

## **INTRODUCTION**

The grey wolf (*Canis lupus*) is the largest member of family Canidae, with head and body length 100-150 cm, shoulder height 66-81 cm and weight 16-60 kg. Males are heavier than females. Females are considerably smaller standing 50 cm or less at shoulder, with head and body length 100-130 cm and weight 10-17 kg. The skull is heavy and deep with strong dentition. The iris is pale greyish-yellow and the naked lips and gums are black. Legs are ochraceous in colour, paler on the insides. The body is covered with long coarse hairs of grizzled colour with black hairs being predominant in the dorsal region. The tail is less than two thirds head and body length (Roberts, 1997).

Out of 32 sub-species of wolf, two are believed to occur in Pakistan. These include the Tibetan wolf (*Canis lupus chanco*) and the Indian grey wolf (*Canis lupus pallipes*). In Pakistan, the Tibetan wolf inhabits the barren rocky mountain valleys of Baltistan, Gilgit, Hunza, Chitral, Upper Swat and Khunjerab National Park. The grey wolf is found in the deserts of Cholistan, Tharparkar and lower hills of Baluchistan (Roberts, 1997). Currently, grey wolf is also found in Khirthar National Park, Chumbi Surla Wildlife Sanctuary, Hazar Ghanji Chiltan National Park, Hingol National Park, Dureji Game Reserve and Lal Sohanra National Park (IUCN, 2003).

The grey wolf is the great roamer and occasionally occurs in almost any type of habitat but generally avoids natural forest regions and as well as densely

populated areas. It is mainly confined to remote tracks of barren hilly regions and extensive desert (Roberts, 1997). The grey wolf inhabits open plains (semi-arid grasslands, scrublands, grazing land, etc.) whereas other large carnivores are mostly forest dwellers. The grey wolf inhabits semi-arid and dry environment and prefer open plains, scrubland and agriculture landscapes. Their territories range between 150 and 300 sq km and are a function of prey and denning habitat availability (Jhala, 2003). The grey wolf lives in burrows generally in the side of sand hills or under the roots of tree. In mountain areas they occupy natural caves (Roberts, 1997).

The wolves are capable of hunting prey much larger than themselves and primarily achieved by hunting in pack. They used different strategies during hunting like stalking and rushing or chasing (Jhala, 2003). The grey wolves are the predators of both medium sized to small ungulates in much of arid and semi arid areas. Reduction in the body size decreases food demands permits the grey wolf to subsist on small size livestock, primarily goats, sheep and even on small prey like hare and rodents. In addition these wolves also eat locusts, other insect reptiles, birds and vegetable matter, like pods of *Prosopis chilensis* and fruit of *Zizyphus* spp. The grey wolves were also recorded to prey on donkeys and camel calves (Jhala, 1993). In the mountain regions, the bulk diet of grey wolf is probably made up of wild ungulates. They will also frequently kill domestic dogs and even shows a preference for this form of cannibalism on the outskirts of mountain villages. Wolves are persecuted by shooting, because of depredation on domestic goats and sheep and likely to continue decline in Pakistan (Roberts, 1997). The expansion of

agriculture activities into marginal areas, including open plains, result in loss of habitat. Decline in habitat occur due to high human population, land use pattern, development activities, grazing pressure and forest clearing and poor wild prey availability (Jhala, 2003).

The wolves being the largest of Canids have a highly developed social system. They form groups known as packs, thus a pack is normally a family unit which composes dominant male pair “The Alpha Pair” their offspring and an assortment of other adult appears to live and hunt in pairs. Pack includes up to 30 individuals, but smaller sizes of 8-12 individuals are more common. The pack stakes out and defends a resource territory from other wolf packs. Territorial defense is done by scent marking, howling and by actual strife between neighboring pack which acts as spacing mechanism to limit the number of packs in an area (Mech, 1970). Prey density and prey size regulate pack size and territory size (Jhala, 2003).

The grey wolf is mainly nocturnal in activity (Roberts, 1997). Females become sexually mature at two years of age and males at three years. Mostly litters are produced in late winter and early spring (January –April) with five to six young in a litter. The young are covered with dark brown wooly hair and their eyes remain closed until the eight days. The young suckles until eight weeks of age. Juvenile wolves can disperse from their natal pack after the age of eight month (Roberts, 1997). Disperse wander in search of mates and available habitat to establish their own territories and packs (Jhala, 2003).

The Asiatic Jackal (*Canis aureus*) is the second member of family Canidae found in Pakistan. It resembles with wolf in general appearance with relatively shorter legs and slimmer muzzle, adult male stands 38-43 cm at shoulder and head and body length of 60-75cm. Average weight ranges from 7-9 kg in the plains and up to 12.2 kg in the northern Himalayan regions. The body fur is rather coarse and wiry with a sandy-buff appearance. The backs of ears are brownish-buff with an indistinct darker border and upright pointed. The naked lips and rhinarium are black. The hairs around the eyes lips and throat are whiter. The tail has a black tip (Roberts, 1997).

In Pakistan, jackals are widely distributed through out the country and found in all types of habitats (IUCN, 2003). It is an adaptable animal found in mountainous areas, forest plantations and riverine thickets. It is well adapted to dry, open country and generally avoids extensive natural forest, though numerous in irrigated forest plantations (Prater, 2005). The Jackal is found throughout the plains, Balochistan and North West Frontier Province. They do not penetrate into higher mountain regions but may be found in most of the broader Himalayan valleys. They are not uncommon in the southern part of Chitral and are relatively scarce in extensive desert tracts such as Thal or Cholistan. They particularly frequent rural villages and smaller towns, attracted by refuse and garbage (Roberts, 1997).

The bulk of their diet comprises of rodents and reptiles but also eat fruit and insects when available. The stomach contents of four Jackals examined from the semi-desert regions of Rajasthan (India) were found to contain mostly the fruits of

*Zizyphus* with a small quantity of Dung Beetles (*Helicopriss bucephalus*), scorpions (*Palaemneus spp.*) and beetle (*Anthia sexguttata*). Another individual had the remains of Desert Jirds (*Meriones hurrianae*) and small Mongoose (*Herpestes auropunctatus*) in its stomach. Jackals will rob any bird's nest which they encounter but their principal food is probably gerbils and jirds. They often feed on ripe fallen mulberries (*Morus alba*) during the month of April, and during November. They regularly visit the ground underneath pipal tree (*Ficus religiosa*) (Roberts, 1997).

Jackals normally hunts singly, they are social in habits and invariably call to each other as they emerge in the early evening, each individual joining in an answering of yelping and barking. Usually one individual emits a long, drawn out wail followed by three to five rapidly repeated and high pitched yelps which are taken up by other individuals within hearing, like most of the Canidae the male jackal regularly scent their territory by depositing urine on conspicuous bushes and grasses clumps (Roberts, 1997).

Jackals excavate their own burrows; the female excavates a separate den before giving birth to young. They breed throughout the year in India but in Pakistan during the spring and summer months. Litters are born in the second week of April with up to five young per litter. The gestation period is known to be normally sixty- three days. The adult male is an attentive mate and then guards the entrance to the breeding burrow when the young are newly born and later on also assist regurgitating food at the entrance of a breeding den. The young are covered with dark sooty- brown hairs and at six days of age their eyes were still closed and they were too feeble to crawl (Roberts, 1997).

Currently, the Grey wolf has been declared endangered by IUCN Taxon data sheet (2003) and Pakistan red list of Mammals (Sheikh and Molur, 2005). The Asiatic Jackal has been declared near threatened in Pakistan (Sheikh and Molur, 2005). Scientific data on the ecology and population status of both the species is lacking which is required for their management in their natural habitat including the Salt Range. The present study will strive to fill the gap in information about these *Canis* species which could be used for their conservation.

The objectives of the study are:

1. To estimate the population and distribution of *Canis* species in Lehri nature park.
2. To determine the threats to the *Canis* species in the park.
3. To suggest measures for the conservation of *Canis* species in the park.

## **REVIEW OF LITERATURE**

Roberts (1997) reported that the Grey wolf occurs in almost any type of habitat but generally it avoid natural forest region as well as densely populated or well cultivated area and mainly confined to the remoter tracts of extensive desert or barren hilly regions. Presently, grey wolf has become rare throughout the Indus plains and survives mainly in extensive desert regions such as Cholistan and Tharparkar. In the Indus plains wolves live in burrows which they excavate themselves, generally in the side of sand hills or under the roots of tree. In mountains areas they occupy natural caves or excavate burrows under the boulders. It ascends into mountains regions of Pakistan from Balochistan up to Chitral, Gilgit and Baltistan in the north.

Prater (2005) reported that the Indian wolf may live in forest but in India they are more common in bare and open regions. In barren uplands of Kashmir, Ladakh and Tibet they lived as nomadic coming down to the valleys in winter, migrate with game and grazing flock to the snow line in summer. In these parts, holes, caves and cavities in rocks provide them shelter in winter and thickest or reeds and scrub with a refuge in summer. In Indian desert wolves shelter from the heat in burrows dug in sand dunes.

Singh and Kumara (2006) concluded that the Indian gray wolf is the major large carnivore in the plains of Karnataka, India. Their distribution is now mostly restricted to the north-eastern dry plains. The available 'remote area' (rocky terrains

or forests) in the wolf-occupied regions determined the status of wolf. They proposed that the management of these small forest patches, considering them as components of a larger landscape, is the only effective conservation practice for the wolf. Although existing locally in low densities, because of a large ranging area of a single pack, the seemingly isolated wolf packs can become parts of a large metapopulation, providing a sustainable population. Sharma (1978) perceived that population of Indian wolf found in Orissa, Bihar and parts of west Bengal is an exception that occur in moist forest habitats, but not reported in thick forest. Wolves occur on the periphery of some protected forest areas which are under heavy biotic pressure from surrounding human population and are reduced to scrub forest.

Jhala and Giles (1991) observed that range of Indian grey wolf in Gujarat and Rajasthan is continuous and recommended a wolf conservation strategy which include: encouraging public support and education, enforcing legal protection, paying compensation for wolf-killed livestock and surveys of wolf populations and research on their populations, habitats, etc. Shahi (1982) observed that Indian wolf evolved during the drier spell of Pleistocene to exploit a relatively unoccupied niche as top carnivores. Wolves are believed to have evolved in boreal forest system as predator of large ungulate, it is rather surprising than the Indian wolf rarely lived in forest and prefer scrubland grassland and semiarid pastoral/agriculture landscapes.

Rajpurohit (1999) concluded that for the mitigation of human-wolf conflicts, a conservation strategy for wolves might include; surveying wolf habitats

for identification of dens and rendezvous sites, estimating wolf populations, capture of problem wolves, improving compensation to victims' families, research on wolf behavior, rabies, wolf/dog hybrids, and the prey-base, possibilities for introducing natural prey and regulation of wolf populations.

Roberts (1997) reported that Asiatic Jackal is found throughout the plains and throughout Balochistan and the North West Frontier Province. In the summer months they can be regularly found in the forested hills of Hazara and Murree up to 2150m elevation. Though they do not penetrate into higher mountain regions they may be found in most of the broader Himalayan valleys. They are not uncommon in the southern part of Chitral. They are relatively scarce in extensive desert tracts such as Thal or Cholistan (Roberts, 1997).

Prater (2005) reported the Jackal living in almost any environment, in humid forest country, or in dry open plains or desert. Asiatic Jackals have been found at an elevation of 2,102-3,604 m in the Himalayans. Asiatic Jackal is an adaptable animal, readily entering mountainous areas, forest plantations and riverine thickets. It is well adapted to dry, open country and generally avoids extensive natural forest, though it is extremely numerous in irrigated forest plantations. Most of the populations lived in the low lands around towns, villages and cultivation and shelter in holes in the ground among ruins or in dense grass and scrub.

Poche *et al.* (1987) perceived that the feeding range of several jackals in Bhal, India overlapped. Jackals were observed to range over large distance in

search of food and suitable habitat and linear forays of 12- 15 km in a single night. Home range size varies from 1.1-20 km<sup>2</sup> depending on the distribution and abundance of food resources.

Jhala (1993) concluded that the Jackals often scavenge off the kills of larger predators like lion, tiger, leopard, spotted hyenas, dholes and grey wolf. They have been observed following grey wolf on a hunt and scavenging off wolf kills without evoking any hostile reaction from the wolves in India. Duckworth *et al.* (1998) reported the Asiatic Jackal in Laos in open deciduous forest areas at low altitudes. The species seems to be quite scarce and may have declined in the region. Jaeger *et al.* (1996) observed that Jackals in India howling is more frequent between December and April a time when pair bonds are being established and breeding occurs suggesting a role in territory delineation and defense. Singh (1983) perceived that Pythons (*Python morulus*) were a major predator of jackals in Corbett National Park, India. Jackals are often chased and sometimes killed by feral dogs when they approach human habitations. Spotted hyenas also have been observed to kill and feed on Asiatic jackals

Poche *et al.* (1987) reported that the Asiatic Jackal occupied semi desert short medium grass lands savannahs in Africa and forested, mangrove, agriculture, rural and semi-urban habitat in India and Bangladesh. Jhala (2006) reported that the den excavations begin in late April to May with dens primarily located natural and manmade embankments, usually in scrub habitat. Rivulets, gullies, road, check-dams and prime denning habitats although drainage pipes and culverts have served as den on several occasions in Bhal, India. Jaeger *et al.* (2007) observed that Asiatic Jackals are locally common in Nepal, despite intensive cultivation and high

human densities. Jackals were less common all in the course of the year where floodwaters occurred that would have excluded them for one to three months during their pup-rearing season.

Poche *et al.* (1987) observed that the jackals caused damage to melon, peanut grape, coffee, maize and sugar cane crops and they also takes to killing lambs kids week sheep, goats and poultry. Giannatos *et al.* (2005) used jackal howls for population estimation Asiatic Jackal in Greece. The results of the study showed that both populations and distribution area of jackals have been declining steadily during the last three decades. The Asiatic jackal has disappeared from Central and Western Greece.

## **MATERIALS AND METHODS**

### **3.1 STUDY AREA**

#### **3.1.1 Geographical Location**

The study was conducted in the Lehri Nature Park district Jhelum. The geographical location of the Lehri nature park is centered on Latitude  $32^{\circ}41' N$  and Longitude  $72^{\circ} 32' E$ . The park covers an area of 6672 ha; elevation ranges from 250 m to 1025 m and forms the most eastern extension of the Salt Range (Awan, 1998). The northern edge touches the Mangla Reservoir, while east and west boundaries are close to the Mangla cantonment and Lehri village, respectively. Grand Trunk (GT) Road from Lahore to Rawalpindi serves as southern boundary of the park (Awan, 1998). The study area has two major divisions; the Lehri Reserve Forest and Jandi Reserve Forest. Lehri Nature Park was notified as reserve forest in 1987 for the protection of natural vegetation and fauna of the park. It contains 41 compartments with total area of 7010 ha. Jandi Reserve Forest covers an area of 2164 ha having 16 compartments and is located in the north of the Lehri Nature Park. An area 388 ha was transferred to the army in 2007 and named as Lehri firing range. Hence the total area of the Lehri Nature Park is 6672 ha at present. The Punjab Forest and Wildlife Departments manage the park (Forest department district Jhelum).

### **3.1.2 Climate**

The climate of the area is sub-humid type. There are two distinct rainy seasons: monsoon rains (July-September) and winter rains (January-March). The average rainfall varies from 48 to 69 mm per annum, but in the rainy season the water torrents flow from North to the river Jhelum with a very fast speed and cause damages to the crops, bridges, roads and are responsible for the soil erosion in the area. Most of the precipitation is received during July and August. The mean monthly temperature ranges from 5.9-38.4 °C, January being the coldest and June the hottest month of the year. During winters the temperature often drops to below zero usually in December and January (Awan, 1998).

### **3.1.3 Topography**

Lehri Nature Park is part of Pothwar plateau (latitude 32° 10 to 34° 9 N and longitude 71 ° 10 to 73 ° 55 E) which covers an area of more than one million hectares. The topography of the study area is generally flat to gently undulating surface, locally broken by gullies and low hills ranges. High intensity monsoon rain fall and undulating topography are the main causes of the water erosion in the area, which is firm with the covering with scrub vegetation. Physical features of the area such as vegetation cover, ground morphology (broken, unbroken, smooth, boulder or small rock) and erosion, cliffs, caves and water sources are noted as was slope, elevation and aspect by directed observation by using appropriate instruments.

### **3.1.4 Geology**

Sedimentary rocks and the fossils preserved gave a complete record of the

geological and biological history of the area. The geology of the study areas consist of the rocks, soil and minerals. The rocks are composed of limestone and sandstone or both. The rocks present in the study area mostly of primary rock. The over use of vegetation has accelerated rates of erosion resulted in bare sheet rocks. Texture of soil comprises of the following categories such as sandy loam, sandy clay loamy and clay loam along with their percentages such as, 15%, 81% and 4% respectively of the study area. The texture percentage of sandy loamy soil is highest among the other texture of the soil in percentage hence; the majority of the soil consists of sandy clay loam soil in Lehri Nature Park (Forest department district Jhelum).

### **3.1.5 Flora**

The study area falls under dry sub-tropical, semi-evergreen scrub forest. The dominant plant species include; *Acacia modesta*, *Olea ferrugenia*, *Salvadora oleioides*, *Zizyphus nummularia*, *Dodonea viscosa*, *Prosopis glandulosa*, *Calotropis procera*, etc. Shrubs are sparse with scattered *Zizyphus nummularia*, except in some ravines and on the high ridges where *Dodonea viscosa* is prominent. Grasses of the park includes *Cymbopogon jwarancusa*, *Eleusine compressa*, *Heteropogon contortus*, *Aristida adscensionis* and *Cynodon dactylon* (Awan, 1998).

### **3.1.6 Fauna**

Lehri Nature Park is scrub forest which also supports great diversity of wildlife species including, mammals, birds and reptiles. Major wildlife species of the park included Fox (*Vulpes vulpes*), Hare (*Lepus nigricolis*), Hedgehog (*Hemiechinus collaris*), Striped Hyena (*Hyena hyena*), Common Mongoose

(*Herpestes edwardsi*), Little Indian Mouse (*Mus booduga*), Pangolin (*Manis crassicaudata*), Pig (*Sus scrofa*), Porcupine (*Hystrix indica*) and Urial (*Ovis vignei*) (Awan, 1998). Major game bird species are Chukar partridges See-See partridges, black and grey partridges. Partridges were in plenty due to topography and nature of the vegetation of the area. Passerine birds were mostly observed chirping in the vicinity of water or in the agricultural fields. Sand grouse, Red turtle dove, black drongo, Purple sunbird, Birds of prey and Scavenger birds were also observed (Awan, 1998).

## **3.2 METHODOLOGY**

### **3.2.1 Sampling Plot**

A preliminary survey of the study area to find out the occurrence and also the potential habitat of *Canis* spp. The potential habitat of the *Canis* spp. was divided into four major zones within the study area. The stratified random sampling technique was used for population estimation. The sample plots were randomly selected in these potential zones and were separately sampled for populations of the *Canis* spp. Each transect was sampled by walking during the morning and evening times to observe the signs of the *Canis* spp. The distance traveled was recorded by using of Global Position System (GPS).

### **3.2.2 Population Density**

Data on population density of *Canis* spp. was collected by direct and indirect observations using the line transect method. Each transect was 500 m length and 10 m width at appropriate intervals. Population density was calculated by dividing the

no. of signs observed by the total area survey. The total population was estimated by multiplying the density with the potential habitat area. Population of the species was calculated by multiplying the population in the samples with the total study area. In addition to direct observation, any indices such as pug marks, prey consumed, etc was noted.

### **3.2.3 Pug Marks Survey**

The pug marks surveyed was conducted under the principle of line transect method. The pug marks were keenly observed while walking on transect and also on suitable places such as near water reservoirs, river and stream beds, dusty and damp ground and dry nullah beds. The pug marks were also observed near the depredation on the livestock in the study area. The pug marks were identified from size and shape. The data was collected on the data sheet of the pug marks. The transects were also selected on the presence of their natural prey, .i.e. Urial. These sites consisted of the sandy and dusty ground. These were monitored on the consecutive days for the collecting of indirect signs of the *Canis* species.

### **3.2.4 Dens Survey**

The den survey of *Canis* spp. was carried out in the selected sites in the study area. Water availability, remoteness from human disturbance, visual cover and shade were the critical parameter for the denning sites. Canids milk is dilute and the females need to drink a lot of water so as to produce milk (Jhala, 1999). Fresh water holes were located in the study area. The radius of about 2 km keenly surveyed for any denning of the *Canis* spp. The survey was also conducted near the river and stream embankments for the denning (Jhala, 2003).

A global position system (GPS) was used to record the distance of the dens from the nearest water body, metallic road, track, human habitation and cover and also between the two denning sites. However, during surveyed most of the denning sites were occurred near the rock crevices which were observed for the collection of any indirect evidences of the *Canis* species.

### **3.2.5 Depredation Survey**

The wolves are capable of hunting prey much larger than themselves and primarily achieve by hunting in pack. They use different strategies during hunting like stalking and rushing or chasing (Jhala, 2003). The grey wolves are the predators of both medium sized to small ungulates in much of arid and semi- arid areas (Jhala, 1991). The information was collected from the local peoples living in and around the study area. Based on this, eight villages were selected out of which five were those where the depredation occurred repeatedly. The selected villages were located on the boundary of the study area.

The depredation survey was conducted in these five villages by meeting with the locals and nomadic shepherds. The information collected about the killed livestock was confirmed by personally meeting one of the members of the victim family and observing the remains of the prey killed by the grey wolf and taking by taken the photographs for distance from the fenced area and the location of the killed prey in the study area.

### **3.2.6 Interviews**

To get secondary information on livestock depredation by wolf, interviews are conducted with the help of questioner selected villages five namely Dart, Lehri,

Buden mera, Bakhra and Goffa. The interviews are taken from the local residents, nomads, hunters, and field staff and especially from the victim of the livestock depredation. The data was collected on the type and number of livestock killed by the wolf per month/seasons. Total number of live stock owned by them and time, date and place of depredation was noted.

### **3.3 HABITAT STRUCTURE ANALYSIS**

#### **3.3.1 Vegetation Analysis**

Vegetation analysis was carried out with random sampling methods in all representative areas in the habitat. The quadrates method was used for obtaining the data on plants community structure and cover of particular species in a sample plot. The area was divided in to seven stands on the basis of physiognomic contrast. Fifteen quadrates were laid systematically in each of the stand. Plot size was used that is 10m X 10m for tree layer, 4m X 4m for all woody undergrowth to 3m in height, and 1m X 1m for the herb layer (Schemnitz, 1980).

The trees were counted and the circumference of each tree was determined at breast height and converted to basal area, Density, frequency and canopy cover/basal area thus measured were changed to relative values. Three parameters Relative density, relative frequency and relative canopy cover were added to get which gave importance value (I.V.) for each of the recorded species (Hosetti, 2000). The dominants plants were used for naming the community (Malik and Hussain, 1990). For calculating plant density, frequency, abundance etc.

### 3.3.2 Density

Density relates to the number of plants rooted within each quadrat. The sum of the individuals of a species was calculated for the total area sampled.

$$\text{Density of species A} = \frac{\text{Total no. of individuals of species A} \times \text{area of a plot}}{\text{Total no. of plots sampled}}$$

$$\text{Relative density of species A} = \frac{\text{Density of species A}}{\text{Total density}} \times 100$$

### 3.3.3 Frequency

It relates to the percentage of total quadrants that contain at least one rooted individual of a species.

$$\text{Frequency of species A} = \frac{\text{No. of plots in which species A occurs}}{\text{Total no of plots sampled}}$$

$$\text{Relative Frequency of species A} = \frac{\text{Frequency value of species A}}{\text{Total frequency value of all species}} \times 100$$

### 3.3.4 Cover

It is the percentage of quadrant area beneath the canopy of a given species. Area occupied by the aerial projections of the plants in different strata was measured by the crown diameter method.

$$\text{Crown cover} = \frac{[D_1 + D_2]}{\pi}$$

where

D1 = First measured crown diameter

D2 = Second measured crown diameter

Cover percentage was determined as,

$$\text{Relative cover} = \frac{\text{Cover of individuals of a species} \times 100}{\text{Total cover of all individuals of all species}}$$

$$\text{Relative Dominance of spp A} = \frac{\text{Total basal area of species A}}{\text{Total basal area of all species}} \times 100$$

Basal area of a species was a sum of basal area of individual trees of that species which will be calculated using the formula:

Basal area =  $\pi (d / 2)^2$  Where, d= diameter of tree at breast height.

### **3.3.5 Importance Value Index (IVI)**

IVI of a tree species was obtained by the summation of relative density, relative frequency and relative dominance.

$$\text{IVI} = \text{relative density} + \text{relative frequency} + \text{relative dominance.}$$

## **RESULTS AND DISCUSSION**

### **4.1 DISTRIBUTION AND HABITAT**

The study on two *Canis* spp. i.e. Grey wolf and Asiatic jackal was conducted from September 2008 to July 2009 in Lehri Nature Park. For the purpose of data collection on distribution and population status of these species, the study area was divided into four zones which are at different altitudes and have different vegetation cover based on their potential habitat. Both of the species were mostly found in the northern and southern regions of the study area. The evidences of presence of these species were recorded in Compartment Nos. 2, 3, 4 and 5 in the north part of the study area which have dense vegetation cover (Plates 1 & 2) and Compartment Nos. 26, 27 and 28 in the southern part which are distribution of the livestock near the human settlement. Both of the animals were found near the hamlets which were situated around Lehri Nature Park. Signs of these species were frequently recorded near the villages of Lehri, Gadari, Drat and Buden Fig (4.1).

To determine habitat preference of Grey wolf and Asiatic jackal, vegetative survey of these potential habitat areas was conducted. Sites for survey were selected close to the areas of their presence such as dens, depredation and pug marks. Dominant tree species in their preferred habitat were *Acacia modesta*, *Zizyphus nummularia*, *Prosopis juliflora*, etc. (Table 4.1).

**Table 4.1. Tree species in the habitat of *Canis* spp. in the study area.**

<b>S. No</b>	<b>Common Name</b>	<b>Botanical name</b>	<b>Relative cover</b>	<b>Relative density</b>
1.	Phulai	<i>Acacia modesta</i>	34.04	21.05
2.	Koko ber	<i>Zizyphus nummularia</i>	18.91	13.16
3.	Jundii	<i>Prosopis juliflora</i>	15.13	7.89
4.	Kikar	<i>Acacia nilotica</i>	11.35	5.26
5.	Jund	<i>Prosopis cineria</i>	11.35	2.63
6.	Tali	<i>Dalbergia sissoo</i>	6.05	7.89
			100.0	100.00

Shrubs are probably more important in providing cover to the Canids. Dominant shrub species in these areas included *Dodonea viscosa*, *Calotropis procera* and *Adhatoda zeylinica* Table (4.2). In those areas caves and cavities in the rocks were also noted which provide shelter and cover for dens to both of these species. Presence of fresh water holes was also recorded in their habitat areas. They preferred the undulating surface broken by gullies and low hill ranges having gentle slopes. The grey wolf and Asiatic jackal were distributed between the altitudes of 330 m to 515 m in the study area (Jhala, 1991).

#### **4.2 POPULATION ESTIMATION**

Data on population size of Grey wolf and Asiatic jackal was collected through indirect observations using the line transect method. The population density of Grey wolf and Asiatic jackal was determined by using the pug marks and denning sites in each zone of the study area. The pug marks were observed while walking along the transects and also near the depredation sites. The pug marks of both the species were differentiated from others animals by their shape and size. Measurements of wolf pug marks were taken at four different sites which were about 5 inches (Plates 3, 4, 5 & 6). The size of the pug mark of Grey wolf has also been reported as 5 inch in measurement by Donald (1948). The estimated population density of Grey wolf was 0.1 animals per km<sup>2</sup> and total population was estimated 6 individuals in the study area (Table 4.3). The depredations data of the wolves is also an evidence of the presence of wolves in the study area. A high density wolf population up to 5 wolves per 100 km<sup>2</sup> has been reported in some habitat pockets and reserves (Jhala, 1991). Population density of the Asiatic jackal

**Table 4.2. Shrubs in the habitat of Canis spp. in the study area**

<b>S. No</b>	<b>Common name</b>	<b>Botanical name</b>	<b>Relative cover</b>	<b>Relative density</b>
<b>1</b>	Sanatha	<i>Dodonea viscosa</i>	26.48	23.68
<b>2</b>	Bhaikar	<i>Adhatoda zeylinica</i>	15.13	15.79
<b>3</b>	Ak	<i>Calotropis procera</i>	18.91	10.53
<b>4</b>	Karir	<i>Capparis aphylla</i>	7.56	13.16
<b>5</b>	Bata	<i>Periploca aphylla</i>	7.56	2.63
<b>6</b>	Pairi booti	<i>Latana camera</i>	3.78	5.26
			100.0	100.00

was estimated 0.42 per km<sup>2</sup> and total population estimation in the study area was 28 individuals (Table 4.4).

A survey of denning sites of Grey wolf and Asiatic jackal was also conducted in the study area. A total 8 dens were located in plains, less disturbed and remote areas. Three dens were located in remote area about 4 km away from the nearest village out of which one of the den was active. The active den was of Asiatic jackal which was identified by the pug marks of Asiatic jackal. Most of dens were between rocks in the valleys covered by bushes or made by digging on hill slopes. Three dens were located in plain areas near the river embankment that was about 2 km away from the villages. Two denning sites were observed near the village in which one of the den was active. The active den was found through the howling of jackals at night and fresh pug mark near the den. This den was covered by thick vegetation of *Prosopis juliflora* that were about 3 km from the nearest fresh water hole. The culverts and water pipelines were also used by the Asiatic jackal as denning sites. Six dens sites were found inactive in the study area at different localities. None of the dens of Grey wolf were found active in the study area (Table 4.5).

**Table 4.3. Population estimation of Grey wolves in Lehri Nature Park**

<b>S.No.</b>	<b>Zones</b>	<b>Area covered (km<sup>2</sup>)</b>	<b>No. of Pug marks</b>	<b>Population Density/ km<sup>2</sup></b>	<b>Total population of wolves</b>
	A	15	2	0.13	
<b>2</b>	B	12	-	-	
<b>3</b>	C	10	1	0.10	
<b>4</b>	D	13	2	0.15	
<b>Total</b>		<b>50</b>	<b>5</b>	<b>0.1*</b>	<b>6</b>

---

**\*Weighted mean**

**Table 4.4. Population estimation of Asiatic jackals in Lehri Nature Park**

S.No.	Zones	Area covered ( km <sup>2</sup> )	No. of Pug marks	Population Density/ km <sup>2</sup>	Total population of Jackals
1	A	15	7	0.47	
2	B	12	5	0.42	
3	C	10	3	0.30	
4	D	13	6	0.46	
<b>Total</b>		<b>50</b>	<b>21</b>	<b>0.42*</b>	<b>28</b>

**\*Weighted Mean**

**Table 4.5. Distribution of Dens of Canis spp. in Lehri Nature Park.**

S.No.	Zones	Area covered Km <sup>2</sup>	Fresh water holes	Active dens (Jackal)	Inactive Dens	Total Dens	Distances (km)From fresh water holes
1.	A	15  (Remote area)	2	1	2	3	4 km
2.	B	12  (Plains)	1	-	2	2	2 km
3.	C	10 ( Plains near river)	1	-	1	1	2 km
4.	D	13 (Dense vegetation)	2	1	1	2	3 km
<b>Total</b>		<b>50</b>	<b>6</b>	<b>2</b>	<b>6</b>	<b>8</b>	

### 4.3 POPULATION TREND

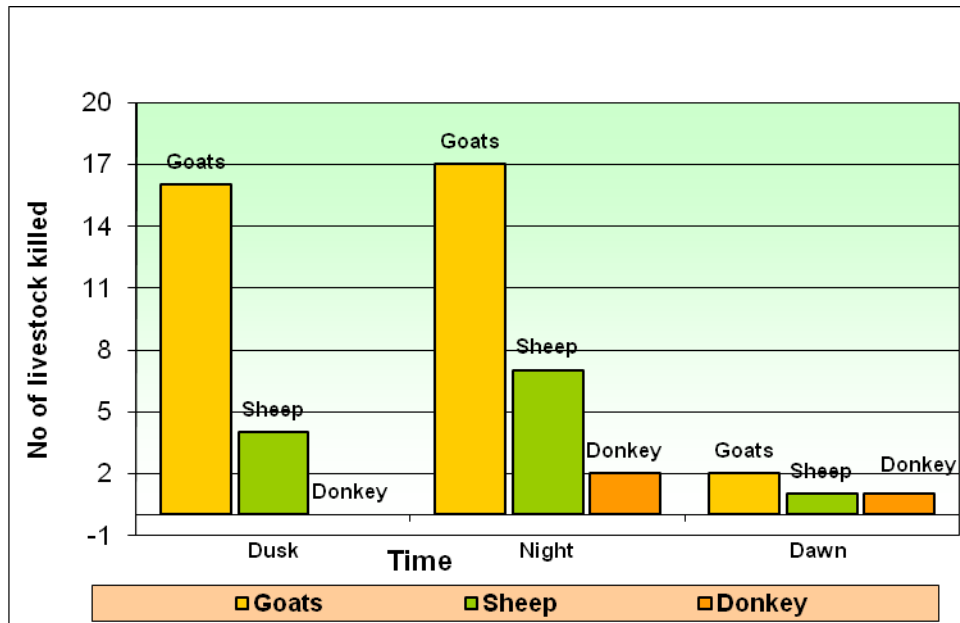
Secondary information gathered through a questionnaire revealed that during the past 25 years, both Grey wolf and Asiatic jackal have been the permanent residents of the study area. These species have done a lot of damage to the livestock in the area at different occasions in the past, the wolves have been killing 1-2 goats daily in different localities of Lehri Nature Park. The respondents told that they usually heard the sound of both the species in different localities of the study area.

The density of natural prey of these species was rich in the past, but due to illegal killing, shooting, poaching and military exercises in the study area density of the natural prey has decreased. Urial is one of the natural prey species in the study area but, presently the density of Urial is low and only found in the selected compartments. Hence, this is probably one of the reasons that decrease in natural prey population have resulted in the decline of grey wolf population in the area. Disturbance in the habitat of both the species through firing and military exercise may also have affected their populations. The local people informed that the grey wolf is not the permanent resident of the study area for the last 2 years and moves around in the surrounding areas of Lehri Nature Park. Probably, Grey wolf and Asiatic jackal have shifted from their potential habitat in the study area to the surrounding areas due to the above mentioned reasons i.e. decreased natural prey and disturbance. The wolves depend upon the livestock of locals and nomadic shepherds in the study area. The rate of killing of livestock was not as high as in the past year. The nomadic shepherds reside here in winter and migrate in summer to the higher areas.

Nomadic shepherds used to select the places with grazing potential and availability of water for their livestock. The killing rate of livestock by wolves increases when nomadic shepherds are present here but it reduces when they leave the area. Presence of nomadic shepherds and killing rate may have a relation with the shifting of the wolves from the study area. Therefore, it could be concluded that the population trends of the Grey wolf and Asiatic jackal decreased in the study area due to less availability of the natural prey species and habitat destruction and movement of the nomadic shepherds in and out of the Lehri nature park.

#### **4.4 DEPREDATION OF LIVESTOCK BY GREY WOLF**

Secondary information about depredation of livestock by the wolves was collected through the interviews conducted with the help of questionnaire in selected villages namely Drat, Lehri, Buden mera, Bakhra and Goffa. The respondents included the local residents, nomads, hunters, field staff of wildlife department and especially those whose livestock was killed by wolves. The confirmation of the attack by the wolves in the study area was done by using the photographs and GPS reading. Total numbers of respondents was 70. Majority of the killing was done during the night and dusk (Fig 4.2).



**Fig 4.2 Depredation of livestock during Night, Dusk and Dawn**

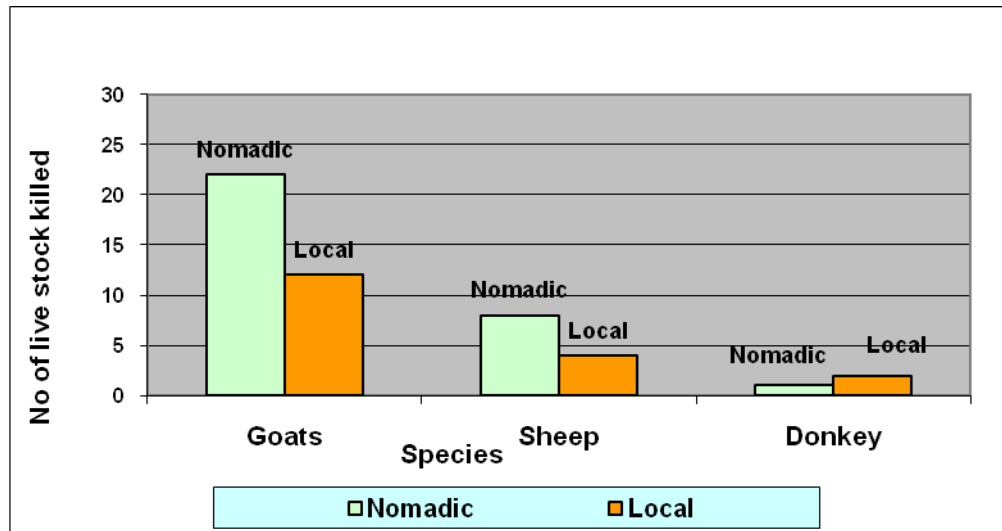
The data of depredation on goats, sheep and donkeys was separately noted along with the time, number of livestock killed and number of wolves involved. During the study period, highest killing of livestock were in the Lehri village which is 19, followed by Drat (11), Bakhara (8) and Buden (13) (Table 4.6). Goats formed major portion of wolf attacks with 27 (66%) individuals killed in all the four villages. Sheep followed with 11 (27%) killings and donkey only 3 (7%) killings (Plates 7,8 & 9).

Result of depredation indicated that the goats and sheep were the major prey species of wolves in study area. Attacks on donkeys by the grey wolf were only reported in the villages of Drat and Bakhara.

The interviews were taken of local and nomadic shepherds who were the eye witness of attacks on livestock by wolves which was further confirmed through discussion and by using the pictures of grey wolf. Nomadic shepherds hold a large numbers of livestock as compared to locals, so were severely affected by depredation as compared to local people Fig (4.3).

**Table 4.6 Depredation of livestock by Wolves in different Villages of the study area.**

<b>Sr.No</b>	<b>Place</b>	<b>Goats</b>	<b>Sheep</b>	<b>Donkeys</b>	<b>Total killed</b>
<b>1</b>	Lehri	13	6	0	19
<b>2</b>	Buden	3	0	0	3
<b>3</b>	Bakhra	3	3	2	8
<b>4</b>	Drat	8	2	1	11
<b>Total</b>		<b>27 (66%)</b>	<b>11(27%)</b>	<b>3 (7%)</b>	<b>41</b>



**Fig 4.3 Depredation of livestock by the wolves of Nomadic and local People**

The local people reported that majority of the livestock killing were outside the enclosures but in some of the cases the wolf attacked inside the fence. The fence was 3-4 meter in height and surrounded by the thorny bushes. In some of the attacks prey was carried away from the fence by the wolf to the distance of 250-300 meters.

Survey revealed that 100% of the respondents know about the Grey wolf and Asiatic jackal in the study area, and 28% of the respondents have themselves seen both the species. Attack on human beings was not reported by any of the respondent in that region. No evidence of Grey wolf predation on Urial in the recent years was reported by the locals and staff. The nomadic communities take measures to protect their livestock from the wolf predation which include maintaining guard dogs, fencing by thorny bushes and bringing the stock back to the village each night. According to the respondents, wolf is not the permanent resident of the area and keeps on moving to surrounding areas due to lack of prey species, habitat destruction, human population interference and disturbance by military exercises in the study area (Table 4.7).

**Table 4.7. Secondary information on Grey wolf and Asiatic jackal in the study area**

Sr. No	Questions	Option	Respondents	
			Numbers	%
1.	Know Grey wolf and Asiatic Jackal.	Yes	70	100
		No	0	0
2.	Existence in this area.	Yes	66	94.28
		No	01	1.42
		Not known	03	4.28
3.	The more common spp.	Grey wolf	05	7.14
		Asiatic jackal	65	92.85
4.	Area/village have any history about these spp.	Yes	67	95.71
		No	01	1.42
		Not known	02	2.85
5.	Existence of grey wolf in the area.	10 years	03	4.28
		20 years	05	7.14
		30 years	60	85.71
		Not known	02	2.85
6.	Seen grey wolf personally.	Yes	20	28.57
		No	50	71.42
7.	Seen Asiatic Jackal personally.	Yes	60	85.71
		No	10	14.28
8.	Attacks on livestock by the grey wolf	Yes	62	88.57
		No	08	11.42

<b>9.</b>	Livestock attacked by the grey wolf.	Goats	62	88.57
		Sheep	06	8.57
		Donkey	02	2.85
<b>10.</b>	Attack on human by the grey wolf	Yes	01	1.42
		No	69	98.57
<b>11.</b>	Natural prey species of the grey wolf.	Urial	45	64.28
		Hares	10	14.28
		Birds	15	21.42
<b>12.</b>	Population trend in the prey spp.	Increased	06	8.57
		Decreased	62	88.57
		No change	02	2.85
<b>13.</b>	Reasons for population decline of prey species.	Illegal killing	36	51.42
		Habitat degradation	12	17.14
		Military firing	20	28.57
		Not known	02	2.85
<b>14.</b>	Major threats to the Canis Spp. in the area.	Lack of prey availability	40	57.12
		Military exercises	15	21.42
		Habitat degradation	13	18.57
		Not known	02	2.85
<b>15.</b>	Measures for the conservation of grey wolf & A. jackal.	Paying compensation	60	85.71
		Legal protection	05	7.14
		Awareness and education	05	7.14

#### 4.5 THREATS

The major threats to Grey wolf and Asiatic Jackal population in the Lehri Nature Park included loss of habitat, biotic pressure by the human i.e., grazing, fuel wood collection and human wolf conflict due to depredation on their livestock. The part of the potential habitat of Grey wolf and Asiatic Jackals was disturbed by encroachments and military exercises i.e. firing which has resulted in shifting of many wildlife species from the study area. Grey wolf and Asiatic jackal have probably also moved in the surroundings of the study area.

The questionnaire survey revealed that Urial, hares and birds were the natural prey of Grey wolf (Table 4.7). The density of these prey species was rich in the past, but due to illegal killing, shooting, poaching and habitat loss, their population has decreased in the study area. Hence, this was probably the major reason that dependence of wolves had increased on the livestock of local and nomads shepherds. Presently, their main prey species was the livestock i.e goats and sheep. The loss of livestock to wolf was higher for nomadic shepherds than the local shepherds. However, wolves face more persecution from local shepherds as compared to nomadic shepherds. The grey wolf was persecuted by shooting in some part of the study area by the local residents. Wolves are presecuted by smoking pups in their dens and dig out dens to kill the pups (Jhala, 2003). Den smoking and digging out den to kill the wolf pups was not reported in the study area.

## SUMMARY

The study was conducted to collect data on distribution range, population status, and threats to Grey wolf and Asiatic Jackal in Lehri Nature Park from Aug 2008 to May 2009. The data on population was collected using direct observations and indirect signs in the field. The line transect method was used for population density by using stratified random sampling techniques. Data on plant community structure and cover of particular species was obtained by using line transect method.

## CONCLUSIONS

The grey wolf and Asiatic jackal occur in the Lehri nature park. The population of grey wolf and Asiatic Jackal were scattered into pocket of the study area and its surroundings. Grey wolf is not the permanent resident of the study area. The current population of grey wolf was estimated 6 individuals and that of Asiatic jackal 28 individuals in the study area.

The present study showed that Grey wolf and Asiatic jackal were distributed in the northern and southern part of the study area having dense vegetation cover of tress and shrub between the altitudes of 330 m and 515 m. It was noted that the scrub forest is the preferred habitat of both the species but due to biotic pressure of local people this forest is under threat. The dominant trees species in their were *Acacia modesta*, *Zizyphus nummularia* and *Prosopis juliflora* and shrubs species of *Dodonea viscosa*, *Calotropis procera* and *Adhatoda*

*zeylinica*. They preferred the undulating surface broken by gullies and low hill ranges having gentle slopes.

Urial is one of the natural prey species in the study area but, their population is low due to number of reason and therefore the maximum dependence of the wolves was on the livestock of the local and nomadic shepherds. The main prey species in the livestock was goats and sheep. The personal contact and interviews were conducted with the eye witnesses of wolf attacks including Bashir, Jamil, Qasim and Khwaja told that their livestock were killed by 4-5 number of wolves in different hamlets in the study area.

The killing rate of the livestock by the wolves was greater when the nomadic shepherds were present in the area and decreased when they left the area. Presence of nomadic shepherds and killing rate has relation with the shifting of the wolves from the study area. The depredation in the surrounding areas by the grey wolf on the livestock was also noted. Therefore, it could be concluded that the Grey wolf and Asiatic jackal occur in the study area. The population of the Grey wolf and Asiatic jackal has decreased in the study area over the time due to less availability of the natural prey species and habitat destruction.

## **RECOMMENDATIONS**

- The potential habitat should be protected for the conservation of Grey wolf and Asiatic jackal.
- Habitat should be protected with prohibition on collection of forest products, domestic livestock grazing, forest fires, and other human activities.

- Conducting research studies and monitoring of *Canis Spp.* population in the Lehri Nature Park.
- Paying compensation to the owners of the livestock killed by wolf.
- Enforcing legal protection by wildlife department and Forest department.
- Encouraging public support and environmental education and awareness.

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## **ANNEXURE**

### **PLATES**



**Plate 1. Potential habitat of Grey wolf in north of the study area near Mangla dam.**



**Plate 2. Potential habitat of Grey wolf in north of the study area near Forest Rest House.**



**Plate 3. Pug mark of Grey wolf in Lehri village in the study area**



**Plate 4. Pug mark of Grey wolf in Lehri village in the study area.**



**Plate 5. Pug mark of Grey wolf in Bakhra village in Study area.**



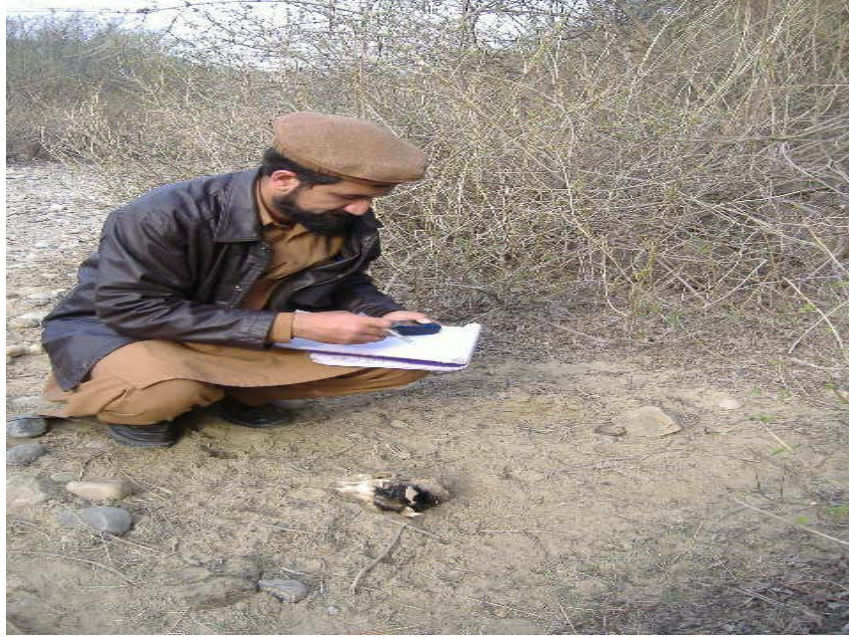
**Plate 6. Pug mark of Grey wolf in Drat village in the study area.**



**Plate 7. Predation on donkey by the wolves in the study area.**



**Plate 8. Predation of sheep by grey wolf in the study area.**



**Plate 9. Predation of goat by grey wolf in the study area.**



**Plate 10. Interviews with the eye witness in Drat village in the study area.**



**Plate 11. Sighting of Urial in the Study area.**



**Plate 12. Sighting of Urials in the Study area.**

## QUESTIONNAIRE

### A. General Information

1. Respondent Name: \_\_\_\_\_
2. Location: \_\_\_\_\_
3. Gender: \_\_\_\_\_
4. Education: \_\_\_\_\_
5. Profession: \_\_\_\_\_
6. No. of Livestock:            Goats            Sheep            Buffalos
7. Firewood source:            Forests            Market
8. Total number of house holds in the village
9. Total number of guard dogs in the village

### B. Information about the Carnivore Species

10. Please enlist the carnivore species of the area?
  - 
  - 
  - 
  -
11. Which one is the more common, please mention it? \_\_\_\_\_

### C. Information about the Grey wolf and Asiatic jackal

12. Do you know Grey wolf and Asiatic jackal? Y/N
13. Does both of species exist in your area?    Y                            N
14. If yes, did you heard about from any one or see both species by yourself?
15. Does your village or area have any history about these species? If yes please specify those
  - a. attacks on human beings            No.                            Year
  - b. attacks on livestock                No.                            Year
  - c. attacks on donkeys                 No.                            Year
16. If yes, where? Does these species have any den site in your area?
17. If yes, where these species could be seen periodically?
18. If no, where these species has migrated?
19. Please mention some of the major reasons of the Grey wolf extinction/migration according to yours opinion?
  - Lack of prey availability
  - Shooting
  - Poisoning
  - Habitat destruction
  - Killing for skin
  - Trapping for money
  - Human Population load
  - Military exercises

20. How many years ago did this animal exist in your area?  
a. 10 years,                      b. 20 years,                      c. 30 years
21. Do you have any information about the recent past killing/attacking incidence related to wolf in the area Yes -----, No -----
22. If yes, then where? Please provide the information;
- Name of the species
  - Village name
  - Forest type
  - GPS reading                      N    E
  - No. of the animals killed
  - Is there any eye witness?
23. What are the major prey species of the Grey wolf in the area?
- - 
  - 
  - 
  -
24. Has there any change occur in the prey species of the wolf in the area?  
a. Increased                      b. Decreased                      c. No change
25. What are the reasons behind that?
26. What were the major threats to Canis Spp. in your area?
27. Please do suggest some important measures for the conservation of the Grey wolf and Asiatic jackal

**The End**