



## Survey on abundance of carnivores and their prey in Kalesar NP and WLS in Haryana, India

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### Abstract

A survey was conducted to find out the status of carnivores and their prey in Kaleswar National Park (30°18' to 30°27' North latitude and 77° 25' to 77° 35' East longitude) and Wildlife Sanctuary (30° 16' to 30°28' North latitude and between 77°20' to 77° 37' East longitude) in Haryana, India. A total of nine trails were surveyed covering 32.2 km in February-April, 2012. Among this, about 23.8 km trail of national park area and another 8.5 km of wildlife sanctuary was surveyed. Survey covered Guga and Kalesar beats in national park area and Faizpur, Tibriyan and Ambala beats in wildlife sanctuary area. The 'presence – absence' survey was conducted to find out carnivores and their prey population. Presence of carnivores and prey was also determined from signs (pugmarks, scrape, scat, kill remains etc.). Among carnivores, leopard (*Panthera pardus*), jackal (*Canis aureus*), hyena (*Hyanea hyanea*) and fox (*Vulpes bengalensis*) were found during survey. However no sign was found about the presence of tiger in Kalesar NP & WLS. Among prey, sambar (*Cervus unicolor*), spotted deer (*Axis axis*), barking deer (*Muntiacus muntjak*), chowsingha (*Tetracerus quadricornis*), wild boar (*Sus scrofa*) and elephants (*Elephas maximus*) were found during survey. Number of indirect evidence of leopard was 1.02 per km followed by Jackal (0.09/km), and both hyena and fox (0.02/km). Number of indirect evidence of sambar was 0.71 per km followed by spotted deer and wild boar (0.37/km), barking deer and elephant (0.12/ km), nilgai (0.9/ km and chowsingha (0.03/ km) (Fig.-7). Study confirms that tiger was not present in both Kalesar NP and WLS. However, leopard was very common in both the parks. Abundance of prey though widely distributed their population size might be not that enough to support major predator like tiger. However, it is good habitat for small carnivore.

**Keywords :** Kalesar, Carnivores, Prey, Leopard.

### 1. Introduction

Habitat loss and fragmentation due to urbanization are among the primary threats to global biodiversity (McDonald *et al.*, 2008; McKinney, 2002). Mammalian carnivores tend toward large home ranges, low population densities, and slow population growth rates, making them especially vulnerable to extinction brought on by habitat loss or human persecution (Gittleman *et al.*, 2001; Noss *et al.*, 1996).

Carnivores (eg. tiger, leopard, jackal, fox, hyena etc.) have been considered prophetic indicators of the overall fate of ecosystems due to their top-level trophic position (Crooks *et al.*, 2010; Estes *et al.*, 2001; Faeth *et al.*, 2005; Noss *et al.*, 1996). Therefore, carnivores can be useful as a tool to measure the relative health of ecosystems.

Big cats (tiger and leopards) are not only a flag bearer of conservation but also an umbrella species for majority of eco-regions in the Indian

subcontinent. Its role as a top predator is vital in regulating and perpetuating ecological processes and systems (Sunquist *et al.*, 1999). The carnivore needs large undisturbed landscapes with ample prey to raise young and to maintain long term genetic and demographic viability (Seidensticker and McDougal, 1993; Karanth and Sunquist, 1995).

Habitat fragmentation due to urbanization can cause the decline or local extinction of fragmentation-sensitive carnivores (Crooks 2002). The loss of large carnivores can facilitate the ecological release of smaller mesopredators that readily adapt to urban environments, potentially contributing to increased predation on smaller prey such as birds (Crooks and Soule, 1999). In addition, roads and urban development can act as physical and social barriers for gene flow and direct causes of mortality due to collision (Dickson *et al.*, 2005; Tigas *et al.*, 2002). Increased human activity and recreation associated with urbanization can lead to the behavioral displacement of carnivores (George and Crooks, 2006; Mathewson *et al.*, 2008; Tigas *et al.*, 2002). Exposure of carnivores to wildlife diseases and poisons also is common in urban areas. Landscape connectivity via corridors, coupled with the preservation of large habitat areas, can lessen the numerous impacts of urbanization and are considered important for the persistence of carnivores in urban areas (Crooks and Sanjayan, 2006).

Based on projected human population growth, the researchers predict that many carnivore species will join into the list of endangered species by 2030. Most of these species live in Africa, where human populations are growing faster than the global average. It is indicated that as human population pressures increase, it becomes ever more important to take account of each species biological traits to best predict which species will become most vulnerable.

The National Tiger Conservation Authority (NTCA) of India under Ministry of Environment and Forests, Govt. of India initiated monitoring

and survey of tiger and other species of carnivore and their prey across India (Jhala *et al.*, 2011). However, no survey was conducted in Kalesar NP and WLS. Therefore, this study was aimed to find out the abundance of different carnivores and their prey species in Kalesar NP & WLS.

## 2. Study areas

The study was conducted in Kalesar Wildlife sanctuary and Kalesar National park, Yamuna Nagar and Haryana, India. Both Kalesar Wildlife Sanctuary (between 30°6' to 30°28' North latitude and between 77°20' to 77°37' East longitude) and Kalesar National Park (located 30°18' to 30°27' North latitude and 77°25' to 77°35' East longitude) are situated in district Yamuna Nagar of Haryana State. Both the parks are sharing the boundary with three states viz. Himachal Pradesh, Uttar Pradesh and Uttarakhand. The Yamuna River forms the Eastern boundary with Uttar Pradesh, the main Shiwalik ridge separates state boundary among Haryana, Himachal Pradesh and Uttarakhand in the north.

It was notified as Wildlife Sanctuary in the year December, 1996 with an area of over an area of 54.06 km<sup>2</sup> the entire area is very rich in plant and animal species and has historical, economic and medicinal significance.

The KWLS has a number of water bodies, both natural and man-made which provide wetland habitat. There is mixed to dry deciduous forest cover with central tracts of Sal, Shorea robusta.

The temperature in Haryana is very hot in summers when temperatures go up to even 46°C. But in the winter the region is quite cold. The rainfall in the region is low. The average daily relative humidity for April is around 46%.

## 3. Methods

**Monitoring of tiger and leopard population** : The 'presence – absence' survey was conducted to find out tiger and leopard population. Animal trails were also searched to ascertain the movement. Presence of tiger and leopard was determined from signs (pugmarks,

scrape, scat, kill remains etc.). Survey effort was maintained in terms of total distance walked during each effort. In the search effort, GPS location of every sign was recorded.

### Prey abundance and distribution

**Ungulate evidence count :** Indirect signs (pellet / dung / hoof mark / scratch / wallowing / digging) were counted in the sample plots to ascertain frequency of occurrence of the species and their distribution.

**Pellet - Group Counts :** Pellet – group count was done in the sample plots. The method, widely used as an index of ungulate abundance, was first

described by Bennett *et al.*, (1940), and has since been improved by Eberhardt and Van Eten (1956) and established as a reliable method for a variety of conditions.

### 4. Results

A total of nine trails were surveyed covering 32.2 km. Among this, about 23.8 km trail of national park area and another 8.5 km of wildlife sanctuary was surveyed. Survey covered Guga and Kalesar beats in national park area and Faizpur, Tibriyan and Ambala beats in wildlife sanctuary area (Table-1). Details of the findings are given below :

**Table -1 :** Different beats of Kalesar NP & WLS where trails were laid

Beat	NP/WLS	Trail (km)	Forest
Guga Beat	KNP	3	Closed forest
Kalesar Beat	KNP	4	Closed forest
Faizpur Beat	KWLS	3	Open forest
Kalesar and Guga Beats	KNP	5.3	Close forest
Kalesar Beat	KNP	4	Open/ Shrub forest
Tibriyan Beat	KWLS	3.5	Open forest
Ambwala Beat	KWLS	2	Open forest
Kalesar Beat	KNP	4	Closed forest
Kalesar Beat	KNP	3.5	Closed forest

#### 4.1 Abundance of carnivores and prey

Among carnivores, leopard (*Panthera pardus*), jackal (*Canis aureus*), hyena (*Hyanea hyanea*) and fox (*Vulpes bengalensis*) were found during survey. However no sign was found about the presence of tiger in Kalesar NP & WLS. Among prey, sambar (*Cervus unicolor*), spotted deer (*Axis axis*), barking deer (*Muntiacus muntjak*), chowsingha (*Tetracerus quadricornis*), wild boar

(*Sus scrofa*) and elephants (*Elephas maximus*) were found during survey.

Interestingly, there was no sighting of carnivore during survey. But several indirect evidences were recorded during survey. Pug marks were the most common (76.3%) means of indirect evidence followed by scat (15.8%), nesting or resting sign (5.3%) and hairs (2.3%) (Fig. - 1). These clearly indicate that pug-marks were the common indirect evidence of carnivores.

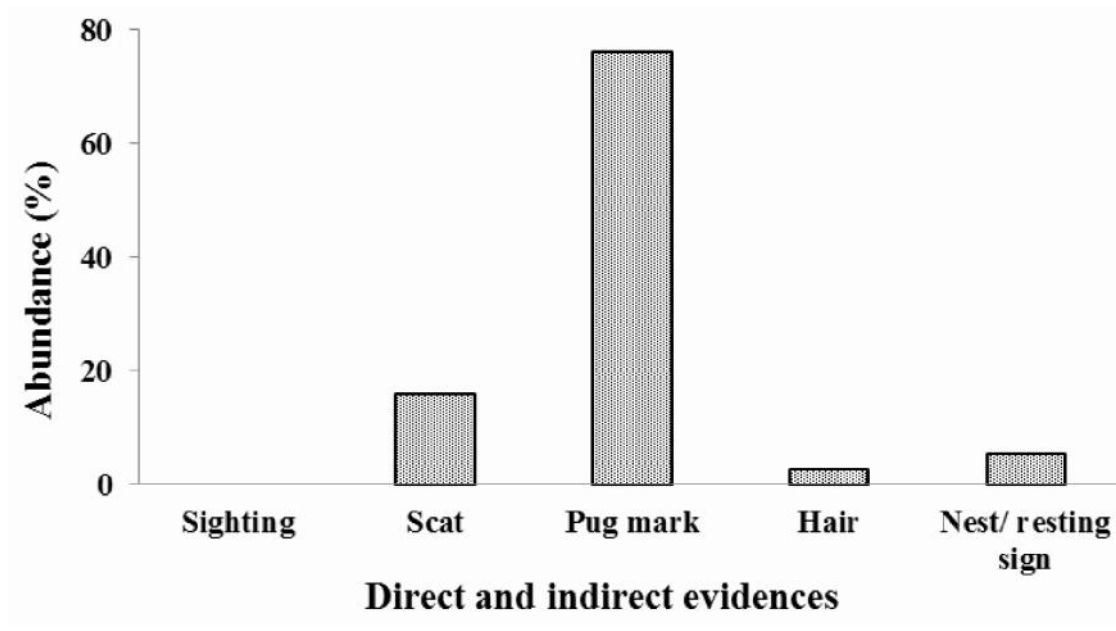


Fig. - 1 : Abundance of direct and indirect evidences of carnivore.

Species wise abundance of different indirect evidence also showed similar trend (Fig. - 2). Pugmark was the most common indirect sign except fox.

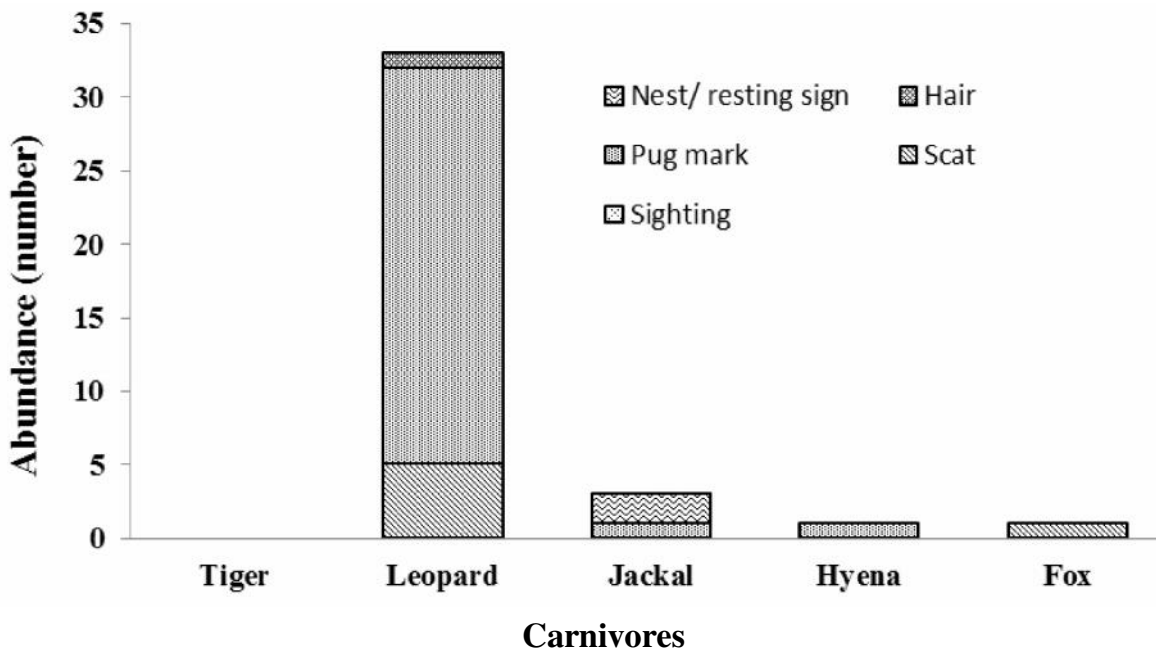


Fig. - 2 : Carnivore Species wise abundance of direct and indirect evidences.

Like carnivore, sighting of prey species were also very rare (5%). But indirect evidences were common throughout the park. Like carnivore, hoofmark was the most common indirect evidence (56%) followed by pellet/dung (32%) and other (hair, rubbing sign and carcass) by 7% (Fig. - 3). This clearly indicates that hoof mark was most common means of indirect sign for prey species.

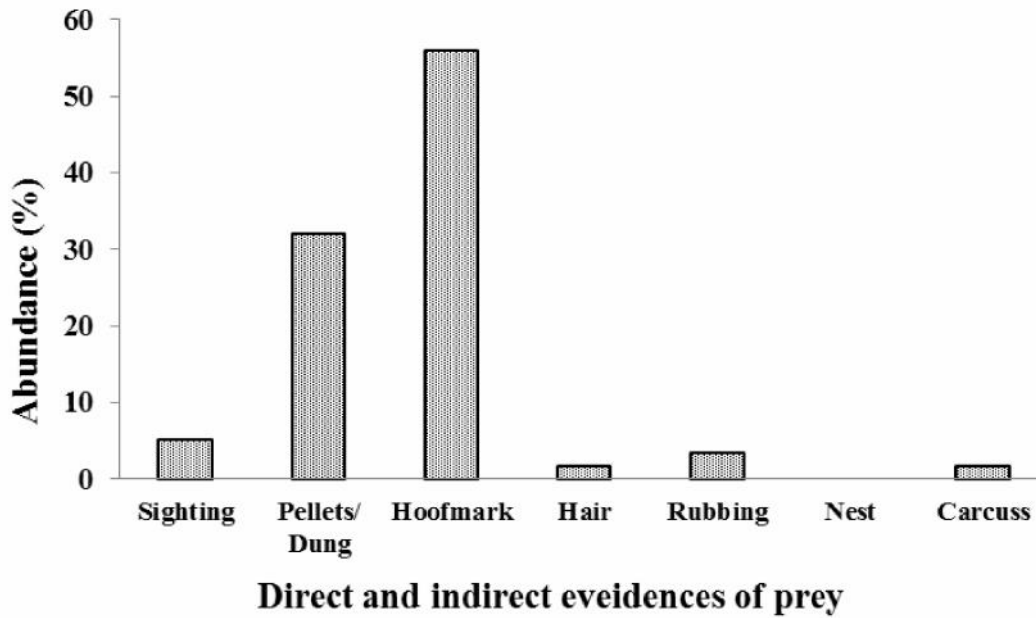


Fig. - 3 : Abundance of direct and indirect evidences of prey.

Prey species wise abundance of different indirect evidence also showed similar trend (Fig.- 4). Presence of hoofmark was the most common and pellet/dung was the second most common indirect sign.

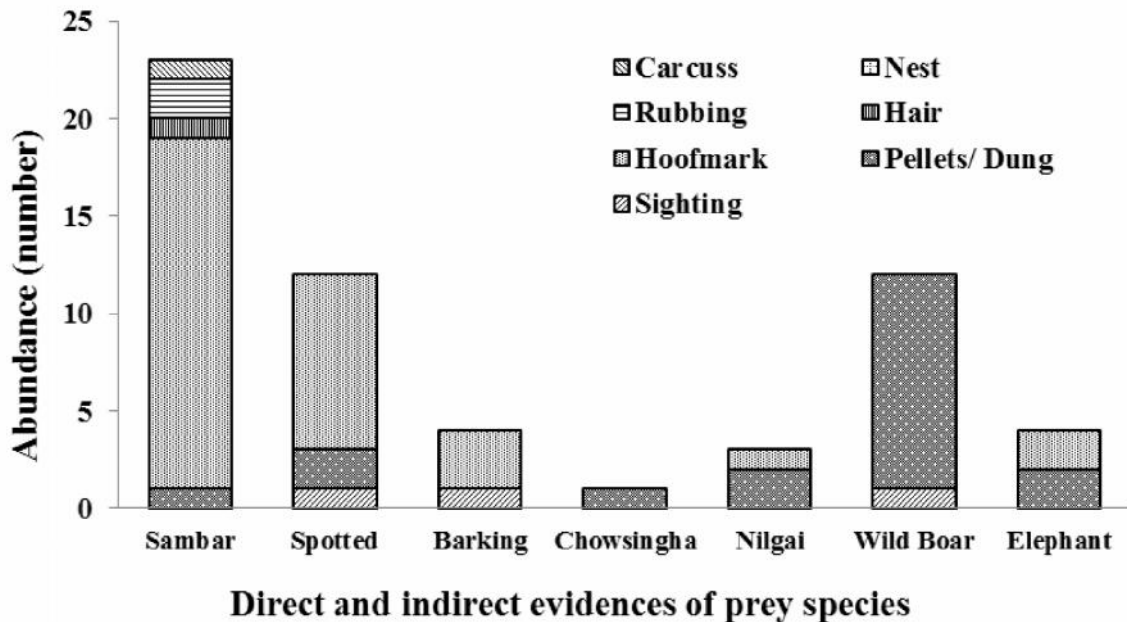


Fig. - 4 : Prey species wise abundance of direct and indirect evidences.

#### 4.2 Encounter rate

Number of indirect evidence of leopard was 1.02 per km followed by Jackal (0.09/km), and both hyena and fox (0.02/km) (Fig. - 5). This clearly indicates that leopard was the most common carnivore widely distributed in Kalesar.

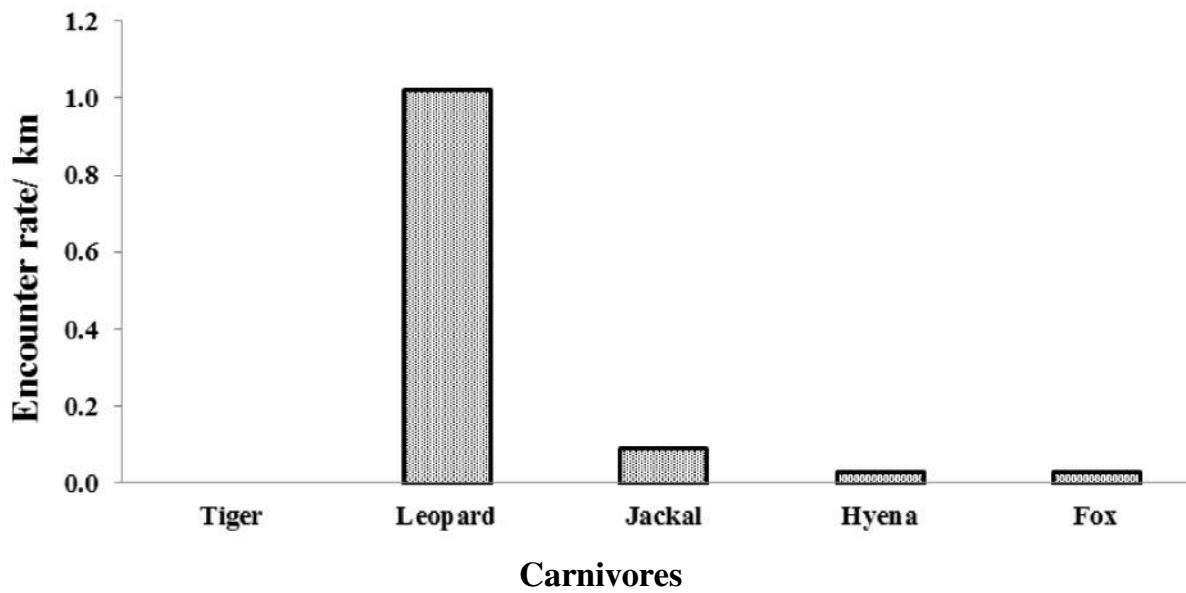


Fig. - 5 : Carnivore encounter rate (both direct and indirect sign) in Kalesar.

Leopard was also the most common carnivore in Kalesar NP (1.13/ km) and Kalesar WLS (0.71/ km). Interestingly, no evidence of jackal, hyena and fox was found in Kalesar WLS (Fig. - 6). This clearly indicates that leopard was common in both the protected areas.

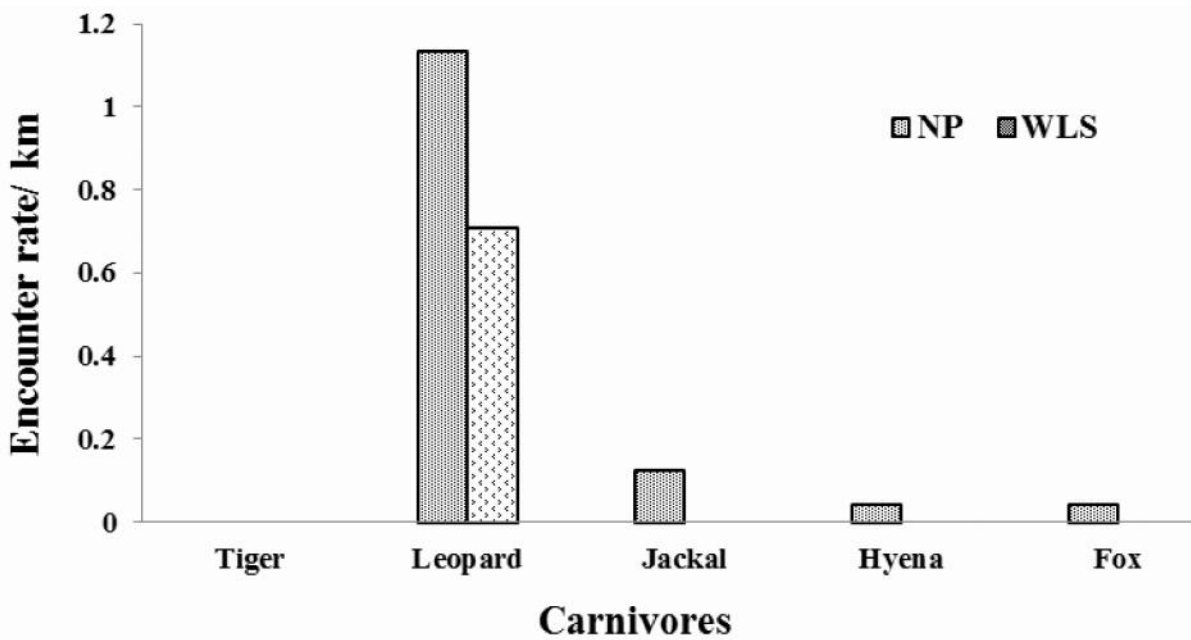


Fig. - 6 : Carnivore encounter rate in Kalesar NP and Kalesar WLS.

Number of indirect evidence of sambar was 0.71 per km followed by spotted deer and wild boar (0.37/km), barking deer and elephant (0.12/ km), Nilgai (0.9/ km and chowsingha (0.03/ km) (Fig. - 7). This clearly indicates that sambar, wild boar and barking deer were the most common prey species widely distributed in Kalesar.

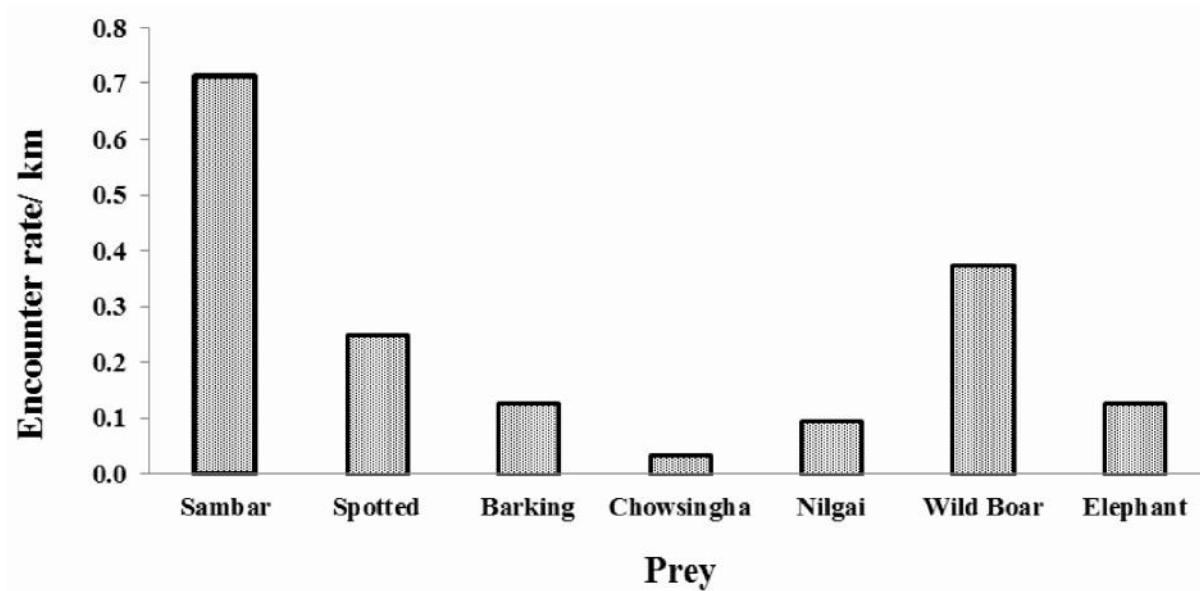


Fig. - 7 : Prey species encounter rate (both direct and indirect sign) in Kalesar.

In Kalesar NP, sambar, spotted deer and wild boar were most common prey species. But in Kalesar WLS, sambar, wild boar and barking deer were common prey species (Fig-8).

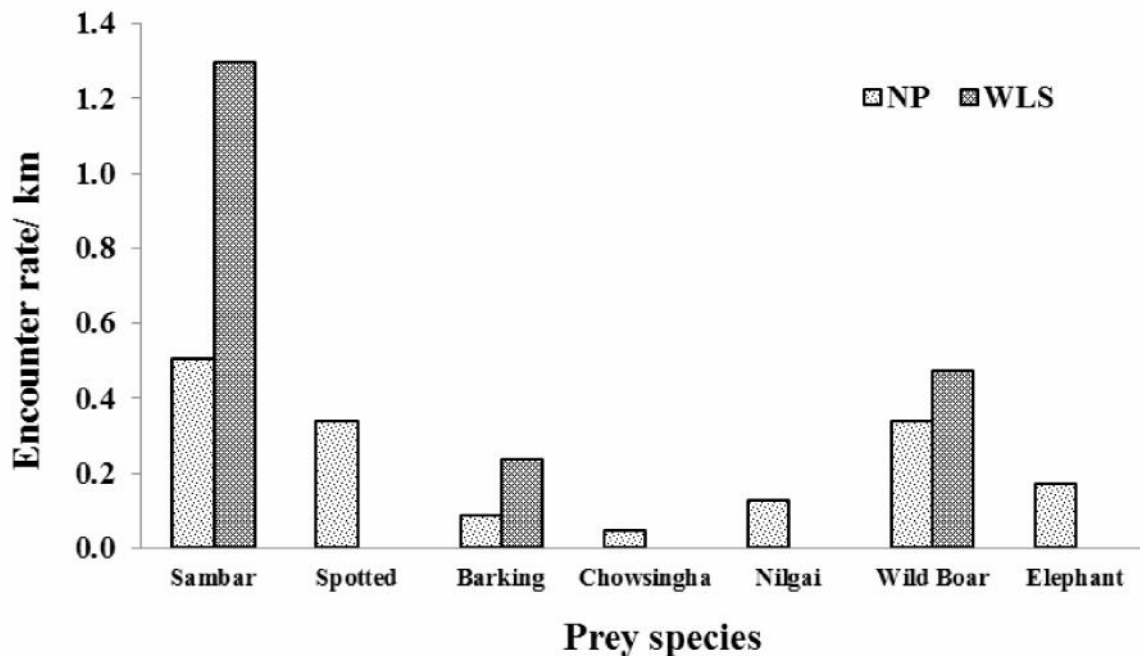


Fig. - 8 : Prey species encounter rate in Kalesar NP and Kalesar WLS.

### 4.3 Habitat selection

Study found that both Sal dominated and open forest were preferred habitat for prey species. Similarly carnivores were also found in sal dominated and open forests (Fig. - 9). This clearly indicates that distribution of carnivores depend upon the distribution of prey species.

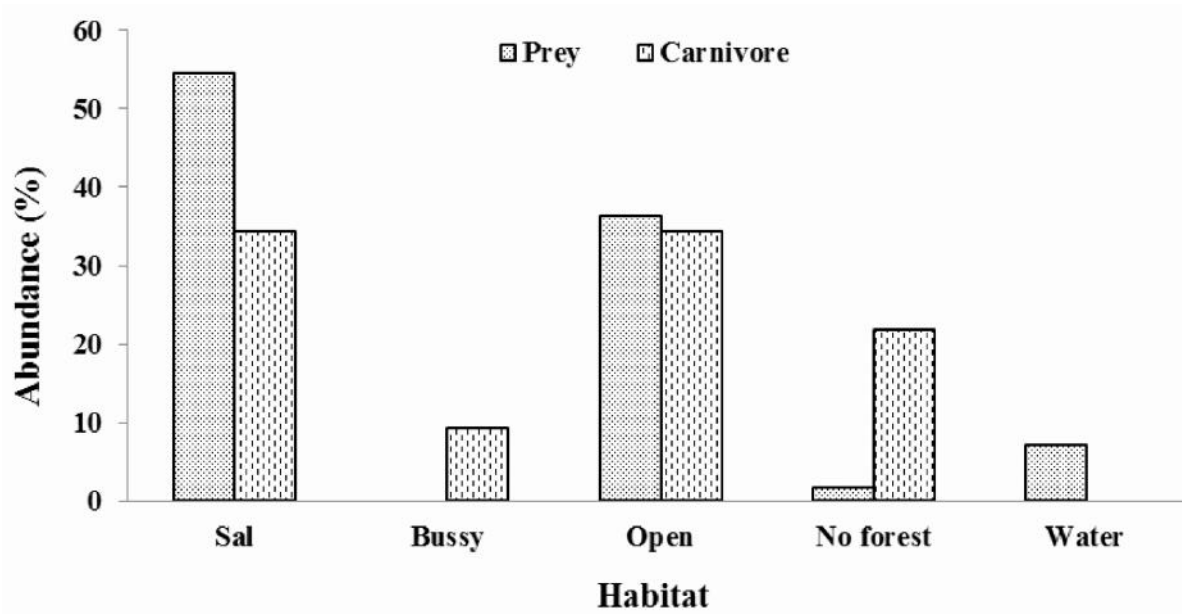


Fig. - 9 : Habitat selection by prey and carnivore species.

#### 4.4 Terrain selection

Study also found that leopard prefers both plain and gentle slope in Kalesar. However, jackal, hyena and fox preferred only the plain terrain (Fig. - 10).

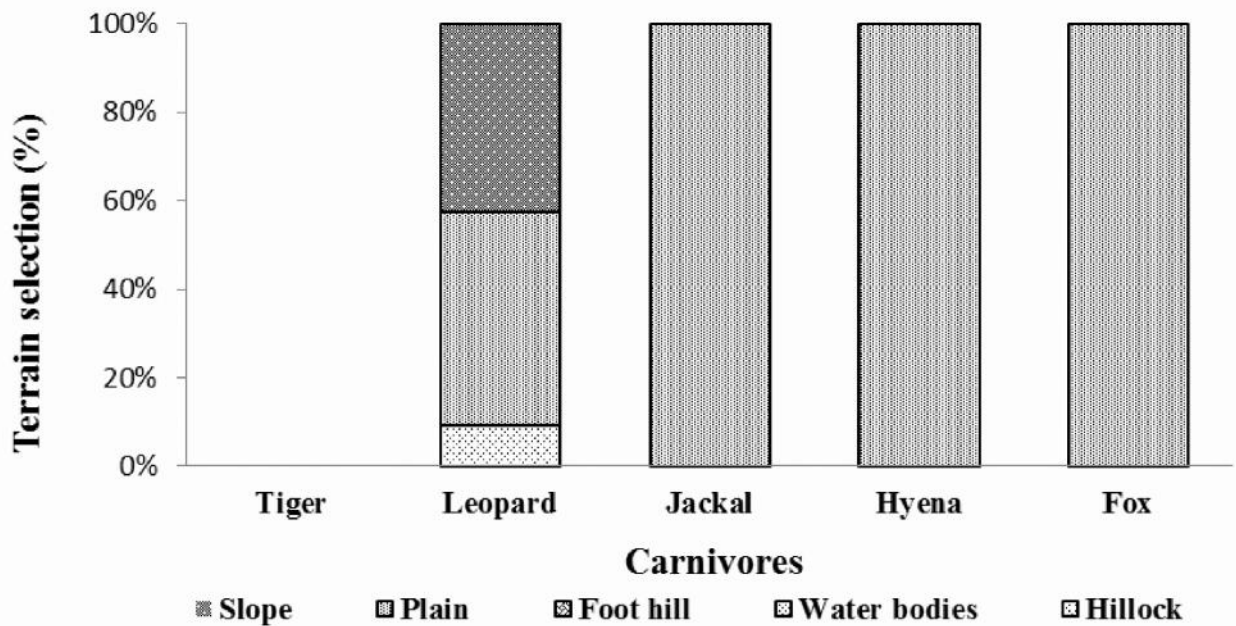


Fig. - 10 : Terrain preference by carnivore species in Kalesar.

Among prey, sambar, spotted deer and nilgai mostly preferred gentle slope while barking deer, chowsingha, wild boar and elephant preferred plain terrain (Fig. - 11). This clearly indicates that prey species mostly prefers both plain and gentle slope terrain.



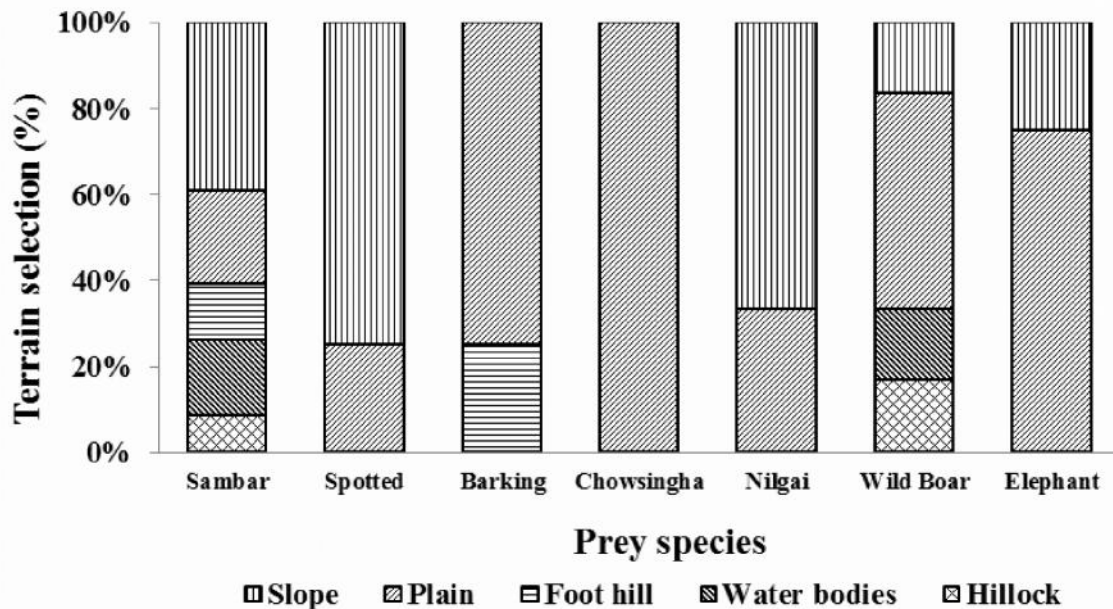


Fig. - 11 : Terrain preference by carnivore species in Kalesar.

## 5. Discussion

Deer as a group are the most important prey items for big cats (carnivores) (Schaller, 1967; Sunquist, 1981). Many of the grasslands and scrubland forests support four deer species- Sambar, spotted deer, chowsingha and barking deer. Two large herbivores, the Asian elephant and nilgai are also co-exist (Dinerstein, 2002). In Kalesar, the deer assemblage includes one small deer - the barking deer, the intermediate sized barking deer and one large species, the sambar. Loss of grasslands due to natural succession in the reserve might have adversely affected the abundance of the species leading to scarce sightings.

The present abundance estimation of ungulate species using indirect signs gives comparative and empirical status of prey species in the reserve. On the whole, the prey species richness is medium in the park, but low in abundance, resulting in poor sighting of animals and small herd size. Barking deer being a grazer species (Schaller, 1967) was also not abundant in the grasslands. The range has mixed – moist plain forest preferred by deer species during the hot-dry season due to the fact that this forest type provides shade during the hottest hours of the day.

Most of the prey species was restricted to less disturbed hilly sal forest of the reserve. Dinerstein (1987) observed the species occupying the sal forest in Royal Bardia Wildlife Reserve (Now National Park) in Nepal where understorey was dominated by woody vegetation and grasses were few. Barking deer was associated with high shrub density and grasses. He reported barking deer in secondary forest with high shrub density, mature sal forest and moist – mixed riverine forest in the Royal Bardia Reserve. Small rumen to body size ratio of the species along with higher nutritional requirements restricts this species to forested habitat where fruits, leaves and buds were more abundant. Such a diverse habitat preference of the species results into its uniform distribution in the entire reserve. Wild boar was also less abundant throughout the park. The species prefers grassland and secondary forest to mature sal forest (Dinerstein, 1987). Its association with nilgai states its close association with the grasslands in the reserve. Nilgai, was very common in the outskirts of the forest despite of high disturbances along the forest fringe.

Interestingly, the reserve holds the distinction of being the only distribution range of the species

in northern India. The species inhabits hilly areas, below 1,800 m, covered with large tracts of forests (dry sal forest, evergreen forest, mixed-deciduous forest) and grasslands (Schaller, 1967). They use a large range of habitats and tend to spend more time in evergreen forest and in higher elevation zones during the dry season. Water availability throughout the year is particularly important to support this species. Within the park, the species was restricted to comparatively less disturbed hilly sal forest tract with perennial water supply which is a favorable habitat.

Large carnivore prey selection is a complex phenomenon (Bekoff *et al.*, 1984; Sunquist and Sunquist, 1989). The hypotheses so far proposed to explain prey selection by predators indicate that the energetic benefits for the predator and proximate mechanisms of selection shape the overall prey selection by predators (Karanth and

Sunquist, 1995). Tigers select larger prey than the wild dog and leopard, which can survive even on small sized prey (Karanth and Sunquist, 1995). Prey selection also depends on prey availability and sometimes tigers show high selectivity towards less abundant species.

Non availability of tiger in this park may be due to local extinction. However the study could generate information on leopard distribution and relative abundance in the reserve. It is now evident that leopard is more uniformly distributed throughout the park. In large prey scarce areas, where tiger abundance is poor or nil, leopard was more abundant and occupied more extent of the park. Since there is less prey base in the park, there is higher possibility to increase cattle lifting by leopard in the future. Therefore more focused study on distribution and ecology of leopards in the reserve is needed to check future human-leopard conflict in this park.

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