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Research Article

Prey selection and utilization by the wild carnivores in the Segur Plateau, Nilgiris.

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Abstract

Very little is known about intrinsic prey selection by three large carnivores Tiger (*Panthera tigris*), Leopard (*Panthera pardus*) and Wild dog (*Cuon alpinus*).The study was conducted in Segur plateu of Nilgiri north division. The diet consumption was found out based on a scat analysis, scat was converted to relative biomass and number of prey consumed using regression equation. Large carnivores suffer from multiple pressure of habitat degradation and conflicts co-exist. The occurrences of Human carnivore conflict were recorded as some of the cattle also fall prey for these cats. The cattle kills were also counted near villages adjoining the forest fringes to know about the variability in prey pattern. It was found that the tiger consumed nine prey species, leopard consumed six prey species and wild dog consumed four different prey species were found. However, the overlap of prey species between these predators is a question of concern as the same prey species may be preyed by all the carnivores leading to a population constraint to that particular prey species. This paper provides adequate information regarding the prey selection and utilization by the predators in the by the Segur Plateau is part of Mudumalai Tiger Reserve.

Keywords: Prey selection, utilization, Wild Carnivores.

Introduction

The Large carnivores live at the apex of the food chain and this ensures that they are the least abundant of large mammals in any habitat. Low numbers and large range requirements mean that very large areas need to be set aside for their conservation **(**Smith *et al.*, 1993). Large carnivores suffer from multiple pressure of habitat degradation, hunting and domestic diseases and commercial markets for body parts (Weber and Rabinowitz, 1996). Large carnivores are widely distributed across different vegetation types from thorn to evergreen forests of Asia (Nowell and Jackson, 1996). India has a wide assemblage of large carnivores like Lion (*Panthera leo persicus*), Wolves (*Canis lupus*), Wild dogs (*Cuon alpinus*), Tiger (*Panthera tigiris*), Leopard (*Panthera paradus paradus*), Snow leopard (*Panthera unica*) and Clouded leopard (*Pardofelis nebulosa*) that are endangered and listed as protected species in schedule I of the Indian Wildlife Act (1972).The rate of decline of carnivore for example tiger from about 1,00,000 at the beginning of twentieth century to about 1700 now (Jhala *et al*., 2011) is indication of negative external forces acting on the species. This is mainly due to human population explosion which leads to forest degradation and habitat fragmentation. As the human populations have converted the rich alluvial plains to agricultural lands, large carnivores became confined to the forest the regions of both Protected (Tiger reserves, Sanctuaries, National parks, and Reserve forests) and non-protected areas (Estates and plantations) that are abundant to the adjoining place of study. In addition to poaching and illegal trading also remain threats to the conservation of large carnivores in India (REF) and in Asia (REF). Hence understanding the population status of carnivores is an immense concern to conserve the species.

India is a home of over 50% of world population of tigers and Western Ghats is one among the six major landscapes of tiger predominance (*Jhala et al*., 2011). Segur Plateau is part of the Mudumalai tiger reserve buffer area, located in Western Ghats. The landscape has been identified as one of the 34 Biodiversity hotspots of the world and it is also one of the potential area for long-term conservation of tigers and other carnivores in India (*Jhala et al*., 2011). This area is also connects the Western Ghats with Eastern Ghats with narrow stretches of forest corridors (Sukumar, 1985; Desai, 1991). This area is also centers of anthropogenic disturbance due to large concentration of human and livestock population inside as well as on the fringes of the Mudumalai tiger reserve (Silori and Mishra, 1995, 2001). Furthermore the developmental activities in the form of construction of a series of hydroelectric power stations are also causing serious disturbance to larger mammals especially elephants during their seasonal movements. The developmental activities and increase in tourism and the attraction of people to settle in the corridors and putting additional pressure for the resources such as fuel wood, fodder, grass and a variety of non-timber forest produces. Thus considering the potentiality of long term conservation value and existing and growing human population in the Segur plateau, it is essential to know the status and distribution pattern of large carnivores for conservation management. The growing densities in livestock population can create an overlap of diets and forage competition with wild herbivores, resulting in overgrazing and decline or local extinction in wild herbivore population (Mishra *et al*., 2003) in India, domestic animals outnumber wild ungulate within protected areas, reaching densities of up to 1,500 km2 and it has been ascertained that livestock graze in 73% of wild life sanctuaries and 39% of protected areas (Mishra, 1997) under these circumstances, livestock becomes an important source of prey for predator.

Study area:

Segur Plateau is part of Mudumalai Tiger Reserve buffer area and is located in the Nilgiri District of Tamil Nadu (11º 32´ and 11º 42´ N and 76º 20´ and 76º 45´ E). It extends over an area of 321 km^2 and forms a part of the Nilgiri Biosphere Reserve (5520km^2). The sanctuary is located in the Western Ghats, which is one of the 34 Biodiversity hotspots of the world. Altitude in the study area varies from 485 to 1226 m above MSL with a general elevation of about 900 to 1000m. The annual rainfall varies from 1001mm to 1648mm. The study area receives rain from both Southwest (May to August) and Northeast (September to December) monsoons.

The study area has three major forest types namely tropical moist deciduous forest (MDF), dry deciduous forest (DDF) and tropical thorn forest (TF) (Champion and Seth, 1968). The large herbivores include elephant *Elephus maximus*, three species of cervids: chital *Axis axis*, sambar deer *Rusa unicolor* and barking deer *Muntiacus muntjak*, two species of antelopes: the four-horned antelope *Tetracerus quadricornis* and the blackbuck *Antilope cervicapra*. In addition predators like tiger *Panthera tigiris*, leopard *Panthera pardus* and wild dog *Cuon alpinus* are found. segur plateau is threatened by habitat degradation from overgrazing, poaching and human disturbance.

Methods

Food habits studies:

Scat studies:

Scats of tiger, leopard and Wild dog were collected to identify food items of these predators indirectly. Intensive combing of the entire study area by foot transect by making use the existing game roads, foot paths and cattle trails (Sunquist 1981 and Johnsing 1983**)** was done for scat collections. Surveys were made every day.

Collection and treatment of scats:

Scats of the three species were identified by their characteristic appearance and supplementary evidences in the form of tracks, scrapes and size of the scat (Karanth and Sunquist I995), tiger scats are large in size and diameter, less coiled, larger distance between constrictions and terminal end doesn't have hooked tip. The leopard scats are usually associated with characteristic scratching signs; Wild dog scats were small, found in clusters, while the scats of the felid were larger, stickier and deposited on grass patches (Johnsingh, 1983) which was pivotal in identification.

The scats collected were air dried and kept in separate zip lock bags with a label bearing information on the date, collected area latitude and longitude obtained

from Global Positioning System, predator name, etc. A journal of all scats collected in the study area was maintained. Totally 232 scats was collected in the field were tiger 97 scats, leopard 63 and wild dog 72 respectively. All scats were soaked in water, washed and strained thoroughly to separate prey remains like bones, hooves, hairs, quils, feathers, etc.,. Samples of undigested hair from the scats were washed in water and they were than dried and passed through ether and xylene (Koppiker and Sabnis, 1975). The hair was then mounted on a slide in xylene and examined under a binocular microscope for characteristic medullary patterns. To identify prey species the hairs were compared to those in the reference slides and manuals (WII 2011). Key given by Koppiker and Sabnis (1975), Oli (1993) and Easa (1995) were also used for prey species identification from the hairs found in the scats. The method described by Schaller (1967) was adopted to obtain the frequency of food items in scats and their percentages. Jaws were identified by following Cohen (1977).

Diet Analysis:

Frequency of occurrence (%) i.e. number of scats with specific species over total number of scats in percentage was enumerated and this was subsequently used to estimate the biomass consumed by predator following the Ackerman equation.

This equation is represented as,

Y= 1.980 + 0.035 X (tiger and leopard)

Y= 0.035 + 0.02 X (wild dog)

where Y = biomass (kg) of species in each scat,

X = average weight of individual of each prey species, and 1.980 and 0.035 are standardized correction factors.

Once the biomass consumption was determined for each scat, cumulative biomass consumption for specific prey species was obtained by multiplying the number of scats in which the species was found with the biomass value of individual scat. Selection of prey was studied by comparing observed proportion of scat for each prey with expected proportion of scat for that prey in the area. Expected proportion of scat for each species was obtained from density of species and number of scat produced from one kill using equation given by (Karanth & Sunquist 1995):

Expected proportion of scat containing prey in the area

= **{(di/dt)* λ}/Σ{(di/dt)*λ}**

Where, **di** is the individual species density, **dt** is sum of density of all **i** species, **λ**= number of scat produced per kill which is computed as body weight (X) of animal divided by correction factor Y (Ackerman, Lindzey & Hemker 1984).

Food Preference Index

Ivlev's (1961) index of selection was used to find out the food preference of leopard by using the formula given below.

Ivlev's index of selection = (U - A) / (U + A)

Where ^{S}U' denotes percent use and ^{v} A' denotes percent available.

Kill data collection:

An intensive search for kills constitutes a daily routine of field work. The entire study area was searched for kills. Other clues used were odor, alarm call of prey, predator signs, calls and flight patterns of vultures and crows, some information collected from forest officials. Whenever kills were got, the following information was recorded.

I. Identity of the predator by ancillary evidences such as tracks, scats, scrape marks, teeth marks, type of killing injury, feeding method, prey size and caching behavior.

II. The species preyed upon, its sex and approximate age.

III. Description of the kill.

Results and Discussion

Prey selection by tiger:

A total of 232 scats were collected in the field tiger-97 scats, leopard-63 and wild dog-72 respectively .Tiger sample category percentages were also calculated fresh scat 9.3%, old scat 64.9% and very old 25.8% (Table 1). All prey items found in the scats could be readily identified, the results of which, including percent occurrence, frequency of occurrence, relative biomass killed and estimates of

relative number of individuals consumed by tigers are presented in Table 2 . A total of nine species were identified in the 97 scats analyzed. Remains of bones and hooves were found in 50 scats (39.44% of the total scats collected).

Table 1. Tiger category wise samples percentage

Category	Collected sample	Sample percentages
Fresh	9.0	9. 3
Old	63.0	64.9
Very old	25.0	25.8

The 97 scats analyzed contained 144 prey items. Tiger diet was primarily constituted by nine species, sambar, chital, Black napped hare, common langur, wild pig, gaur, four horned antelope and porcupine and domestic cattle. Of the total prey consumed, three species namely sambar, chital, and black napped hare formed the bulk of tiger's feeding habit with 80.13% occurrence. Other prey species recorded were Wild pig 6.9%, gaur 2.8%, four horned antelope 2.8% and porcupie 1.4% and domestic cattle 1.4% formed a part in tiger's diet. Relative Biomass contribution was highest from sambar (42.5%).Total biomass available for sambar, chital, hare, wild pig, gaur, porcupine and common langur was 6566 kg/km^2 in segur plateau, out of which 65 kg was consumed in the tiger diet during the sampling period (Table 2).

Table 2. Contribution of prey species in Tiger diet in segur plateau (scat sample n=97)

Prey species	Occurrences	Percentages	Frequency of occurrences	Body weight (x kg)	Correction factor (y)	Relative biomass killed (%)	Relative ind killed (%)
			A	B	C	D	E
Sambar	51.0	35.4	52.6	62.0	5.1	42.4	20.2
Chital	49.0	34.0	50.5	48.0	4.4	0.1	0.0
Hare	17.0	11.9	17.5	3.0	2.1	5.9	58.4
Wild pig	10.0	6.9	10.3	38.0	3.9	6.3	4.9
Common langur	5.0	3.5	5.2	8.0	2.4	1.9	7.2
Gaur	4.0	2.8	4.1	80.0	6.0	3.9	1.4
Four horned antelope	4.0	2.8	4.1	12.0	2.6	1.7	4.2
Porcupine	2.0	1.4	2.1	8.0	2.4	0.8	2.9
Cattle	2.0	1.4	2.1	80.0	6.0	2.0	0.7

A) Percent frequency of occurrence
B) Estimated mean live weight (kg) of individuals consumed
C) Estimated weight of prey consumed per collectable scat produced, when such prey is the only item in a scat
D) = (A*C)/∑(A*C)
E) = (D/B)/Σ(D/B)

Ivlves' Index showed that predation occurs disproportionately to availability, indicating selective predation of ungulates prey (Table 3). Consumption of sambar, chital, black napped hare, wild pig and was more than the availability, whereas four horned antelope consumption was less than availability.

Table 3. Selectivity Index of ungulate prey for Tiger in segur plateau

Species	Scat/kill	Density	Available biomass kg/sq.km	Observed proportion of scat	Expected proportion of scat	Ivlevs index u-a/u+a
Sambar	12.20	62.08	3259.80	0.53	0.0190	0.9304
Chital	10.96	86.41	2424.70	0.51	0.0237	0.9103
Hare	1.41	7.50	52.60	0.18	0.0003	0.9970
Wild pig	9.79	7.24	391.80	0.10	0.0018	0.9661
Common langur	3.36	5.61	41.20	0.05	0.0005	0.9820
Gaur	13.38	12.09	329.90	0.04	0.0040	0.8202
Fore horned antelope	4.65	4.59	49.50	0.04	0.9499	-0.9172
Porcupine	3.36	10.56	16.50	0.02	0.0009	0.9188

Prey selection by Leopard:

A totally 63 leopard scat were collected. Leopard sample category percentages were also calculated fresh scat 3.2 %, old scat 54.0% and very old 42.9% (Table 4). All prey items found in the scats could be readily identified, the results of which, including percentage occurrence, frequency of occurrence, relative biomass killed and estimates of relative number of individuals consumed by tigers are presented . A total of six species were identified in the 63 scats analyzed. Remains of bones and hooves were found in 40 scats (16.44% of the total scats collected).

Table 4. Leopard category wise Samples percentage

Category	Collected sample	Samples percentages
Fresh	2	3.2
Old	34	54.0
Very old	27	42.9

The 63 scats analyzed contained 77 prey items. Leopard diet was primarily constituted by six species, chital, Sambar, Black napped hare, common langur, wild pig and porcupine. Of the total prey consumed, three species namely Sambar, Chital, and Black napped hare formed the bulk of leopard food habit constituting 83.2% occurrence. Other prey species enumerated were Common langur 9.0% wild pig 7.5% and porcupine 3%, also formed a part in leopard diet. Biomass contribution was highest from Chital (49%), followed by Sambar(22.6%) ,and black napped hare (16.0%) .The total available biomass chital, sambar, hare, common langur and wild pig was 5711.1 kg/km^2 out of which 100 kg was consumed by leopard during the sample period (Table 5).

Table 5.Contribution of Prey Species in Leopard Diet in Segur Plateau (Scat Sample N=63)

Prey species	Frequency	Percentages	Frequency of occurrences	Body weight (x kg)	Correction factor (y)	Relative biomass killed (%)	Relative ind. killed(%)
			A	B	C	D	E
Chital	37.0	48.1	55.2	48	3.7	49.2	28.5
Sambar	15.0	19.5	22.4	62	4.2	22.6	10.1
Hare	12.0	15.6	17.9	48	3.7	16.0	9.2
Common langur	6.0	7.8	9.0	3	2.1	4.5	42.1
Wild pig	5.0	6.5	7.5	38	3.3	6.0	4.4
Porcupine	2.0	2.6	3.0	8	2.3	1.6	5.7

Ivlves' Index showed that predation occurs disproportionately to availability, indicating selective predation of ungulates prey (Table 6). Consumption of black napped hare, common langur, and wild pig was more than the availability, where as chital consumption was less than availability. However, sambar was consumed almost in proportion to availability.

Table 6. Selectivity Index of Ungulate Prey for Leopard in Segur Plateau

Species	Scat/kill	Density	Available biomass kg / sq.km	Observed proportion of scat	Expected proportion of scat	Ivlevs index u-a/u+a
Chital	13.11	55.50	2650.74	0.55	0.62	-0.06
Sambar	14.94	15.03	1388.05	0.22	0.19	0.08
Hare	13.11	8.90	859.70	0.18	0.10	0.29
Common langur	1.44	5.64	26.86	0.09	0.01	0.86
Wild pig	11.48	7.28	283.58	0.07	0.07	0.02
Porcupine	3.54	4.56	23.88	0.03	0.01	0.37

Prey selection by wild dog :

Totally 72 wild dog scat were collected and wild dog sample category percentages were also calculated fresh scat 8.3 %, old scat 54.16% and very old 37.5% (Table 7). All prey items found in the scats could be readily identified, the results of which, including percentage occurrence, frequency of occurrence, relative biomass killed and estimates of relative number of individuals consumed by wild dog are presented. A total of four species were identified in the 72 scats analyzed. Remains of bones and hooves were found in 60 scats (26.44% of the total scats collected).The 72 scats analyzed contained 84 prey items. Wild dog diet primarily constituted of four species, chital, sambar, Black napped hare, and wild pig of the total prey consumed, one species chital formed the bulk of wild dog food habit with 58.5% occurrence. Other species were Sambar 21.3%, black napped hare14.9%, wild dog 5.0% also formed a part in wild dog diet. the total available biomass chital, sambar, hare, and wild pig was 5232.81% out of which 99.9 kg was consumed by wild dog during the sample period (Table 8).

Table 7: Wild dog category wise Samples percentage

Category	Collected sample	Percentage of sample
Fresh	6	8.33
Old	39	54.16
Very old	27	37.5

Table 8.Contribution of prey species in wild dog diet in segur plateau (scat sample n = 72)

Prey species	Frequency	Percentages	Frequency of occurrences	Body weight (x kg)	Correction factor (y)	
Chital	27.8	62.0	1.3	29.8	16.0	**Relative biomass killed**
Sambar	19.4	3.0	0.1	1.6	14.9	**(%)**
Hare	6.9	38.0	0.8	4.6	63.3	
Wild pig	5.0	5.3	0.2	1.6	14.9	**Relative ind killed(%)**

A) Percent frequency of occurrence
B) Estimated mean live weight (kg) of individuals consumed
C) Estimated weight of prey consumed per collectable scat produced, when such prey is the only item in a scat
D) = (A*C)/∑(A*C)
E) = (D/B)/Σ(D/B)

Ivlves' Index showed that predation occurs disproportionately to availability, indicating selective predation of ungulates prey (Table 9). Consumption of chital, sambar, black napped hare, and wild pig was more than the availability.

Table 9. Selectivity Index of ungulate prey of Wild dog in segur plateau:

Species	Scat/kill	Density	Available Relative biomass kg/ sq.km	Observed proportion of scat	Expected proportion of scat	Ivlevs index u-a/u+a
Chital	17.15	60.70	3666.70	0.76	0.72	0.03
Sambar	15.70	22.10	1722.20	0.28	0.24	0.07
Hare	6.60	7.45	58.30	0.19	0.03	0.70
Wild pig	1.89	4.32	263.90	0.07	0.01	0.85

Livestock population estimation:

The livestock population was collected from the local people and from the NGO's. Each village livestock population was estimated anaikatty, siriyur, chemmanatham and vazhzthottam. The grazing purposes villagers should not following any cropping pattern they enter the open and closed forest areas. The siriyur and vazhaththtam villages had more percentages of cattle population 20.03% and 35.7%, followed by anaikatty 18.31%, chemmanatham 15.42% and sokkanali 10.54%. Buffalo population was more in the anaikatty 45.45% followed by siriyur23.74%, chemmanatham 21.72% and vazhathottam 9.09%. The goat population is very less compare to other cattle vazhathottam 47.81%, sokkanali 41.04% and siriyur 7.97% (Table 10).

Table 10. Percentage of livestock presence in segur plateau (different villages)

Place	Cow	Buffalo	Goat
Anaikatty	18.31	45.45	0
Siriyur	20.03	23.74	7.97
Sokkanali	10.54	0	41.04
Chemmanatham	15.42	21.72	3.19
Vazhathottam	35.7	9.09	47.81

Carnivores kill data:

Totally 4 tiger kills were recorded and studied during the study period. All the four kills were of cattle. The kill was found at open scrub area where the canopy was open. Among 5 cattle kills 3 were adult and one sub adult and the kills were found near to villages (Table11).

Table 11. Details of Carnivores Kills and Kill Sites at the study area during study periods

S.No	Date	Owner Name	Place	Hunting Place	Carnivore	Category
1	23.8.2011	Rajendran	Sokkanalli	Koparakadava	Tiger	Cattle adult
2	7.10.2011	Bellamma	Chemmanatham	Athimarakadavu	Tiger	Cattle adult
3	28.10.2011	O.K.Mathan	Vazhathottam	Ulamathappan koil	Tiger	Cattle adult
4	18.11.2011	Sanmugam	Sokkanalli	Puthikudai	Tiger	Cattle Sub adult

Discussion

Sambar was observed to be the principle prey species for tigers as inferred from the percentage occurrence of prey remains in tiger scats. Sambar also contributed to highest biomass of prey consumed by the tiger and was consumed more than the availability of individuals Sambar's preference by tiger could be attributed to the larger body weight and wide distribution of sambar across the study area and hence there could have been higher frequencies of encounter since both the species are crepuscular in habits (Johnsingh, 1983). Similar results were obtained by other studies in the country (Schaller 1967; Karanth and Sunquist 1995) showing coinciding correlation. Chital constituted 34% of the tiger diet during the present study which is less than the reported data from other areas *i.e.,* Kanha-52.2% (Schaller, 1967), Nagarahole- 31.2% (Karanth and Sunquist, 1995) and Bandipur- 39% (Johnsingh, 1983). Griffiths, 1975; Sunqusit, 1981; Karanth and Sunquist, 1995 concluded that tiger would select a large prey species or medium sized prey species similar to the findings of the present study .

Leopard fed on six different prey species. Chital, Sambar and Common langur constituted 83.2% of leopard's diet which was similar to the findings reported from Nagarahole (Karanth and Sunquist, 1995). In Sariska (Sankar and Johnsingh, 2002), chital, sambar and common langur constituted only 47.2% of the leopard's diet. The leopard preferred common langur, sambar and wild pig in the study area and was observed that both tiger and leopard showed preference for sambar in the study area. Since leopard is nocturnal and tiger is crepuscular in behavioral habits they may show preference for the same prey species but their utilization might be in different times (hours) of a day, this was ground point recording of this study. The observed high dietary overlap (55.2%) for the utilized prey species in terms of percentage of frequency occurrence of prey remain in the diet and percentage of biomass consumed by tiger and leopard may be attributed to high prey availability and suggestively also the palatability of sambar meat in the study area.

The wild dog scat was found to contain four prey species in this study area. The chital is most preferred prey species chital 58.5% and sambar 21.3%. Johnsingh (1983) recorded that sambar and chital constituted the main prey of wild dog, with just these two species making up about 95 % of all kills and scats recorded. Nearly 70% of the kills were that of the 26-100 kg size class, with the large (51-100 kg) prey size being the preferred weight class by wild dog were similar to our findings in this study. Black napped hare were found in the scats of three carnivores. Karanth and Sunquist (1995) estimated that about 5% of the leopard prey in Nagarhole comprised of hare. Further, Andheria *et al* (2006) estimated the scat of all three carnivoresand recorded that Black naped hare contributed to 1.08% in tiger, 2.27% in leopard and wild dog was found to have a high percentage of 12.8% compared to other two carnivores. However, in the present study it was estimated that the Black naped hare constituted about 11.9% in tiger , 14.9% in wild dog and 15.6% in leopard, leopard contributed to a higher consumption of Black naped hare than the other two carnivores.

The prey common Langur was present in the diet of two carnivores namely tiger and leopard not found in the wild dog diet, contributing 3.5% in tigers and 7.8% in leopard. This might perhaps be due to the tree climbing ability of the leopard, as according to Sankhla (1977) the ability of leopard to climb trees with ease provided access to prey on arborneal animals like Langurs, Squrriels and other monkeys. Sathyakumar (1988) also observed Nilgiri Langurs and bonnet macaques in the food of leopards at the Mundanthurai plateau and stated that leopards provided to be efficient in hunting primates for food. Schaller found leopards to be killing langur frequently in Kanha tiger reserve, Madhya Pradesh. Many other studies had also documented the opportunistic nature of the tiger and leopard hunting pattern (e.g., Bothma and Richie, 1984; Bailey, 1993).

According (Karanth & Sunquist, 1995) tiger preferred mostly large ungulate prey species like gaur and sambar, The result also found a tiger diet constituted of gaur 2.08%. Wild pig mostly observed in the all three carnivores respectively tiger 6.9%, leopard 6.5% and wild dog 5.3% similar findings were reported in carnivores of Mundanthurai plateau by Sathiyakumar (1988).This might perhaps be due the reason given by Sankhla (1977) that killing wild pigs was not easier for leopard. Four horned antelope and porcupine were also recorded in leopard and tiger diet.

Live stock had been recorded as a major component of the tiger diet. The number of live stock kills by tiger in the villages around had also been recorded. The carnivores protein rich diet and large home large home ranges draw then into recurrent competition with humans, who similar needs. Indeed, many large carnivore species are specialized for ungulate predation, therefore, some wild cats readily kill domesticated ungulates when opportunities arise (Meriggi and Lovari 1996; Karanth et al.1999; Pollsar 2000). This is worldwide problem exemplified by wolves and bears killing sheep in North America and Europe; numerous carnivores genera preying on cattle and goats in Africa; and tiger and leopard killing livestock in Asia (Kaczensky 1999). Since cattle competes with natural prey species such as chital, Sambar, black bug and hare, cattle population should be reduced in the villages that are located adjoining forest areas. Additionally cattle shed should be protected with stone walls and solar fence. In the state of Gujarat, chain link fencing of the eastern boundary of Gir National Park was installed to stop lions and leopards from straying out of the park and to prevent illegal grazing at the same time proved efficacy only partially and was not to be economically viable. In the same area, other types of barriers are under experimentation, such as rubble walls and barbed wire fencing, which have been constructed along some sections of the reserve's boundary Vijayan and Pati, (2002). Some concern about the negative impacts of physical barriers on the ecological equilibrium of the region has been expressed by different authors, Sekhar (1998), Vijayan and Pati (2002) pointing out that fencing reserves may affect the population dynamics of animals and hinder their natural migratory and dispersal behavior, especially in the case of highly territorial species like lion. It is also essential to take into consideration the different, unexpected effects that fencing may have on a wide range of non target species.

Conclusion

Carnivores need certain amount of vegetation cover to hunt prey therefore wood collection in the forest areas near the villages should be avoided. Local people should also be educated by researchers and forest department on why carnivores become man eater or cattle lifter and elephant feeding, social behavior and how to reduce the conflict. Conflict mitigation has been a challenge throughout the country especially in villages adjoining forest regions. This paper provides information about the prey selection and utilization of the three carnivores namely Tiger, leopard and wild dog will be immensely useful to handle conflict conditions in the upcoming times. Proper management of the various prey species their regulation and following proper guidelines by people especially those living adjoining forest regions will should be practiced. Further intensive studies in the core zones regarding prey utilization by carnivores will bring to light the factors undermining predator existence and prey survival.

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