



Asiatic Black Bear - Human Conflicts around Dachigam National Park, Kashmir



भारतीय वन्यजीव संस्थान
Wildlife Institute of India

Asiatic Black Bear-Human Conflicts around Dachigam National Park, Kashmir

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Executive Summary

Black bear- human conflict is a major concern throughout the western Himalayas and particularly in the Kashmir valley of Jammu and Kashmir State. We assessed the Black bear-Human conflicts using Questionnaire surveys around Dachigam National Park (NP), Jammu and Kashmir. The black bear – human conflicts recorded were in the form of crop damage, livestock predation, human attacks and sometimes even death of humans. Crop damage was observed to be the most common type of conflict as reported by more than 80% of the respondents. The extent of crop damage varied in different months and can be related to the cropping pattern. Crop damage and livestock damage was estimated for the areas surveyed.

Crop raiding by black bear was reported as a common problem in the villages that are located in the close vicinity of forests in Central and South Divisions. Over 80% of the respondents reported crop damage by black bear. In most cases, maize, apple, cherry, pear, and walnut were raided by black bear. The extent of crop damage varied in different months and can be related to the cropping pattern. The protection measures adopted by the villagers to scare or chase off bear included noise by drumming empty tin/metal container, putting up scare crows, keeping guard dogs, barbed wire fencing and animal-proof walls. Drumming is the most commonly used protection measure; as over 81% respondents reported using this technique, followed by use of scare crows, guard dog, barbed wire fencing, and animal-proof walls.

Bear attacks on humans were mostly in crop fields and orchards (65%) followed by in forests (25%) and in villages (10%). Over 55% of the attacks occurred during crepuscular period (dawn & dusk), and most of the cases (45%) occurred during summer and autumn as consequence of high human activity in agricultural fields and orchards during these periods as people were either going for work or returning after work. Of the 68 cases of reported human-black bear encounters, 40% resulted in human injuries, <17% were without harm to both, but 14% of humans were injured when people tried to chase black bear. About 67% of the respondents reported that they tried to stay calm in case of a close encounter with black bear and 33% reported that tried to chase the bear. Of the 34 livestock depredation cases by bear, 31 were livestock killings in cattle sheds and three were in forest, and most of the cases occurred during nights. The bear-human conflict cases were high in areas that were close to forest and in general, bear-human conflicts decreased with increasing distance from forested areas. Most of the villages situated between 1,900-2,200m elevation zones are close to black bear habitats and the inhabitants are mostly dependent on forests resources making them more vulnerable to bear-human conflicts.

A comparison of Black bear-human conflict pattern for the 2007 and 2008 carried out for six villages in Central Division revealed that the crop damage ranged from June to September in 2007, ($H=3$, $df= 3$, $p=0.392$), but it lasted up to October in 2008, The conflict cases varied at different elevation zones ($H= 4$, $df= 4$, $p=0.406$) with the maximum occurring in the 1900-2000m elevation zone largely due to bear raiding cherry orchards that are grown at these elevations but the pattern with respect to distance from forest were same.

A black bear rescued from a nearby village was radio-collared and released in Dachigam NP. That collared animal went out of the NP after 15 days and was involved in conflicts in the nearby villages.

The ecological study being carried out at Dachigam NP provided some valuable information about the density, diet and behavioural aspects of black bear and has been helpful to the wildlife managers in managing and mitigating conflicts.

Preliminary recommendations for understanding and mitigating black bear-human conflicts are as follows:-

Development and maintenance of Conflict Database

The basic step towards understanding and developing mitigation strategies for reducing black bear-human conflicts in the State would be the development and maintenance of a database on conflicts for different regions using GIS in both spatial and temporal scales. WII has a spatial database of bear-human conflicts around Dachigam NP and has provided the same to the Department of Wildlife Protection for use in its management.

Creation of Conflict Management Team

In order to strengthen the bear conflict management activities of the Department of Wildlife Protection, J & K State, a fully equipped, well trained and motivated 'Conflict Management Team' comprising of wildlife staff, veterinarians, staff of related line departments or institutions, and wildlife NGOs has to be formed at the Wildlife Division Level to respond to conflict situations, including bear rescue, translocation and monitoring. At present, there are three Bear Rescue Teams based at North, Central and South Wildlife Divisions.

Awareness creation

Knowledge on black bear behavior is essential for the villagers who live near bear habitats and suffer crop losses and are vulnerable to attacks due to bears. Simple precautionary measures such as avoiding moving singly during dawns and dusks in crop fields or orchards or forests during summer and autumn could greatly reduce bear attacks on humans. Avoiding potential denning areas and sites with high bear food abundance in different seasons by the people would minimize bear-human encounters in bear habitats. Another crucial factor that can reduce bear attacks is providing a safe passage or escape for a stranded bear, particularly in the villages. These 'dos' and 'don'ts' have been widely circulated through posters in local language and also through media and press.

Guarding of crop/orchards from black bear damage

A Village level cooperative effort for guarding of crop fields and orchards on rotational basis could be tried as an option using the effective means of scaring bears such as drumming of empty metal tins or containers. Using guard dogs while patrolling and keeping them in villages would be of added advantage. Proper lighting in the corners or boundaries of crop fields and orchards particularly the vulnerable points lying close to forest fringes and building cemented walls are other options that may help to reduce crop depredation as observed in a few cases during the survey.

Reducing livestock depredation by Black Bear

As most of the livestock killings have taken place at the night shelters in the villages, it would be necessary to strengthen the doors, windows and other vulnerable portions of these night shelters to reduce loss by predation to black bear and common leopard. A dozen villagers have replaced the wooden doors with iron doors in their cattle sheds and this has been successful in preventing livestock depredations. Supervised livestock grazing by at least 3-4 villagers will reduce livestock depredation by black bear and leopard.

Changing Agricultural and Animal Husbandry Practices

Changes in cropping patterns can significantly influence the Black bear-Human conflict intensity in an area as villagers are growing cherry in the immediate vicinity of Dachigam NP. Such crops are vulnerable to damage by black bear and if this practice of growing cherry is either reduced or stopped near high density black bear areas, it would help in minimizing the Black bear-Human conflict.

Monitoring of Conflict areas

Use of passive and preventive actions is an important step in conflict management. There should be proper monitoring of black bear-human conflict areas where at least one of the employees is present at the problem site until the situation is resolved. While monitoring the bear, information such as number, age, location, bear behaviour and the direction of the movement of the conflicting animal has to be recorded and reported. Movement of the people should be restricted to give safe passage to the problem bear.

Translocation and marking of problem bear

The problem bears that are captured and translocated from the conflict areas should be marked by radio collar, florescent collar or, by ear tags prior to their release back into the wild so that the movement and the ranging patterns of these animals could be studied. This will be very helpful in better understanding of problem bears and ultimately help in mitigating the problem.

Aversive conditioning of a problem bear

Aversive conditioning of a problem bear (habituated to people or raiding crops) is very much essential so that the problem bear learns to associate 'undesirable activities' such as entering a village, crop field or orchard with 'negative events'. Such problem bears could be subjected to one or more of the following treatments prior to release back into the wild. The treatments include: being hit with bear pepper sprays or rubber bullets, loud noise by bursting of crackers, and barking and/or chased by specially trained dogs. During this study, rescued black bears were subjected to aversive conditioning before releasing them into the wild.

Strengthening of local and traditional black bear deterrent methods

Traditional methods such as burning of red chilli mixed in cow dung was found to be effective in preventing bears from entering crop fields. Use of such local deterrent methods could be identified, encouraged and strengthened.



Asiatic Black Bear - Human Conflicts around Dachigam National Park, Kashmir

1.0 Black bear - Human conflicts

Wildlife conservation in South Asia is a challenging task as there is a need for a balanced approach between natural resource conservation and meeting the growing needs of human population and development. Wildlife biologists, managers and policy makers have to evolve strategies for conservation of endangered species and their habitats on one hand and dealing with wildlife-human conflicts on the other. Asiatic Black bear (*Ursus thibetanus*) - Human conflicts is not a local, small-phenomenon; but an issue that spans a diverse array of geographic and human demographic contexts. The increase in number of black bear-human conflict cases is due to competition for resources at different levels, fear as a threat to local people, and trade of body parts of animals (Sillero-Zubiri & Laurenson 2001). Although humans and carnivores have co-existed for a long time but the frequency of conflicts have increased in recent decades as a result of increased human activities in wildlife areas or on natural habitats (Graham *et al.* 2005, Bulte & Rondeau 2005). People generally get rid of these kinds of unusual conflict problem by killing the problematic animals. Bear populations usually require large areas of land to survive. They typically compete directly with people for resources such as space, food, security and cover. Almost all bear species kill or injure livestock, damage agricultural or horticulture crops, or otherwise directly compete with people (Herrero *et al.* 1999). Therefore, if legally protected species damage livestock, property or agricultural fields, people think that they are at a disadvantage against these species, and since the species is legally protected, they prefer illegal ways of dealing with this problem.

1.1 Black Bear-Human Conflicts in India

One of the most serious limiting factors for black bear conservation in India is the response of people to Black bear- human conflicts. Such conflicts have existed since long back but the intensity of these cases has increased through the recent years (Chauhan, 2003). Reports to the Forest and



Wildlife Departments of black bear attacking humans and killing livestock are common, largely in the north western and western Himalayan region. For example, in Uttarakhand, black bears accounted for 28.5% of 540 attacks on humans by large carnivores between 1991 and 2001. Of these attacks, 9% resulted in a human fatality (Chauhan 2004). In the Great Himalayan National Park, 350 of 1,348 (26%) incidents of livestock predation during 1989-98 were by black or brown bears (Chauhan 2003). In Kashmir, Black bear-human conflicts have increased in the recent past (Choudhury *et al.* 2008). In Arunachal Pradesh, black bears cause damage to maize, which is a major crop for many hill tribe people. Sathyakumar and Choudhury (2008) have specified the possible causes for the increased incidences in the reporting of livestock depredation and attacks on humans by black bears. They are: (1) shrinking habitat due to extension of agricultural lands, other human encroachment, and habitat degradation which have lead to increased use of agricultural lands by bears, (2) increasing human and livestock population in and around PAs and forested areas, and increased dependence on forests by humans leading to increased frequency of bear-human encounters, (3) unsupervised livestock grazing, and (4) increased awareness among local people regarding compensation paid by the government for damage caused by wildlife, leading to an increase in the proportion of incidents reported. As a result of the above, any report of an increase in black bear population in an area in the recent past, is very unlikely with the exception of a very few undisturbed areas.

1.2 Conflict types

1.2.1 Damage to agricultural crops and orchards

The croplands and orchards are unintentionally providing high quality food for bears. Black bear has excellent memory that helps it to locate seasonally available cultivated crops around its habitats. Individuals that have once tasted good quality and high energy food come out regularly to raid the crops and orchards near their natural habitats. As bears become habituated to cultivated crops, growing such kinds of crops near bear habitats actually lead to human-bear conflicts in the immediate area and the broader community. Knowledge of bear ecology and behaviour can provide a basis for solutions to prevent human-bear conflicts. Most conflicts cases arise when bears have



been using human food sources such as garbage, livestock foods, orchards, and or when natural foods are in low abundance in their habitat (Craighead 2000, Davis *et al.* 2002).

1.2.2 Livestock killing

Killing of livestock (sheep, goat, cow) by black bears is not uncommon and may become a serious problem. Black bear do occasionally kill livestock when there is no food available in wild for there animal protein requirements. There are instances when grazing domestic animals are predated by bear in their habitats and some cases of livestock killing in night shelters. During late autumn and early winter when food availability in bear habitats is low and due to late snowfall some bears go in for late hibernation and during such period kill livestock.

1.2.3 Human attacks and killing by black bear

Increased human population in and around protected areas, forest encroachment and increased dependence on forests by humans have led to increased frequency of bear-human encounters. Black bear compete directly with people for resources such as space, food, security and cover (Herrero *et al.* 1999). Black bear-human encounters can be classified in to two categories: Predatory and defensive. Black bear generally do not attack people unless and until: - (1) it feels threatened, (2) if it is a sudden encounter, or (3) a female black bear with cubs or with food. (Center for Wildlife Information 2005).

1.3 General Account on Asiatic black bear

The Asiatic black bear has been reported to be continuously distributed through southern and eastern Asia from westward through Pakistan and Afghanistan to Baluchistan Province of Iran; east to Indo-China through much of China, Korea, and Japan, and an isolated population in Taiwan (Servheen 1990, Sathyakumar 2001). Schaller (1977) reported a wide distribution for black bear from Russia and Korea to Indo-China and from the forests of the Himalayas below an altitude of 3,750m west as far as Afghanistan and Iran. The Himalayan region and the hills of northeast India cover *ca.* 591,800 km² (18% of India) and probably holds one of the largest



population of black bear in Asia (Sathyakumar 2001, Sathyakumar & Choudhury, 2008).

In India, black bear inhabits forested habitats ranging from 1,200 m to 'treeline' and its range overlaps with that of the sloth bear (*Melursus ursinus*) below 1,200 m and the Himalayan brown bear (*Ursus arctos isabellinus*) above 3,000 m (Prater 1980). In north-east India, their range overlaps with both sloth and the sun bear (*Ursus malayansis*). The black bear is distributed throughout the Himalayan ranges in the northwest (Jammu and Kashmir; Himachal Pradesh), west (Himachal Pradesh and Uttarakhand), central (Sikkim and northern West Bengal) and east (Arunachal Pradesh). It is also present in the hills and edge of the plains of other north-eastern states of India such as Assam, Meghalaya, Mizoram, Tripura, Nagaland and Manipur (Sathyakumar & Choudhury, 2008). At present, the black bear are continuously distributed in north India, all along the Himalayas (1,200m to 3,300m) and the Eastern Himalayan ranges and the hills of northeast India (70m to 4,300m). Sathyakumar & Choudhury (2008) have reported that the black bear is present in 83 Protected Areas (PA) and over 98 Forest Divisions (FDs), Reserved Forests, (RFs), and Forested Valleys (FVs). PAs include National Park (NP), Wildlife Sanctuary (WS), Conservation Reserve (CR), and Community Reserve (CMR). It has been estimated that the potential black bear habitat range in India would support 5,400 to 6,750 bears (Sathyakumar 2001, Sathyakumar & Choudhury, 2008).

1.4 Conservation Status of Black Bear in Jammu & Kashmir State

As per the 2005 survey (Sathyakumar & Choudhury, 2008), the status of black bear in the state of Jammu and Kashmir has been reported as 'fairly common'. Black bear is reported from 16 PAs and 20 FDs, RFs, and FVs of the State. The Dachigam (NP), Kishtwar NP, City Forest NP, Overa-Aru (WS), Limber WS, Lachipora WS, Gulmarg WS, Thajwas (Baltal) WS, Rajparian (Daksum) WS and five (CRs) viz., Ajas, Bran-Harwan, Khiram-Shikarkgarh-Panyar-Khangund, Khrew-Khonmoh, Naganari and Wangat have black bear populations. Black bear is also reported from over 20 other areas and some of these include FDs in Lidder (Pahalgam), Naranaga, Sindh, Wangat, Anantnag, and RFs of Gugnar, Biancoi, Pir Panjal, Zaberwan,



Bandipora, and Kahai. It is also reported from Banihal CR, Sumchan Saphare WS, proposed PAs such as Pir Panjal NP, Ghambiar Mongtu WS, Dhera-ki-Gali WS, Ans River WS, and Nowshera WS. In Jammu region, black bear is reported from the FDs of Marwa, Rambandh, Batote, Doda, Badhruwa, Kistwar, Poonch, Rajouri, Nowshera, Reasa, Mahor, Udhampur, Jammu, Ramnagar and Bilwar (Sathyakumar & Choudhury, 2008).

1.5 Threats to Black Bear in India

Black Bear are threatened due to poaching for gall bladder (medicine), skin (ornamental), retaliatory killings to reduce bear-human conflicts, and due to large scale habitat degradation or loss. As a result of these threats, the black bear population in India is decreasing in many areas. Existing information on black bear in India is either anecdotal or insufficient for effective conservation and management. A few short investigations (Schaller 1969, Manjrekar 1989, Saberwal 1989, Sathyakumar 1999, 2001, 2006, Sathyakumar & Viswanath 2003, Sathyakumar & Choudhury 2008) on black bear have been carried out so far in India. Black bear-human conflicts is an important management issue that needs to be addressed on priority basis as depredation of agricultural/ horticultural produce by black bears have resulted in the resentment of the local people who suffer such losses leading to retaliatory killings and animosity with the government departments

1.6 Black bear Ecology and Behavior

Black bear is a forested animal found in areas with dense canopy cover with limited human disturbance. Black bear is typically nocturnal, although occasionally it is active during day time. In Eastern Himalayas, black bear tend to be active year-round; but in North-western Himalayas it undergoes hibernation during winter. It spends this period of hibernation in dens, such as hollow tree, caves and holes dug into the ground. Black bears in North-western Himalayas may remain in their dens for 3 to 5 months. They breed during the summer months, usually in late June or early July and cubs are born between late December and early February, while the female is still denning. Black bears are omnivorous in the food habits, foraging largely on fruits and to some extent on leaf material,



grasses, insects and other animal matter. The movement and ranging of the black bear is largely dependent on the quality, quantity and distribution of food which in turn is influenced by topography and climate. The ability of black bear to climb trees to feed and use food resources efficiently, makes it to survive in relatively small home range provided one or other food species is available in the area at all times of the year. In Kashmir, when there is shortage of fruits in certain periods of year they become bolder and travel more widely in search of food towards crop lands so human encounters with bears are more frequent during this period.

The home range of Asiatic black bear in Japan has been reported to be between 3 and 28 km², with an average size of 12.5 km² and a density of 0.16/km² (Hazumi and Maruyama 1983, 1986). Reid *et al.* (1991) also estimated low densities (0.1-1.3 bears/km²) in China. Habitat use by black bears in North America is influenced by phenological status of fruit species in the area and resulting in great variation in home range sizes (Jonkel and Cowan 1971).

1.7 Black Bear–Human Conflicts in Dachigam NP and adjacent areas in Kashmir Valley

As like many other parts of India, the human population in the State of Jammu & Kashmir has also increased over the last 100 years. The decadal variation in human population growth in this state was less than +11% between 1911 and 1961, but it rapidly grew and ranged between + 23.69% and + 29.65% during the period 1961 and 1991. The census by the Government of India for Jammu and Kashmir during 2001 reported a human population of 100,699,17. In Srinagar and Anantnag districts, the human population growth rate is 31.45% and 32.7% respectively. In rural areas of Srinagar and Anantnag Districts the human population density is 127/km² and 258/km² respectively (<http://www.indiastat.com>). As a result of growing human population, changing land use practices and resultant anthropogenic pressures, forest cover had either decreased or declined in quality due to habitat degradation. The official estimate of forest encroachment in Jammu and Kashmir (as of 4.12.2007) is 14,375 ha. (<http://www.indiastat.com>).



Movement and ranging patterns of large mammals are controlled essentially by availability of food and water, escape cover, and the availability of mates (Mace *et al.* 1983). When food is the limited factor, its nature (ephemeral or long lasting, super abundant or scarce) and its distribution (clumped or random) will be crucial importance in determining animal movement and distribution (Clutton-Brock, 1975). Kashmir being a valley has an interspersed pattern of orchards, croplands with human habitations and forest. The movement of bears for food outside these forest areas in search of cultivated crops leads to close encounters of man and bear, and sometimes to conflict. The black bear–human conflicts are in the form of crop damage, livestock predation, human attacks and sometimes even death of humans. All these have led to strong backlash from people resulting in confrontation with the Department of Wildlife Protection or the Government authorities, and sometimes retaliatory killing of strayed bears. The Dachigam NP and its surrounding forested and agricultural/horticultural landscape has black bear in relatively high densities resulting in increasing bear-human conflicts and also providing ample opportunities for ecological research on different aspects of ecology and bear-human conflicts. Comparison of scientific information generated on these ecological aspects in other forested areas near Dachigam NP would help in better understanding of the species behavior, habitat ecology and bear–human conflicts in north west Himalayan landscape. Keeping this in view the Wildlife Institute of India initiated a research project with the following objectives.



1.8 Objectives of the WII's Research Project

- To assess the bear–human conflicts and threats to black bear and its habitats at Dachigam and adjacent Reserve Forests, Protected Areas in the north west Himalayan landscape.
- To evaluate whether the distribution and relative abundance of Asiatic black bear is influenced by the availability of major food plants found in Dachigam National Park.
- To evaluate whether the activity, habitat utilisation, and movement and ranging patterns of Asiatic black bear on a daily, seasonal and annual basis at Dachigam NP is influenced by the availability and distribution of major food plants of Dachigam National Park.

Based on the ongoing ecological study on black bear in Dachigam NP we estimated the encounter rates of black bear to range from 0.18 to 1.13 bears/km (Charoo *et al.* 2008). We recorded 29 food items in the diet of black bear based on scat analysis and feeding observations Sharma *et al.* (2008). During the months of May and August, black bears disperses out of the park due to very low food availability. In May and August the availability of cultivated crops such as maize, cherry, apple in the nearby villages result in crop raiding by lack bears and thus to black bear-human conflicts (Charoo *et al.* 2008).

1.9 This Report

The field investigations for this project were initiated in Dachigam NP during May 2007. This Technical report presents the findings on the assessment of black bear-human conflicts around Dachigam NP and the Central and South Divisions, Kashmir for the period May 2007 to April 2009.



2.0 The Study area

The Kashmir valley is an oval plain with a chain of mountains ranging from 2,700m in the south to 5,000m in the north surrounding it. The valley has an interspersed pattern of forests, orchards, croplands and human habitations. Administratively, the Department of Wildlife Protection works under three Wildlife Divisions (Central, North and South) in Kashmir region. The study area, covering Dachigam NP and adjacent areas come under the Central and South Divisions (Fig.1). The movement of bears from their habitats in Dachigam NP to croplands or orchards in search of cultivated food leads to bear-human conflicts (Fig. 2). The Kashmir valley experiences four distinct seasons: winter (Dec.-Feb.), spring (Mar.-May), summer (Jun.-Aug.), and autumn (Sep.-Nov.). The average rainfall is about *ca.* 664-700 mm and the average temperature is around 24° C in summer and -5° C in winter (Fig. 3). The climate is sub-Mediterranean type with bixeric regime having two spells of dryness of June and September-November (Singh and Kachroo, 1977, 1978).

2.1 Central Wildlife Division

The Central Wildlife Division includes PAs such as Dachigam NP (Lower Dachigam area), Dara, Khonmoh, Khrew, Brain-Nishat, Khimber, Sharazbal, Wangat, Naganari CRs and Thajwas-Baltal WS. All these PAs are located in the Zaskar mountain range. The altitudinal variations range from 1,650 to 3,950m. The administrative office is located at Dachigam NP.

2.2 South Wildlife Division

The South Wildlife Division is in continuation of Central Division and encompasses the upper Dachigam of Dachigam NP. The other PAs in this Division are: Overa-Aru WS, Pahalgam WS, Hirpora WS and Daksum WS. The various CRs falling in South Division are Hajin, Khagund, Shikargarh, Panyer, and Khiram. The altitudinal variation ranges from 1,700 to 3,500m and above. The administrative office of South wildlife Division is located at Bijbihara, Anantnag.



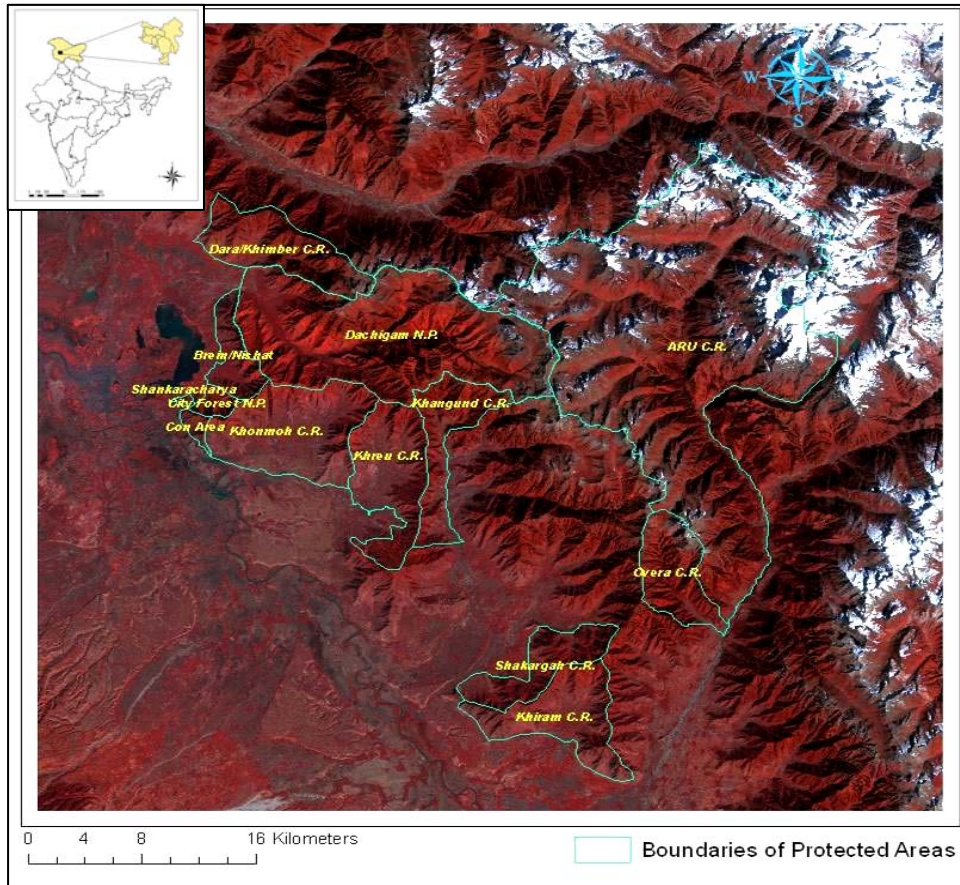


Fig. 1 A map of the Dachigam Landscape showing the Wildlife Protected Areas and the areas surveyed during 2007-09

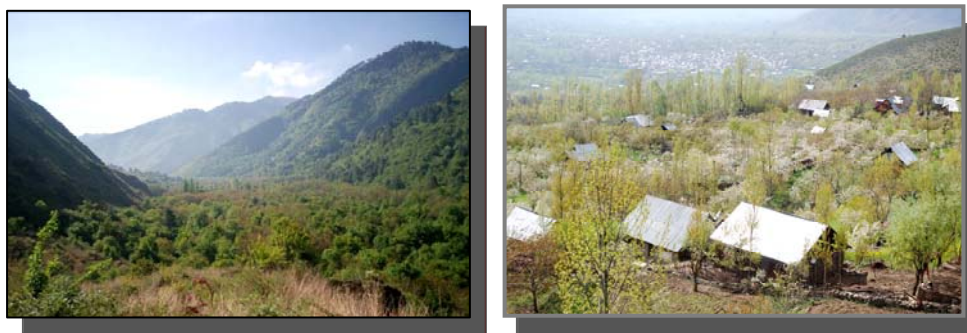


Fig. 2 Asiatic Black Bear Habitats in Dachigam National Park and the adjacent agriculture / horticulture landscape outside

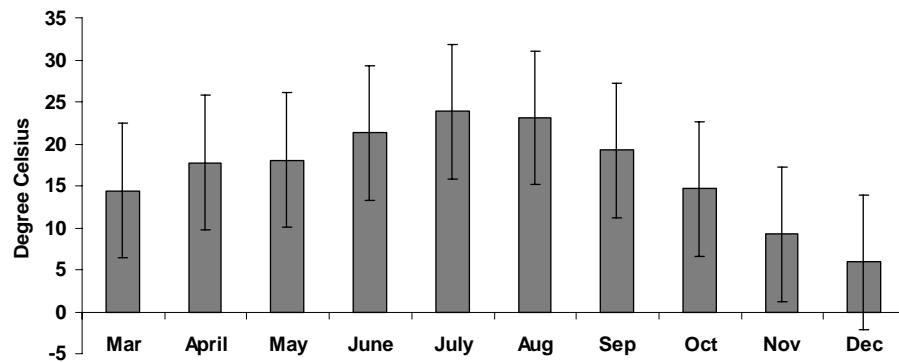


Fig. 3 Average Temperature (°C) recorded at Dachigam National Park, Kashmir, June 2007 to June 2009

2.3 Dachigam National Park

The Dachigam NP is located in Kashmir Valley, 21 Km northeast to Srinagar, Capital of Jammu and Kashmir state of India. It covers an area of 141Km² which extends between 34⁰ 05'-34⁰ 11'N and 74⁰ 54'E and 75⁰ 09'E in Zaskar mountain range of Northwest Himalayan biogeographic zone (2A) of India (Rodgers *et al.* 2000). This NP is bounded by Dara block of the Sindh FD in the north; by Brain block, Khrew and Tral ranges of Forest Plantation Divisions in the South; by Harwan village and Harwan reservoir in the west; and by Lidder FD in the east. The Over-Aru WS is connected to the south-eastern portion of Dachigam NP.

The Lower Dachigam encompasses areas that range from 1,650m to 3,950m (Mahadev peak) and the altitudinal range of upper Dachigam ranges from 2,000m to 4,400m. Dachigam NP has a temperate climate with cool summer and chilling winter. The temperature recorded in summer shows a maximum and minimum mean temperature of 27.3 and 2.0⁰C. Average rainfall recorded is 660mm but there is no definite rain season as like other parts of the country (Ahmad *et al.* 2005).

Vegetation of lower Dachigam NP is classified as Himalayan Moist Temperate Forest (Champion and Seth, 1968). The middle altitude of the park is typical of the west Himalayan upper broad leaved conifer mixed forests (Fig. 2). Above 3,000m the west Himalayan Sub alpine birch forests are present which give way to alpine scrub and juniper in the



higher altitude (Saberwal, 1989). The vegetation of the valley is very patchy. The tree species such as *Ulmus wallichiana*, *Salix alba* and *Populus cilia* are found along the streams. *Prunus armeniaca* is found in open scrub areas, and *Quercus robur* and *Robina pseudoacacia* in distinct pure patches which show evidence of having been planted on abandoned agricultural fields. Shrubs species are quite evenly distributed throughout the valley. Common shrub species in the lower parts of Dachigam are four species of *Prunus*, two species each of *Rubus*, *Berberis*, *Vibernum* and *Rosa*, *Indigofera* and *Parrotiopsis* (Sharma *et al.* 2007). The vegetation on the southern aspects is characterized by grassy slopes with *Prunus armenica*, *Rosa webbiana* and *Rubus niveus*. The nullahs (streams) have reasonable tree cover, including species such as *Aesculus indica* and *Juglans regia*. The northern aspects have more tree and shrubs cover with species such as *Pinus griffithi*, *Aesculus indica*, *Prunus armenica* and *Parrotiopsis jacquemontiana* (Sharma *et al.* 2007). Human use and disturbance of wildlife and their habitats in Dachigam NP includes grazing in higher altitudes in summer by nomadic pastoralists; collection of firewood, fodder etc. by local people; and tourism.

There are about 17 large mammals in Dachigam NP and adjacent PAs where the last surviving population of the endangered Hangul (*Cervus elaphus hanglu*) is present. Other large mammals include Asiatic black bear, Common Leopard (*Panthera pardus*), Himalayan brown bear (*Ursus arctos isabellinus*), Himalayan Musk deer (*Moschus chrysogaster*), Serow (*Nemorhaedus sumatraensis*), Jackal (*Canis aureus*), red fox (*Vulpes vulpes*), Himalayan yellow-throated marten (*Martes flavigula*), Jungle cat (*Felis chaus*), Leopard cat (*Felis bengalensis*), Common otter (*Lutra lutra*), Common Mongoose (*Herpestes edwardsi*) and long tailed marmot (*Marmota caudata*) Above 100 species of birds have been reported in the NP (Ahmad *et al.* 2005, this study).



3.0 Methodology

Informal interviews using semi-structured questionnaires (Appendix – I) were carried out in the villages located on the periphery of Dachigam NP in the Central and the South Wildlife Divisions (Fig. 4). In every village, five villagers chosen randomly were interviewed (Fig. 5a). Data on aspects such as bear encounter, human and livestock attacks, cropping pattern, and crop damage by black bear were recorded. In addition to this, reports of some conflict cases that occurred nearby Dachigam NP were investigated to understand circumstances leading to conflicts. The research study on the ecological aspects of black bear was initiated in Lower Dachigam (*ca.* 90 km²) during May 2007. Aspects investigated include: density and abundance estimates, assessment of Asiatic black bear food availability inside Dachigam NP; density and phenological estimates of major food plants of black bear; and black bear diet analysis based on scats collected in different seasons. One black bear rescued from a conflict area was radio collared and released in Dachigam NP, the findings are presented and discussed.

Camera traps along with the hair traps were used in Lower Dachigam (intensive study area) to estimate the population based on non-invasive DNA technique. We divided the intensive study area into 23 grids (2x2 Km) and each grid represented a camera (Fig. 5b) and hair trap station. For density and abundance estimation line transects/trails were laid in different habitats of the study area. Each grid has atleast one transect/trail passing through it. The micro-histological analysis of black bear scats was carried out for understanding the black bear diet. These scats were also used for non-invasive DNA sampling for population estimation. We are planning to radio-collar (satellite and VHF) six black bears during 2009. The data that will be generated by GPS tracking will help us in better understanding of movement and the ranging patterns of black bear in the study area which will help us in mitigating conflict around Dachigam NP.

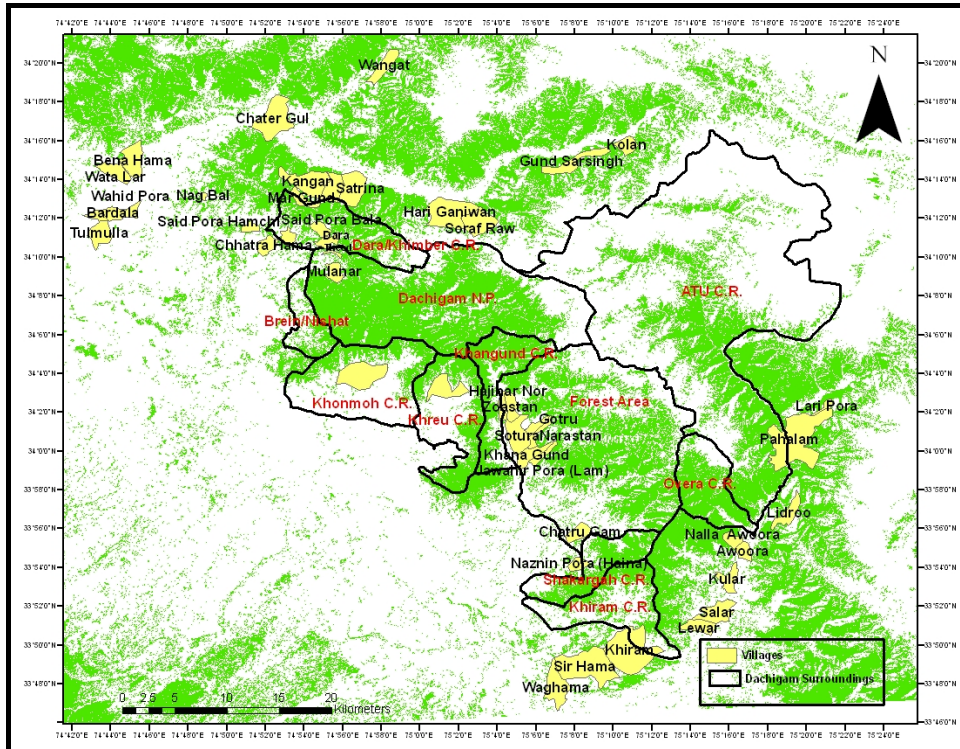


Fig.4 A map of the Dachigam Landscape showing the locations of surveyed villages during 2007-09



Fig. 5 (a) Questionnaire Survey / Informal Interviews with local Villagers and (b) Camera / Hair Trap Station in the Study Area



4.0 Ecology of Asiatic black bear in Dachigam National Park

4.1 Black bear abundance in Dachigam National park

Dachigam NP is known to possess one of the best populations of black bears (Sathyakumar 2001). The population density of black bears has been estimated to be high as reported by the two studies at Dachigam NP (Saberwal 198, Charoo *et al.* 2007). As per the results of the ongoing study at Dachigam NP, during 2007 and 2008, the encounter rates (#/km) of black bears showed a seasonal variation ($p=0.04$, One Way ANOVA) (Table 1). It was highest in summer followed by autumn, spring and winter.

Table 1: Encounter rates (# / km) of Black bear in Dachigam National Park, 2007-09.

Season	Encounter Rate (# / km)	SE
Spring (Mar. - May)	0.52	0.05
Summer (Jun. - Sep.)	1.13	0.17
Autumn (Oct. – Nov.)	1.01	0.02
Winter (Dec. – Feb.)	0.17	0.12

The distribution and availability of food has a considerable influence on the black bear movement and activity. In spring, black bear encounter rates (ER) (Fig. 6) was low as bears have just come out of hibernation. In summer, the fruit abundance was highest and bears were more active during this period. Autumn season also had bear food in the form of oak acorns and walnuts, but comparatively less when compared to the summer. ER was low in winter as bear activity ceases from December onwards.

The occupancy and detection probability showed almost a similar trend for all the three seasons of spring, summer and autumn (Fig. 7). But in case of spring season detection probability was comparatively less probably because of the less activity of animals after the state of hibernation.

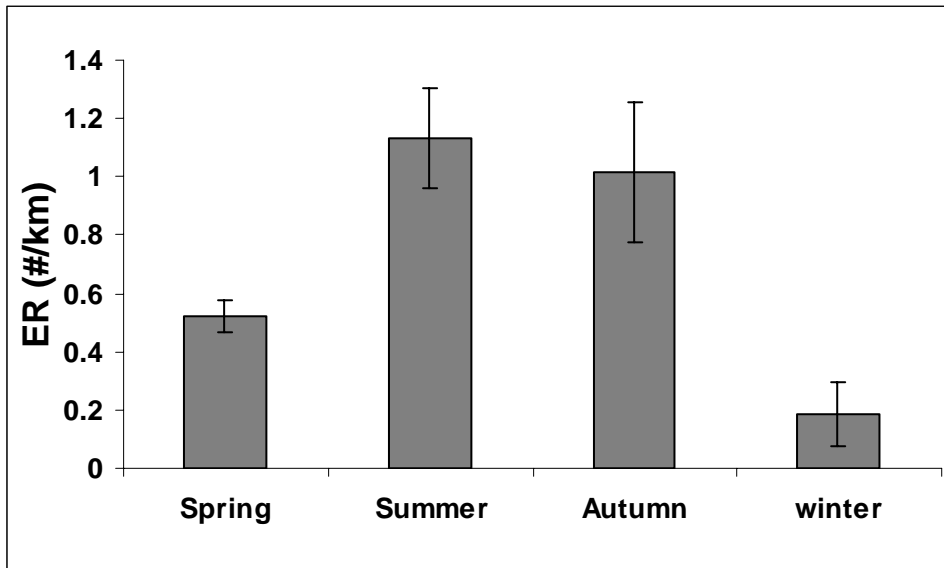


Fig. 6 Encounter rates (#/km) of Black bears at Dachigam National Park during different seasons, 2007-08

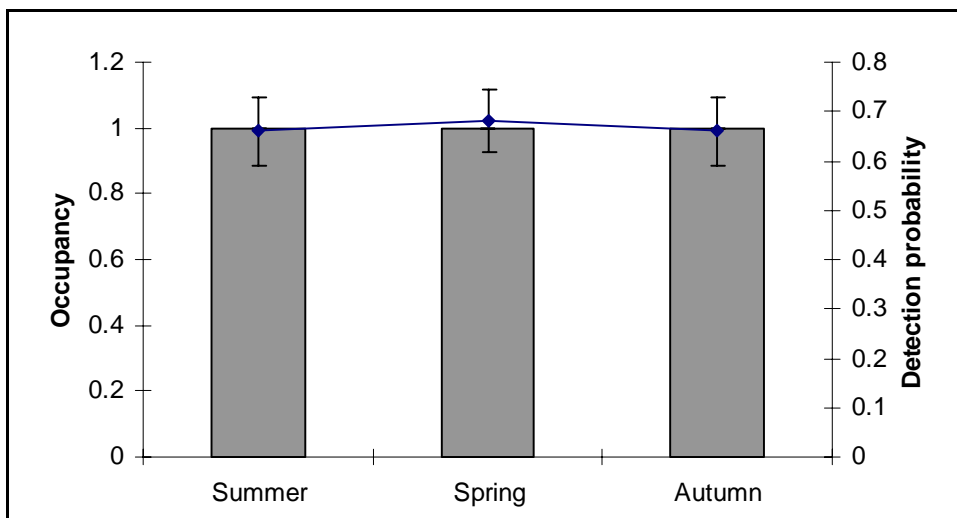


Fig. 7 Occupancy and detection probability of Black bear in Dachigam National Park, 2007- 2008

4.2 Habitat use by Black bear in Dachigam National Park

The selection of a habitat is based on food, cover and other requirements of a species. A number of habitat use studies have been carried out on the American black bear (*Ursus americanus*) and such studies have related black bear habitat use to food availability (Amstrup and Beecham 1976, Kelley House, 1980).



We categorized six major bear habitats *viz.*, Riverine, Oak, Lower temperate, Lower temperate pine mixed, Mid temperate, Temperate grasslands and scrub land in Lower area of Dachigam NP. Based on Black bear sightings and signs (Fig. 8), we found that black bears showed considerable variation ($p < 0.05$, Chi-square test) in the use of different habitats in different seasons. Oak habitat recorded maximum number of signs followed by Lower temperate pine mixed, riverine, lower temperate and mid temperate (Table 2). Grassland and scrub land habitats were comparatively less used by black bear. Maximum number of black bear signs and sightings were recorded in habitats with more than 80% canopy cover indicating black bear preference for forested habitats. North-eastern aspect ($p < 0.01$, Chi-square test) and the altitudinal ranges of 1,800-2,000m were used most by the black bears.

Table 2: Black bear signs (%) recorded at Dachigam National Park in different habitats, June 2007-August 2008.

Habitat	Black bear sign type (n=295)		
	Feeding sign (n=70)	Scat (n=171)	Other signs (n=54)
Riverine (58)	10	26.90	5.71
Oak plantation (98)	14.28	30.40	39.04
Lower Temperate (67)	41.42	12.28	8.57
Lower temperate pine mixed (51)	27.14	18.77	33.33
Mid temperate (15)	7.14	8.77	13.33
Temperate grassland/ scrub land (6)	0	3.50	0

Figures in parenthesis denote number of observations.



Fig. 8 Bear signs recorded during the Study (a) track, (b) scat, (c) claw marks on tree, (d) digging signs, (e) feeding signs, and (f) stone turning signs

4.3 Use of Camera - hair trap stations

During the study period 2007-2008, 53 hair samples of black bears were obtained. We were successful in extracting DNA from some of the hair samples. Further analysis is underway and we hope to estimate black bear population in Dachigam NP based on DNA analysis. The camera trap capture rate varied seasonally, we obtained 399 black bear photo captures (Fig. 9), and the capture rate was maximum in summer (8.61) followed by autumn (2.82) and was minimum in winter (1.95).



Fig. 9 Camera trap pictures of Black bear at Dachigam National Park

4.4 Feeding ecology

The feeding ecology of black bear was studied based on opportunistic sampling, feeding sign observations and scat analysis. Although an omnivore, black bears diet comprised of fruits and vegetation matter depending on the availability in various seasons (Fig. 10) (Sharma *et al.* 2007). Herbs and insects formed the major components of bear diet in spring. Species such as *Prunus prostata*, *P. armenica*, *P. cerasifera*, *Juglans regia*, *Quercus robur*, *Pyrus malus* and *Morus alba* formed the major food components of black bear diet in Dachigam NP during summer and autumn.

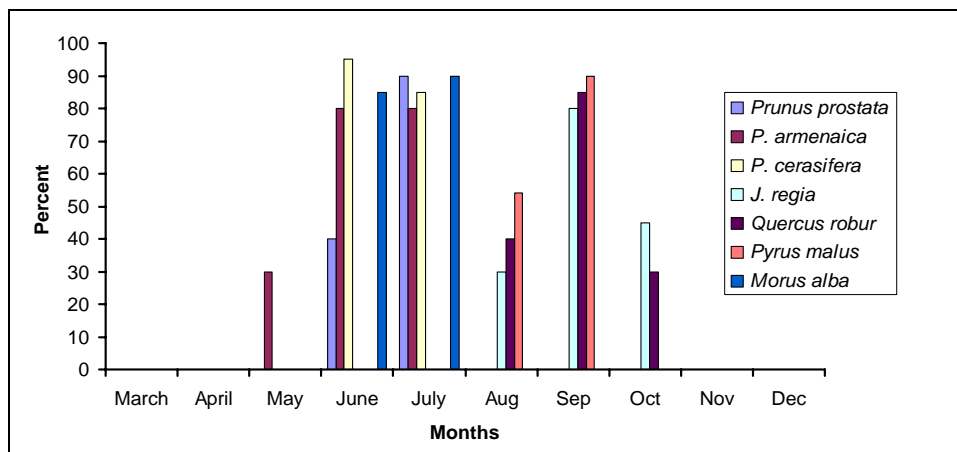


Fig. 10 Availability of major food items for black bear inside Dachigam National Park, during 2007-08

However, based on analysis of the scats collected from Dachigam NP, there is an evidence of cultivated food crops such as cherry, maize, apple and walnut in the diet of black bear. This indicates the movement of black bears from the park to agricultural/horticulture crop lands nearby.

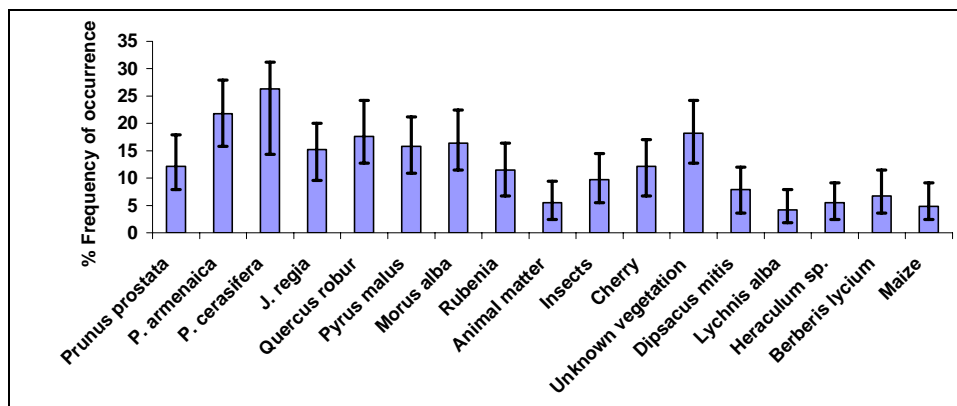


Fig. 11 Diet of Black bear in Dachigam National Park based on scat analysis, during 2007-08



5.0 Asiatic Black bear-Human conflicts around Dachigam National Park

In total, 314 families were interviewed from 46 villages (28 in Central Division & 18 in South Division). These villages are located in the fringes of Dachigam NP whose inhabitants are dependent on forest resources inside NP such as fuel wood, livestock grazing, and collection of some Non Timber Forest Produce (NTFP). In addition to this, the nearby orchards grow apple, cherry, pear, and walnut that attract bears. The black bear-human conflicts were in the form of crop damage, livestock killing and human attacks. In addition to crop damage, black bear kill livestock and in the recent years there has been an increase in the number of human attacks by black bear. In most cases human and black bear close encounters occurred when villages were guarding/working in agricultural crop lands and orchards or, at time of NTFP collection by locals in the black bear habitats. In 2007-09, during the months of higher fruit abundance inside Dachigam NP, bear ER (#/km) was high ranging from 0.33 (July) to 1.55 (August). The fruits of *Prunus spp.*, berries of *Morus spp.*, acorns of *Quercus robur* and nuts of *Juglans regia* form the major composition of food available to the black bears inside Dachigam NP (Fig. 10). Similarly the nutritious food outside Dachigam NP in the form of cherry, apple, pear and maize that are available in substantial quantities also attract the bears in the respective fruiting seasons. The variation in the seasonal availability of major food plants inside and outside Dachigam NP is possibly responsible for bear movements in search of food.

The results of scat analysis also showed the movement of bears from Dachigam NP to agriculture/horticulture landscapes nearby (Fig. 11). The remains of cultivated crops such as apple, cherry, maize in the scats collected from Dachigam NP, confirm this movement. Despite the availability of various food items inside the NP, bears move out owing to the easy access of large quantity of high quality food. Further, the presence of bears outside PAs and RFs has been confirmed during surveys by the identification of some denning sites in rock crevices nearby villages.



5.1 Types of conflict

5.2 Crop damage by Asiatic black bear around Dachigam National Park

5.2.1 Central Wildlife Division

A total of 184 families belonging to 28 villages in the (nine blocks) of Central Division were surveyed during 2007-09 (Table. 4). Crop raiding by black bears was reported as a common problem in the villages that are located in the close vicinity of forests in Central Division (Fig. 12). More than 89% of the respondents reported crop damage by black bears. In most cases, maize, apple, cherry, pear, and walnut were raided by black bears. The protection measures adopted by the villagers to scare off bears included: drumming empty tin or metal containers, putting up scare crows, keeping guard dogs, barbed wire fencing and animal-proof walls (Fig. 13). Drumming empty tin/metal containers is the most commonly used protection measure, as 81% respondents reported using this technique, followed by use of scare crows (49%), guard dog (31%), barbed wire fencing (56%) and animal-proof wall (21%).

The extent of crop damage varied in different months (Tables 3 & 4, Fig. 14), and can be related to the cropping pattern. Bears raided cherry orchards in the months of June and July; maize fields and apple orchards during August and September; and apple orchards and walnuts in November and December. The distance between village and forest (Fig. 15) seems to be an important aspect in determining bear-human conflicts. The conflict cases were high in areas that were close to forest and in general, bear-human conflicts decreased with increasing distance from forested areas. In addition to this, location of villages within the 1,900 to 2,200m elevation zones seems to be another factor (Fig. 16) as most of the conflict cases occurred within this elevation zones. Most of the villages at this elevation zone are located close to black bear habitats and are forests dependent making them more vulnerable to bear-human conflicts. The results of the survey conducted during 2007-09 in Central Division indicates that > 67% villagers are dependent on forests for fuel wood and



NTPF and about 30-75% of the respondents use the nearby forests for livestock grazing. The forest dependency is also a result of the economic status of the local villagers where over 75% respondents belong to below poverty line category.

5.2.2 Protective measures against black bear damage

Villagers used different protection measures against black bear damage. Most villagers used two or more types of preventive measures in combination to scare off bears. About 41% used simple exclusion methods, such as simple fences enclosing small fields or metal sheets placed around tree trunks in orchards, while 13% used deterrents such as dogs, clothing with human smell, or human presence near ripe crops. Only 21% of the interviewed did not use any measure against bear damage.

5.2.3 South Wildlife Division

A total of 130 families belonging to 18 villages (from ten blocks) that fall on the southern fringe of Dachigam NP were sampled during 2007-09 (Table 3). Over 78% of the respondents reported crop damage by black bears as a major problem. Despite the use of protection measures such as drumming empty tin/metal containers (>91%), use of guard dog (34%), barbed wire fencing (31%) and scare crow (18%), the crop damage cases were high. It appears that the protection measures adopted by the villagers were not effective in reducing the crop depredation by black bears.

Crop damage was reported as high during the months of August and September, and on maize, apple and walnut (Fig. 17). Damage was high in the months of less food abundance inside the forested areas and in general, bears go to farm lands at the forest fringes to raid crops. When compared to Central Division, the villagers in South Division are more forest dependent as >95% of the respondents reported that they used forested areas for their fuel wood and other non-timber forest produce, and 67% used the forests for livestock grazing. About 82% of villagers interviewed were below poverty line category. The animal-proof walls



(stone and cement) may be more effective against bears, but costs are much higher. The approximate cost for a 5 feet high, 30 feet long and of 1.5 feet wide wall during 2008 was about Rs. 18,000. Many villagers were not able to afford walls around their orchards or crop fields due to their economic status.

As like the Central Division, the conflict cases were high in areas that were close to forest and in general, bear-human conflicts decreased with increasing distance from forested areas (Fig. 18). Similarly, location of villages within the 1,900 to 2,200 m elevation zones have more black bear-human conflicts (Fig. 19).

5.2.4 Comparative analysis

For a comparison of the conflict patterns between the two years, six villages were selected in Central Division close to Dachigam NP which has similar topographic conditions. The conflict patterns were almost similar for both the years. Crop damage by black bears correlated with the cropping pattern of the area and varied considerably for the two years of study ($H=3$, $df=3$, $p=0.392$), the period of crop damage ranged from June to September in 2007, while in case of 2008 it lasted up to October (Fig. 20 & 21). The bear-human conflicts decreased with increasing distance from the forests and the areas with distance $< 250\text{m}$ had highest number of cases. The trend was almost similar for both the years ($H=2.2$, $df=3$, $p=0.532$) (Fig. 22 & 23).

Black bear-Human conflict cases varied at different elevation zones for the two years ($H=4$, $df=4$, $p=0.406$) and the maximum no. of cases occurred in the elevation ranges of 1900-2000m (Fig. 24 & 25).

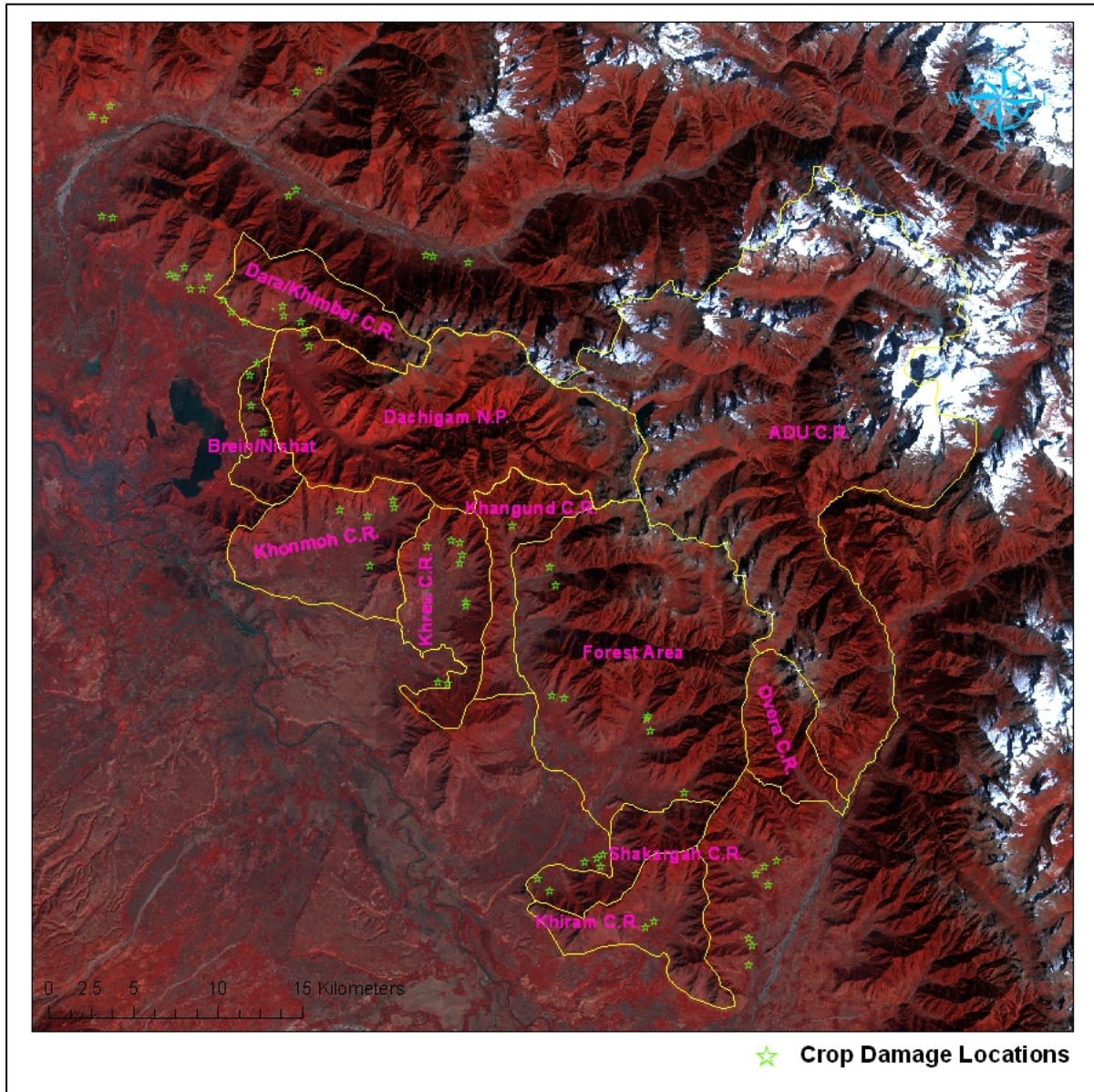


Fig.12 A map showing locations of Black bear crop damage in the Study Area, 2007-09



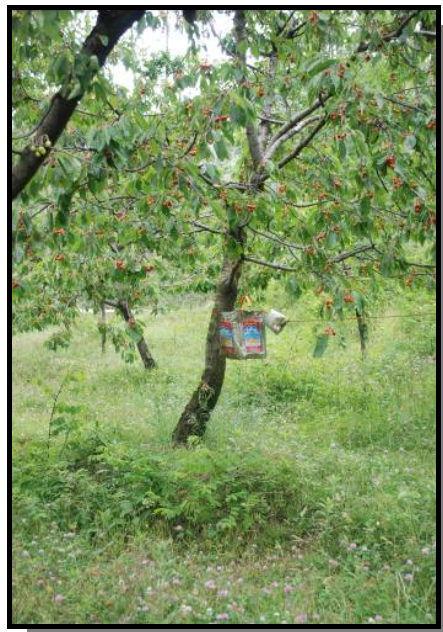


Fig. 13 Crop protection measures adopted by villagers (Clock wise from top left) barbed wire fencing, cemented wall, watchtower, human watch, drumming of empty tin/metal containers



Table 3: Crop damage by Black Bear in Central and South Wildlife Divisions, Kashmir, 2007-09

Crop	J	F	M	A	M	J	J	A	S	O	N	D
Apple												
Almond												
Cherry												
Maize												
Walnut												

Division	J	F	M	A	M	J	J	A	S	O	N	D
Central												
South												

Table 4: Month-wise Black Bear-Human conflicts in different Blocks of Central Wildlife Division, Kashmir, 2007-09

Block	Month of crop Damage	No. of cases	No. of human attacks
Chattergul	8, 9	9	2
Dara	6, 7, 8, 9	78	11
Ganderbal	8, 9	5	1
Khonmoh	6	6	0
Khrew	6	1	1
Kangan	9, 10, 11	14	0
Kulan	9	9	0
Soil conservation block	9	4	1
(Sindh) forest range	9, 10	38	1

Table 5: Month-wise Black Bear-Human conflicts in different Blocks of South Wildlife Division, Kashmir, 2007-09

Block	Month of crop damage	No. of cases	No. of human attacks
Bangdar	8, 9	10	1
Khiram wagnar	8, 11, 12	11	0
Kasnar	8, 9, 11, 12	12	1
Narasthan	8, 9, 10	8	1
Overa	8, 9	5	0
Pannar	8, 11, 12	10	2
Phrasnar	8, 11, 12	2	0
Pahalgam	8, 9, 10, 11	52	2
Reserve forest block (Sular)	8, 9, 11	9	1
Suturu	8, 9	6	2



Fig. 14 Month-wise Black bear crop damage reports from Central Wildlife Division, Kashmir, 2007-09 (n=184)

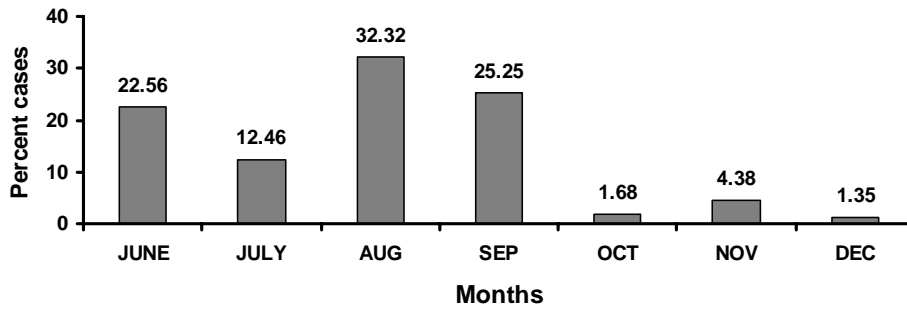


Fig. 15 Black bear-human conflict cases vis-a-vis distance from forests in Central Wildlife Division, Kashmir, 2007-09 (n=184)

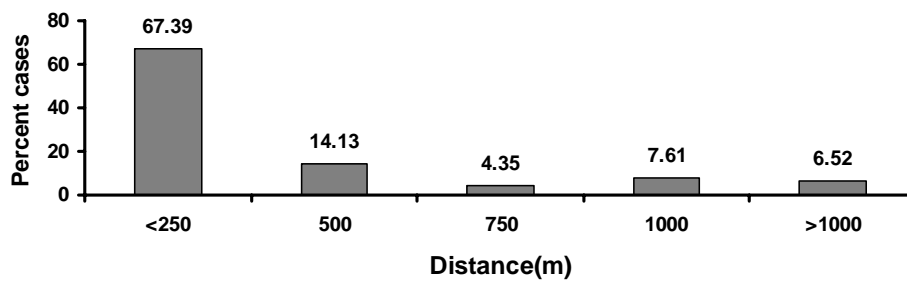


Fig. 16 Black bear-human conflict cases at different elevation zones, Central Wildlife Division, Kashmir, 2007-09 (n=184)

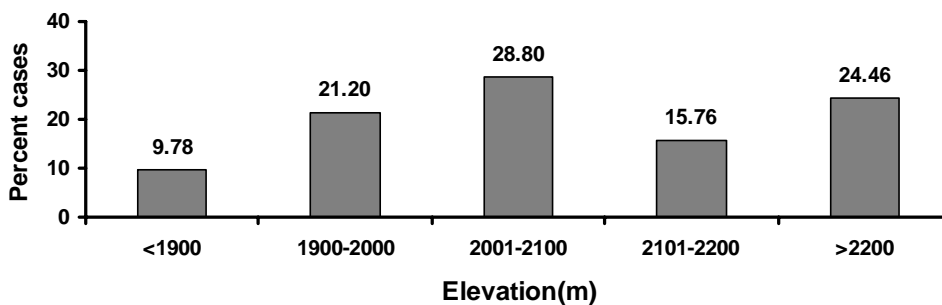




Fig. 17 Month-wise Black bear crop damage reports from South Wildlife Division, Kashmir, 200-09 (n=130)

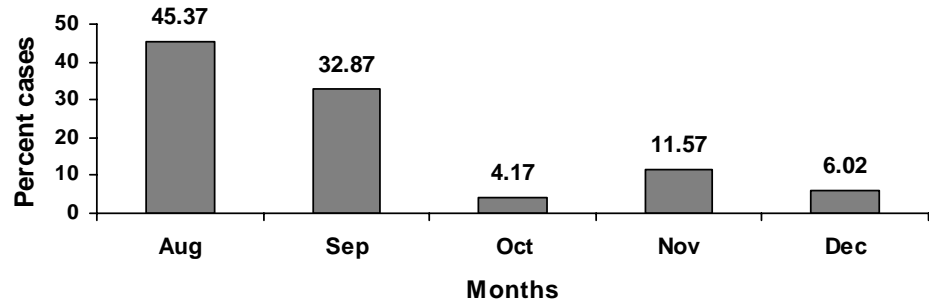


Fig. 18 Black bear-Human conflict cases vis-a`-vis distance from forests in South Wildlife Division, Kashmir, 2007- 09 (n=130)

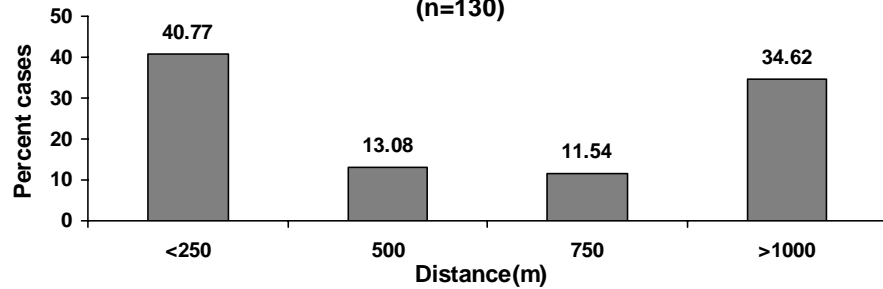


Fig. 19 Black bear - Human conflict cases at different elevation zones, South Wildlife Division, Kashmir, 2007- 09 (n=130)

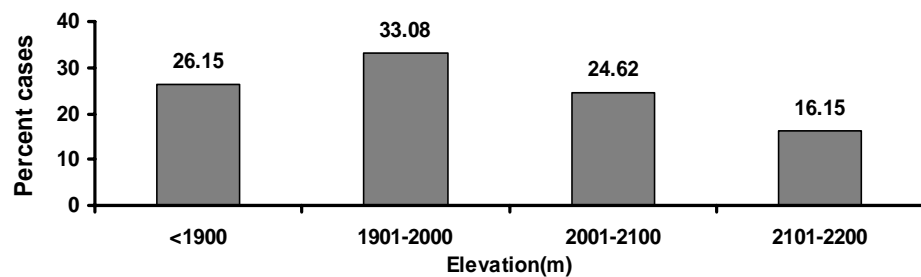




Fig. 20 Month-Wise Black Bear Crop Damage Central Wildlife Division, Kashmir, 2007

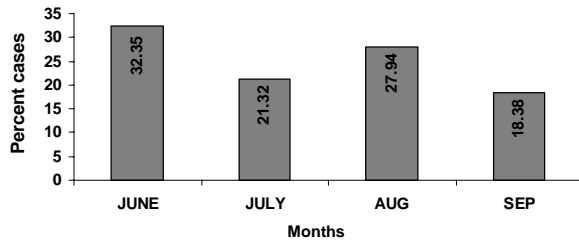


Fig. 21 Month-wise Black Bear Crop Central Wildlife Division, Kashmir, 2008

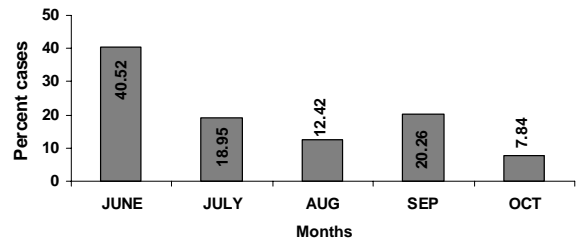


Fig. 22 Black Bear-Human conflict cases vis-a-vis distance from forests in Central Wildlife Division, Kashmir, 2007

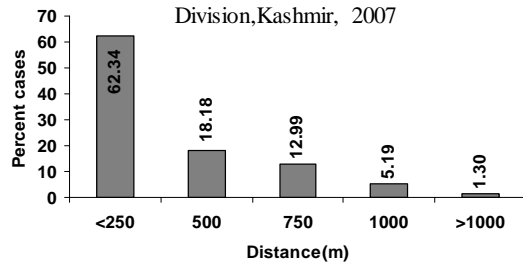


Fig. 23 Black Bear-Human Conflict cases vis-a-vis distance from forests in Central Wildlife Division, Kashmir, 2008

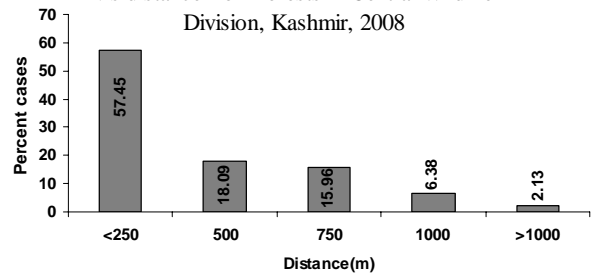


Fig. 24 Black Bear-Human conflict cases at different elevation zones, Central Wildlife Division, Kashmir, 2007

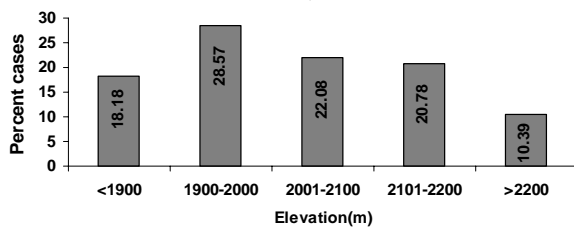
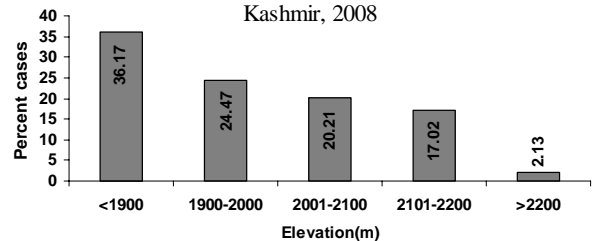


Fig. 25 Black Bear-Human conflict cases at different elevation zones, Central Wildlife Division, Kashmir, 2008





5.3 Human attacks by black bear around Dachigam National Park

In total, 27 cases of bear attacks were reported during 2007-09 in Central (17) and South (10) Wildlife Divisions (Table 6, Fig. 26). Most of the bear attacks were on people working in crop fields [n=17; (63%)] and while in forests for resource use [n=7; (22%)] about 15% cases occurred in villages.

Table 6: Time, Location and Seasonality of Black bear attacks on humans in Central and South Wildlife Divisions, Kashmir, 2007-09.

Place of attack	Season				Time of day			Total
	Spring	Summer	Autumn	Winter	Night	Day	Crepuscular	
Crop Field	1	9	4	3	2	5	10	17
Village	1	2	1	0	1	0	3	4
Forest	1	3	2	0	1	2	3	6
Total	3	14	7	3	4	7	16	27

5.3.1 Human-bear close encounters

The maximum numbers of human-bear encounters occurred in crop fields or orchards while black bears were raiding crops. During 2008-09, 68 cases of human-black bear close encounters were reported (Table. 7). Of these, 40% of the encounters resulted in human injuries (all were unprovoked attacks), and in 17% cases, there was no harm to both. But when the black bear was harassed by people cases humans were injured (14%). There were many human-bear encounters which did not result in any kind of harm to human and black bear. Attacks occurred only when the bear did not get an escape route and it panicked or when it was a surprise close encounter.

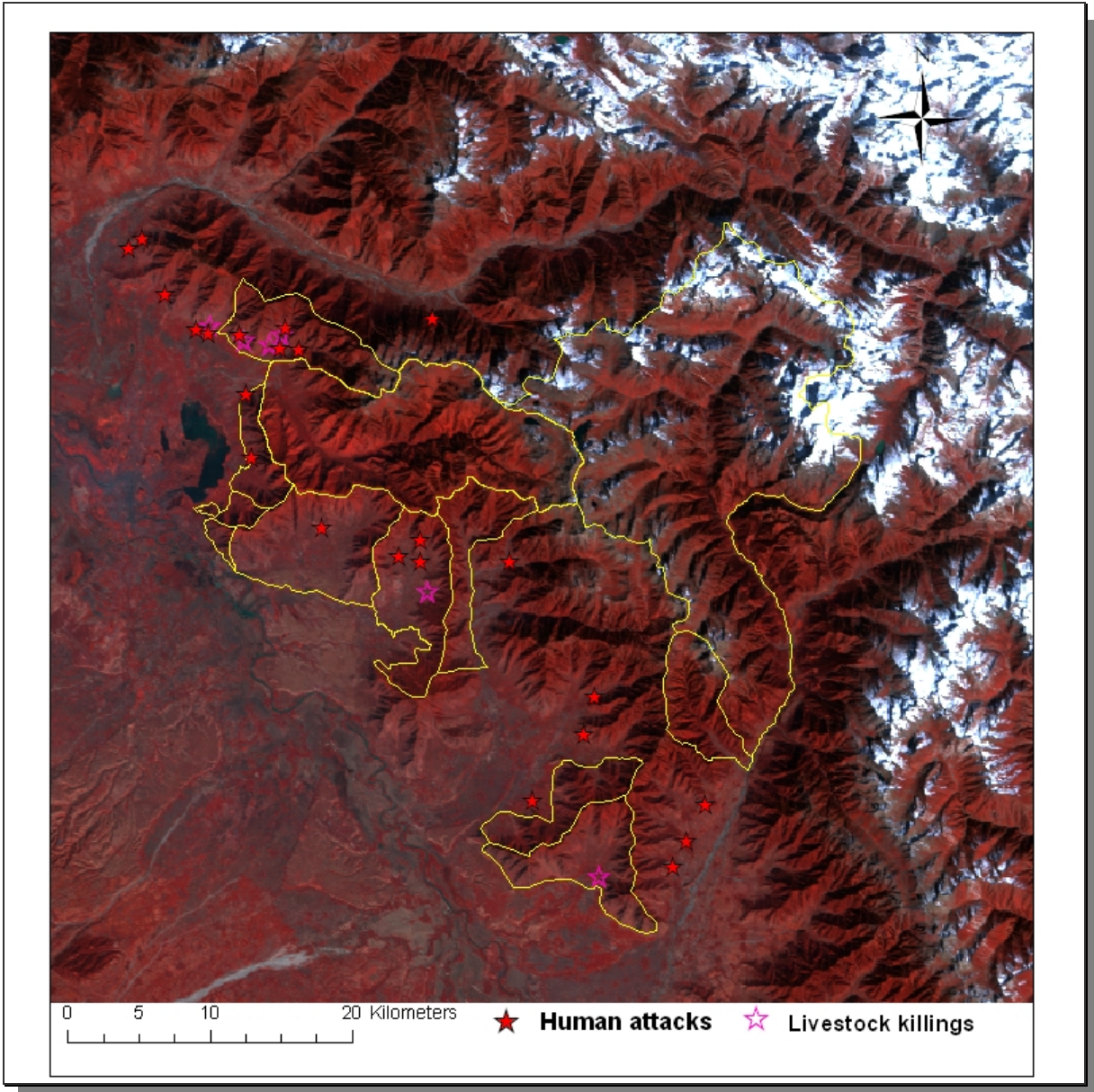


Fig. 26 Map showing locations of Black bear attacks on Humans and livestock killings in Central and South Wildlife Divisions, Kashmir during 2007-09



Table 7: Types of Black bear-human encounters, 2007-09

Type of Human-Black bear encounter		Number of instances
No interaction	No consequence	11
Bear chased by human	No consequence	8
Bear chased by human	Bear harmed	5
Bear chased by human	Human harmed	10
Bear charge	No consequence	7
Bear – charge	Human harmed	27

5.3.2 People's reactions and precautions during close encounter

Out of total (n=314) interviewed, almost 67% villagers responded that they tried to stay calm or moved away from the place of encounter. About 33% respondents tried to put themselves in unnecessary risk by chasing the bear and by not giving an escape route to the bear. The villagers reported that when the bear is encountered at close distances, they were frightened and tried to either stay calm or use any tactic to chase the bear away. If the encounter was far away, the villagers preferred to watch a bear and maintained the distance from the moving bear (Fig.27).

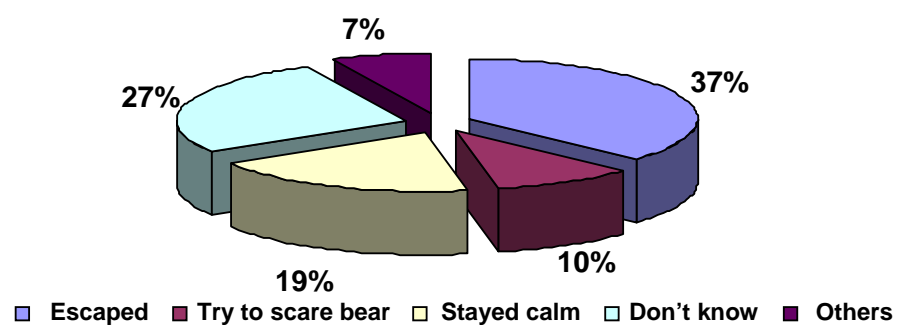


Fig. 27 People's reactions during close encounters with Black bear



5.3.3 Location, Time and Seasonality of attacks

Bear attacks were mostly in crop fields and orchards (63%) followed by in forests (22%) and in villages (15%). Over 59% of the attacks occurred during crepuscular period (dawn & dusk), 26% during day time, and 15% cases occurred during night (Fig.28). Most of the cases (52%) occurred during summer followed by autumn (26%), spring (11%) and winter (11%). The low number of cases during winter may be due to that fact that there was less human activity and bears were either hibernating or were less active.

The number of bear-human conflict cases was high at crepuscular periods and during summer and autumn seasons as human activity is also high in agricultural fields and orchards during these periods when people are either going for work or returning after work.

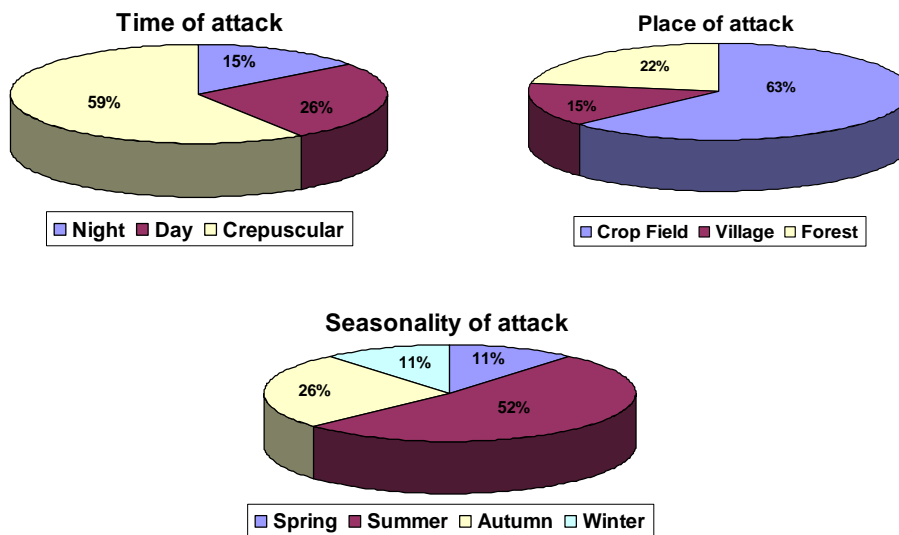


Fig. 28 Time, Location and Seasonality of Black bear attacks on humans in Central and South Wildlife Divisions, Kashmir, 2007-09 (n=27)



5.4 Livestock depredation by Asiatic black bear

The total numbers of livestock killed by black bears within the surveyed localities in Central and South Divisions during 2007-09 were 34 (Fig. 26 & 29). Of these, 31 livestock were killed by bears in cattle sheds or night shelters and three were killed in forest. In many cases, respondents reported that the bears usually make their kills during night and drag their kills from the cattle shed or night shelters. Most of the cases (n=26) occurred in winter season. During November and December, food availability in the forests was less and some bears go in for late hibernation due to late snow fall during winter.



Fig. 29 A livestock that was attacked by Black bear at Saidpura village in Central Wildlife Division during winter, 2008



5.5 Perceptions of the local people about the government compensation program

Of the total respondents (n=314), about 46% were aware of the government compensation program and most of them were of the opinion that the compensation amount provided to the affected families was less and expressed that this amount should be increased.

5.6 Economics of loss

Data on crop depredation by bear was collected from farmers through interviews. The economics of loss was estimated based on assumptions given in Table 8. The estimated rates were confirmed from local traders dealing with these fruits and crops.

Table. 8: Approximate cost of horticulture/agriculture crops and livestock in the Dachigam landscape 2007-09 (Actual costs may vary depending upon market inflation)

Item	Economic value (Rs)
1 Kg of Cherry	70
1 Kg of Apple	30
1 Kg Walnut	100
Maize crop (produced in 1 Kanal* land)	2400
1 Cow	15000
1 Sheep	2000

*4.5 Kanal = 1 Acre

Using the above economic value of livestock a loss of about Rs 198,000 in 2-years was calculated for the villages surveyed. However, 90% of that loss originated from Villages which comes under Central Wildlife Division. The economic loss due to crop depredation by black bear was high in Central Wildlife Division probably due to more number of fruit orchards such as cherry are grown in this Division .



The economic loss due to black bears were Rs. 861,000 in Central and Rs. 375,000 in South Wildlife Division during the period of two years (2007-2009).

5.7 Radio tracking of a rescued black bear

Radio telemetry has been used to study various aspects of wild fauna *viz.*, the movement patterns, habitat use, survival, and behavioral studies. In addition to the above, it is simply used to determine presence or absence of animals in particular places or habitats e.g. den or nest sites (Samuel and Fuller 1994). Radio telemetry has been used in studies of free ranging wildlife for almost 40 years (Rodgers 2001).

During our study, we radio-collared a rescued bear to understand its movement patterns. On 14th December 2008, a female black bear was fitted with a radio-collar (GPS + VHF radio collar from Habit Research) in Dachigam NP (Fig. 30). The body weight of the collared animal was estimated to be around 130-150 kg and its other morphometric measurements are given in Table.9. The collared animal was safely released in Dachigam NP and the physical condition of the animal was observed prior to its release. After 2-3 hours, the animal was located in the steep rocky area 'Mongdor' in Dachigam NP. It stayed there for a full night without moving. In the next morning, it moved around 1.5-2 Km in *Paratiopsis*- pine mixed forest probably in search of food or water but it again came back to the same place in evening probably to bed. GPS locations of the animal were downloaded using the Habit Research Receiver and plotted on the false color satellite map with 1:50000 scale. The animal was continuously monitored for 3 days and it restricted its movement in the lower part (Dachigam block) of the park for a few days (Fig. 31). Probably because of low temperature and scarcity of natural food the animal constrained in a resting place for the next 5 days and 6 nights. On 23rd December 2008, we lost the signals of the collared animals in Dachigam NP. After two days a villager near Dachigam NP reported the presence of collared animal near a cattle shed. We got the signals of the animal in the village 'Saidpura' as claimed by the villager.



Fig. 30 GPS-Collaring of the rescued Black bear at Dachigam National Park

From the downloaded GPS-Fixes we confirmed the bear's movement near that village. The collared black bear continued to be active throughout the month of December and killed nine livestock in a nearby village called 'Tailbal'. Because of the livestock depredation by this black bear, locals demanded capture of the bear from the area and the Wildlife Department captured the animal on 15 February 2009 by using culvert trap, and the collar was removed as the animal was in bad health condition. In total, this bear was tracked for 58 days. In autumn 2009, radio-tracking studies will commence again as there is a proposal for collaring six black bears.



Table 9: Morphometric measurements of collared Black bear

Parameters	Measurements (cm.)	
Body length(head to tail)	145	
Girth	129	
Neck girth	58.5	
Ear to ear length	22	
Fore limb	66	
Hind limb	74	
Ear length	12	
	Fore	Hind
Paw width	9	10
Paw length	15.6	20.5
Paw length with claws	21.1	26

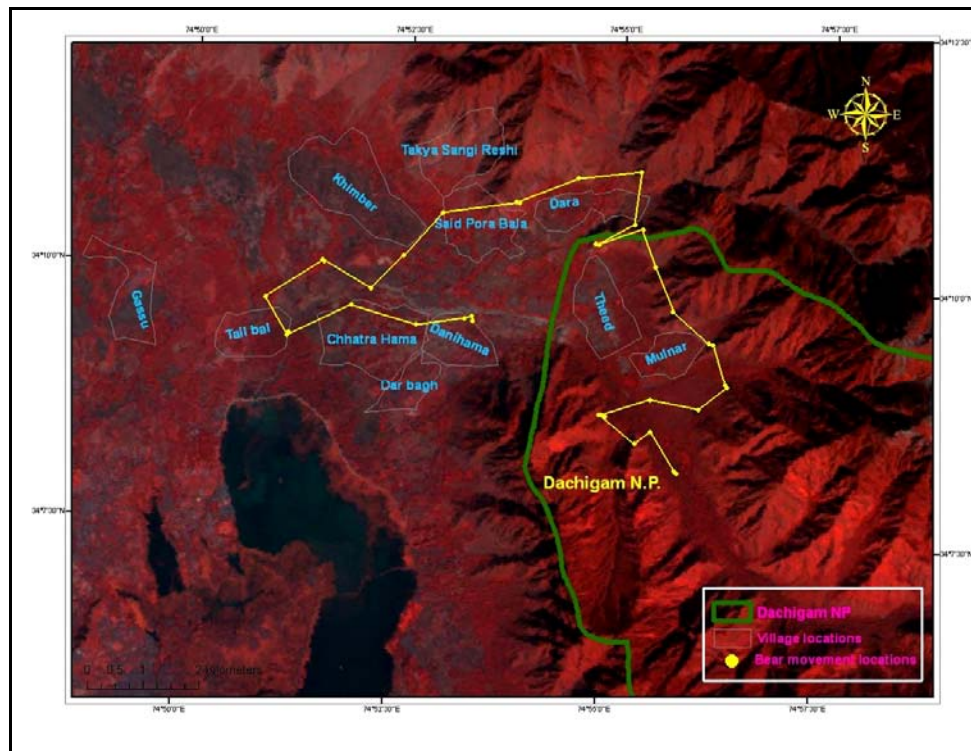


Fig. 31 Map showing locations and movement of collared black bear



Fig. 32 (a) Black bear near a crop field in Tulmul village of Central Wildlife Division and, (b) Problem Black Bear tranquilised by Wildlife Department personnel for capture and translocation



6.0 Management of Black Bear–Human Conflicts around Dachigam NP

Based on the questionnaire and field surveys carried out in the 28 villages of 18 blocks in the Central and South Divisions during 2007-09, some basic understanding of the black bear–human conflicts in this region has been obtained. Some patterns have been observed and these need to be monitored for the next few years to get a better understanding of the conflicts. Some of the preliminary recommendations for understanding and mitigating black bear–human conflicts are given below.

6.1 Black Bear-Human Conflicts Database Development and Maintenance

The basic step towards understanding and developing mitigation strategies for reducing black bear-human conflicts in these two Divisions and elsewhere in the State would be the development and maintenance of a database. The patterns of black bear–human conflicts in a large landscape both in spatial and temporal scales will be extremely important to understand underlying causes and preventing conflicts. For instance, in the State of Alaska, U.S.A, a century (1901-2000) of bear-human conflict database has been maintained (Smith and Herrero, 2008) based on which analysis, management actions and awareness education have been proposed and implemented. It is extremely important for the Department of Wildlife Protection, J & K State to develop and maintain a database on conflicts for its different regions using GIS. It would be necessary to distinguish causes and symptoms of bear-human conflicts. Changing land use patterns, development and use of black bear habitats by humans are the causes, while un-natural behavior, human habituation are the symptoms.

Database on number of conflict cases reported during 2007 and 2008 has been developed through this study and the same is being maintained by WII and the Department of Wildlife Protection J&K Govt.



6.2 Creation of Conflict Management Team

Recently, the Department of Wildlife Protection, J & K State, has initiated some management activities to deal with black bear–human conflicts. These include: payment of *ex gratia* to the victim’s family who suffered loss due to black bear; and capture and translocation of bears from affected areas into the wild. In some cases, injured bears were captured, treated and then released back into the wild (Fig. 32). A fully equipped, well trained and motivated ‘Conflict Management Team’ comprising of wildlife staff, veterinarians, staff of related line departments or institutions, and wildlife NGOs has to be formed at the Wildlife Division Level to respond to conflict situations, including bear rescue, treatment (if required), translocation and monitoring. Efficient and effective response to complaints is more feasible when rapid communication is possible from and to the conflict site and between the personnel of the Conflict Management Team and when duties are shared amongst the members of the Team. Control rooms have been established at district level and conflict management teams are established by the department at divisional level for handling wildlife-Human conflict cases. In addition, to that the state government has constituted a committee to deal with Man-Animal Conflict cases under the Chairmanship of Commissioner/ Secretary. A coordination committee headed by Principal Chief Conservator of Forests has also been constituted for the better coordination with the Forest Department to handle problem in forested areas outside PAs. The assistance of Police is also taken by the department to tackle the problem.

6.3 Awareness Creation

Knowledge on black bear behavior is essential for the villagers who live near bear habitats and suffer crop losses and are also vulnerable to bear attacks. Awareness creation through elected bodies at the village or block levels, religious or educational establishments, and other government or non-governmental agencies needs to be explored. Simple precautionary measures such as avoiding moving singly during dawns and dusks in crop fields or orchards or forests during summer and autumn could greatly reduce bear attacks on humans. Avoiding potential denning areas and



sites with high bear food abundance in different seasons by the people would minimize bear-human encounters in bear habitats. Another crucial factor that can reduce bear attacks is providing a safe passage or escape route for a stranded bear, particularly in the villages. These ‘dos’ and ‘don’ts’ were widely circulated through posters in local language. T.V and print media were also used for awareness creation for villagers in study area (Fig. 33). During the study, pamphlets and posters were distributed in the villages that were affected by black bear-human conflicts. Students were educated about wildlife through seminars, and other activities organized at Nature Interpretation Center in Dachigam NP. We propose to continue such conservation education activities in future as well.



Fig. 33 Awareness creation through media

6.4 Reducing livestock depredation by Black Bear

As most of the livestock killings have taken place at the night shelters in the villages, it would be necessary to strengthen the doors, windows and other vulnerable portions of these night shelters to reduce loss by predation to black bear and common leopard. Supervised livestock grazing by at least 3-4 villagers will reduce livestock depredation by black bear and leopard.



Villagers who were affected by livestock depredation by black bear and leopards were advised to use iron doors and proper lighting at their cattle sheds or night shelters. More than a dozen villagers replaced wooden doors with iron doors and have strengthened the walls of cattle sheds and both have been found to be very effective in reducing livestock loss (Fig. 34).



Fig. 34 A picture of a cattle shed in Saidpora village in Central Wildlife Division where the wooden door was replaced with iron door

6.5 Guarding of crop/orchards from black bear damage

A Village level cooperative effort for guarding of crop fields and orchards on rotational basis could be tried as an option using the effective means of scaring bears such as noise by drumming empty tin/metal containers. Using guard dogs while patrolling and keeping them in villages would be of added advantage. Proper lighting in the corners or boundaries of crop fields and orchards particularly the vulnerable points lying close to forest fringes may be another option that may help to reduce crop depredation as observed in a few cases during the survey. Animal-proof walls seems to very effective in reducing crop raiding by bears, but many villagers may not be able to afford it due to its high cost. The Department of Wildlife Protection, Rural Welfare, Horticulture and other line Departments of J & K Govt. in consultation with the village communities could evolve



strategies to raise financial resources for building animal-proof walls around the vulnerable portions of a few seriously affected villages on a trial basis to assess its utility and sustainability.

6.6 Changing Agricultural and Animal Husbandry Practices

Change in local cropping patterns can significantly influence Black bear-Human conflict intensity. Villagers growing Cherry in the vicinity of Dachigam NP are vulnerable to losses due to bear. If such villagers change to other crop or stop growing cherry then there is a likelihood of minimizing the Black bear-Human conflicts. Similarly, changing animal husbandry practices by keeping a few high-yielding breeds and stall feeding animals in proper shelters instead of large number of local breeds that are less productive in terms of meat and milk, could be an alternative that can reduce conflicts.

6.7 Monitoring of Conflict areas

Use of passive and preventive actions is an important step in conflict management. There should be proper monitoring of black bear-human conflict areas where at least one of the employees is present at the problem site until the situation is resolved. While monitoring the bear, information such as number, age, location, bear behaviour and the direction of the movement of the conflicting animal has to be recorded and reported. Movement of the people should be restricted to give safe passage to the problem bear.

6.8 Translocation and Marking of problem bear

The problem bears that are captured and translocated from the conflict areas should be marked by radio collar, florescent collar or, by ear tags prior to their release back into the wild so that the movement and the ranging patterns of these animals could be studied. This will be very helpful in better understanding of problem bears and ultimately help in mitigating the problem.



More than 10 Black bears were captured and translocated from the conflict sites in both Central and South Wildlife Divisions by the Department. One female bear (5 years) was captured from the conflict area, marked with fluorescent (color-coded) collar and released back to wild for monitoring its movement. Another female black bear was radio collared (GPS+ VHF) in December 2008 and released back into the wild to understand its movement and ranging patterns. This collared animal has provided some important information about the movement of problem bears and has confirmed that such bears are active in early winter and probably go in for partial hibernation. Blood samples of the rescued bears were collected for DNA studies which will help in estimating the population of black bear in Kashmir and also for the physiological changes in problem bears (Fig. 35).



Fig. 35 Marking a rescued black bear by fitting a color-coded collar, and collection of blood and hair samples from the rescued animals



6.9 Aversive Conditioning of problem bears

Aversive conditioning of a problem bear (habituated to people or raiding crops) is very much essential so that the problem bear learns to associate ‘undesirable activities’ such as entering a village, crop field or orchard with ‘negative events’. Such problem bears could be subjected to one or more of the following treatments prior to release back into the wild. The treatments include: being hit with bear pepper sprays or rubber bullets, loud noise by bursting of crackers, and barking and/or chased by specially trained dogs. During this study, rescued black bears were subjected to aversive conditioning before releasing them into the wild.

6.10 Strengthening of local and traditional black bear deterrent methods

The traditional methods of burning red chillies mixed in cow dung was experimented for many orchards in villages which were located in the periphery of Dachigam NP such as Dara, Saidpora in Cherry production season. This traditional method was found to be effective in preventing bears from entering fields and therefore recommended for the use by local villagers.





6 References

- Ahmad, K, Sathyakumar, S & Qureshi, Q. 2005. Feeding Preferences of Hangul (*Cervus elaphus hanglu*) at Dachigam National Park, Kashmir, India. Final Report of the Department of Wildlife Protection, Jammu & Kashmir Government, Srinagar, and Wildlife Institute of India, Dehradun.
- Amstrup, S.C., and Beecham, J. 1976. Activity patterns of collared black bear in Idaho. *J. Wildlife Management*. 40:340-348.
- Center for Wildlife Information 2005. Be Bear Aware- Bear Encounters: <http://www.centerforwildlifeinformation.org/BeBearAware/BearEncounters/bearencounters.html>
- Champion, H.G and Seth, S.K. 1968. A revised survey of the vegetation types of India. *Government of India Press*.
- Charoo, S.A., Sharma, L.K., and Sathyakumar, S. 2007. Asiatic Black Bear - Human conflicts around Dachigam National Park, Kashmir. Technical Report. Wildlife Institute of India, Dehradun. 36 pp
- Charoo, S.A., Sharma, L.K., and Sathyakumar, S. 2008. Distribution and relative abundance of Asiatic Black bear at Dachigam NP. Internal Annual Research Seminar, Wildlife Institute of India, Dehradun.
- Chauhan, N.P. S. 2003. Human casualties and livestock depredation by black and brown bears in the Indian Himalaya, 1989-98. *Ursus* 14(1):84-87
- Chauhan, N.P.S. 2004. Black bear – Human conflicts in Garhwal and Kumaon Hills Uttaranchal, India. Poster presentation at the Fifteenth International Conference on Bear Research and Management. San Diego, California, USA, 8-13 February 2004 (Abstract).
- Clutton-Brock, T.H. 1975. Reeding behaviour of the red colobus and black and white colobus in East Africa. *Folia primato*. 23:165-207.
- Choudhury, S., Ali, M., Mudashir, T., Ahmad, N, S., Sofi, M, N., Mughal, I., Sharma, U.J., Srivastava. A. K., Kaul. R. (2008). Predator Alert - Attacks on humans by leopards and Asiatic black bear in the Kashmir valley - Analysis of case studies and spatial patterns of elevated conflict. Wildlife Trust of India.
- Craighead L., 2000. Bears of the World, Voyageur Press, Inc. U.S.A, 132pp.
- Davis, H., Wellwood, D., Ciarniello, L. 2002. “Bear Smart” Community Program: Background Report. pp.101. (<http://www.bearinfo.org/GBOPBearSmartAssessmentReport1.19.05%20FINAL.pdf>)



- Graham, K., Beckerman, A.P., Thirgood, S. 2005. Human-predator-prey conflicts: ecological correlates, prey losses and patterns of management. *Biological Conservation* 122: 159-171.
- Hazumi, T. and Maruyama, N. 1983. Movements and home ranges of Japanese black bears in Nikko. *International Conference on Bear Research and Management*. 6:99-101.
- Hazumi, T. and Maruyama, N. 1986. Movements and home ranges of Japanese black bears in Nikko. *International Conference on Bear Research and Management*. 7:275-279.
- Iqbal, S., Quershi, Q, Sathyakumar, S & Inayat Ullah, M. 2005. Predator-prey relationship with special reference to Hangul (*Cervus elaphus hanglu*) in Dachigam National Park. Final Report of the Department of Wildlife Protection, Jammu & Kashmir Government, Srinagar, and Wildlife Institute of India, Dehradun.
- Jonkel, C.J. and McT. Cowan., I. 1971. The black bear in the Spruce-fir forest. *Wildl. Monogr.* 27. 57 pp.
- Kelley House, D. 1980. Habitat utilization by black bear in Northern California. *Int. Conf. Bear Res. And manage.* 4:221-227.
- Mace, G.M., Harvey, P.H. and Clutton-Brock, T.H. 1983. Vertebrate home-range size and energetic requirements. (IN) Swingland, I.R. and Greenwood, P.J. (Eds.). *The Ecology of Animal Movement*. Clarendon Press. Oxford. 32-53pp
- Mace, R.D., Minta, S.C., Manley, T.L., Aune, K.A. 1994. Estimating grizzly bear population size using camera sightings. *Wildlife Society Bulletin* 22, 74-83.
- Manjrekar, N. 1989. Feeding ecology of the Himalayan Black bear (*Selenarctos thibetanus*) in Dachigam National Park. M.Sc. dissertation, *Saurashtra University, Rajkot, Gujarat*. 55pp.
- Prater, S.H. 1980. The book of Indian Animals. *BNHS. Bombay*.324pp.
- Reid, D., Jiang, M., Teng, I., Qin, Z. and Hu, J. 1991. Ecology of the Asiatic black bear (*Ursus thibetanus*) in Sichuan, China. *Mammalia* 55:221-237.
- Rodgers, W.A., Panwar, H.S. and Mathur, V.B. 2000. Planning a Wildlife Protected Area Network in India. *Wildlife Institute of India, Dehradun*.
- Rodgers, A.R 2001. Recent telemetry technology. Pages 82- 121 in J.J. Millsapough and J.M. Marzloff, editors. *Radio- tracking and animal populations*. Academic Press, San Diego California, USA.



- Saberwal, V. 1989. Distribution and movement patterns of the Himalayan Black bear (*Selenarctos thibetanus*) in Dachigam National Park. M.Sc. dissertation, *Saurashtra University, Rajkot, Gujarat*. 81pp.
- Sathyakumar, S. 1999. Conservation status and of Asiatic black bear (*Ursus thibetanus*) and Himalayan brown bear (*Ursus arctos isabellinus*) in India. Bear Conservation Action Plan, *IUCCN/SSC Bear Specialist Group, Gland, Switzerland*.
- Sathyakumar, S. 2001. Status and Management of Asiatic Black Bear and Himalayan Brown Bear in India. *Ursus*. 12:21-30.
- Sathyakumar, S. 2006. Status of Asiatic Black Bear in India (IN) *Asian Bears for their Future – Asian Issues in Conservation and Management*. Chapter 2. Proceedings of Special Workshop to be held during the 17th International Conference on Bear Research and Management, Japan.
- Sathyakumar, S., and Choudhry, A. 2008. Distribution and Status of Asiatic black bear in India, 2005. *J. Bombay Nat. Hist. Soc.*, 104(3): 316-323.
- Sathyakumar, S. and Viswanath S. 2003. Observations on food habits of Asiatic black bear in Kedarnath Wildlife Sanctuary, India: Preliminary evidence on their role in seed germination and dispersal. *URSUS*. 14(1):103-108.
- Schaller, G.B. 1969. Food habits of the Himalayan Black bear (*Selenarctos thibetanus*) in Dachigam Sanctuary, Kashmir. *J. Bombay Nat. Hist. Soc.* 66(1):156-159.
- Schaller, G.B. 1977. Mountain Monarchs: Wild Sheep and Goats of the Himalaya. University of Chicago Press, Chicago. 425pp.
- Servheen, C. 1990. The Status and Management of the Bears of the World. *Int. Conf. Bear. Res. and Manage., Monogr Series No. 2*. 32 pp.
- Sharma, L.K., Charoo, S.A and Sathyakumar, S. 2008 Habitat use by Asiatic Black bear at Dachigam NP. Internal Annual Research Seminar, Wildlife Institute of India, Dehradun.
- Singh, G., and Kachroo, P. 1977. Forest Flora of Srinagar. Natraj Publishers, Publications Division, Dehradun. 98pp
- Singh, G., and Kachroo, P. 1978. Plant Community Characteristics in Dachigam Sanctuary, Kashmir, Natraj Publishers, Publications Division, Dehradun. 434pp.
- Smith, T.S. and Herrero, S. 2008. A Century of Bear-Human Conflict in Alaska: Analysis and Implications. Alaska Science Centre, Biological Science Office. (www.absc.usgs.gov/research/brownbears/attacks/bear-human_conflicts.htm.)



Appendix – I

Format used for Black Bear – Human Conflict Survey in Central and South Divisions, Kashmir during 2007-09.

S.No.	<input type="text"/>	Date:	<input type="text"/>	GPS location
Name:	<input type="text"/>	Address:	<input type="text"/>	

Crop:	Name of crop	Land	Seed used for	Yeild	Damage	Distance from

Month of damage:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
------------------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Plant part eaten:	Leaves	Fruits	Stem	Flower	Stage of crop:	Pre-mature	Mature
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Number of Livestock:	<input type="text"/>	Livestock killing:	<input type="text"/>
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Orchard damage:	Crop name	Number of trees	Production in (kg)	Damage in(kg)	Cost per/Kg

Income source:		Agriculture	Job/Government	Private/shop
Income sources				

Human-attack:()

Attack by	Place	Activity	Type	Time/place
Black bear				
Leopard				

Asiatic Black Bear (*Ursus thibetanus*) is threatened due to poaching for bear bile or skin, retaliatory killings to reduce bear-human conflicts, and habitat loss thereby leading to decline in its populations throughout its distribution range in India and Asia. Due to increasing human population and changing land use practices, much of the wildlife habitats have been lost to human habitations, expansion of agriculture/horticulture lands, and developmental activities. The Kashmir Valley in Jammu & Kashmir State is one such region where the mosaic of bear habitats, human habitations and agriculture/horticulture lands have led to increasing bear-human conflicts. The Wildlife Institute of India, Dehradun, has initiated a research project on the 'Ecology of Asiatic Black Bear in Dachigam National Park, Kashmir' with special reference to bear-human conflicts. The Dachigam landscape has one of the best known black bear populations in India with a high bear density and increasing levels of conflicts. This technical report documents the patterns of black bear – human conflicts around Dachigam National Park along with the scientific information generated from the ecological studies conducted during the years 2007-2009. Management initiatives taken up so far and the recommendations for reducing bear-human conflicts are presented.



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