Forest, Wildlife and Parks Department
Government of Gilgit-Baltistan

2021-22 RUT SEASON SURVEY REPORT

HIMALAYAN IBEX & BLUE SHEEP

IN GILGIT-BALTISTAN

PARKS & WILDLIFE Gilgit Baltistan

FOREST DEPARTMENT Gilgit Baltistan

10 Billion Tree Tsunami 2020

SNOW LEOPARD FOUNDATION

IUCN

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IN GILGIT-BALTISTAN, PAKISTAN

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HIMALAYAN IBEX (*Capra ibex sibirica*) & BLUE SHEEP (*Pseudois nayaur*)

IN GILGIT-BALTISTAN, PAKISTAN

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Report Summary

Gilgit-Batistan (GB) is becoming conservation hotspot for some of world's rarest wildlife e.g., markhor, blue sheep, Himalayan ibex, Marco Polo sheep, Ladakh urial, Kashmir musk deer, snow leopard, brown bear, and Asiatic black bear, only two decades back these animals were not flourishing at the pace they are now, when there was no trophy hunting program. The trophy hunting program not only earned diligence of communities for wildlife conservation rather it also helped wildlife to recover their dwindling numbers. Now, trophy hunting earns millions of Pakistani rupees each year, which help communities to uplift their socioeconomic status. The effectiveness of this program could not only be measured by the income it earns, rather it could only be assessed from its impacts on population trends of wild ungulates. Using different methods that were never statistically robust population estimates of wild ungulates were produced which were biased and demographically not well defined, but for past two years statistically robust methods like double observer survey method is being applied to assess the population trends of wild ungulates in GB. Using this method an estimated population of 5,149 Himalayan ibex was recorded in 18,444 km^2 area of 31 Community Controlled Hunting Areas (CCHAs), while an estimated population of 626 blue sheep was recorded in two CCHAs. If the 2% of animals are harvested from total population, then 103 Himalayan ibex and 13 blue sheep can be harvested, if 25% of trophy size animals are opted to harvest then 123 Himalayan ibex and 14 blue sheep can be harvested.

1. Introduction

The wildlife of Gilgit-Baltistan has been sustainably harvested for centuries by the people of Gilgit-Baltistan, but in 1960s the construction of Karakoram Highway (KKH) and amalgamation of princely states collapsed that local controlled over the harvesting of wild ungulates. Furthermore, KKH provided access to remote valleys where there had abundance of wildlife, resulted into extinction of many precious wild species i.e., during the construction of KKH wildlife in valleys along KKH was rampantly poached (Rasool, 1990) especially the Marco Polo sheep (*Ovis ammon polii*) which was hunted to display its horns as symbol of upscale families, while Himalayan ibex, Astor markhor, Ladakh urial and blue sheep were hunted as subsistence food.

Sustainable harvesting of wild ungulates was introduced in Gilgit-Baltistan in 1990 by World Wide Fund for Nature-Pakistan (WWF-Pakistan) and International Union for Conservation of Nature (IUCN), when world's rarest and gigantic goats i.e., Astor markhor (*Capra falconeri falconeri*), Himalayan ibex (*Capra ibex sibirica*), sheep like Ladakh urial (*Ovis vignei vignei*), Marco Polo sheep (*Ovis ammon polii*), Kashmir musk deer (*Moschus cupreus*) and world's most praised and unique carnivores including snow leopard (*Panthera uncia*), brown bear (*Usus arctos isabellinus*), Asiatic black bear (*Urus thimbetanus*), Himalayan lynx (*Lynx lynx*) and grey wolf (*Canis lupus*) were at the verge of extinction.

Since the inception of the trophy hunting program in GB the population of not only the wild ungulates increased, rather the number of carnivores has also been increased and the number of all ungulates that are being offered as trophy animals is on the increase (Ahmad et al., 2020; Haider et al., 2021; Khattak et al., 2019), while the number of non-trophy animals has not increased at the same folds (Ali et al., 2019; Din et al., 2016; Haider et al., 2018).

The trophy hunting program is on a mutual agenda, where the custodian communities pledge to protect wildlife at their own and in return they get 80% share from the legal hunts, which the community will use for social development in their valley, there are many intriguing success stories to share where the local communities spent its 80% share on education and health development (Shackleton, 2001).The trophy hunting program helped recovered the population from verge of extinction of once widely distributed Himalayan ibex, and blue sheep.

The Himalayan ibex, also called as Asiatic or Siberian ibex occurs on the mountain ranges starting from Eastern Sayan to Himalayas, which makes a widespread presence of ibex in the northern ranges of many countries including Afghanistan, China, India, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, and Uzbekistan (Figure 1), and in Pakistan it is the most numerous species of genus capra occurs mostly in the northern parts of the Pakistan on the mountain ranges of Himalayas, Karakoram, Pamir, and Hindu Kush in the provinces of Gilgit-Batistan, Khyber Pakhtunkhwa (KPK), and in the state of Azad Jammu and Kashmir (AJ&K) (Figure 2). Despite having wide range distribution, the population of ibex is on the decline globally, it is recently up listed from “Least Concern” to “Near Threatened” on IUCN red list (Reading et al., 2020), while in Pakistan the ibex has been listed as “Least Concern” (Sheikh and Molur, 2004).

Himalayan ibex is a highly dimorphic animal with males of the species are considered as the heavily built males within the genus Capra with large elegant backward horns and body weight of an adult males may weight up to 130 kg and that of females up to 60 km (Schaller, 1977).

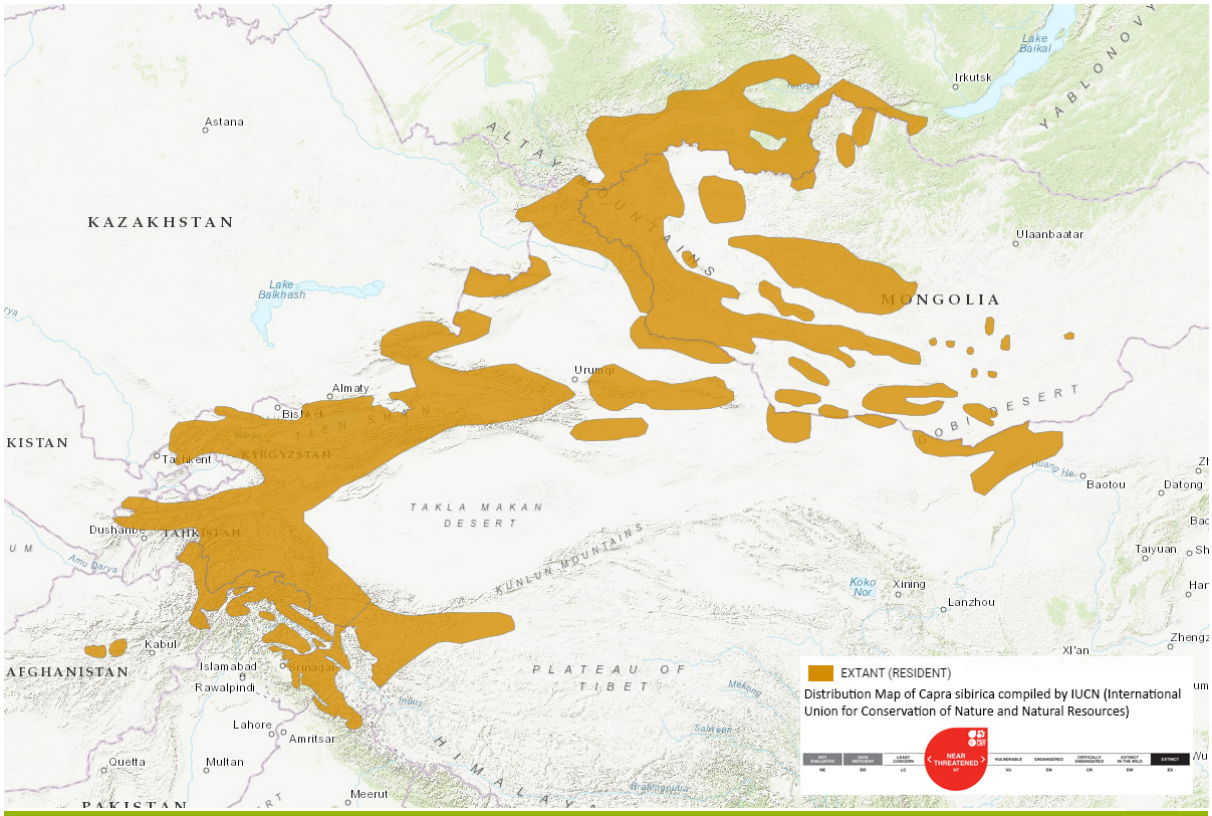

Figure 1: Capra ibex sibirica IUCN distribution range

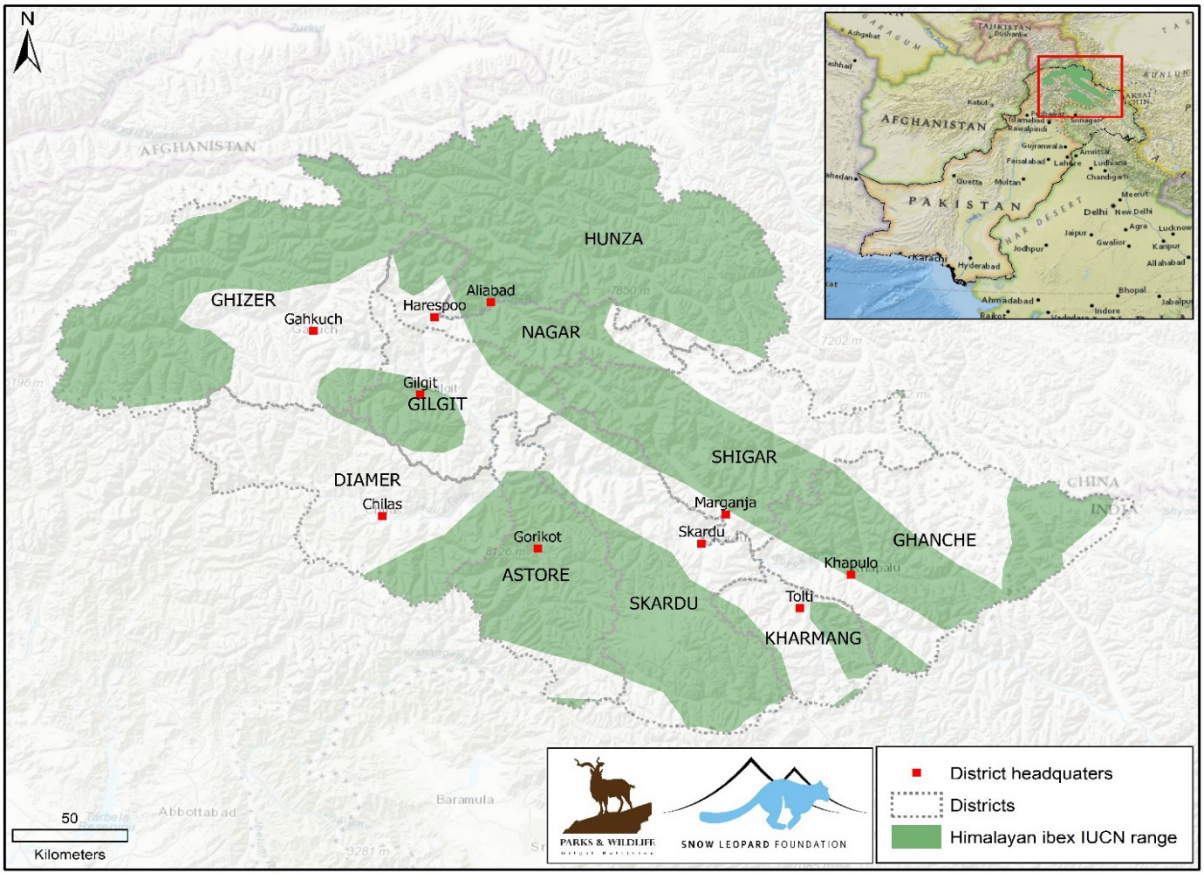

Figure 2: Capra ibex sibirica distribution range in Pakistan

Blue sheep is considered as an intermediate between goat and sheep, taking the morphology blue sheep look like a sheep, but its behavior and habitat requirements are more like a goat (Schaller, 1977). It is a dimorphic animal the males have larger horns and body size than the females, the males may weigh up 75 kg and females may weigh up to 45 kg (Schaller, 1977). Globally blue sheep occurred in China, India, Nepal, Bhutan (Figure 3), while in Pakistan it is endemic to norther most parts of district Hunza in Gilgit-Baltistan (Figure 4). Blue sheep is listed as "Least Concern" on the IUCN red list (Harris, 2014), while in Pakistan it is listed as "Endangered" by (Sheikh and Molur, 2004).

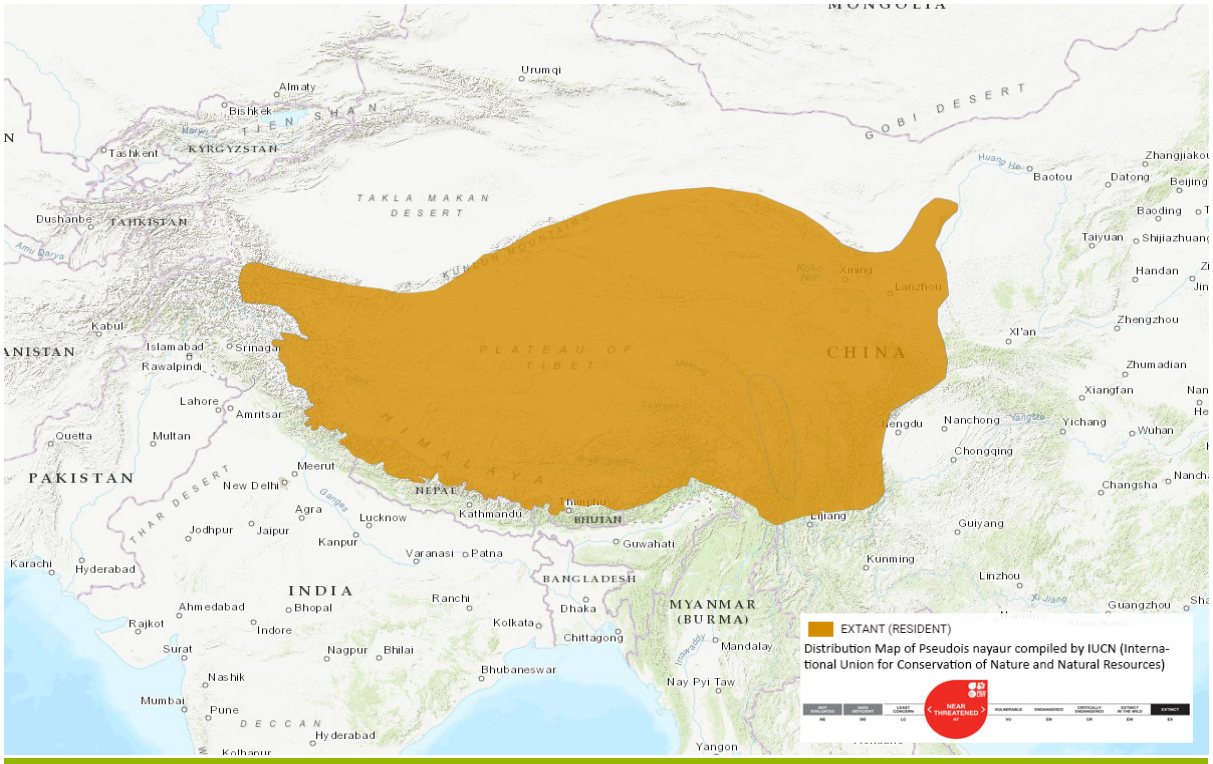

Figure 3: Pseudois nayaur IUCN distribution range

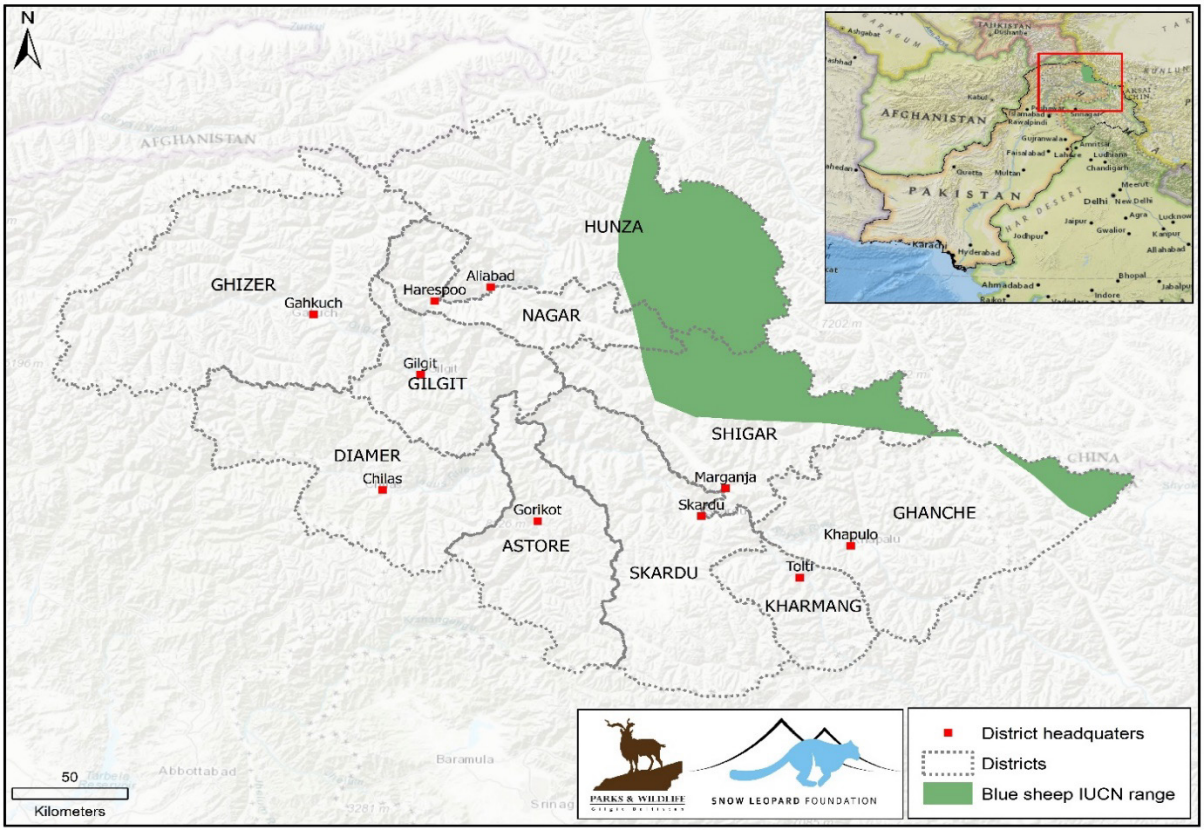

Figure 4: Pseudois nayaur IUCN distribution range

The trophy program in Pakistan has now become a multimillion rupees program and the impact of trophy hunting programs on communities could be assessed from social development but how much this intervention has benefited wild ungulates could only be assessed by long term monitoring of those wild ungulates (Singh and Milner-Gulland, 2011).

Hence, it is pragmatic to monitor the wild fauna of any area using advanced techniques to better understand the population trends, impacts of management and conservation (Zhang et al., 2012). Population trends of animals can be used as the best indicator of assessing the conservation success (Gaillard et al., 1998), especially in the areas where trophy hunting is in practice (Arshad et al., 2002) though, conducting such large-scale and long-term surveys in the remote areas often remain difficult due to the budget and human resource limitations (Singh and Milner-Gulland, 2011). But under the

aegis of Ten Billion Tree Tsunami Programme (TBTT) and Forest Regeneration Fund (FRF) the Parks and Wildlife Department, Gilgit-Baltistan arranged the major chunk of financial resources required for accommodation, food, and transportation, while the communities and Snow Leopard Foundation bore the allowances for their staff involved, to document the population of Himalayan ibex and blue sheep using double observer survey method. The objectives of the survey were.

1. Population estimation of Himalayan ibex and blue in rut season using robust and reliable method of double observer survey.
2. Assessment of population size and demographic parameters of Himalayan ibex and blue sheep.

2. Methodology

2.1 Study Area

The survey was conducted in the Community Controlled Hunting Areas (CCHAs) of district Hunza, Ghizer, Nagar, Gilgit, Astor, Skardu, and Ghanche. In district Hunza the survey was conducted in CCHAS viz., Chipurson Valley, Raminji Valley, Misgar Valley, Khunjerab Villagers Organization (KVO) area, Shimshal Valley, Ghulkin Valley, Hussaini Valley, Ghulmit Valley, Khyber Valley and Passu. In district Nagar in Hisper Valley, Hopper Valley, SAS Valley, Minapin-Pisan Valley, Sikandar Abad Valley and in Bar Valley the survey was conducted. In Ghizer district the survey was conducted in Qurumber Valley, Yasin Valley, and Sher Qilla Valley, in district Gilgit the survey was conducted in the Bagrote Valley, in district Astor the survey was conducted in Rupal Valley, Kalapani Valley, Gorikot Valley, DMT Valleys, Harcho Valley, and Parishing Valley, in Ghanche district survey was conducted in the valleys of Hushey, Thallay, and Kanday, in district Shigar catchments of Biafo, Askoli and Braldu were scanned, while in Skardu Valley the survey was conducted in SKB Valleys, and Hussainabad-Gole, lastly in Karmang district Mehdiabad-Manthoka-Manthu Nallah was scanned. (Figure 5) from 19th November 2021 to 18th December 2021 and from January 2nd, 2022, to 15th January 2022.

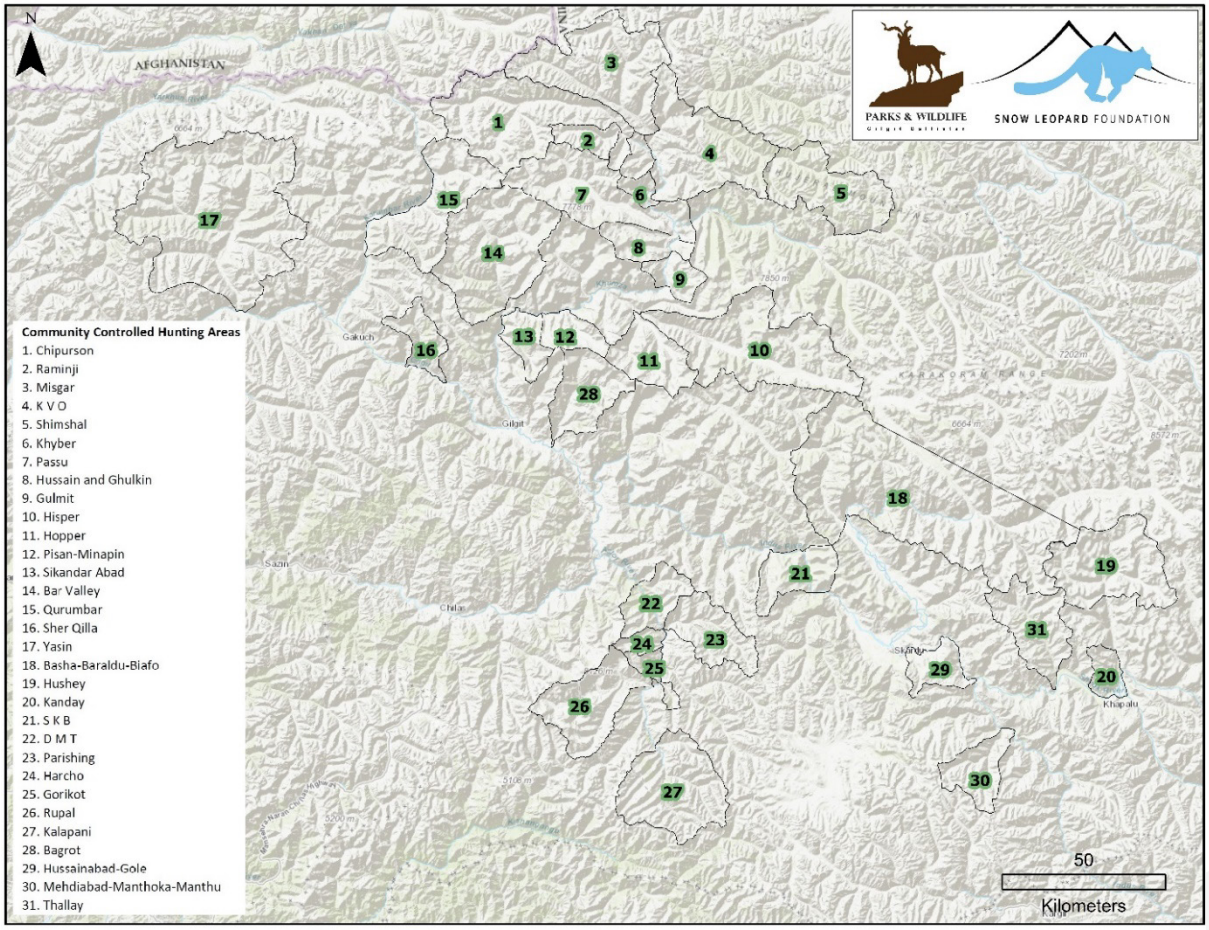

Figure 5: Map of surveyed Community Controlled Hunting Areas of Gilgit-Baltistan

2.2 Double Observer Method

The double observer survey method (DOSM) was developed to estimate the detection probabilities of different wild species that had been estimated using aerial surveys (Cook and Jacobson, 1979), while (Magnusson et al., 1978) added the ability in the analysis to measure the detection probabilities of each observer to detect the target species. DOSM is based on the principles of Capture Mark Recapture (CMR). Himalayan thar (Hemitragus jemlahicus) was the first ungulate species on which (Forsyth and Hickling, 1997) applied DOSM in New Zealand. This method generally involves two observers, scan for and count animals simultaneously, while ensuring that they do not signal or cue each other about the location of animal groups. The two observers conduct the survey as independent surveyors. Hence, an individual group of ungulates becomes the unit that is being "marked" and "recaptured" in a double observer technique. (Ahmad et al., 2020; Ali et al., 2019; Khattak et al., 2019; Suryawanshi et al., 2012) used this method for estimating the mountain ungulates population in the mountain areas of Asia.

DOMS require dividing the study area into manageable small watersheds that should not be larger than the daily movement ability of wild ungulates and surveyors, an area of approximately 25 km2 serves this purpose, the high ridges hinder the movement of animals to adjacent watersheds and hence evades the suspicion of evading of animals to the next watershed (Figure 6).

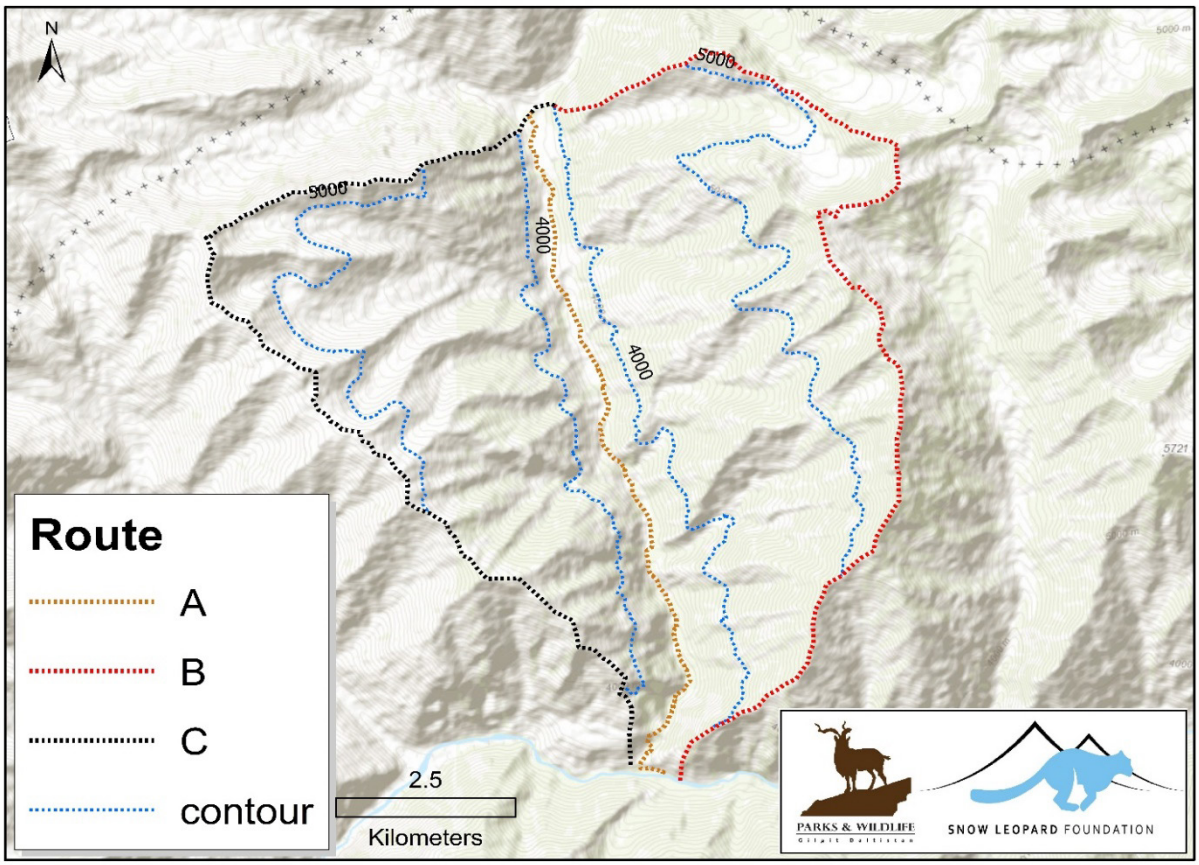

Figure 6: A survey block with possible routes for DOMS

These blocks could be surveyed using two possible approaches i.e., either both the observers should start the survey simultaneously on the predetermined routes if two routes (B and C in Figure. 09) are available which will be called as “spatial separation” (Figure. 09), or the observer B start moving into watershed after pre decided time, if only one route is available (route A in Figure. 09) in this case it will be called as “temporal separation”.

2.3 Data collection in the field

2.3.1 Survey maps

Each Community Controlled Hunting Area (CCHA) was divided into single day surveyable blocks (Figure 7) using Arc GIS 10.8.1 (ESRI, Redland, California USA). The observer A and B were separated either temporally or spatially taking the possibility available. The reference grids were given on the map to help the observers find assigned survey block and later to delineate the location of herd on the map (Figure 7).

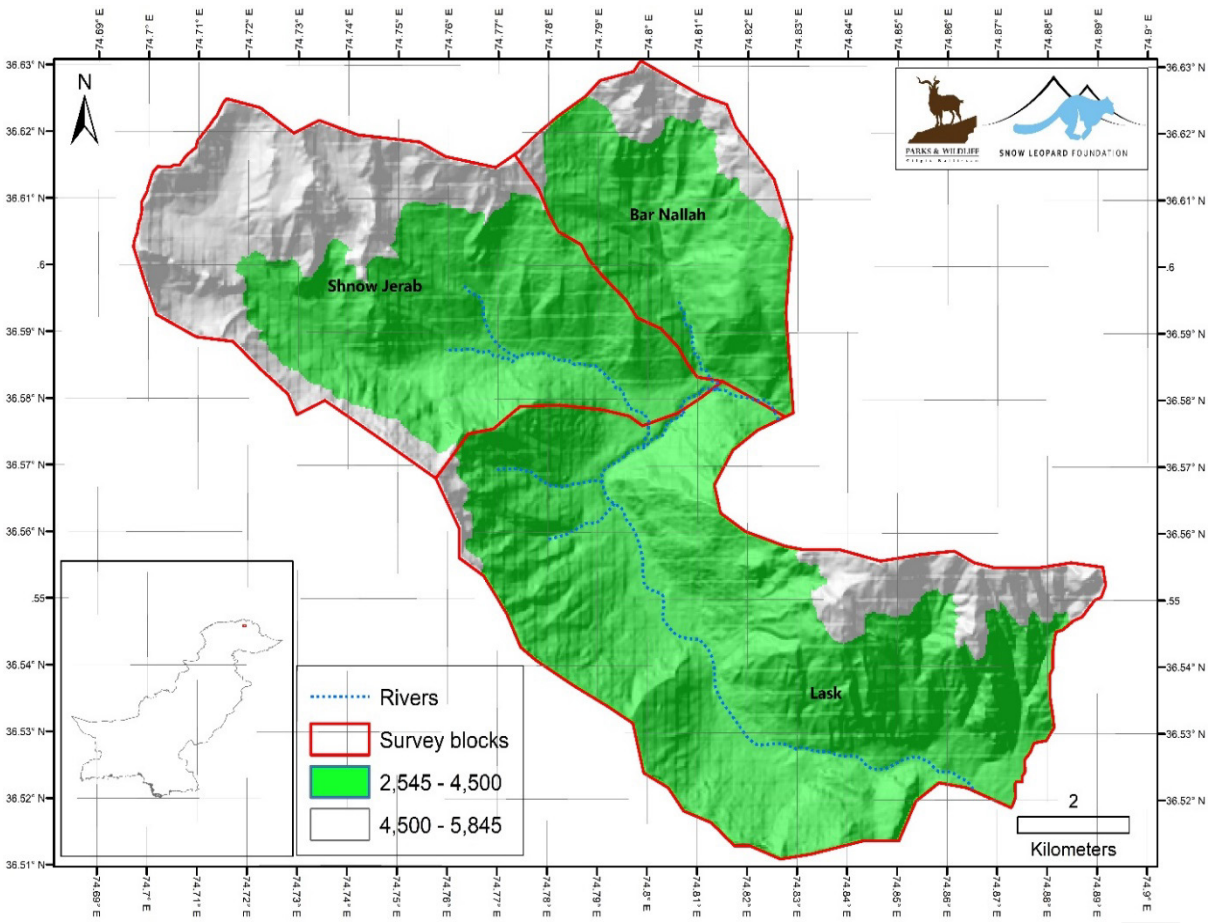

Figure 7: Survey blocks developed using Arc GIS for DOMS in Khyber Valley

2.3.2 Scanning for Animals

The mountain ungulates are crepuscular in nature (Roberts, 1997; Schaller, 1980, 1977), the scanning was ensured at dawn and in the dusk, spotting scopes (Swarovski, 30 x 70), binoculars (Nikon 10x50) were used to aid the scanning effort. Whenever, any herd was sighted the information required to record in the filed data collection sheet was recorded, using the Geographical Positioning System (GPS) Garmin (64S, 66S and 66st) the location of observer was recorded, and the location of herd was delineated on the map.

2.3.3 Demographic classification

As the "Capture Recapture" could only be accurately apply on the wild ungulates if they are dimorphic and are possible to identify based on age classes (Suryawanshi et al., 2012), using demographic classification suggested by (Schaller, 1977) in Table 1, the herds were identified. The composition of herds i.e., female herd (female and Young, male herd (only males), Mix herd (Males, Females and Youngs) was recorded to later aide in identifying repeated captures and single captures. While the number of trophy size animals within the class IV were separately recorded.

Table 1: Demographic classification suggested by Schaller (1977) for mountain ungulates

Female Classification	Kids Classification		Male Classification				
Female > 2	Young < 1	Yearling 1 < 2	Class I (21/2) years	Class II (31/2) Years	Class III (41/2) Years	Class IV (51/2) Years	Trophy Size Within

2.3.4 Habitat features of herds

To aide distinction of the herds sighted by both observers, habitat features of herds i.e., snow, bare rock, glacier, rangeland, shrubs, mix forest, slope (North, South, East, and West) and to ascertained whether the animals had given the chance to the observer to count well the behavior of herd time of sighting was also recorded i.e., feeding, walking, running, resting.

2.3.5 Post Survey Discussion

Both observers matched the field records in the evening to ascertained repeated and single groups based on herd size, composition, habitat type, location, and behavior. The information was then complied in the summary sheets to use later in the population estimation analysis.

2.5 Analytical Approach

The estimated population, detection probabilities, mean group size and variance in the group size were calculated by using formulas following (Forsyth and Hickling, 1997).

Estimated Number of Groups

$$G=(B+S1+1)(B+S2+1)/B+1-1 \quad (1)$$

Where,

S1 = number of group sighted by observer 1
S2 = number of group sighted by observer 2
B = number of animal group sighted by both observers
N = population estimated (rather than the number of individual)

Estimated Population Size

Population size estimated as the number of group in the population multiplied by the mean group size (Choquenot, 1990)

$$\check{N}=\hat{G}\hat{u} \quad (2)$$

Where,

$\check{N}$ = estimated population as the product of estimated number of group $\hat{G}$ and mean group size

The variance of estimated population, Var ($\check{N}$) is the variance of the product of independent random variables (Goodman, 1960).

Variance in Estimated Population

$$Var(\check{N})=\hat{G}^2Var(\hat{u})+\hat{u}^2var(\hat{G})-Var(\hat{G})Var(\hat{u}) \quad (3)$$

Where,

$$Var(\hat{G})=S1S2(S1+B1+1)(S2+B+1)/(B+1)2(B+2) \quad (4)$$

S1 = number of group sighted by observer 1
S2 = number of group sighted by observer 2
B = number of animal group sighted by both observers

Confidence Interval

Confidence intervals were calculated for each population estimated in each conservancy using the following formula (Forsyth and Hickling, 1997):

$$\check{N}\pm z\ \alpha/2^{se}\ (\check{N}) \quad (5)$$

Estimating Density

The density was estimated by divided total number animals by the surveyed area (Suryawanshi et al., 2012)

$$D=(\text{Total number of animals sighted})/(\text{surveyed area}) \quad (6)$$

Detection Probability

We used multinomial regression to determine the detection probability of observers with three possibilities for each herd in the study area:

i. herd sighted by observer OB-1 only,
ii. herd sighted by OB-2 only and/or
iii. Sighted by both observers (Unique sighting).

On the basis of "Walt test" (Yan and Su, 2009), the significance variable was selected for our model and according to p-value criteria removed the insignificant variables from the model.

3. Results

3.1 Population of Himalayan ibex

An overall population of 5,149 and estimated population of 5,114 was sighted in 31 CCHAs of 09 districts, in 318 herds (Figure 8) with mean herd size of 16 animals (Table 2), the density of Himalayan ibex is showed in (Figure 9). The double observer survey statistics in (Table 3).

Table 2: The double observer survey statistics

Estimates parameters	
# groups sighted by both observers	252
# groups sighted by observer one only	54
# groups sighted by observer two only	10
Estimated number of groups	318.13
Mean Group size	16.18
Observer ONE total	5009
Observer TWO total	4554
Overall total	**5114**
Estimated population	**5149**
Variance in mean group size	0.79
Variance in estimated number of Groups	2.68
Variance in estimated population	80838.56
95% Confidence interval	**564.43**
Detection probability Observer 1	0.962
Detection probability Observer 2	0.824

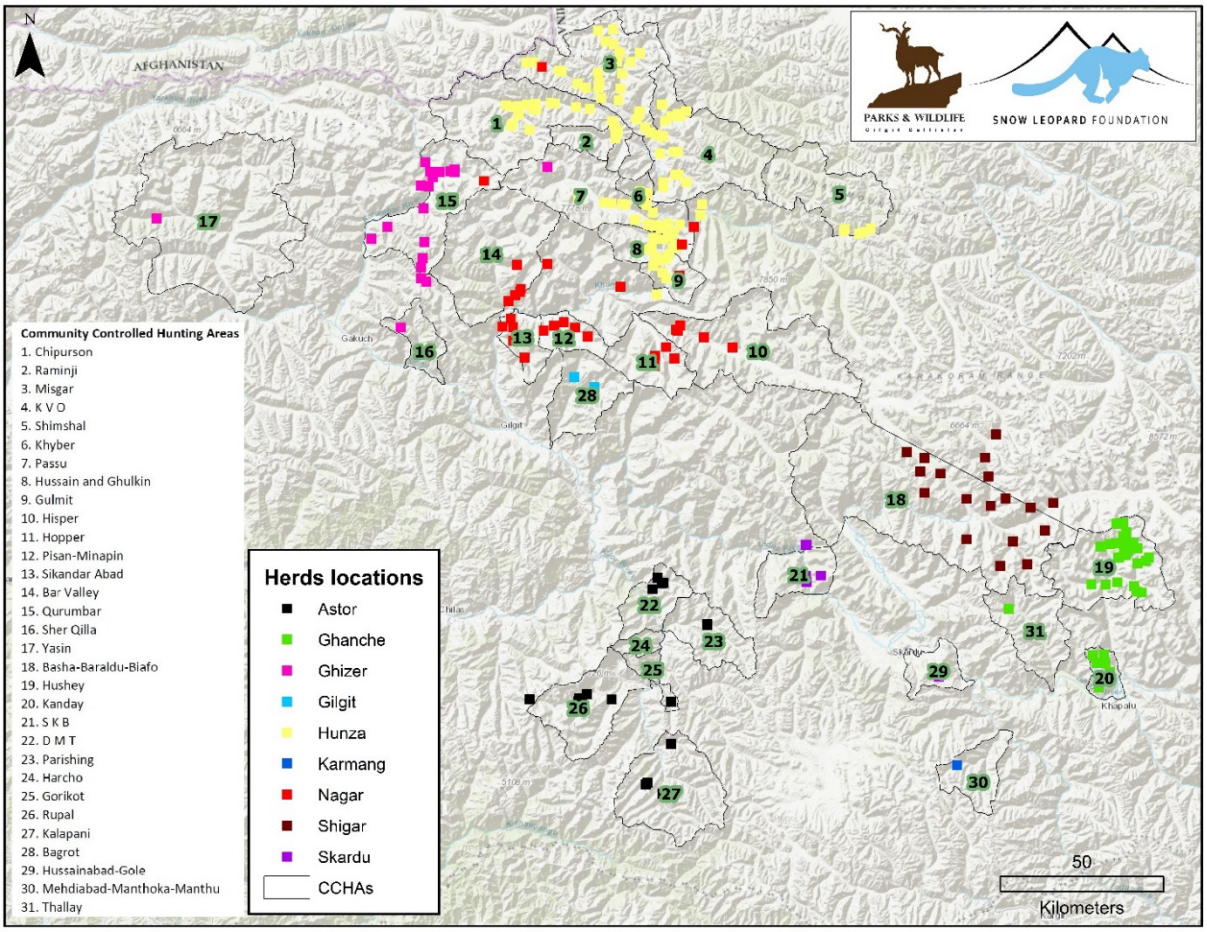

Figure 8: Locations of herds sighted during the survey

Table 3: Population details and demography of Himalayan ibex in CCHAs of different districts

S. No	District	Females	Youngs	Yearlings	Class I	Class II	Class III	Class IV	Total	Trophy Size
1	Hunza	931	415	381	163	185	136	291	2,502	230
2	Ghanche	232	225	207	39	44	30	121	898	117
3	Nagar	249	119	109	42	50	32	55	656	47
4	Shigar	158	100	29	43	43	20	50	443	49
5	Ghizer	115	76	36	10	11	23	22	293	17
6	Astor	85	25	14	7	23	28	25	207	27
7	Skardu	32	18	2	3	5	13	9	82	2
8	Gilgit	16	2	5	5	5	5	3	41	2
9	Karmang	8	4	2	3	4	3	2	26	2
	Total	**1,827**	**985**	**785**	**315**	**370**	**290**	**578**	**5,149**	**493**

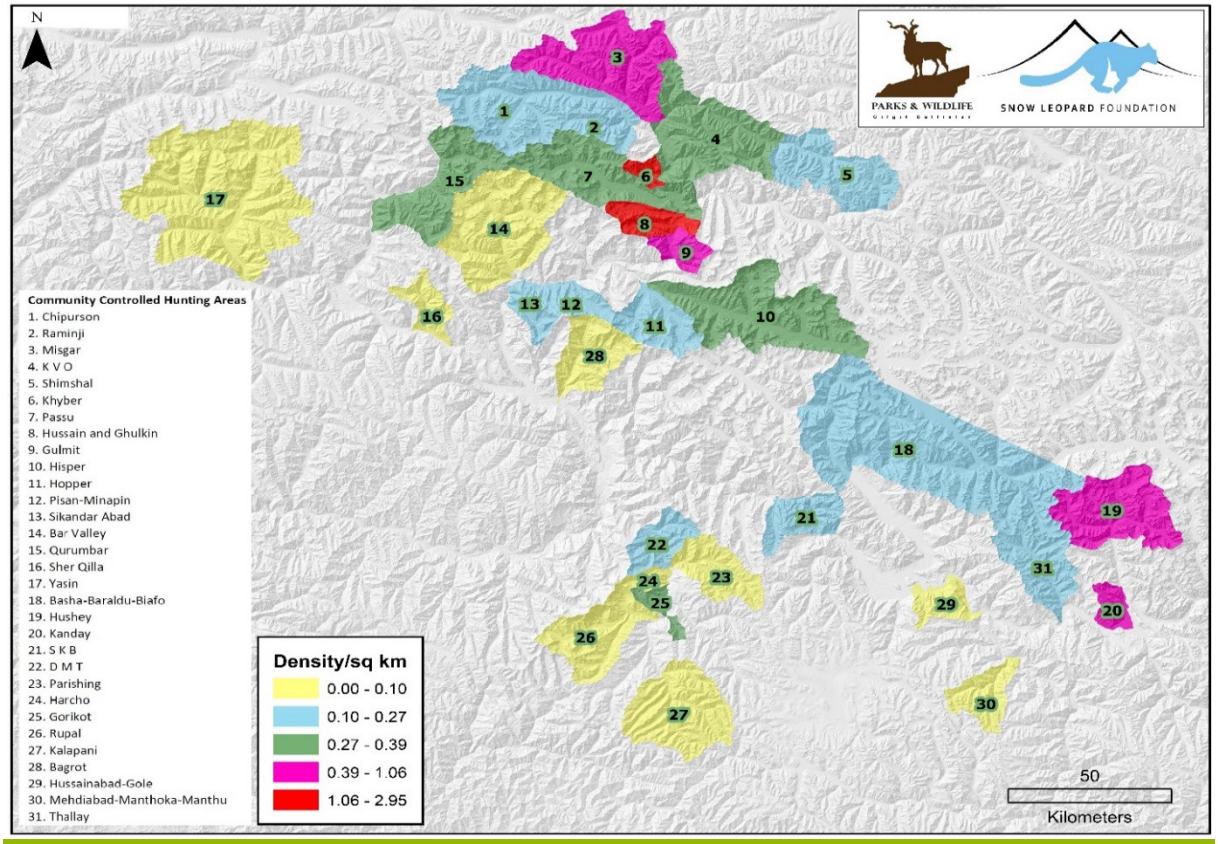

Figure 9: Density of Himalayan ibex in different CCHAs

3.1.1 Hunza District

The highest overall population of ibex was sighted in the district Hunza i.e., 2,502, with an estimated population of 2,532 individuals. These 2,502 individuals were sighted in 155 (Figure. 13) herds with a mean herd size of 17 individuals (Figure. 14 and Table.03). within Hunza the highest population was reported from Misgar Valley i.e., 661 individuals in 31 herds with mean herd size of 22 animals, the details of ibex population in other community-controlled hunting areas of district Hunza are in (Table. 04) and (Figure. 14).

Table 4: Detail of demography of Himalayan ibex sighted in CCHAs of district Hunza

S. No	Valley	Females	Youngs	Yearlings	Class I	Class II	Class III	Class IV	Total	Trophy Size
1	Shimshal	39	12	13	4	9	14	20	111	15
2	KVO	109	40	38	26	29	25	50	317	43
3	Chipurson	77	35	37	31	33	10	11	234	14
4	Khyber	84	23	60	15	17	14	21	234	19
5	Passu	116	28	51	15	25	28	29	292	28
6	Hussaini	62	35	55	12	8	8	10	190	13
7	Ghulkin	80	45	47	22	21	15	15	245	22
8	Gulmit	54	40	32	13	10	17	12	178	13
9	Misgar	291	147	48	21	28	5	121	661	61
10	Raminji	19	10	0	4	5	0	2	40	2
	Total	**931**	**415**	**381**	**163**	**185**	**136**	**291**	**2,502**	**230**

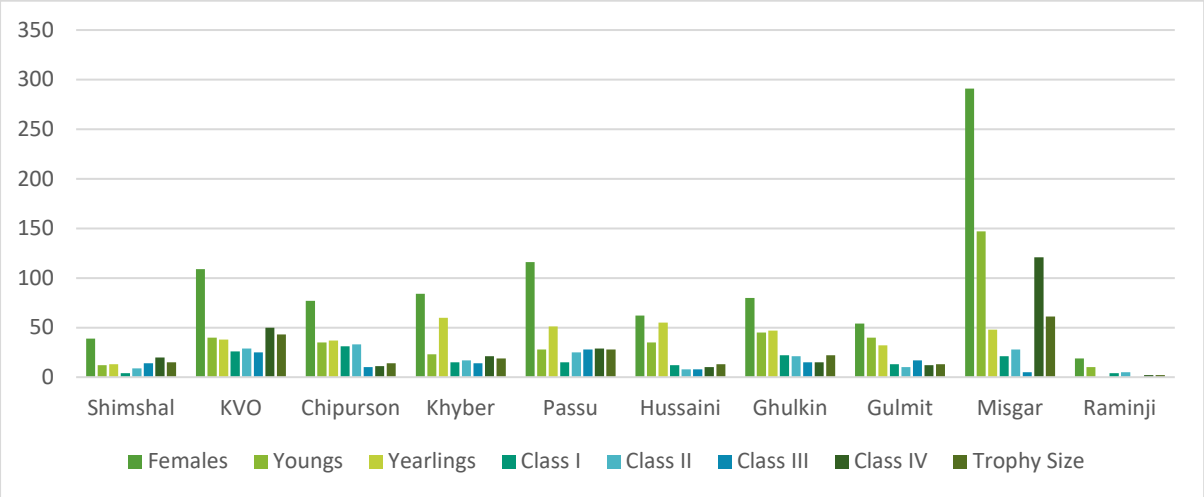

Figure 10: Demography of Himalayan ibex in CCHAs of district Hunza

3.1.2 Ghanche District

The district Hunza was followed by district Ghanche with an overall and estimated population 898 individuals in 38 herds with mean herd size of 23 animals. Hushey Valley had the highest population of Himalayan ibex i.e., 628 which was observed in 27 herds with mean size of 23 animals, the details of ibex population in other community-controlled hunting areas of district Ghanche are in (Table 5) and (Figure 11).

Table 5: Detail of demography of Himalayan ibex sighted in CCHAs of district Ghanche

S. No	Valley	Females	Youngs	Yearlings	Class I	Class II	Class III	Class IV	Total	Trophy Size
1	Kanday	43	43	20	5	5	4	23	143	19
2	Hushey	144	160	162	24	29	18	91	628	91
3	Thallay	45	22	25	10	10	8	7	127	7
	Total	**232**	**225**	**207**	**39**	**44**	**30**	**121**	**898**	**117**

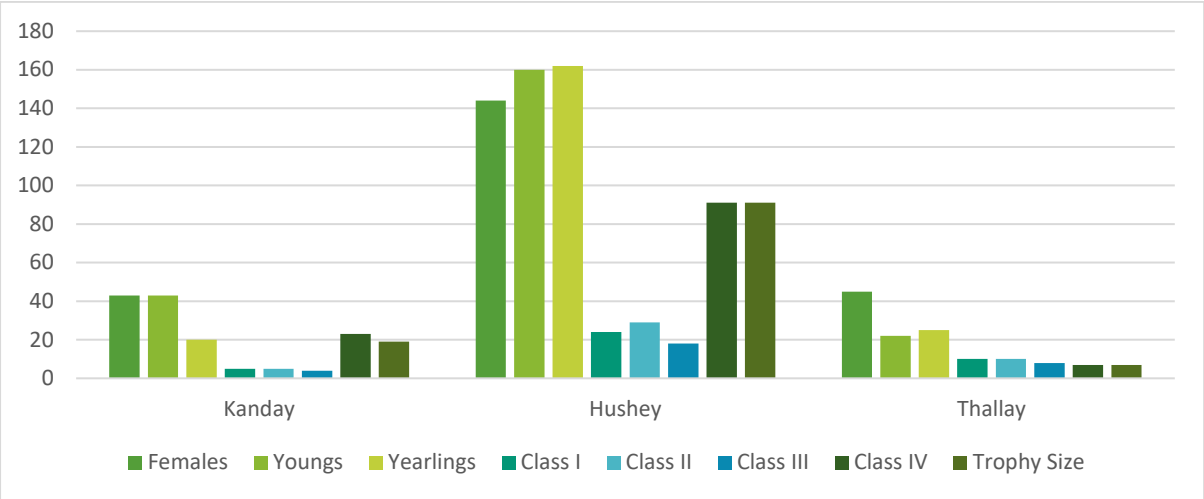

Figure 11: Demography of Himalayan ibex in CCHAs of district Ghanche

3.1.3 Nagar District

District Nagar had the third highest population among the district surveyed with an overall and estimated population of 656 individuals of Himalayan, these animals were sighted in 32 herds (Figure.12) with mean herd size of 20 animals, within the district the highest number of ibex was sighted in Hisper Valley i.e., 420 of overall and estimated population in 7 herds of mean size 60 animals, the details of ibex population in other community-controlled hunting areas of district Nagar are in (Table 6) and (Figure 12).

Table 6: Detail of demography of Himalayan ibex sighted in CCHAs of district Nagar

S. No	Valley	Females	Youngs	Yearlings	Class I	Class II	Class III	Class IV	Total	Trophy Size
1	Bar Valley	37	7	10	8	8	7	5	82	6
2	Hisper	155	83	84	23	31	13	31	420	23
3	Hopper	17	6	10	5	3	2	12	55	12
4	SAS Valley	3	2	1	1	0	3	1	11	1
5	Pisan-Minapin	15	7	4	2	3	5	5	41	3
6	Sikander Abad	22	14	0	3	5	2	1	47	2
	Total	**249**	**119**	**109**	**42**	**50**	**32**	**55**	**656**	**47**

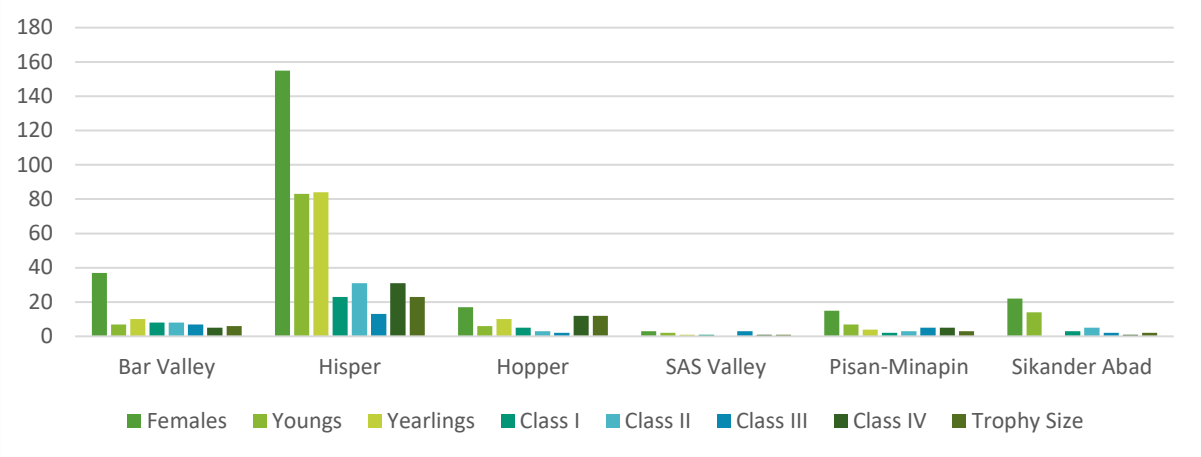

Figure 12: Demography of Himalayan ibex in CCHAs of district Nagar

3.1.4 Shigar District

The glaciated district Shigar has only community-controlled hunting area i.e., Askoli-Biafo, which had an overall and estimated population of 443 Himalayan ibex in 18 herds (Figure.12) of mean herd size of 25 animals, the details of ibex population in other community-controlled hunting areas of district Shigar are in (Table 7) and (Figure 13).

Table 7: Detail of demography of Himalayan ibex sighted in CCHAs of district Shigar

S. No	Valley	Females	Youngs	Yearlings	Class I	Class II	Class III	Class IV	Total	Trophy Size
1	Askoli, Braldu, Durumdo, Biafo	158	100	29	43	43	20	50	443	49

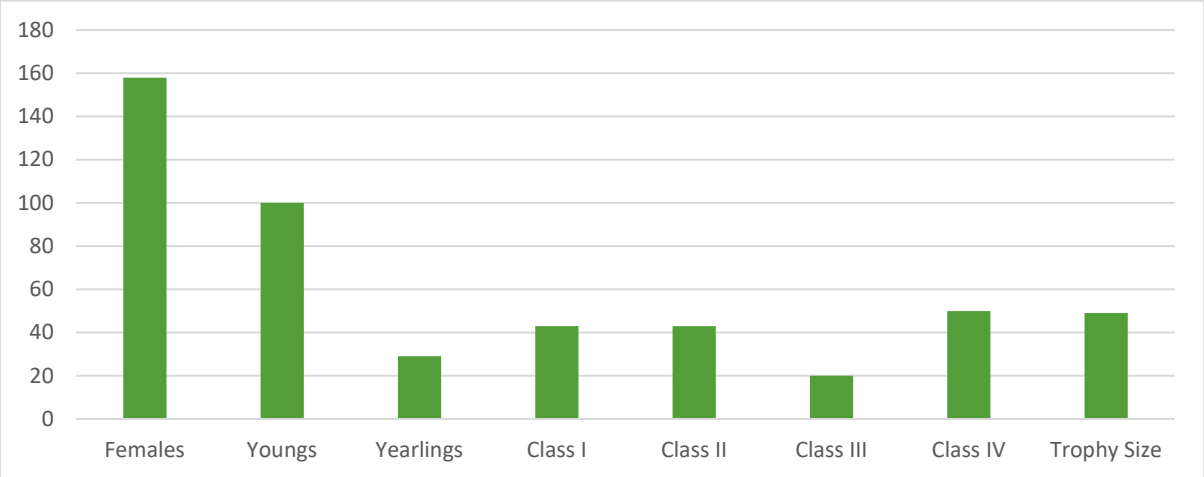

Figure 13: Demography of Himalayan ibex in CCHAs of district Shigar

3.1.5 Ghizer District

In the district Ghizer three CCHAs i.e., Qurumber Valley, Sher Qilla, and Yasin Valley were surveyed, where the team sighted an overall and estimated population of 293 Himalayan ibex in 32 herds with mean herd size of 9 animals, the highest population of ibex i.e., 278 individuals were sighted in Qurumbar CCHAs the details of ibex population in other CCHAs of district Ghizer are in (Table 8 and Figure 14).

Table 8: Detail of demography of Himalayan ibex sighted in CCHAs of district Ghizer

S. No	Valley	Females	Youngs	Yearlings	Class I	Class II	Class III	Class IV	Total	Trophy Size
1	Qurumber	108	72	36	9	10	22	21	278	17
2	Sher Qilla	3	2	0	1	0	0	0	6	0
3	Yasin	4	2	0	1	1	0	1	9	0
	Total	**115**	**76**	**36**	**11**	**11**	**22**	**23**	**293**	**17**

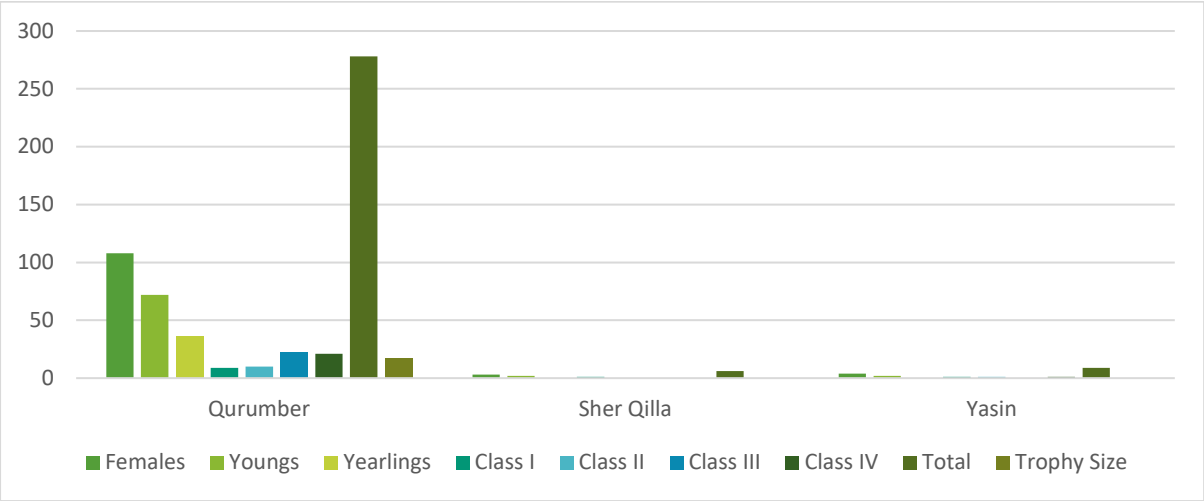

Figure 14: Demography of Himalayan ibex in CCHAs of district Ghizer

3.1.6 Astore District

In district Astor the surveyors sighted a total of 207 Himalayan ibex in 33 herds with mean herd size of 6 animals in the CHHAs of Rupal, Kalapani, DMT, Gorikot, Parsing and Harcho, the highest population of Himalayan ibex exists in Rupal CCHAs with a total population of 62 individuals that were sighted in 10 herds of mean herd size of 6 animals per herd, the details ibex sighted in other CCHAs of district Astor are in (Table 9 and Figure 15).

Table 9: Detail of demography of Himalayan ibex sighted in CCHAs of district Astore

S. No	Valley	Females	Youngs	Yearlings	Class I	Class II	Class III	Class IV	Total	Trophy Size
1	Rupal	34	0	0	0	11	12	5	62	7
2	Parishing	5	3	2	2	2	1	1	16	1
3	Kalapani	14	6	6	2	4	8	9	49	9
4	DMT	18	7	5	1	1	1	7	40	7
5	Gorikot	12	8	0	1	4	5	2	32	2
6	Harcho	2	1	1	1	1	1	1	8	1
	Total	**85**	**25**	**14**	**7**	**23**	**28**	**25**	**207**	**27**

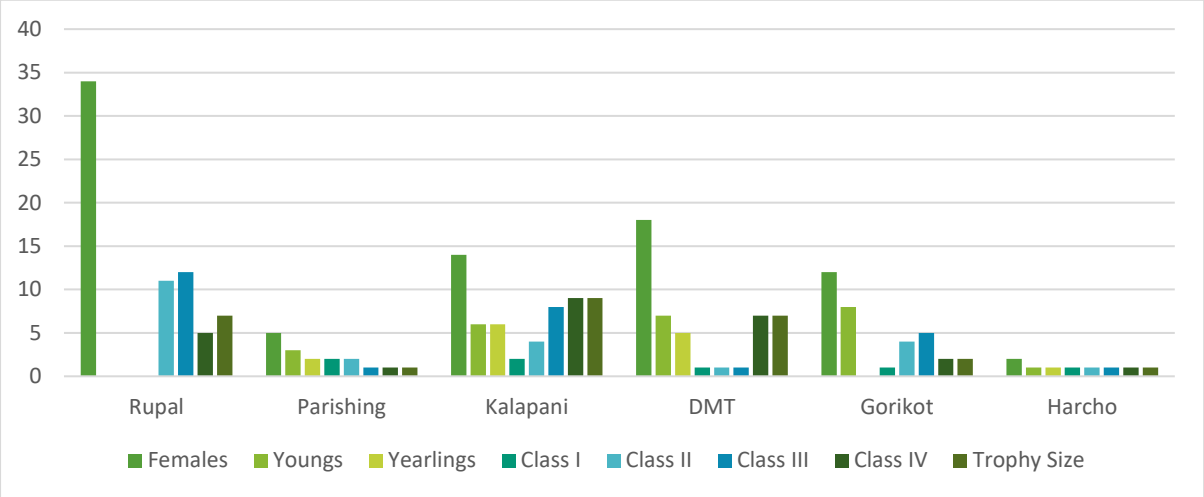

Figure 15: Demography of Himalayan ibex in CCHAs of district Astore

3.1.7 Skardu District

In district Skardu two community-controlled hunting areas were surveyed where the team located an overall and an estimated population of 82 Himalayan ibex in 7 herds with a mean herd size of 12 animals per herd, the details of herd demography are (Table 10 and Figure 16).

Table 10: Detail of demography of Himalayan ibex sighted in CCHAs of district Skardu

S. No	Valley	Females	Youngs	Yearlings	Class I	Class II	Class III	Class IV	Total	Trophy Size
1	S K B	27	16	0	1	3	12	8	67	1
2	Hussainabad-Gole	5	2	2	2	2	1	1	15	1
	Total	**32**	**18**	**2**	**3**	**5**	**13**	**9**	**82**	**2**

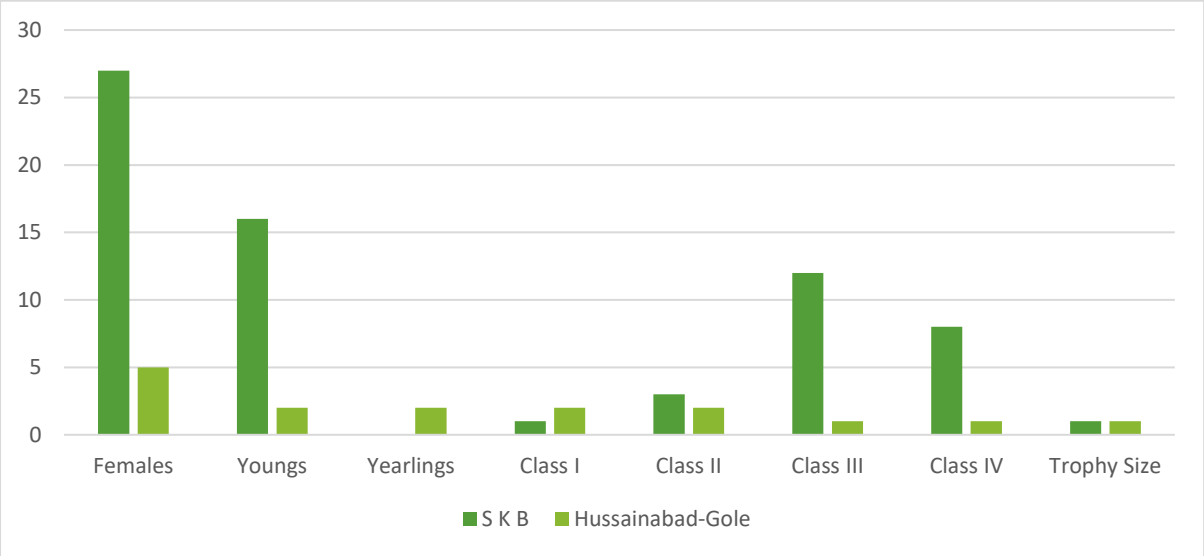

Figure 16: Demography of Himalayan ibex in CCHAs of district Skardu

3.1.8 Gilgit District

In district Gilgit, Bagrot Valley was surveyed where 41 Himalayan ibex were sighted in 02 herds with mean herd size of 20 animals per herd, the detail demography of the herd is in (Table 11 and Figure 17).

Table 11: Detail of demography of Himalayan ibex sighted in CCHAs of district Gilgit

S. No	Valley	Females	Youngs	Yearlings	Class I	Class II	Class III	Class IV	Total	Trophy Size
1	Bagrot	16	2	5	5	5	5	3	41	2

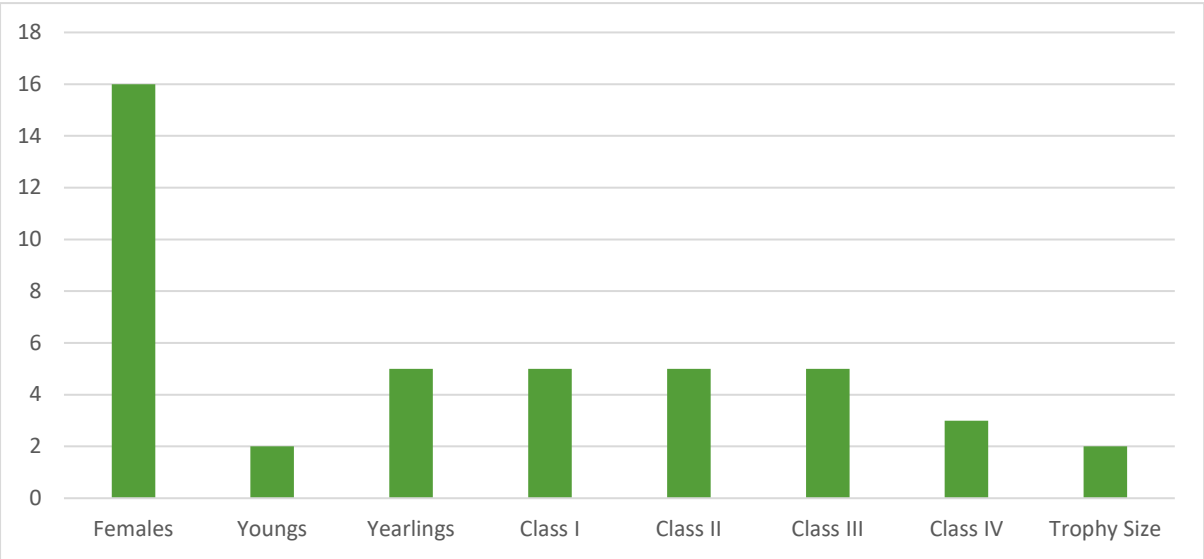

Figure 17: Demography of Himalayan ibex in CCHAs of district Gilgit

3.1.9 Karmang District

Lastly, in district Karmang the only CCHA i.e., Mehdiabad-Manthoka-Manthu the survey for wild ungulates was conducted where the survey teams sighted an overall and estimated population of 26 Himalayan ibex in a single herd, the demographic details of the herd are in (Figure 18 and Table 12).

Table 12: Detail of demography of Himalayan ibex sighted in CCHAs of district Karmang

S. No	Valley	Females	Youngs	Yearlings	Class I	Class II	Class III	Class IV	Total	Trophy Size
1	Mehdiabad-Manthoka-Manthu	8	4	2	3	4	3	2	26	2

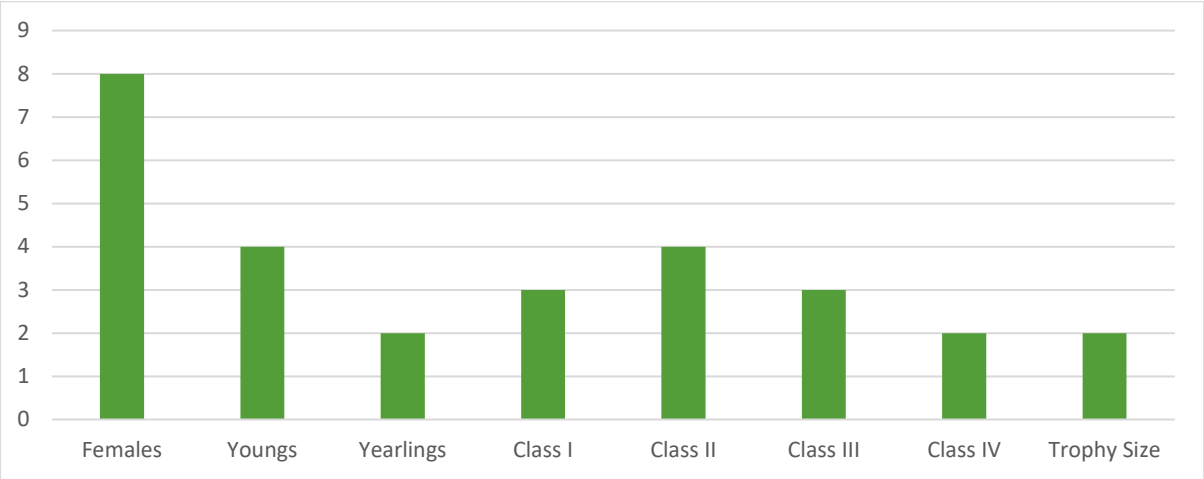

Figure 18: Demography of Himalayan ibex in CCHAs of district Karmang

3.2 Population of Blue Sheep

Blue sheep is found in two CCHAs viz., Sockterabad Nallah of KVO CCHA and Shimshal CHHA (Figure. 08), the teams only focused the CCHAs area and sighted an overall and estimated population of 626 blue sheep in Sockterabad and Shimshal in 13 herds (Figure 19) with mean herd size of 48 animals per herd (Figure 19). There were more blue sheep in Shimshal 555 than Sockterabad 71 for demographic details of population (Table 13 and Figure 20).

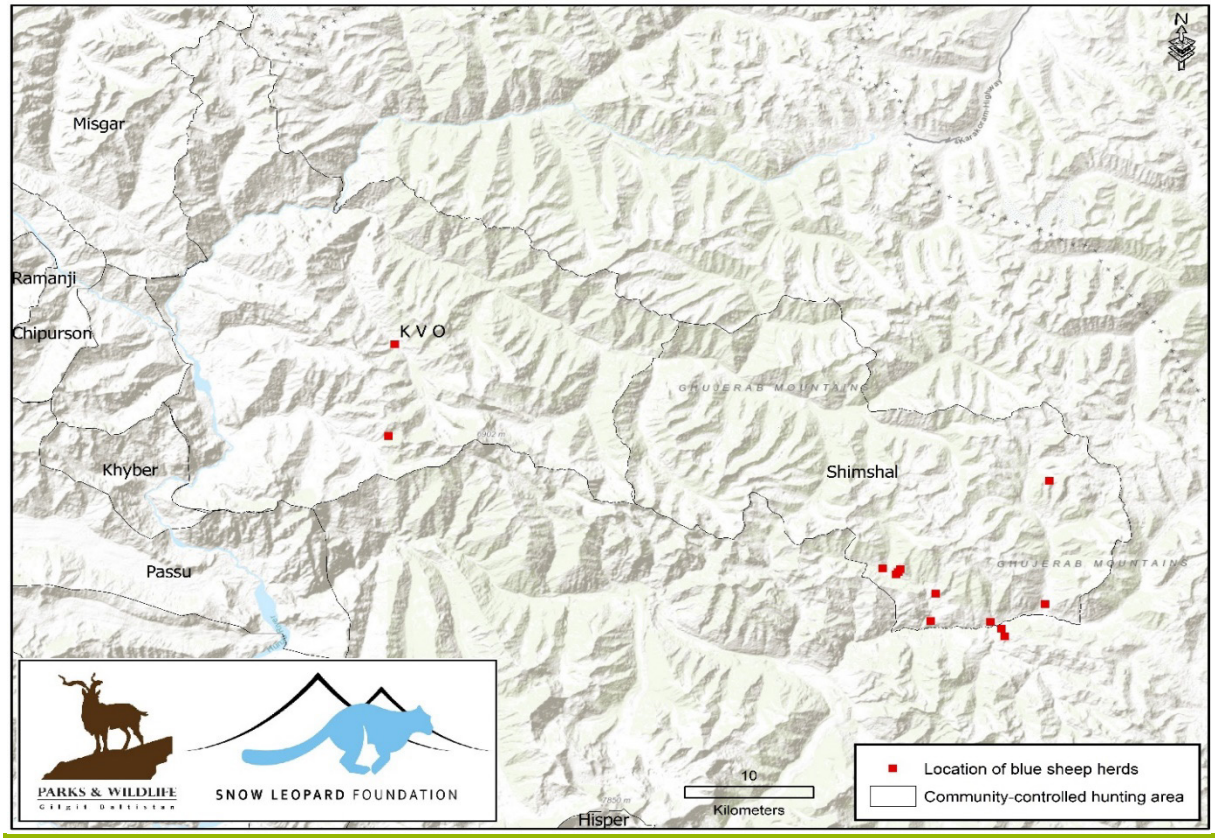

Figure 19: Location of blue sheep herds in KVO and Shimshal CCHAs of district Hunza

Table 13: Population and demographic categories of blue sheep KVO and Shimshal CCHA of district Hunza

S. No	Valley	Females	Youngs	Yearlings	Class I	Class II	Class III	Class IV	Total	Trophy Size
1	Shimshal	168	75	94	61	49	48	60	555	52
2	Sockterabad	30	8	13	8	8	0	4	71	4
	Total	**198**	**83**	**107**	**69**	**57**	**48**	**67**	**626**	**56**

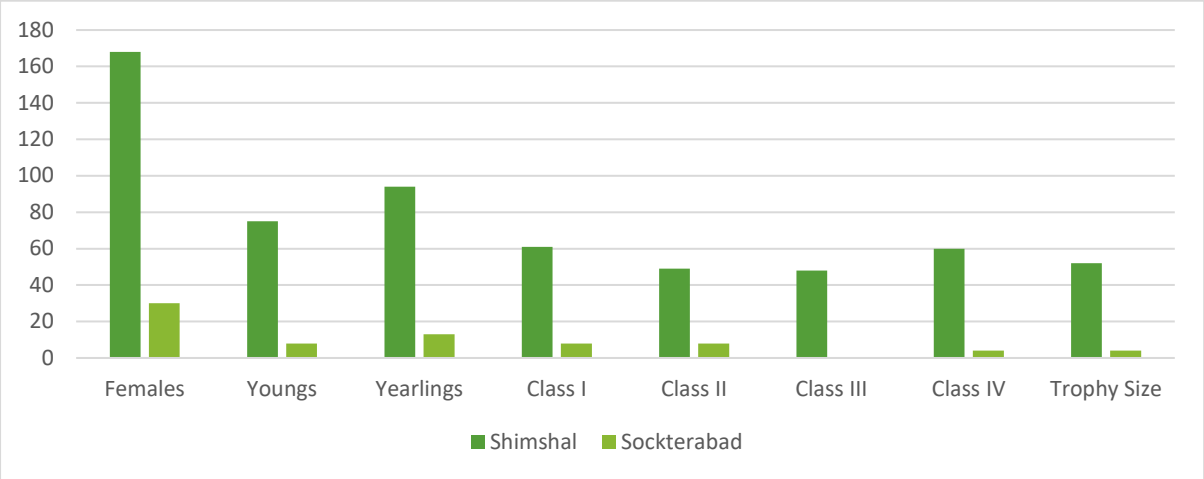

Figure 20: Demography of blue sheep in KVO and Shimshal CCHA of district Hunza

3.3 Allocation of Trophy for Year 2023

If the 2% of animals are harvested from total population, then 103 Himalayan ibex and 13 blue sheep can be harvested, if 25% of trophy size animals are opted to harvest then 123 Himalayan ibex and 14 blue sheep can be harvested in 31 CCHAs.

4. Discussion

Regular monitoring of wild ungulates populations is the only way to assess to what extent the conservation efforts have helped recovered wildlife populations (Singh and Milner-Gulland, 2011), in areas where human dependence on natural resources is high (Mishra et al., 2004). In Gilgit-Baltistan, trophy hunting was introduced as a last resort to recover the population of wild ungulates from the verge of extinction in 1991(Jingfors, 2000), the population of wild ungulates is now increased from few individuals (Virk, 1999) to thousands of Himalayan ibex (Ahmad et al., 2020), blue sheep (Khattak et al., 2019), and markhor (Haider et al., 2021).

The mountainous terrain of South Asia is though home to several species of wild ungulates, but these mountains are considered as toughest to survey on, for the reasons like remoteness, lack of accessibility, financial constraints, train manpower and for lacking an appropriate robust survey technique (Singh and Milner-Gulland, 2011). These constraints often curtail the organizations to monitor population trends of wild ungulates over longer periods (Singh and Milner-Gulland, 2011), hence researchers relied on anecdotal or interviewed based numbers, which in some cases are contracting and raised questions e.g., (Wegge, 1989) reported a population of 2000 Himalayan ibex in Khunjerab National Park, while for the same park (Shafiq and Ali, 1998) reported 1605 Himalayan ibex using direct and indirect survey methods (Ahmad et al., 2020) reported an estimated population of 2376 Himalayan ibex for KNP and its buffer valleys using double observer survey method, the area of their survey was twice the area covered by (Shafiq and Ali, 1998; Wegge, 1989).

The survey methods if selected by taking care of the topography of study area, and if it is supported by robust statistical techniques on the collected data, rather than demanding for taking care of certain width of line transect (Burnham et al., 1980) or requires climbing to all possible high ridgelines which provide equal chance to each observer to scan at least 60% of the block (10 to 100 km2) (Jackson and Hunter, 1996). The narrow valleys of Gilgit-Baltistan make this

impossible to maintain a uniform width of line transect on both sides of the line transect even for few meters which is one of assumption of line transect (Burnham et al., 1980), and find a single vantage point which could offer 60% visuality of the survey block or climbing to multiple vantage points due to steepness, these both conditions are mandatory to meet the assumption of vantage count method (Jackson and Hunter, 1996).

The rugged mountain topography could only be traverse using the possibilities showed in (Figure.09), hence double observer survey method is the only method whose assumptions i.e., individual identification of groups, availability of animals till the survey period in the same block and finally independence of both observers (Suryawanshi et al., 2012), are possible to meet in the rugged topography, incorporation of classical method in population estimation i.e., Capture-Recapture Method (CMR) in the DOSM makes it statistically robust.

The current survey for the first time used DOSM on the whole range of Himalayan ibex and blue sheep in Gilgit-Baltistan, the teams found this method applicable in the study area and found an overall and estimated population of 5,149 Himalayan ibex and 626 blue sheep. (Hess et al., 1997) quoted an unpublished report of 1993 (Wildlife wing, Northern Areas) which estimated 9,000-10,000 Himalayan ibex, while (Khan et al., 2014), after two decades claimed that there was a total population of 15,596 Himalayan ibex in Gilgit-Batistan, with worrisome fecundity rate of only 1,435 kids for 6,164 females.

No other study focused whole range of Himalayan ibex but part of the range/valleys, our results are akin to (Ahmad et al., 2020) for Gojal, for Central Karakoram National Park (CKNP) to (Zafar Khan et al., 2014) for Hushey Valley to (Raza et al., 2015).

We recorded a viable population of blue sheep i.e., 626, (Rasool, 1990) reported 600 - 700 blue sheep in KNP, while (Hess et al., 1997) cited (Rasool, 1992) for an unpublished report where a population of 2,000 – 2,500 blue sheep were reported. While in other range wide surveys (Khan et al., 2014) reported 1,035 blue sheep and (Khattak et al., 2019) reported an estimate population of 834 blue sheep in blue sheep range, the

results of our survey are less as this survey only scanned blue sheep within the declared boundaries of Shimshal and Sockterabad CCHAs.

Trophy quotas can be assigned either by trophy hunting guidelines set by IUCN at the inception of trophy hunting i.e., a markhor/ibex/blue sheep could be harvest if in two consecutive surveys 50 individuals of these ungulates are found with four trophy size animals, and if this threshold did not observe the following year there will be zero trophy quota for that CCHA (Jackson, 2004). Allocating trophy quotas on 2% percent of total population is seems not sustainable as it is noticed that communities often found interested in counting trophy animals and overall population trend does not matter (Jackson, 2004).

4.1 Recommendations

1. The Parks and Wildlife Department must enforce single survey methodology and data collection format to uniform the data collection for longer periods.
2. The game watchers shall be train regularly in latest survey techniques and equipment to ensure collection of data each year.
3. Trophy shall be allocated using the IUCN guidelines agreed with communities at the inception of trophy hunting i.e., census and population based.
4. Data collected shall be entered in a database and should be publicly available.

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