

Threats to Ladakh Urial (*Ovis vignei vignei* Blyth, 1841) in Gilgit Baltistan, Pakistan

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ABSTRACT

The Ladakh urial is the smallest among wild sheep with very restricted distribution range confined to Ladakh (Indian held Kashmir) and Gilgit- Baltistan (Pakistan). In Pakistan, the endangered Ladakh urial is facing severe threats of illegal hunting, habitat degradation, by increasing livestock population and extraction of wood, fodder, medicinal plants, poaching, lamb picking, and disease transfer from domestic livestock. Its distribution range is shrinking continuously, and they have been extirpated from at least six previously known localities during the last decade. The present study was conducted from January to September 2013 to collect the information on status, magnitude, and severity of threats to urial population in Gilgit- Baltistan. Field surveys were conducted to collect data on Ethno-ecology and threats to urial in the study area. Local knowledgeable persons including hunters, shepherds, wildlife guards, and community wildlife rangers, officials of governmental and nongovernmental organizations were identified to collect the secondary information about the presence of threats to urial at different localities in the area. Data was collected through formal and informal interviews (n=150). During the last 13 years (2000-2013), about 70 Ladakh urial killings were reported and confirmed from different areas of GB. All the respondents, interviewed during study, were familiar to the urial existence in the area. Majority of these locals (n=79, 53%) were happy with urials presence in their area and favors (n=61, 41%) its protection in their respected areas. Majority of the respondents (70%) reported that Ladakh urial population has declined over the last few decades. Most of the respondents had very key information about the past records of population and hunting of urial. These locals along with their important information can be utilized for formulating and implementing the conservation strategies for these highly threatened animals in the area.

Key words: Ladakh Urial; Gilgit Baltistan; poaching; habitat degradation; hunting; threats.

INTRODUCTION

The Ladakh urial is the smallest and least studied among wild sheep with very restricted distribution range confined to Ladakh (Indian held Kashmir) and Gilgit- Baltistan (Pakistan) (Roberts, 1997; Valdez, 2008; Din *et al.*, 2016, 2018). In Ladakh it is distributed infrequently in a narrow band along the valley-bottom, to the foothill boundary and some of the major tributaries of the Indus and Shyok-Nubra rivers. Most of the urial population is found along the Indus valley westward from Likchey to Khalsi villages, and around the junction of the Nubra and Shyok valleys (Valdez, 2008; Fox *et al.*, 1991; Mallon, 1983, 1991) (Fig. 1). In Ladakh, the population had been reduced to a few hundred individuals in the 1960s and 70s through hunting for trophies and meat (Fox *et al.*, 1991; Mallon, 1983; Chundawat and Qureshi, 1999). However, with the protection under the Indian Wildlife Protection Act 1972, and resultant decrease in hunting, the population has increased to about 1000-1500 individuals in its range in Ladakh (Chundawat and Qureshi, 1999; Raghavan and Bhatnagar, 2003). In Paistan Ladakh urial was present as small fragmented populations in some localities of GB. In Gilgit, the presence of Ladakh urial was confirmed at Bunji Valley (Rehman Nallah, Nelli Daar, Pooring Boori, Nelli Harae, Jachaa, Ramgat Thock, Dadar Misiken, Burmay, Fataro Lot, Budayba, Chooko Jail, Mayar Dass, Burmay Gutum, Burchi), in

Nanga Parbat (Jalipur, Jabar Daar, Shero-Taaey, Shero-Munair, Boori Baizer, Batchulee Goolo Shut, Raikot) and Nagar (Huru). In Baltistan region, the urial were recorded from Skardu, which included sub-localities, Thalay, Nar Gorro, Safranga and Karrpochu (Din *et al.*, 2016,). Its range encompassed most of the Western Himalayas (Himalayan/Karakoram/Hindu Kush mountain region) on rolling slopes at from 1500 m to above tree line (Schaller, 1976; Roberts, 1997). However, urial from higher elevations, historically made altitudinal migrations to lower valleys to avoid winter snows (Schaller, 1976; Fox *et al.*, 1991; Din *et al.*, 2016, 2018). These elevations and habitats, however, correspond to the region most heavily utilized by humans, and a combination of overhunting, disturbance, and competition with livestock. Hence, Ladakh urial like many other wild animals is affected by competition with livestock, leading to the brink of extinction (Roberts, 1977; Schaller, 1979; Mallon, 1991; Shackleton, 1997; Chundawat and Qureshi, 1999). Besides, the habitat of these urial is arid and of low primary productivity, hence their densities are often naturally low (<one/km²). With increasing human populations, the grazing pressure from domestic livestock is increasing significantly. In addition, the mountain habitats are also severely destroyed and shrunken due to severe livestock grazing and deforestation for fodder and fuel wood by the local communities. Again the major cause is directly related to increasing human numbers, in this case their rising energy demands for fossil fuels, hydroelectric power, and fuel wood (Shackleton, 1997; Raghavan and Bhatnagar, 2003).

Based upon various threats, all subspecies of urial have been globally considered as vulnerable in the IUCN Red List of Threatened Animals (2015) because their population is believed to be declining by at least 30% over three generations due to hunting, hybridization and habitat deterioration (Valdez, 2008; IUCN, 2015; Din *et al.*, 2016, 2018).

In Pakistan, Ladakh urial have severe threats of habitat degradation, poaching, lamb picking, and disease transfer from domestic livestock. Hence the national status of the species is considered endangered (Sheikh and Molur, 2004). IUCN Red List 2015.2 places it as vulnerable. It is also listed in the Appendix 1 of Convention on International Trade in Endangered Species of Fauna and Flora. However, their conservation status has not been studied properly for the last two decades. Din *et al.*, (2016, 2018). The population of Ladakh urial has been declining during the last few decades due to illegal hunting and habitat degradation by increasing livestock population and extraction of wood, fodder and medicinal plants. Its distribution range has also been shrinking and they have been extirpated from at least six previously known localities during the last decade (Din *et al.*, 2016). To ensure the continuous survival of the existing urial population, a comprehensive research based integrated strategy is required hence they need to be immediately located and surveyed for taking proper conservation measures to ensure their continued survival. Keeping this in view, the present study was designed to collect the information regarding investigate threats to urial in GB.

MATERIALS AND METHODS

Gilgit-Baltistan formerly called Northern Areas is situated in the extreme north of Pakistan between 33-37°N to 37-40°N north latitudes and 72-73°E to 77-78°E east longitudes, sandwiched among the highest peaks of Karakoram and Hindu-Kush in the north and those of western Himalayas in the south. GB covers an area of 72,971 km² and an estimated population approaching 1,000,000 (Khan, 2012; Din *et al.*, 2016, 2018). The biogeographic position of GB is unique. Three of the world's great mountain ranges- the Himalayas, Karakoram and Hindu Kush- meet at the confluence of Gilgit and Indus rivers, while the Karakoram Range joins the Pamir and Kun Lun ranges in the north. The landscape is dominated by some of the world's highest mountain peaks, including 5 peaks over 8,000 m elevation above mean sea level (asl), which overshadows the biological richness of this region (Virk *et al.*, 2003; Din *et al.*, 2016, 2018). Monsoon rains are rare due to blockage by the high Himalayan Mountains, while snowfall largely occurs in areas above 4,000 m asl. The area has the highest concentration of glaciers, including some of the longest glaciers of the world e.g., Siachin Glacier, 78 km long (Virk *et al.*, 2003; Zain, 2010; Din *et al.*, 2016, 2018). Based on this unique geography, a number of significant species of mammals are found in the area, including some of the globally threatened species of mammals and birds (Virk

et al., 2003; Din *et al.*, 2016, 2018) (Fig. 1).

Field surveys were conducted from January to September 2013 to collect data on Ethno-ecology and find threats to urial in the study area. Local knowledgeable persons including hunters, shepherds, wildlife guards, community wildlife rangers and officials of NGOs were identified to collect the secondary information about the presence of urial at different localities and its conservation status in the area. Data was collected through formal and informal interviews (n=150) respondents of the above-mentioned persons using semi structured questionnaires and group discussions. Besides taking information from the above said sources, the existing literature was reviewed to collect information about threats to the animal. Discussions were made with officials of GB wildlife department and the official record of registered cases of illegal hunting of Ladakh urial was reviewed.

To test the hypothesis that all the threats viz. lamb picking, hunting, disturbance by livestock and habitat degradation contributed equally or not, Chi square test was used. SPSS version 16 was used for Chi square test. All other calculations were represented in percentage. All these data was used to find threats to animal in the area and to find a base for suggesting conservation measures to develop conservation strategy for Ladakh urial in Pakistan. GPS locations of all the villages were recorded to know the human settlement patterns and their impact on Ladakh urial's habitat in different area.

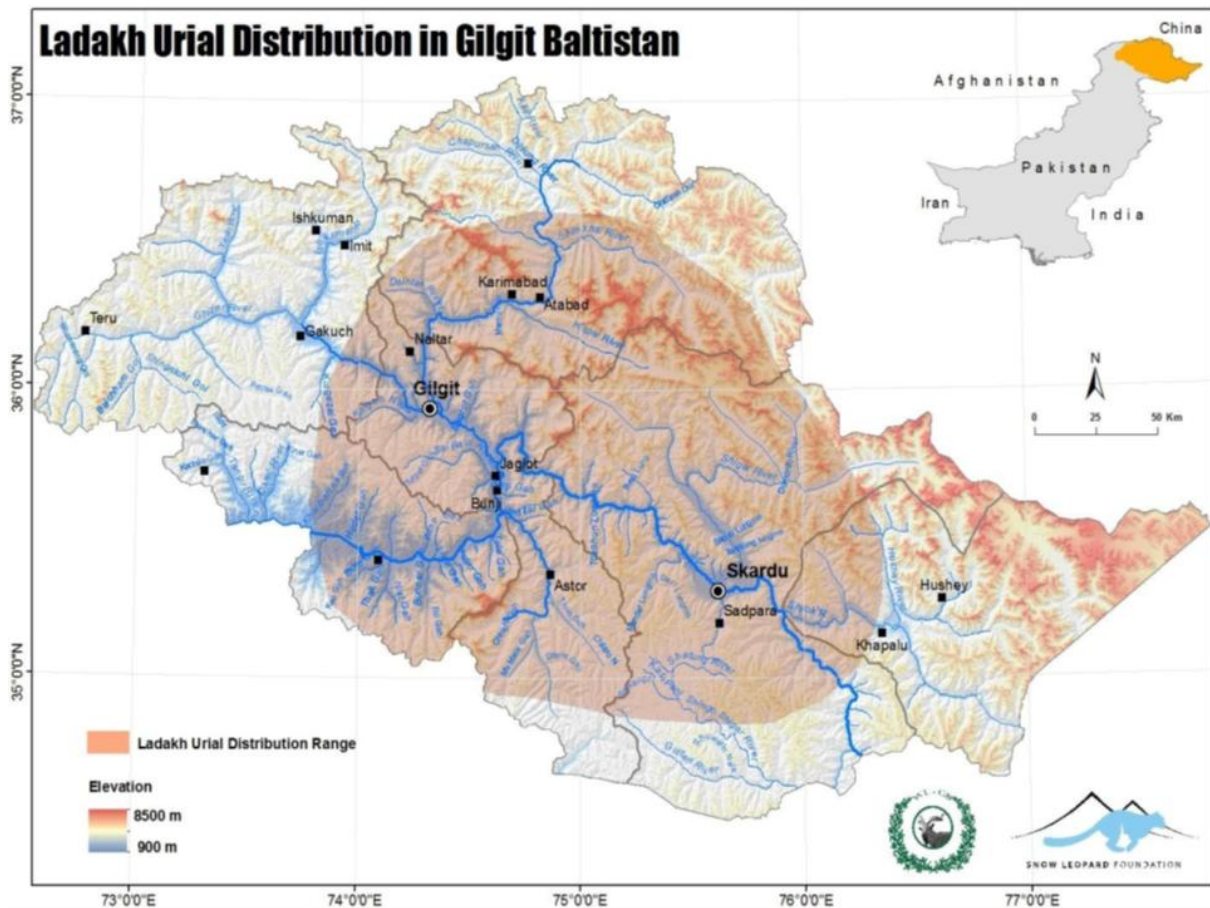


Fig. 1 Distribution range of Ladakh urial in Gilgit-Baltistan.

RESULTS

Human-urial interaction

Like many other areas, humans and their livestock were also found involved in habitat overlapping with Ladakh urial around GB. This type of habitat overlapping characteristics was found the major base of human-Ladakh-urial interaction in the study area. Questionnaire surveys were conducted in the human communities inhabiting around the urial habitats. Details of these interactions among

other findings of the study are provided in the following headings:

Respondents Information

Respondents were categorized into four classes of different ages. Majority of the respondents belonged to age ranged between 18-30 years (31%), 31-45 (38%) followed by 46-45 (18%) and above 65 (13%; Table 3.12). According to their education level, respondents were composed of seven classes i.e., illiterate (23%), primary (36%), middle (25%), SSC (7%), HSC (5%), graduate (2%) and post graduate (1%). Similarly, based on average monthly income, five classes of respondents were categorized, which included below 3000 (Class 1) to above 12000 Pak rupees month incomes (Class 5). Of these, majority of the respondents falls in <3000 (24%) and 3100-600 (25%) income classes (Table 1).

Table 1: Information of respondents, interviewed to assess human-urial conflict

Respondent information by	Groups	Frequency (%)
Age (years)	18-30	31
	31-45	38
	46-65	18
	>65	13
Education (level)	Illiterate	23
	Primary	36
	Middle	25
	Secondary	7
	Higher Secondary	5
	Graduate	2
	Postgraduate	1
Monthly income (PKRs.)	<3000	24
	3100-6000	25
	6100-9000	18
	9100-12000	15
	>12000	17

Livestock Population

Livestock along with crops is the integral part of the livelihood of the communities residing around the habitats of Ladakh urial. Livestock population varies at different localities. 153,368 livestock heads were reported by respondents to have with their households which included cattles (n=42067), buffaloes (n=6640), goats (n=51754), sheep (n=29516), horses (n=264), donkey (n=1454), yaks (n=790), and mules (n=114). The highest portion of this livestock population contained goats and sheep (n=81270) which directly overlaps and affects the urial habitat resulting habitat destruction and degradation (Fig. 2). The highest populations of livestock was recorded in Skardu (n=32958) followed by Nanga Parbat (n=30923) and Nagar (n=29529).

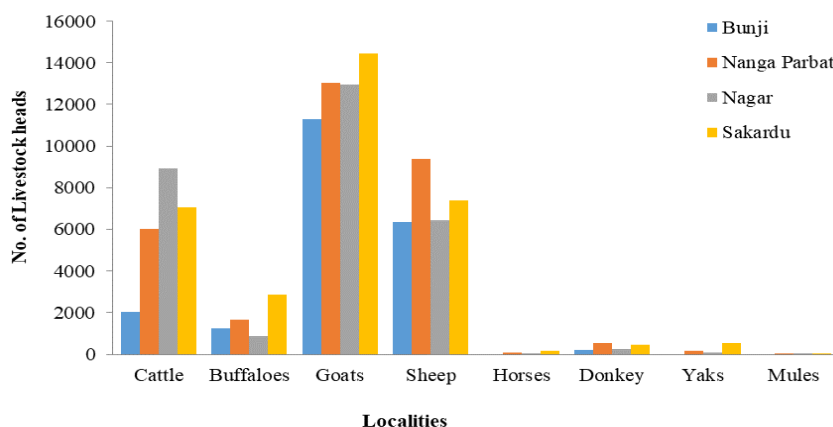


Fig. 2: Livestock population in different localities during 2012-2013**Hunting**

Illegal hunting is one of the most important factors for the decline in the urial population in the study area (Table 2). There is a long tradition of hunting in the study area and everyone without any confrontation with law implementing agencies uses weapons. Hunting of urial by the local community was generally carried out to fulfill their meat requirement. According to questionnaire survey results, illegal hunting was the most significant mortality factor of urial in the area.

During the last 13 years (2000-2013), about 70 Ladakh urial killings were reported and confirmed from different areas of GB (Table 2). The trends of urial illegal hunting is gradually increasing with the maximum killings in 2013 (n=15) followed by 2012 (n=13; Table 2). Unfortunately, none of these cases were registered with the Wildlife department for any legal action against the culprits.

Table 2: Illegal hunting of Ladakh urial in GB during 2000-2013

Sr.No.	Year	Locality	No. of killings
1	2000	Neeli Daar, Pooring Boori, Burmay, Burchi, Ramghat Thook,	5
2	2001	Nanga Parbat, Bunji, Sakaru (Karpouchu)	4
3	2002	Bunji (Burmay), Nelli Daar	2
4	2003	Nanga Parbat	1
5	2004	Bunji (Burmay), Nelli Daar	3
6	2005	Nagar (Huru), Bunji	3
7	2006	Bunji (Burmay), Nelli Daar	4
8	2007	Nanga Parbat, Skardu	2
9	2009	Bunji (Burmay), Nelli Daar, Chooko Jail, Ramgat	6
10	2010	Bunji, Burmay, Nelli Daar, Jachaa	9
11	2011	Bunji, Nelli Daar, Jachaa	3
12	2012	Nanga Parbat, Skardu, Rehman Nullah	13
13	2013	Bunji, Rehman Nullah, Jachaa, Pooring Boori, Burmay, Dadar Misikin	15
		Total	70

Medicinal plant collection

To meet domestic as well as commercial needs, the communities around the study area also collect medicinal plants. The detail of these plants is given in (Table 3). According to respondent's information, the most frequently extracted medicinal plant species by the local communities included *Bunium persicum* (18%) followed by *Thymus serpyllum* (17%), *Berberis lyceum* and *Rheum australe* (11% each; Fig. 3).

Table 3: List of medicinal plants extracted by local peoples in study area during 2012-13

Sr.No.	Family	Botanical Name	Local Name
1	Berberidaceae	<i>Berberis lyceum</i>	Ishkeen
2	Compositae	<i>Saussurea</i>	Bushifonnur
3	Ephedraceae	<i>Ephedra intermedia</i>	Soom
4	Labiatae	<i>Thymus serpyllum</i>	Tumoro
5	Polygoniaceae	<i>Rheum australe</i>	Chontal
6	Polygoniaceae	<i>Rheum emodi</i>	Jaro Chontal
7	Umbelliferae	<i>Bunium persicum</i>	Hayo
8	Umbelliferae	<i>Ferula narthex</i>	Sup
9	Anacardiaceae	<i>Pistacia integerima</i>	Kakayown
10	Oleaceae	<i>Fraxianus hookrii</i>	Kasunar
11	Elaeagnaceae	<i>Hippophae rhamnoides</i>	Buru (Sea Buckthorn)

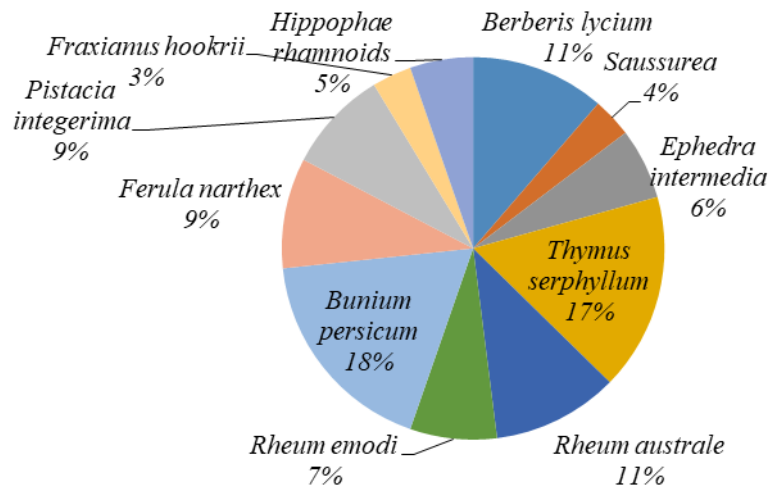


Fig. 3: Percentage of medicinal plants collected by local communities in study area during 2012-2013

Local Knowledge and Perceptions

Human communities living in and around forests and protected areas often have important and long-standing associations with the areas. This results in a lot of highly important indigenous knowledge about the environments in which they live.

Local perceptions

For collecting information on perceptions of the locals about urial, survey of 150 respondents focused upon hunters, herders and local knowledgeable peoples, revealed auspicious results (Table 4).

Majority (n=79, 53%) of respondents were happy with urial's presence and favours (n=61, 41%) its conservation in their respected areas. A small proportion (5%) of respondents favours its conservation only if the animal is not problematic, while other 2% respondents consider urial as a threat to their family as well as for their village. The questionnaire survey data suggests that the urial is not harmful species for the local peoples but still their population has declined during 50 years. The main cause of the declining of the population of urial is that the people residing near the urial habitat are very poor and hunt urial for fulfil their requirement of meat (Table 4).

Table 4: Attitude of respondents towards urial in study area during 2012-13

Attitude towards urial around the villages	Respondent	
	Numbers	%
Happy with urial	79	53
Happy with animal if causing no problem	7	5
Urials are threat to you or your family or your village	3	2
Do you want to or in favor to protect urial in the area	61	41
Not happy with urial	0	0
Total	150	100

Local knowledge about urial conservation status

71% of respondents viewed that Ladakh urial population has declined over the last few decades. Other 31% claimed that it has increased, while, 6% were unaware of the urial abundance in the area (Table 5).

According to respondent's opinions, the main reason of urial population decline is the extensive hunting. Some areas of GB have been declared as protected areas; however, still situation is not much different from other areas due to poor law enforcement. As mentioned in Table 2, during the last 13 years (2000-2013), about 70 Ladakh urial killings were reported and confirmed from different areas of GB (Table 2). It is evident from the above information provided by respondents that the trends of urial illegal hunting is gradually increase.

Table 5: Local community estimates of urial population in study area.

Time Duration	Increased		Decreased		Don't know	
	Numbers	%	Numbers	%	Numbers	%
5 years ago	15	10	55	37	3	2
10 years ago	5	3	13	9	1	1
15 years ago	6	4	12	8	2	1
20 years ago	3	2	9	6	1	1
25 years ago	5	3	18	12	2	1
Total	34	23	107	71	9	6

DISCUSSION

The results of the current study suggested that the trend of illegal hunting of Ladakh urial is gradually increasing in the study area (Table 2). This may be due to the easy access of the community to the modern weapons, poor enforcement of laws, overpopulation, lack of alternate sport activities, increasing poverty and unemployment and political awareness among the local masses which is used to safeguard against any legal actions by the law enforcement agencies. In addition, the resource competition with the livestock was also found among the main reason for urial population decline in the area as these urials remain at comparatively low elevations and share their resources with livestock. Current study suggested a strongly negative correlation between the numbers of livestock heads and urial population in the localities with its distribution. Livestock population is increasing day by day resulting into the continuous decline of the urial population (Fig.2). Hence, it can be inferred that these two main threats (illegal hunting and influence of livestock) are among the top most factors to be overcome for the protection of the last remaining population of Ladakh urial in the area.

Ladakh urial population is facing several threats not only in Pakistan, but also in other distribution ranges. In Ladakh, their population had been reduced to a few hundred individuals in the 1960s and 70s through hunting for trophies and meat (Fox *et al.*, 1991; Mallon, 1983; Chundawat and Qureshi, 1999; IUCN, 2000; Namgail, 2009). In the past, the species been able to coexist with the predominantly Buddhist society of Ladakh, however, the recent increase in the population of both humans and their livestock has placed immense pressures on its habitat (Shackleton, 1997; Chundawat and Qureshi, 1999; Raghavan and Bhatnagar, 2003; Valdez, 2008). Besides, in certain areas of Ladakh, these urials often descend to the agricultural fields and damage crops, and retaliation of the local farmers may result (Namgail, 2009).

As discussed earlier, the majority of the human population around urial habitat in study area is poor and depends on the natural resources of the area for rearing their livestock for their subsistence. According to findings of the present study, a huge amount of livestock heads ($n=153,368$) were found in areas surrounding the urial habitat (Fig. 2). Almost entire populations of these livestock are non-sedentary and hence they travel into the pastures found inside the study area especially during summer season. As they move and interact into the urial habitats, which results in habitat overlapping and hence, lead towards the human-urial conflicts. The livestock is a serious competitor of urial for food due to overlapping niches. Thus because of this competition, the urial has been forced to occupy marginal habitat patches with limited resource availability. Resource limitations in large herbivores have shown to reflect in their population characters as loss of body condition, greater mortality and lower fecundity (Clutton-Brock *et al.*, 1988; Wilson and MacLeod, 1991). A species sharing common resources with other species can limit its availability for the other species (Resource Limitation). It can lead to competition, if the resource use by the two species overlaps and the resource is scarce (Mishra, 2001).

Under natural conditions, such competitions can be minimized by the resource partitioning among the competing species. However, in case of human induced competition, that is the case under discussion, these adaptive strategies work very little. Therefore, such competition between wild animals and livestock always exerts negative impacts on the population of wild animals. The Ladakh urial, one of the critically endangered species among the Himalayan caprins, is also

affected by competition with livestock (Roberts, 1977; Schaller, 1979; Mallon, 1991; Shackleton, 1997; Chundawat and Qureshi, 1999). A very strong negative correlation among the urial populations and livestock populations (although non-significant; $r=-0.87$, $p=0.123$) in the study area suggested that urial population is drastically affected by the livestock. The increasing population of the livestock has heavily degrading the rangelands, which are the habitat, and feeding grounds of Ladakh urial along with other wild herbivores. According to the estimates of Afzal *et al.* (2008), currently, about 0.86 million animal units are being grazed on 2.34 million ha of rangelands in GB. The number of livestock especially cattle, sheep, and goats, have increased from 0.88 million to 2.45 million with an annual increase of 1.67% over the last three decades (Khan *et al.*, 2013). Nearly 80% of this livestock population is grazed in pastures and rangelands exerting a tremendous grazing pressure on these rangelands (Khan *et al.*, 2013). The current stocking rate (of 2.73 ha per animal unit) is considerably higher than in 1996 (2.89 ha/animal unit), and about six times higher than the critical stocking rate (16 ha/animal unit) as suggested by FAO (1987) for low potential rangelands. Thus, the overstocking of animals and declining vegetation are resulting into further degradation of already degraded rangelands (Afzal *et al.*, 2008; Khan *et al.*, 2013).

Besides, the extensive overgrazing by livestock, the habitat of urial and other wildlife species in GB, is also extensively destroyed by the massive extractions of wood, fodder and medicinal plants (Table 3). In study area, the local people gather woods from the forest to fulfill daily fuel and timber requirements from the natural habitat of Ladakh urial. Besides illegal forest cutting, the local peoples resided near the urial habitat also collect the medicinal plants. Majority of the plants extracted by the local communities comprise staple food of the urial (Table 3) which directly poses scarcity of food in the already low productive rangelands. All these activities results in the habitat fragmentation, degradation leading to declining of urial population in the area.

During collection of information from local communities, it was also revealed that beside the habitat degradation by the locals, illegal hunting was also a major factor involved in the population declining of these urial in GB. During the last 13 years (2000-2013), about 70 Ladakh urial killings were reported and confirmed from different areas of GB that are quite alarming for a highly threatened species. Furthermore, unfortunately, the trends of these illegal hunting is gradually increasing with the maximum killings in 2013 even without becoming into the notice of the law enforcement agencies. These threats have leaded the urial population to the verge of extirpation and if the immediate conservation measures were not undertaken, their population will be disappeared from the area soon.

Among all the situations, it was a good sign for the conservation of urial that about all the respondents, interviewed during study, were familiar to the urial existence in the area. Majority of these locals ($n=79$, 53%) were happy with urials presence in their area and favors ($n=61$, 41%) its protection in their respected areas. Majority of the respondents (70%) reported that Ladakh urial population has declined over the last few decades. Most of the respondents had key information about the past records of population and hunting of urial. These locals along with their important information can be utilized for formulating and implementing the conservation strategies for these highly threatened animals in the area.

CONCLUSION

In Pakistan, Ladakh urial have severe threats of habitat degradation, poaching, lamb picking, and disease transfer from domestic livestock. Beside the habitat degradation by the locals, illegal hunting was also a major factor involved in the population declining of these urial in GB. During the last 13 years (2000-2013), about 70 Ladakh urial killings were reported and confirmed from different areas of GB that are quite alarming for a highly threatened species. Furthermore, unfortunately, the trends of these illegal hunting is gradually increasing with the maximum killings in 2013 even without becoming into the notice of the law enforcement agencies. These threats have leaded the urial population to the verge of extirpation and if the immediate conservation measures were not undertaken, their population will be disappeared from the area soon. All the respondents, interviewed during study, were familiar to the urial existence in the area. Majority of

these locals (n=79, 53%) were happy with urials presence in their area and favors (n=61, 41%) its protection in their respected areas. Majority of the respondents (70%) reported that Ladakh urial population has declined over the last few decades

RECOMMENDATIONS

The following suggestions and recommendations are given for the proper conservation of Ladakh urial in GB. (1) Implement and monitor the strong rules and regulations to stop lamb picking and hunting by the local community. (2) Seminars, trainings workshops should be organized at community level to create awareness in people. Educate village level communities about the role of Ladakh urial in maintaining the natural ecosystem. (3) Detailed research studies and conservation projects should be launched both by the public and by private sectors for the conservation, management and improvement of the species in GB. (4) Inbreeding depression can also be an important factor for low population growth in the area, as the existing population of urial in GB is distributed in small fragments with very limited gene flow. Therefore, molecular investigations are highly required to assess the genetic diversity and differentiation among the different population patches.

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