



Ecology and Human Conflict of Asiatic Black Bear (*Ursus thibetanus laniger*) in Mansehra District, Pakistan

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ABSTRACT

The Asiatic black bear (*Ursus thibetanus laniger*) inhabits deciduous, broad-leaved forests, thorn brush forests, and coniferous forests, occurring from 1500 up to 4,000 m above sea level. The species, in many areas of its range, is in conflict with humans, however, data on its population and economic losses are scanty in the country. We investigated its occurrence, population and human conflict in Mansehra District during 2016-2017. A total of 66 indirect signs of Asiatic black bear were recorded with an altitudinal variation of habitat ranging from 1511m to 2570m elevation including 17 dens and 44 scats of the bear from 10 different sampling sites. The sign density of black bear ranged between 17/km² (Paris MRF site) and 1.2/km² (Sharan site). Sign density was high in habitats having thick, dense and broad-leaved forest with steep slopes having the water resource/s. Sightings of the bear were the highest in the month of July (32%), and the least from November 2016 to March 2017. A total of 74 livestock were killed (in previous five years span) by Asiatic black bear including goats (75%), sheep (14%), and cows (11%), amounting to economic loss of 15,240 US\$. Moreover, 16,420 kg maize was damaged by Asiatic black bear having a worth of 3284 US\$.

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Authors' Contribution

MW and TM designed the research and collected the data. TM, A Hussain, A Hamid, SA and HF wrote the manuscript and performed analysis. FA conducted GIS analysis of the research data.

Key words

Ursus thibetanus, Asiatic black bear, Distribution, Signs, Conflict, Economic losses, Depredation

INTRODUCTION

Asiatic black bear (*Ursus thibetanus laniger*) occurs throughout mainland Asia except Malaysia. It is native in Asia and its range extends from Afghanistan into the east up to Vietnam. The south and north-east part of China have an irregular distribution of bear population, while east-central China lacks the species. A small population of black bear occurs in South Korea. Population exists on islands of Japan, that is, Shikoku and Honshu, also in Hainan and Taiwan while in southern Russia a long way to the East and North Korea persists patchy distribution of the species (IUCN, 2017).

Two species of bear are reported from Pakistan viz., Asiatic black bear and Himalayan brown bear (*U. arctos*); two sub-species of black bear including Balochistan black bear (*U. t. gedrosianus*) and Asiatic black bear (*U. t. laniger*) while one sub-species of brown bear, that is, Himalayan brown bear (*U. a. isalbellinus*) of Ursidae family occur in Pakistan (Roberts, 1997; Abbas *et al.*, 2015). The Himalayan black bear was present in all hills/valleys holding temperate forests in northern Pakistan

at 1,500-4,000 m above mean sea level (amsl). Up to 1950's, informal records of bear sightings in Gilgit Baltistan indicated the presence of a good population in Rondu Valley (Roberts, 1997) and Gias valley in Diamer (Ali *et al.*, 2015), although scattered. The species also exists in Khyber Pakhtunkhwa (KP) Province occurring in Dir, Chitral, Mansehra; Sari, Shogran, and lower Kaghan (Roberts, 1997; WWF, 2011; Awais *et al.*, 2015). The black bear also occurs in Azad Jammu and Kashmir including the Neelum valley (Awan *et al.*, 2016).

The black bear usually inhabits deciduous forests, thorn brush forests, and coniferous forests, occurring from 1500 to 4,000 m asl (Abbass *et al.*, 2015). The coniferous forests and broad-leaved forests are the favorite habitats of black bear. The well-known V of whitish hairs is present on the chest of Asiatic black bear; soft black fur covers the body all over.

According to IUCN Red List Asiatic black bear is listed as Vulnerable since 1990, population declining by 49% during the last 30 years (IUCN, 2017). Though there are no records of bear population, it is believed that there are less than 50,000 individuals of Asiatic black bear in natural habitat (IUCN, 2017). With the exception of Japan, where number of bears is increasing, hunting should be banned in other parts because Asiatic black bear is still susceptible to illegal sport hunting, hunting for traditional

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medicinal use, habitat degradation and cub poaching.

Even though humans and wild animals have lived together since ages yet the rate of conflict has increased rapidly in recent years because of increasing human encroachment and actions in or around the environment of carnivores (Graham *et al.*, 2005). The black bear has to struggle for resources like large space because of its large territory, food, safety and cover, and in achieving these resources it struggles and fights with people openly. The black bear is killed in response to its attack on fruit plants, and crops (Herrero *et al.*, 1999). In spring black bear nourishes itself by using juicy flora; following summer it takes insects, fruits, and different vegetation while in autumn it feeds on nuts and acorns, simultaneously taking a high ratio of meat (Hwang *et al.*, 2002; Huygens *et al.*, 2003; Hwang *et al.*, 2010). During autumn, it moves and covers a long distance to explore food for survival just before the hibernation when food requirements increase, resulting in high conflict by the end of autumn. On the other hand, if there is a scarcity of wild fruits, particularly oak (Hwang *et al.*, 2010), it moves around human habitations in search of food resulting in conflict. Bears choose their home range based on food resource distribution (Mitchell and Powell, 2007) and vary their use of feeding sites with shifting spatial and temporal resource availability, as well as human-activity (Davis *et al.*, 2006).

The mammals, especially carnivores are important for keeping an ecosystem viable and dynamic by being top predator in the food chain. Therefore, conservation of such species (like Asiatic black bear) is essential for the maintenance of the ecosystem and for that it is vital to have baseline data about distribution range, habits and habitat requirements of the species so that human –carnivore conflict could be minimized (Irshad *et al.*, 2018). Like many other carnivores, Asiatic black bear, in many areas of its range, is in conflict with humans, however, data on its population and economic losses caused to community are scanty in the country. Keeping in view the previous reports of Asiatic black bear in Mansehra District, and its conflicts with humans, the current study investigated its occurrence, population and human conflict in Mansehra District during 2016-2017.

MATERIALS AND METHODS

Study area

The current study was conducted in Mansehra District, geographically located at 34° 14' and 35° 11' N and 72° 49' and 74° 08' E. District Mansehra covers an area of 4579 km² while the total forest cover in the district is 2053 km² (205,289 ha) (Forest Department, 2004). It is bordered by districts Batagram and Kohistan in the north, Muzaffarabad district (AJ and K) in the east, Abbottabad

and Haripur districts in the south, and Tor Ghar, Shangla and Buner districts in the west. The top crest in Mansehra is Musa-ka-Musalla, about 4077 m asl which goes around in Bhogarmang and Konsh valleys at the northern ending. Thick forests are present particularly on the upper slopes like Kaghan. Due to broad utilization and illegal cutting, thick forests are present only in remote areas. The mountain ranges of Richari and Tanglai extend towards the Chuttar plain, that is, in the west of the Siran valley. From Oghi in the west, Black Mountain, one of the important range, is roofed with forests just on the upper top of the mountain, extends northwards overlooking the Indus river that flows onward to Tarbela. Some plain tracts like Pakhli, the largest plain of Mansehra, Chuttar and Agror in are excellent areas for agricultural crops and tobacco. Most parts of the district are included in Himalayan moist temperate forest zone. The climate in summer is pleasant and cold to very cold during winter. The rain in Mansehra is noteworthy, with the average rainfall being 1445 mm. The average annual temperature is 18.5 °C.

Methodology

Distribution of Asiatic black bear was determined by direct field sightings as well as by using indirect method of “sign surveys” of the species scats, pug marks, activity signs, ground digging, marks on trees, feeding signs and damage to crops, following Scotson (2012). Data on altitude and latitude in the habitat of the black bear with direct and indirect signs of the species were recorded using Global Positioning System (GPS).

Population density of Asiatic black bear was estimated by direct field sightings as well as using indirect method of “Sign Surveys”. For this purpose, transects were established at seven different sites in Kaghan valley and four different sites in Siran valley of the district depending on the type of terrain, altitude and topography. Sign surveys were conducted along the established strip transects and direct sightings and indirect signs (scats, pug marks, activity signs, digging, marks on trees and feeding signs/damage to crops) of the bear were searched and recorded. Sign encounter rate of the species was calculated on each transect using the formula put forth by Scotson (2012); Distance walked along transect X signs encountered / total area surveyed

In addition, a questionnaire survey was conducted in the study area including qualitative (unstructured interviews), quantitative (structured interviews and questionnaire) and secondary methods to collect information from the locals to estimate the population and analyze human-bear conflict in the area. The questionnaire used a combination of qualitative (formless interview, participatory remark and focused cluster debate) and quantitative methods (prearranged interviews). The

structured interviews were the chief source for data compilation. Khyber Pakhtunkhwa Wildlife and Forest Departments staff were also interviewed to record their opinion. Economic losses caused by Asiatic black bear depredation on livestock were computed by considering the average price of one adult goat or sheep in the local market equal to 180 US\$ while young goat/sheep was considered equal to 100 US\$, and the price of one cow was considered equal to 500 US\$.

RESULTS

Spatial distribution

A total of 66 different signs of Asiatic black bear were recorded in the study area (Table I) including its i) foot prints, ii) scats, iii) activities, iv) tree markings, v) sitting places, vi) stone rolling, vii) water pool and viii) dens. Most signs were that of foot prints and scats. Highest number of scats (six) were recorded at Hungrai site, while maximum footprints (six) were found at Kaiwai site. Similarly, relevant abundance of signs was highest ($n=14$) at Ganool site, while the least ($n=2$) was at Banda Gesach Punjool (Table I).

The signs were recorded from 1511 m to 2570 m elevation in Kaghan valley, and 1830 m to 2447 m elevation in Siran valley. Hence the overall distribution ranged between 1511m and 2570m elevation in the study area. No signs of occurrence were found during winter or fall season (from November to March next) when temperature was below freezing point ($< 0^{\circ}\text{C}$), indicating its hibernation period. However, when the hibernation period completed, in the month of May, the bear confined itself to the forest only.

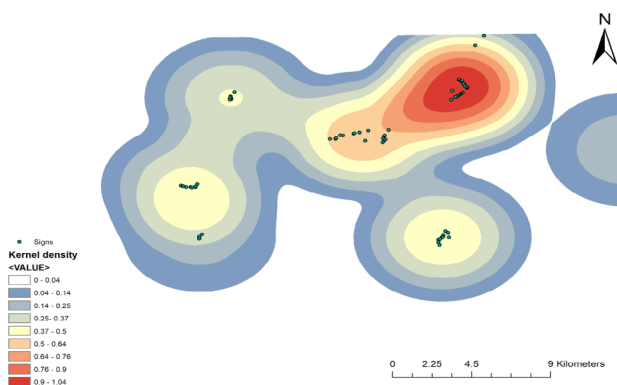


Fig. 1. Kernel density analysis using Arc GIS software showed highest clusters of signs of Asiatic Black Bear (*Ursus thibitanus laniger*) at Ganool site in the study area; Please read Fig. 1 in context of data given in Table 1.

During maize crop season, that is, from the month of July onwards till winter season in the area, field sightings and indirect signs of Asiatic black bear maximized in the

nearby villages around the forest area (Fig. 2), probably because in autumn there is scarcity of food in forests and the bears come down to agricultural lands and raid fruit plants and maize crops. Field signs of black bear were at the peak in autumn season and livestock were more vulnerable in this season near human habitations.

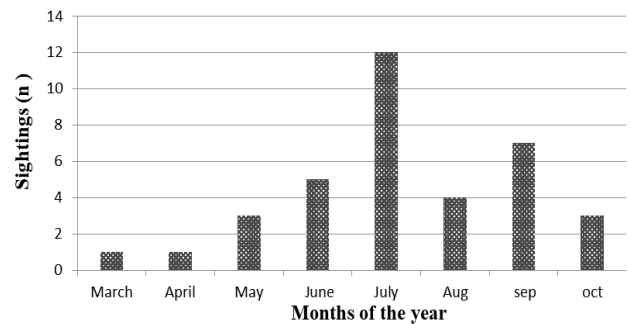


Fig. 2. Indirect Sightings record of Asiatic black bear (*Ursus thibitanus laniger*) in the study area during different calendar months of the year.

Population estimates

The population density of the Asiatic black bear was estimated at seven sampling sites of Kaghan valley and four sampling sites of Siran valley, in the Mansehra District. A total of 109 indirect signs were recorded at all sampling sites in an area of approximately 13.6 km², in addition to 29 direct and indirect field sightings information obtained from local people who actually sighted the bear in the field (Table II). The dens ($n=17$) were the strongest evidence in favor of its occurrence in the study area. Maximum sign density (17 /km²) was recorded at Paris MRF site (Fig. 1) in Kaghan valley while the least was found at Kund Jabori in Siran valley. Based on the sign density at different sampling sites, number of probable individuals of the species were estimated at each site with a total population of 29 individuals having a mean density of 2.23 individuals /km² in the whole District (including 2.14 individuals of the species/km² in Siran valley and 2.23 individuals/km² in Kaghan valley; Table II). These estimates of bear population in the study area are mainly based on occurrence of numbers of dens of the Asiatic black bear, along with other signs of the species in the area. In Kaghan valley, at Paris Jaba sampling site, there were found two dens of the species but 5 individuals were sighted there including 2 males, one female and 2 cubs, similarly, at the same site there found 13 scats of bear and the total sign density of 15 signs per km². Likewise, at Nadi sampling site there were 2 dens of the species but sightings of 4 individuals were confirmed including one male, one female and 2 cubs along with 8 scats and a total sign density of 8.5 signs per km².

Table I. Details of different signs of Asiatic Black Bear (*Ursus thibetanus laniger*) recorded during reconnaissance survey of the study area in District Mansehra for confirming the occurrence of Asiatic Black bear.

Sampling site	N	E	Elevation (m)	Scats	Foot prints	Den	Sitting places	Water pool	Activities	Tree markings	Stone rolling	Total signs	*RA
Kund Jabori	34 37 03.4	073 17 44.0	2420	1	2	0	2	0	0	0	0	5	7.57
Sachan	34 38 42.2	073 15 46.4	2112	0	0	0	0	0	0	0	0	-	-
Banda Gesach punjool	34 37 28.1	073 17 38.2	2267	0	0	0	1	0	0	0	1	2	3.03
Jabar Devli	34 40 54.6	073 18 37.1	2080	1	3	0	1	0	4	1	0	10	15.15
Kaiwai	34 38 45.3	073 31 02.4	1596	1	6	0	1	0	1	2	1	12	18.18
Paris Jabra	34 40 45.5	073 25 56.6	2361	2	1	0	0	0	1	0	1	5	7.57
Paris MRF	34 40 35.9	073 25 58.0	2241	1	0	0	0	0	0	2	0	3	4.55
Nadi	34 39 03.6	073 21 38.8	2396	3	0	0	0	0	2	0	1	6	9.09
Hungrai	34 39 17.1	073 23 41.0	1984	6	2	1	0	0	0	0	0	9	13.63
Sharan	34 42 18.6	073 26 11.3	2455	0	0	0	0	0	0	0	0	-	-
Ganool	34 35 07.3	073 25 15.9	2568	0	1	0	0	1	5	7	0	14	21.21
Battal	34 35 57.1	073 11 43.1	1908	0	0	0	0	0	0	0	0	-	-
Total				15	15	1	5	1	13	12	4	66	

*RA= Relative abundance of bear signs.

Table II. Sign density of Asiatic Black Bear (*Ursus thibetanus laniger*) in Mansehra District of Khyber Pakhtunkhwa, Pakistan.

Sampling sites	Area (km ²)	Scats (#)	Tree markings (#)	Foot prints (#)	Dens (#)	Sitting places (#)	Sign density (km ²)	Direct/indirect Sightings	Male	Female cubs	Probable numbers of Asiatic black bear
Kaghan valley											
Paris Jabra	1.2	13	1	2	2	0	15	2	1	2	5
Paris MRF	1.4	2	18	3	1	0	17	1	-	1	2
Sharan	1.6	0	2	0	0	0	1.2	1	-	-	1
Nadi	1.4	8	1	1	2	0	8.5	1	1	2	4
Hungrai	1.2	7	0	1	2	1	9	1	2	-	3
Boonja Kaiwai	1.2	1	1	2	3	0	6	1	1	2	4
Ganool	1.4	2	5	0	2	0	6.4	1	1	-	2
Sub-total	9.4	33	28	9	12	1	63.1	8	6	7	21
Population density											2.23/km ²
Siran valley											
Kund Jabori	1.6	2	0	0	1	0	1.8	-	1	-	1
Banda Gesach Punjool	1.4	3	1	3	2	1	7	1	1	2	4
Shadal Jabar devil	1.2	6	0	3	2	1	10	1	1	1	3
Sub- total	4.2	11	1	6	5	2	18.8	2	3	3	8
Population density											2.14/km ²
Grand total	13.6	44	29	16	17	3	81.9	10	9	10	29
Mean ±SE		6.76±3.28	11.33±3.65	2.38±1.18	0.46±0.24	0.46±0.24	8 signs				2.23/km ²

Table III. Details of Human-black bear conflict highlighting Livestock and agricultural crops damages caused by the Asiatic black bear in the study area during the last 5 years (2013 – 2017).

Sr. No.	Details of livestock and crop losses and economic loss					
1	Livestock losses N = 74	Adult goats =48 (64.8%)	Young ones =8 (10.8%)	Sheep =10 (13.5%)	Cows =8 (10.8%)	-
2	Cost of livestock	Adult goats 8,640 US\$	Young goats 800 US\$	Sheep 1,800 US\$	Cows 4,000 US\$	Total livestock loss =15,240 US\$
3	Human injured/ killed	2 individuals killed in 2015	13 individuals injured in 2015	6 individuals injured in 2016	2 individuals injured in 2017	-
4	Black Bear injured/ killed	7 persons killed in 2015	one person killed in 2016	-	-	-
5	Place of attack on livestock	Forest (26.5%)	Summer pastures (24.3%)	Outside village (14%)	At water bodies (12.1%)	Inside/outside sheds (4.8%)
6	Total Crop Damages	16,420 kg	-	-	-	3,284 US\$

Respondents (number): 41; males (35); females (6); Average age (46 years)

Human-black bear conflict

Data collected through questionnaire survey revealed that a total of 74 livestock were killed by Asiatic black bear in the study area during the last five years period including goats (75.6%), sheep (13.5%), and cows (10.81%) (Table III). Highest number of livestock (26.5%) were depredated in the forest indicating poor guarding of the herd. Maximum attacks were recorded during July to September. The total economic loss due to depredation on livestock amounted to 15,240 US\$. Simultaneously, a total of 16,420 kg maize crop was damaged and consumed by Asiatic black bear in the study area that was worth US\$ 3284 with an average rate per 40 kg=8US\$ (Table III).

Around 34% respondents considered the main reason for attack on livestock by Asiatic black bear was the increased population of the bear itself, while 32% % respondents considered wild prey species decline as the main reason of attack (Fig. 3).

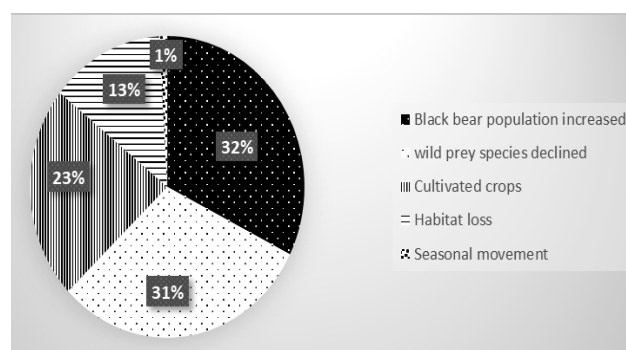


Fig. 3. Respondents' opinion on the main reasons for attack on livestock by Asiatic Black Bear (*Ursus thibetanus laniger*) in District Mansehra.

Regarding management options for mitigating Human-black bear conflict, respondents had different views; maximum respondents (36%) were of the opinion that Fencing around the livestock housing was the ultimate option for management, payment of financial loss compensation (31.7%), habitat management (26.8%), and noise with instruments (12.1%) were the alternate options (Fig. 4).

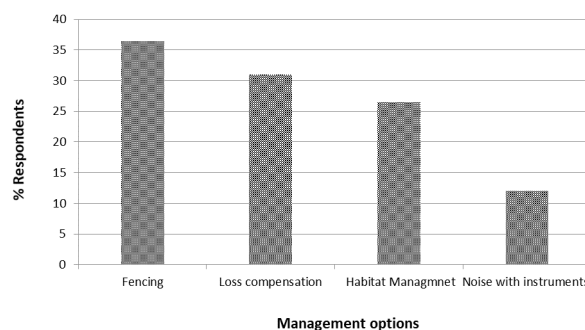


Fig. 4. Possible management options for Asiatic black bear in Mansehra District to mitigate the Human-black bear conflict.

DISCUSSION

The study focused on investigating distribution, population and human conflict of the Asiatic black bear inhabiting Mansehra District. The study area consisted of Himalayan moist temperate forest mixed with deciduous broad-leaved forest, admixture of oak, and thick dense under layer of shrubby vegetation inhabited by Asiatic black bear between 1500 m to 3000 m elevation, and sub-tropical pine forest between 900 m to 1700 m elevation.

Most human settlements are located at lower altitudes interspersed with pasture land and agricultural fields in the center of hilly areas and forests. The livestock and farming are the main source of income of the people of this area.

The Asiatic black bear was found distributed in the study area at elevations ranging from 1510m to 2570m. Kernel density analysis showed that the maximum signs of occurrence were recorded at Ganool sampling site ranging from 0.9 to 1.04 signs per km². Maximum signs recorded were those of scats and foot prints. Asiatic black bear has been reported to occur Neelum valley (AJ and K), Kaghan valley, Indus Kohistan, Dir, Chitral, Gabral valley of Swat (Khyber Pakhtunkhwa), and Chilas, Astore in Gilgit Baltistan from 2150m to 2410m elevation (Roberts, 1997). Whereas, WWF-Pakistan (2011), reported Asiatic Black Bear occurring in Northern Pakistan and Azad Jammu and Kashmir below an altitude of 3750m in forest areas. Schaller (1977) reported its wide distribution below 3750m elevation. Distribution range in Nepal 1524m to 3657m elevation preferring less disturbed thick and mixed forested areas (Shrestha, 1997), and in India from 1200-3300 m (Sathiyakumar, 2001).

Asiatic black bear signs were not recorded in the study area during winter or fall when temperature was below freezing point (< 0 °C) from the end of November till March next (approximately 3-5 months). This indicated the hibernation or sleep period of the species. After hibernation the bears were almost concentrated in the forest areas as their signs could not be found outside of forest areas. This could probably be attributed to the variety of foods available in this habitat. Kucherenko (1974) also observed that Asiatic black bear remained in high mountain forests with plenty of food and water resources till early autumn; also emphasizing that if the food was abundant the bear species could remain in such an area at a density of roughly 1–2 per km², and sometimes even as little as 0.5 –1 per km².

In the current study, however, during maize crop season, (from July onwards up to winter season), field sightings and indirect signs of the bear maximized in the nearby villages because in autumn food was scarce in forests due to which the bears came down to agricultural lands and raided fruit plants and maize crops. Signs of bear were at the peak in autumn and livestock were more vulnerable in this season near human habitations which showed the distribution range and pattern of Asiatic black bear from forest to villages and populated areas. A study from Sikkim reports that the bears cover a long distance to explore food for survival by the end of autumn, just before the hibernation period when food requirement increases resulting into increased conflict with humans. In spring the bear feeds on juicy flora, following summer it takes

insects, fruits, and different vegetation while in autumn it feeds on nuts and acorns, simultaneously consuming a high ratio of meat (Reid *et al.*, 1991; Hwang *et al.*, 2002, 2010; Huygens *et al.*, 2003).

Population sign density of the bear varied at different sampling sites in the study area, ranging from 1.8 individuals/km² to 17 individuals/km², with an average sign density of 2.23 individuals /km². A careful estimate has given a total population of 29 individuals in Mansehra District. It included 21 individuals from Kaghan valley and 8 at Siran valley. The estimate was based on the occurrence of numbers of dens of black bear in the area along with other indirect signs like scats. In Kaghan valley, at Paris Jaba sampling site, there were found two dens of the species but 5 individuals were sighted there including 2 males, one female and 2 cubs, similarly, at the same site there found 13 scats of bear and the total sign density of 15 signs per km². Likewise, at Nadi sampling site there were 2 dens of the species but sightings of 4 individuals were confirmed including one male, one female and 2 cubs along with 8 scats and a total sign density of 8.5 signs per km². So one den was being used by more than one individuals and in some cases by a bear family comprising of 4 to 5 individuals. This fact justifies the careful population estimates of a total of 29 bears in the study area. The occurrence of greater number of signs at Paris MRF, Paris Jabra, Shadal Jabar Devli and Ganool, may be due to good quality habitat, since these sites possess dense broad-leaved vegetation, water resources, plenty of food and cultivated crops. At Dohrpattan Hunting Reserve, Nepal, the bear were frequently observed on northern aspects of the Reserve due to occurrence of maize crop and dense vegetation (Yadav, 2009). Similarly, Wang *et al.* (1995) are of the view that black bear occupy dense forests and prefer broad-leaved, coniferous and mixed forests. In Russia, Asiatic black bear reportedly select for denning, habitats containing water sources (Seryodkin *et al.*, 2003). They drink water frequently when feeding on vegetation, nuts, or insects but infrequently use water when feeding on berries. The bear also use water to ward off heat stress on hot days (Rogers and Allen, 1987).

Among the positive sites in the study area three sites (Paris Jabra, Shaddal Jabar Devli, Banda Geesach Punjool) had dens, footprints and scats. The particular dens were identified on the basis of various signs of the species at the opening of the den. The signs included pug marks, scats and specific composition of tree branches in front of the den for safeguarding and sometimes grasses and scratches on the ground. At least three confirmed dens were recorded; one den each at locations mentioned above. The estimate of black bear population in the study area was based on the occurrence of number of dens (considering at least one den

= one individual), scats, and other signs. Seventeen dens were recorded in the study area indicating that at least 17 individuals were present there. In the study area, 29 black bear were estimated including 10 males, 9 females along with 10 cubs in an area of 13.6 km² surveyed, including 21 individuals in Kaghan valley sites and eight (8) at Siran valley sites. Analysis of data showed that population of black bear was high in Kaghan valley due to good habitat, water resources, dens and steep slopes, abundant food, fruit and cultivated crops.

To investigate human-black bear conflict in the study area, a total of 41 respondents were interviewed from different walks of life, including 13 farmers, 9 shepherds, 4 masons, 4 wildlife watchers from provincial wildlife department, 4 housewives, one each Imam masjid, shopkeeper and laborer. They reported a total of 74 livestock killed by Asiatic black bear in the study area during the past five years including goats, sheep and cows. Highest killings were of goats (75.6%), followed by sheep (13.5%), and cows (10.81%). Most number of killings was due to free grazing goats and sheep in the area which exposed them to Asiatic black bear. This caused huge financial losses to livestock holders amounting to US\$ 1524. Another study in Machiara National Park (AJ and K) had shown 6% losses of livestock by Asiatic black bear including goats, sheep and cows (Dar, 2006). Highest depredation of domestic animals was recorded inside the forest (26.5%), and the least inside the sheds with or without door (4.8%). This could be because shepherds would be busy in their fodder collection or they would idle away the time while grazing their livestock in the forest, that is poor guarding of the herd, and increased chances of black bear attacks. While, during maize crop season, forage for black bear would be scarce in the forest, the bear would descend to the agricultural lands, where the chances of attacking livestock increased at water bodies, nearby crops and sheds in houses. The bear also damaged/consumed 16,420 kg maize worth US\$ 3284 (average rate per 40 kg maize = US\$ 8) in the study area. Rehmat *et al.* (2015) also reported economic losses of Rs. 140,000 including crops and fruits in villages of Gaisvalley in Diamir (Gilgit-Baltistan) during 2013.

Approximately 34% respondents considered the main reason for attacks on livestock by the black bear was their increased population in the study area while 31.9% considered lowered wild prey species availability. However, 15% respondents considered habitat loss, and 24% cultivated crop being the main reasons of black bear depredation on livestock. Some studies highlighted that lowered prey base in the wild and habitat contraction under increasing human intrusion into the wild habitat seemed to attract bears towards human habitations (Bargali *et al.*,

2005; Bargali, 2012). Even though humans and wildlife have coexisted since the start of humanity negative attitude among both has increased particularly in recent years. Anthropogenic interactions and activities in the habitat are the prime cause of negative attitude exhibited by the bear and other carnivores (Chauhan 2003; Graham *et al.*, 2005; Charoo *et al.*, 2009). In the current study, owing to depletion of wild prey species, resulting into shortage of food in the habitat and simultaneous cultivated crops maturation seem to be the main reasons of attack on crops and livestock depredation in the study area as the chance of vulnerability of crops and cattle increased to the maximum. The fact is supported by an earlier study which reported that if there was scarcity of fruits in their natural habitat, in particular oak (Hwang *et al.*, 2010), black bear moved towards human habitations in search of food resulting into conflicts.

The black bear continuously raided mature maize crops and caused damage at a huge scale, besides consuming maize crop. During autumn, the bear were extremely energetic, mobile and moved long distances to explore food (Hwang *et al.*, 2010). They have a broad home range consisting between 3 km² to 158 km² (Hwang *et al.*, 2010); rarely do they walk into human populated areas. The main cause of human-bear conflict is the competition among humans and bears regarding food, cover and various other resources. As a result, black bear end up competing with human beings, directly or indirectly, for food and other resources within their probable home range in a given locality. This has been the prime cause behind conflicts associated with black bear throughout its range. Depredation of crops, killing of livestock and in extreme cases fatal attacks on humans are the main conflict issues related to this species (Chauhan, 2003; Sathyakumar and Choudhury, 2007; Charoo *et al.*, 2009).

Regarding management options for mitigating human-black bear conflict, respondents had different views; highest percentage of respondents were of the opinion that fencing was the ultimate option for management, financial loss compensation, habitat management and noise production with instruments on seeing a bear were the alternate options. (Rehmat *et al.*, 2015) are of the view that people may not kill the black bear if forest or wildlife administration or any other sector or management union would compensate for their economic losses.

Threats to asiatic black bear population

The main threat to Asiatic black bear population in the study area is the retaliatory killing in response to economic losses of crops and livestock they cause to the community. Habitat degradation, especially human disturbance in black bear habitat, enhances the differential

attitude between humans and black bear; as a result, conflict happens. Increased livestock and fodder and fuel collection from the habitat may also disturb the natural balance. Negative attitude and revenge of the local people towards black bear is also a big threat to the bear, that needs to be addressed.

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Statement of conflict of interest

The author there is no conflict of interest.

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