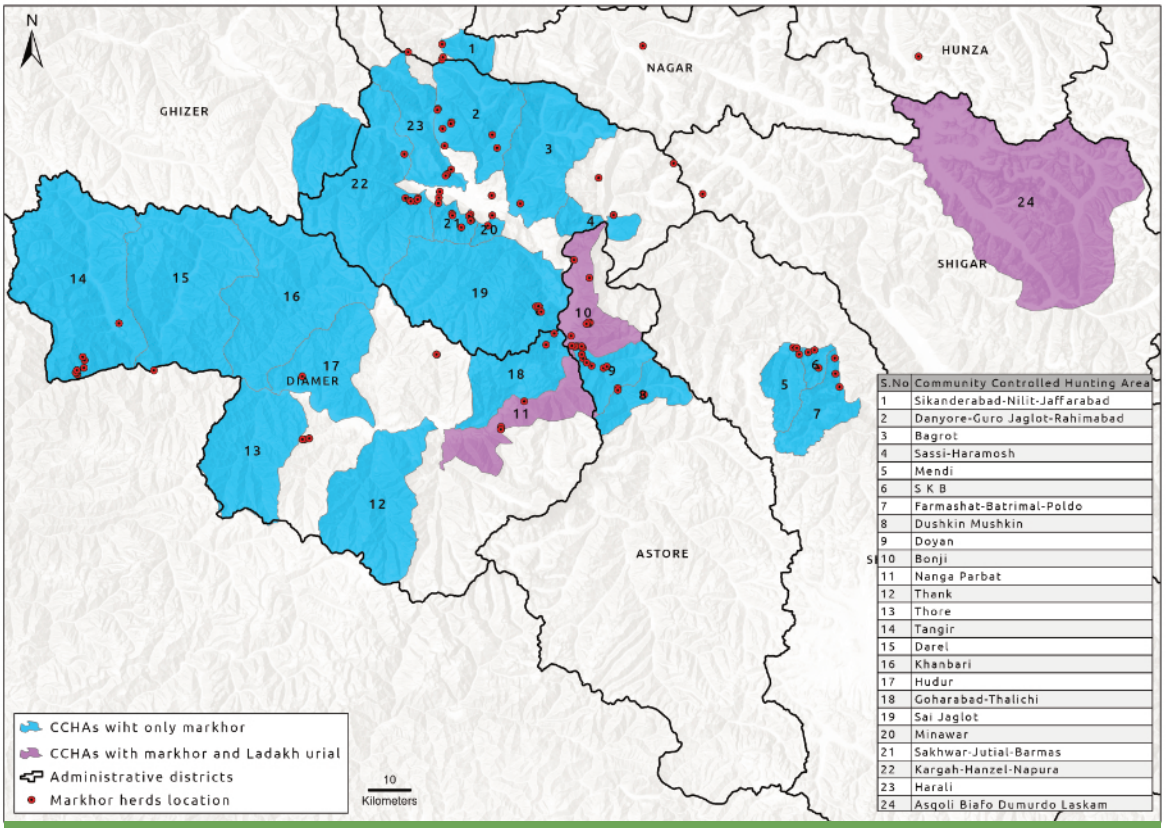


Figure 7.Location of Astor markhor herds.

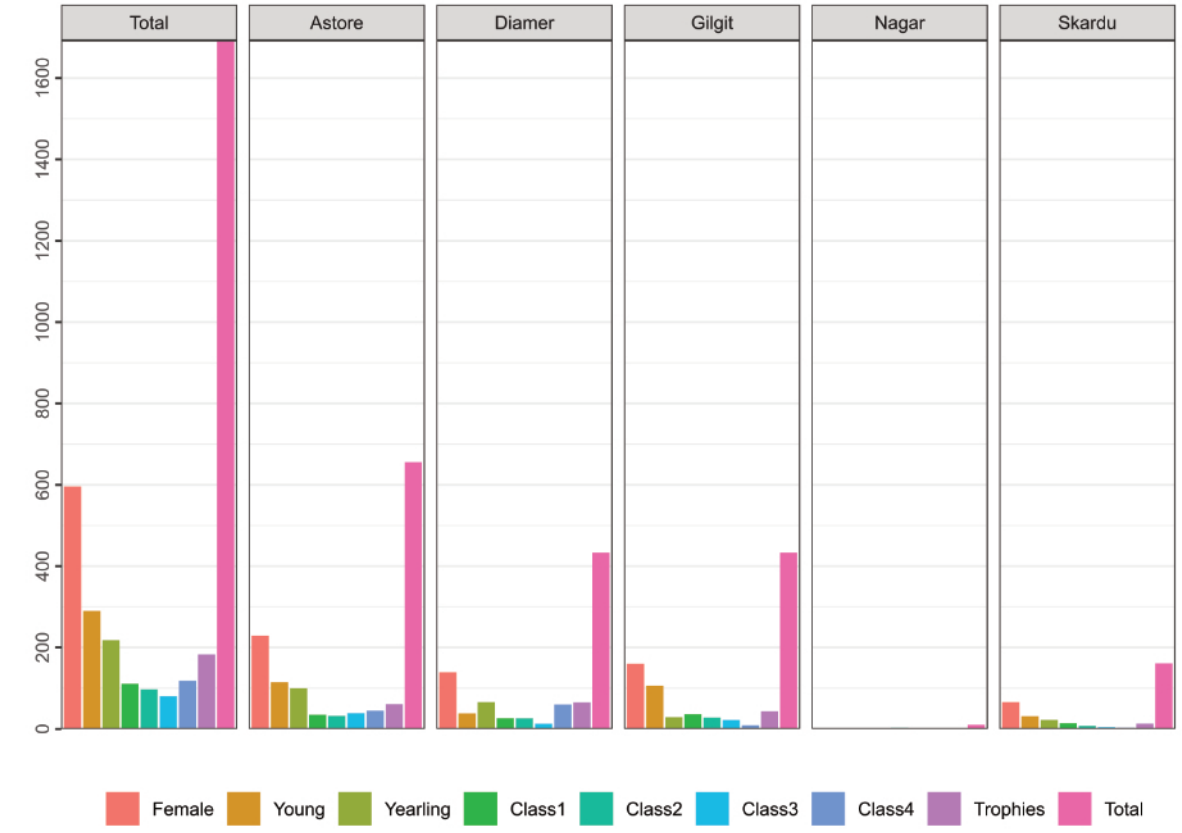


Figure 8.Demographic structure of Astor markhor.

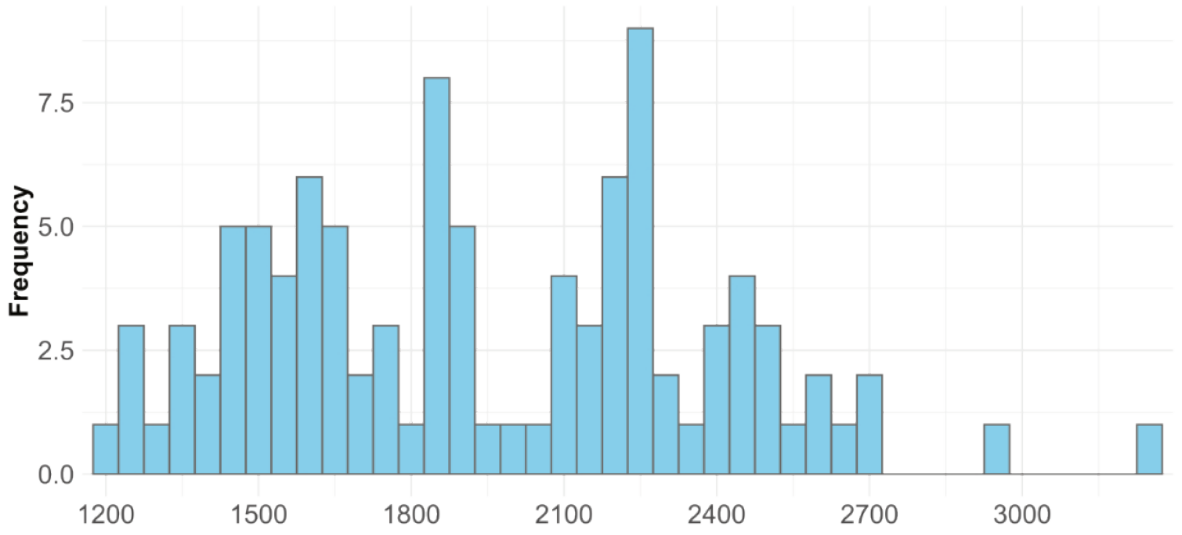


Figure 9.Elevational range of Astor markhor herds.

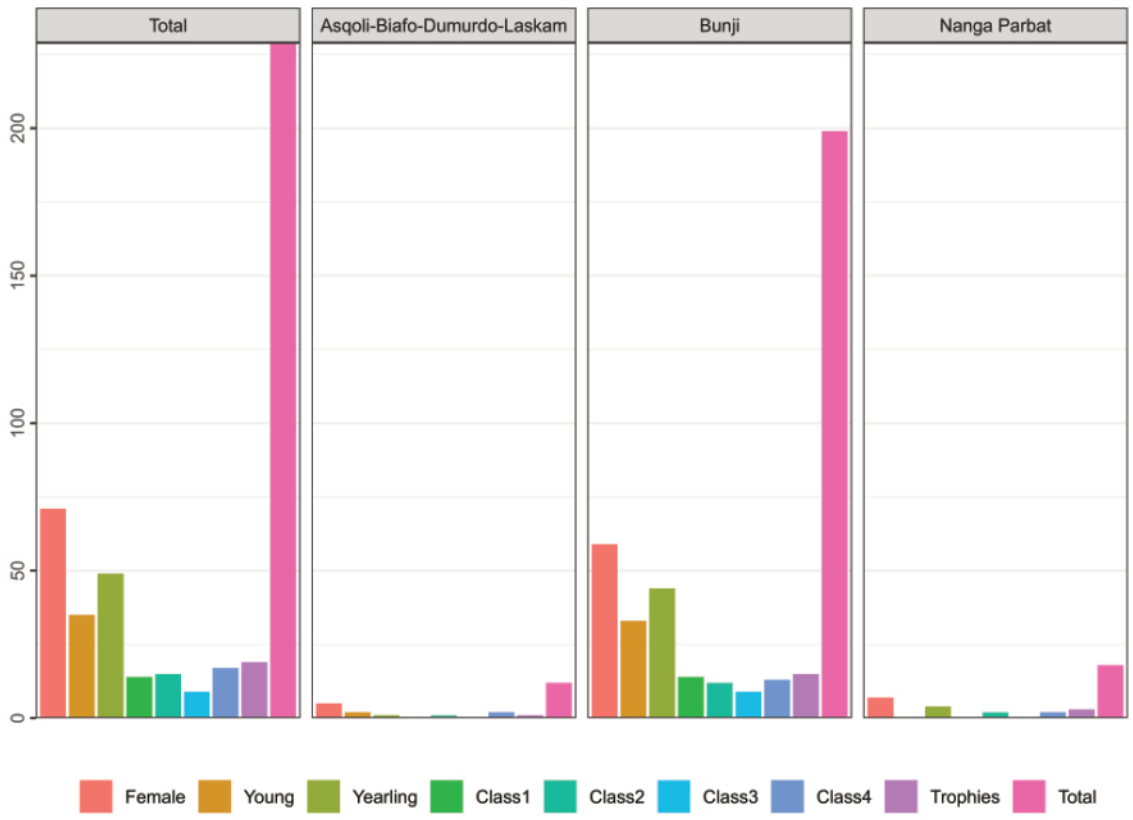


Figure10.Demographic structure of Ladakh urial.

3.3 Population Density

3.3.1 Population Density of Astor markhor

Varying densities were recorded across different CCHAs, ranging from 0.00 to 2.40 individuals per square kilometer. The highest density was observed in SKB (Figure 11 and Figure 12).

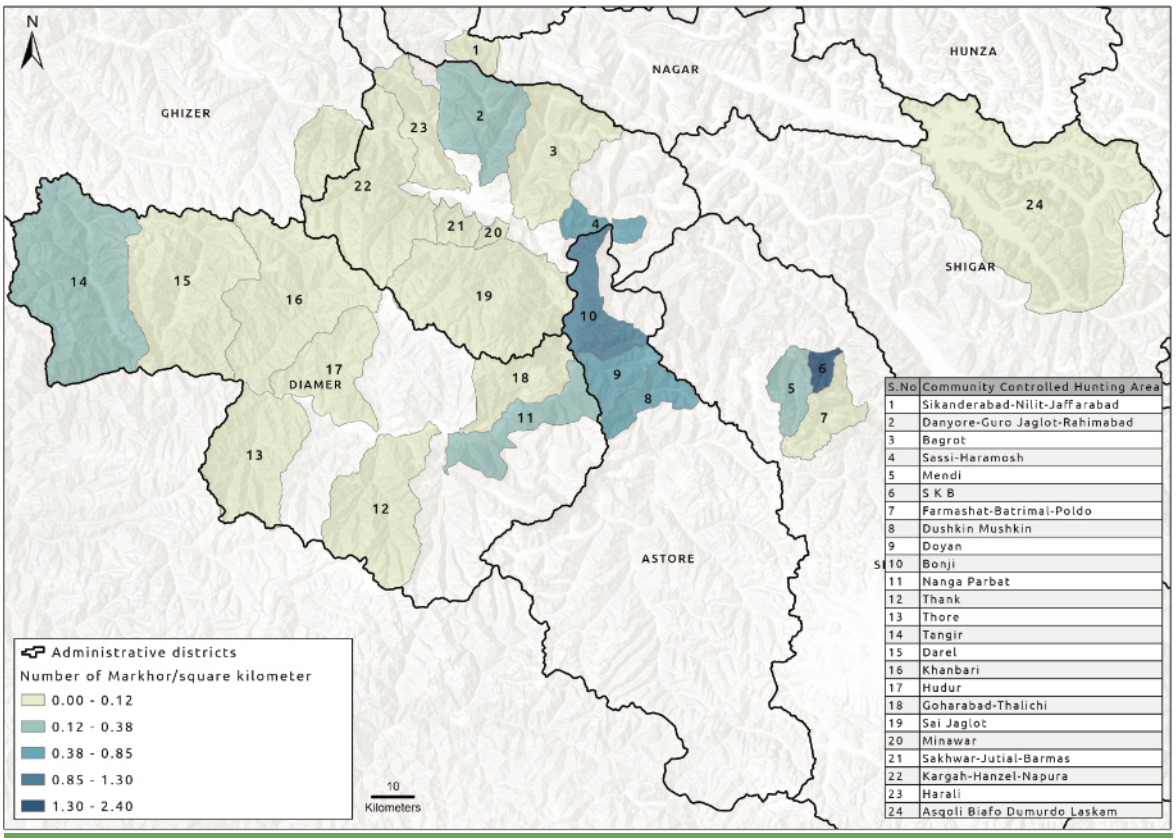


Figure 11.Markhor density per square kilometer in different CCHAs.

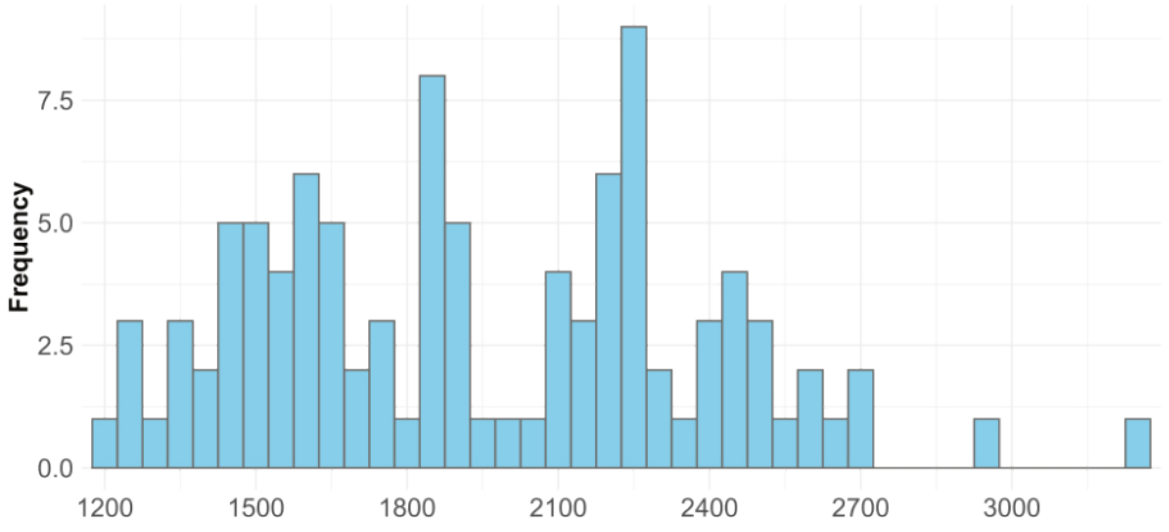


Figure 12.Markhor density/km^2 in different CCHAs.

3.3.2 Population Density of Ladakh urial

As Ladakh urial exist in only three CCHAs, the highest density per square kilometer was recorded in Bonji CCHA (0.66), followed by Nanga Parbat CCHA (Figure 13).

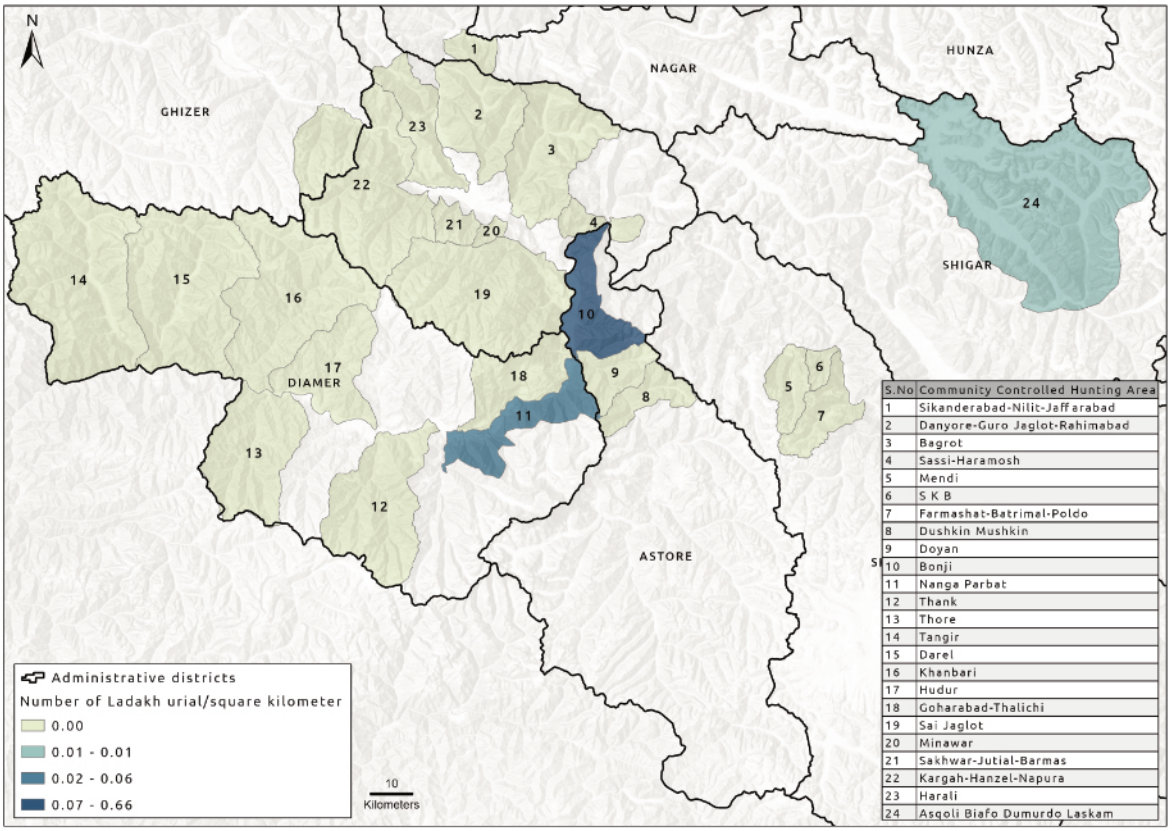


Figure 13.Ladakh urial per square kilometer in different CCHAs.

3.4 Population Trend

3.4.1 Population Trend of Astor markhor

This year, a total of 229 markhor were counted—an increase of 210 individuals compared to the 2023–24 survey, which recorded only 19 markhor (Figure 14). This count marks the highest number of markhor observed since 2020, surpassing the figures from the 2020, 2021, and 2022 surveys. Concurrently, notable changes were observed in markhor population demographics. From 2020 to 2023, the markhor population in the Diamer district remained below 88; however, this year, a remarkable total of 433 markhor were reported from Diamer (Figure 15).

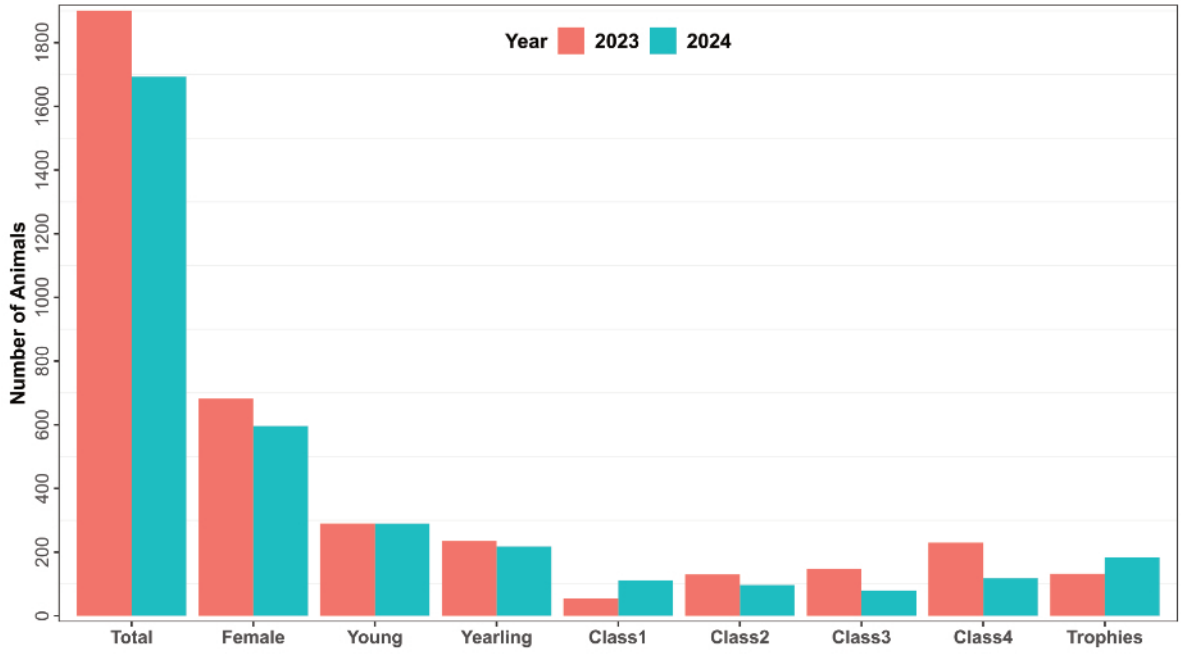


Figure 14.Demographic trend of markhor in 2023 and 2024 surveys.

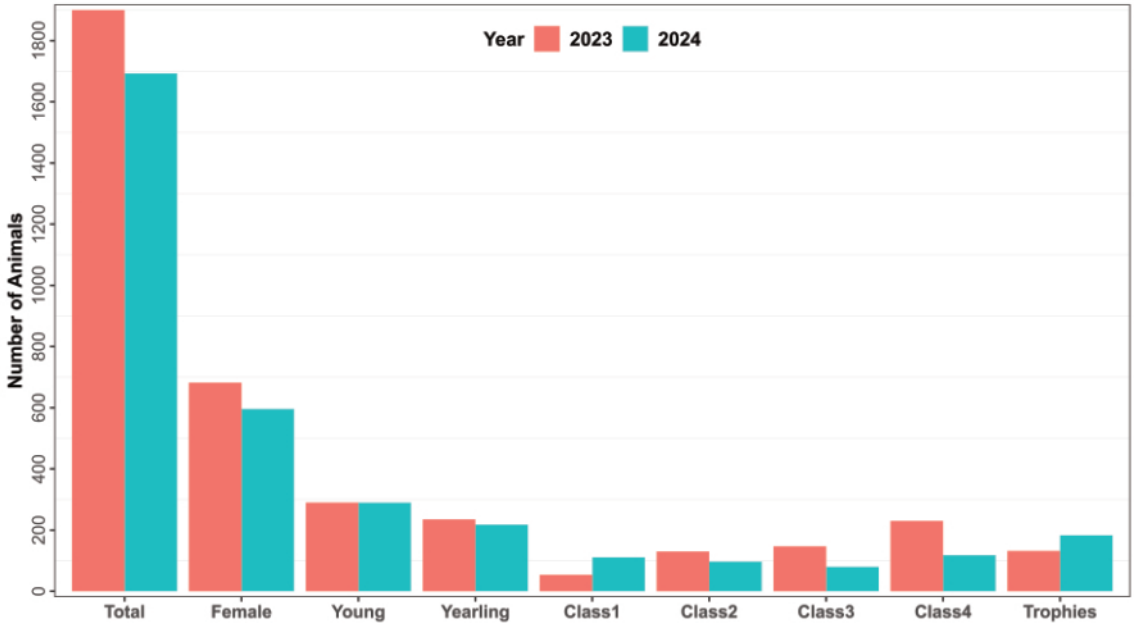


Figure 15.Demographic trends of markhor from 2020 – 2024 surveys.

3.4.2 Populaiton Trend of Ladakh urial

The population trend of Ladakh urial is the most variable among the surveyed wild ungulates. For instance, the total increased from 20 individuals in 2023 to 209 in 2024. Likewise, the population was recorded at 24 in 2020, 134 in 2021, 138 in 2022, 20 in 2023, and 229 in 2024 (Figures 16 and 17).

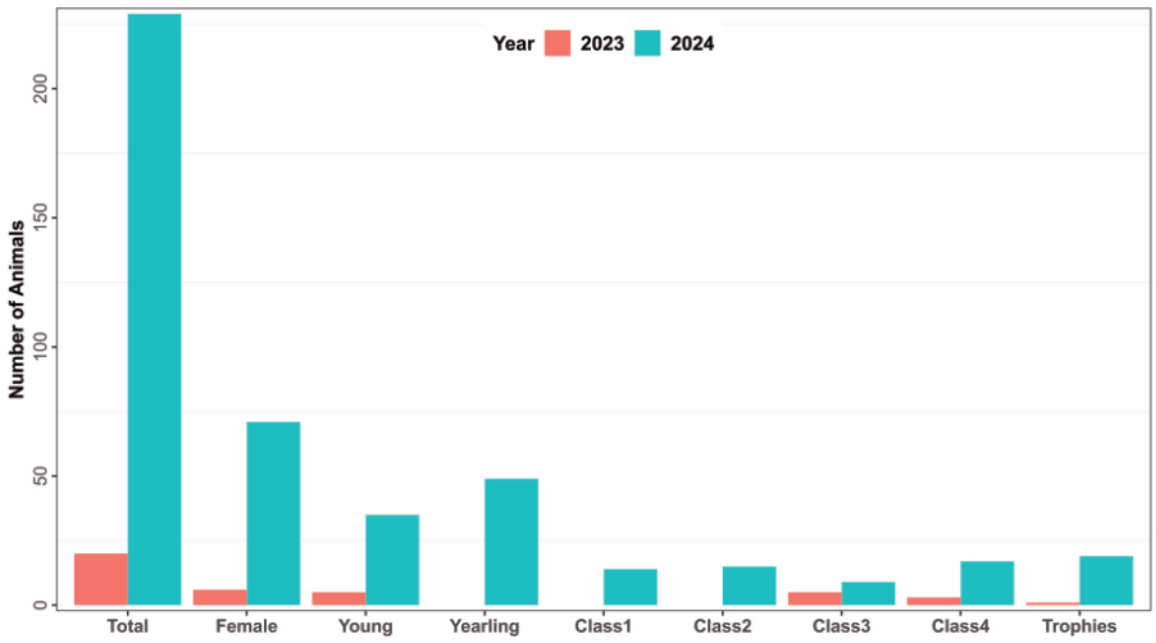


Figure 16.Demographic trends of the Ladakh urial based on 2023 and 2024 surveys.

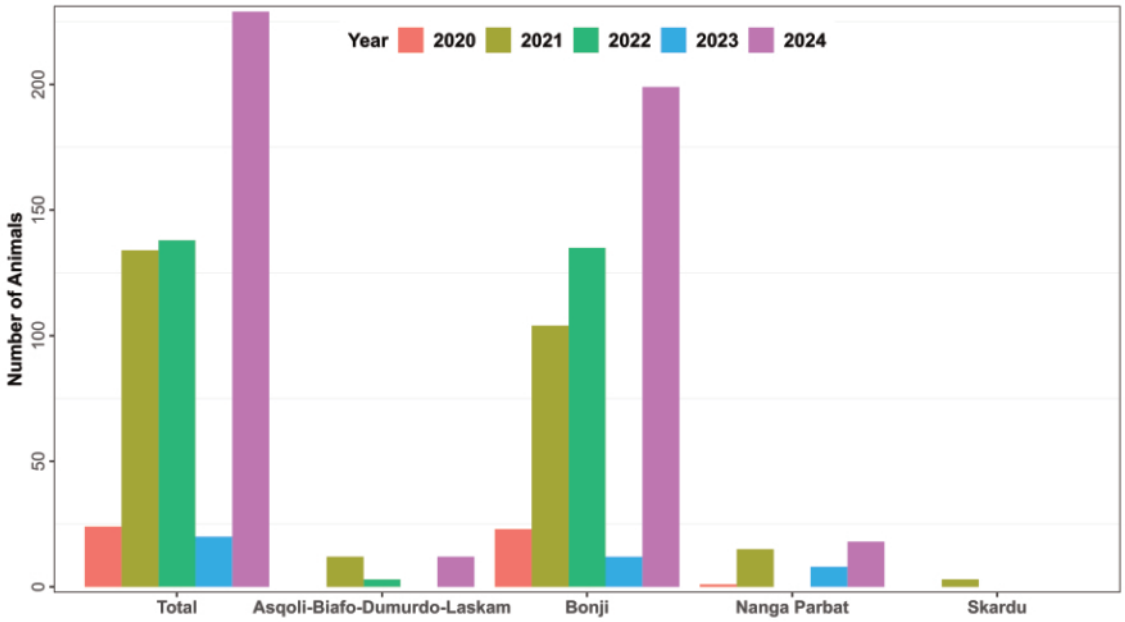


Figure 17.Demographic trends of Ladakh urial from 2020 – 2024.

3.4 Number of Harvestable Animals for Year 2025-26

The number of harvestable animals is determined based on specific rules, for example, 2% of the total population or 25% of trophy-sized animals. If the 2% rule is applied to the total Markhor population (1,693), then up to 34 individuals can be harvested. However, if the 25% rule for trophy-sized animals is used, 45 Markhor may be harvested.

Similarly, applying the 2% rule to the total Ladakh urial population (229) results in a harvestable number of 4 individuals. If the 25% rule is applied to trophy-sized Ladakh urial (25% of 19 = 4.75), then 5 individuals may be harvested.

Plate 8.Chukar Partridge is a common bird of markhor and urial habitats.

4.DISCUSSION

In various countries across Africa, Asia, and Europe, trophy hunting forms a component of wildlife management strategies (Lechuga J, 1995). When carefully designed, such programs can shift local perceptions of wildlife, foster community participation in managing natural resources, and support broader conservation objectives(Baker, 1997; Lewis and Alpert, 1997). Even in cases where unsustainable hunting practices have contributed to species decline, regulated trophy hunting can play a role in conserving endangered species Shackleton, 2001).

By channeling revenue from hunting activities directly to local communities, these programs can reduce incentives for poaching. They offer financial motivation for local people to protect wildlife and monitor illegal exploitation (Harris and Pletscher, 2002; Shackleton, 2001). When grounded in community involvement, sustainable trophy hunting initiatives can significantly bolster conservation outcomes, especially when the management is inclusive and delivers lasting socio-economic benefits. Additionally, when implemented responsibly, such initiatives can act as development tools that contribute to rural livelihoods. The trophy hunting program in Gilgit-Baltistan is based on the principle of involving local communities in wildlife conservation, particularly for species they once hunted. The incentives have yielded remarkable results, with significant increases in the populations of various wildlife species, especially trophy animals.

Using the DOMS methodology, 1,693 markhors were recorded across 24 CCHAs in Gilgit-Baltistan. Although this figure is slightly lower than last year's survey(Khan et al., 2024), sightings of Ladakh urial have increased compared to the previous assessment (Khan *et al.*, 2024). The estimated population at the 95% confidence interval 1,470 to 1,899 is lower for the Astor markhor but higher for the Ladakh urial, at 153 to 301, compared to the previous survey by (Khan et al., 2024). The male-to-female ratio for Astor markhor (0.98:1) has increased, while for Ladakh urial (1.04:1) it has declined relative to (Khan *et al.,* 2024). In both species, these ratios remain significantly below the ideal male-to-female ratio of 1:6 recommended by experts (Adhikari et al., 2021; Zaman *et al.*, 2019).

The number of harvestable markhors, based on 2% of the total population, has decreased slightly from 35 to 34. However, under the 25% rule for trophy-sized animals, the number of harvestable individuals has increased from 35 to 45 this year (Khan *et al.*, 2024). In addition to markhor, applying the 2% rule to the total population allows for the harvest of 4 Ladakh urial, while using the 25% rule for trophy-sized males permits the harvest of 5 individuals.

5.RECOMMENDATIONS

1. Annual surveys should continue using the double observer method, as over half of the Parks and Wildlife Department staff are now trained in its implementation.
2. The standardized data collection format developed for the double observer method is widely recognized by all stakeholders and should be adopted by all organizations to ensure uniform data collection.
3. Surveys are time- and season-sensitive. For instance, the rutting season for Ladakh urial begins in early November and that of Astor markhor after the end of November, coinciding with the onset of snowfall. To complete surveys before snowfall, the Parks and Wildlife Department should procure additional GPS units, cameras, spotting scopes, and binoculars to deploy the maximum number of survey teams.
4. Game watchers should receive regular training in the latest survey techniques and equipment to ensure accurate and consistent data collection each year.
5. Trophy allocations should follow IUCN guidelines, which were agreed upon with local communities at the inception of the trophy hunting program specifically, those based on census data and population assessments.
6. All collected data should be entered into a centralized database and made publicly accessible to promote transparency and data sharing.
7. Resurveys covering at least five percent of the survey area should be conducted to validate the reliability of the data.
8. GPS tracks of survey nullahs and routes should be a mandatory requirement for processing field staff allowance payments.
9. A professional photographer should be included in survey teams to document the survey process, wildlife, and wild ungulates.
10. To initiate a trophy hunting program, it is recommended to have a viable population of the species—typically around 500 living individuals. In the case of the Ladakh urial, however, the population does not appear to be viable, even in the foreseeable future.
11. If the request submitted by MCC&EC is not accepted by CITES due to the non-viable population of the Ladakh urial, it is recommended that a conservation award from the FRF fund be granted to Bonji Valley as an alternative to trophy hunting for the Ladakh urial, after every three to five years.

6.REFERENCES

Adhikari, L., Khan, B., Joshi, S., Ruijun, L., Ali, G., Shah, G.M., Ismail, M., Bano, K., Ali, R., Khan, G., Pasakhala, B., Ali, A., 2021. Community-based trophy hunting programs secure biodiversity and livelihoods: Learnings from Asia's high mountain communities and landscapes. Environmental Challenges 4, 100175. https://doi.org/https://doi.org/10.1016/j.envc.2021.100175

Ahmad, S., Ali, H., Asif, M., Khan, T., Din, N., Rehman, E.U., Hameed, S., Din, J.U., Nawaz, M.A., 2022. Spatial density pattern of Himalayan Ibex (Capra sibirica) in Pakistan. Glob Ecol Conserv 39. https://doi.org/10.1016/j.gecco.2022.e02288

Baker, J.E., 1997. Development of a model system for touristic hunting revenue collection and allocation. Tour Manag 18, 273–286. https://doi.org/https://doi.org/10.1016/S0261-5177(97)00016-2

Caughley, G., 1977. Analysis of vertebrate populations., Analysis of vertebrate populations. John Wiley and Sons., London.

Din, M.S.U., Minhas, R.A., Khan, M., Ali, U., Bibi, S.S., Ahmed, B., Awan, M.S., 2016. Conservation status of Ladakh urial (Ovis vignei vignei blyth, 1841) in Gilgit-Baltistan, Pakistan. Pak J Zool 48, 1353–1365.

Fegatelli, D.A., Tardella, L., 2013. Improved inference on capture recapture models with behavioural effects. Stat Methods Appt 22, 45–66. https://doi.org/10.1007/s10260-012-0221-4

Forsyth, D.M., Hickling, G.J., 1997. An improved technique for indexing abundance of Himalayan thar. N Z J Ecol 21, 97–101.

Haider, J., Rakha, B.A., Anwar, M., Khan, M.Z., Ali, H., 2021. An updated population status of Astor Markhor (Capra falconeri falconeri) in Gilgit-Baltistan, Pakistan. Glob Ecol Conserv 27, e01555. https://doi.org/https://doi.org/10.1016/j.gecco.2021.e01555

Harris, R.B., Pletscher, D.H., 2002. Incentives toward conservation of argali Ovis ammon: a case study of trophy hunting in western China. Oryx 36.

Khan, M., Ali, M., Abbas, S., 2024. Rut Season Survey Report 2023-2024: Astor Markhor & Ladakh Urial in Gilgit-Baltistan. Gilgit.

Khanyari, M., Zhumabai uulu, K., Luecke, S., Mishra, C., Suryawanshi, K.R., 2021. Understanding population baselines: status of mountain ungulate populations in the Central Tien Shan Mountains, Kyrgyzstan. Mammalia 85, 16–23. https://doi.org/doi:10.1515/mammalia-2020-0005

Khara, A., Khanyari, M., Ghoshal, A., Rathore, D., Pawar, U.R., Bhatnagar, Y.V., Suryawanshi, K.R., 2021. The forgotten mountain monarch? Understanding conservation status of the Vulnerable Ladakh urial in India. Eur J Wildl Res 67. https://doi.org/10.1007/s10344-021-01492-4.

Lechuga J, 1995. The feasibility of sport hunting as a wildlife conservation and sustainable development tool in Southern Mexico (MSc Thesis). University of Florida, Florida.

Lewis, D.M., Alpert, P., 1997. Trophy Hunting and Wildlife Conservation in Zambia. Conservation Biology 11, 59–68. https://doi.org/https://doi.org/10.1046/j.1523-1739.1997.94389.x

Magnusson, W.E., Caughley, G.J., Grigg, G.C., 1978. A Double-Survey Estimate of Population Size from Incomplete Counts. J Wildl Manage 42, 174–176. https://doi.org/10.2307/3800708

Roberts, T.J., 1997. The Mammals of Pakistan. Oxford University Press, Karachi, Pakistan.

Schaller, G.B., 1980. Stones of Silence Journeys in the Himalaya. The Viking Press, New York.

Schaller, G.B., 1977. Mountain monarchs. Wild sheep and goats of the Himalaya. University of Chicago Press.

Shackleton, D.M., 2001. A Review of Community-Based Trophy Hunting Programs in Pakistan, Mountain Areas Conservancy Project. Mountain Areas Conservancy Project, Gilgit, Pakistan.

Suryawanshi, K., Bhatnagar, Y., Mishra, C., 2012. Standardizing the double-observer survey method for estimating mountain ungulate prey of the endangered snow leopard. Oecologia 169, 581–590. https://doi.org/10.1007/s00442-011-2237-0

Zaman, S., Chaudary, J.A., Abbas, S., Ghaznavi, M., Essa, M., Ali, A., 2019. Safeguarding Biodiversity Conservation through Sustainable Use in Gilgit-Baltistan: Guidelines for Streamlining the Community-Based Sustainable Trophy Hunting Program in Gilgit-Baltistan. Gilgit.

PARKS & WILDLIFE DEPARTMENT
GOVERNMENT OF GILGIT-BALTISTAN

Office of The Cheif Conservator
Parks & Wildlife Department
River View Road, Chinar Bagh
Gilgit-Baltistan,Pakistan
Tel: + 92 5811-920939
website: https://fwegb.gov.pk