

*Full Length Research Paper*

# Determination of the local, national/global status and effect of urbanization on Carnivora mammals in Jammu District and Trikuta Hills of JandK, India

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**During present study, from 2004 to 2006 in Jammu District and 2006 to 2009 in Trikuta Hills, the impact of urbanization on carnivores was studied. Order carnivora is represented by 5 species. Their local and national/global status was also determined. It was also found that urbanization is taking place by leaps and bounds, which has affected wildlife of the area mostly by habitat destruction, habitat fragmentation and noise. It has been found that the most affected order in the mammals is carnivora, because of the requirement of the larger habitat for fulfilling their needs.**

**Key words:** Trikuta Hills, carnivore, urbanization, Shivaliks, habitat fragmentation.

## INTRODUCTION

Human activities are causing major impacts on natural environments at local and global scales, producing changes to the number, identity and relative density of species in assemblages (Vitousek et al., 1997). These human activities threaten the existence of many organisms by destroying their habitat or directly affecting their survival and reproduction success (Green and Hiron, 1991) and lead to many types of environmental changes which influence the processes that can both augment or erode diversity (Sagar et al., 2003). One of the greatest threats to species biodiversity and ecosystem function may result from the high density and rapid growth of the human population (Wakermagel et al., 2002). The growth and expansion of pre-human and human populations has long displaced other species and led to their extinction, starting in the Pliocene and accelerating in the Holocene. Demographic and social changes place more people in direct contact with wildlife, as human population grows, settlements expand into and around protected areas as well as in urban and sub-urban areas. Forests are vanishing at the rate of 17 million ha/year an area about half the size of Finland and population is being added at the rate of 92 million people

roughly equal to adding another Mexico each year. In spite of the fact that India is one of the mega biodiversity centres of the world, there have been recorded a decrease in the number of species. Some of the species have already become extinct; some are endangered while some others are vulnerable. Not only in India, but all over the world there has been a drastic decline of wild life species. At present some 3956 species are endangered, 3647 species are vulnerable and 7,240 are considered rare (Wilson, 1988).

Objectives of the present work were:

- (i) To prepare an inventory of carnivore mammals of district Jammu and Trikuta Hills of J and K state.
- (ii) To determine the effect of development (urbanisation) on the wild carnivore mammals.
- (iii) Status survey based on their distribution pattern and abundance and information gathered from local people will serve to suggest further conservation strategies to concerned department.

## Study area

Erstwhile Jammu District is situated between 74°19'E and 75°20'E longitudes and 32°27'N to 33°50'N latitudes and

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at an altitude ranging from 340 to 410 m from msl. It is 2942 km<sup>2</sup> and is surrounded by district Kathua, Udhampur and Rajouri. District Jammu is located on alluvial plains and foot hills of Shivaliks. Trikuta hills lies in the Erstwhile District Udhampur and presently in the District Reasi of Jammu and Kashmir of India.

## Vegetation

Forests of study area are typical subtropical. Lower altitudinal zonation is dominated mainly by scrubs with a few scattered patches of broad leaved trees. On moderate elevation, these scrubs are found to be mixed with broad leaved and chir-pine communities, while high elevations are dominated exclusively by chir-pine patches. There are four well defined seasons: Winter season (Mid Nov. to March), Summer season (March to end of June), Monsoon season (July to September), and Autumn season (October to mid November).

## MATERIALS AND METHODS

For identification purpose, colour plates by Prater (1971) and Tikader (1983) proved helpful.

### Direct methods

#### Visual method

Visual observation of different species was made. The study area was surveyed and every animal sighted was noted down along with important information including the topographical features, slope, dominant species etc.

(i) Line transect method: This method was also used for inventorization of mammals. If the animal was seen during the line transect, its colour pattern, group size, habits and type of habitat were observed and recorded. Sometimes evidences like bones (canine teeth), defecation, signs of destruction of habitat were encountered and recorded. These evidences also indicate the presence of particular animals in the study area. The spot where such evidences were found was then marked and later surveyed for the presence of animal.

(ii) Road side surveys: These surveys were made on foot or using a vehicle.

(iii) Point transect method: This method was also tried but did not prove so effective as line transect method and road side survey.

### Indirect methods

Villagers, nomads and army personnel were also interviewed in study area regarding the presence or absence of mammals by providing them with the pictorial guides and photographs of different mammals for identification that are likely to be found there.

### Tools used

(i) Binocular: Mammals were observed with naked eye, and through 7 × 50 prismatic fields Binocular (Bushnell make).

(ii) Camera: whenever found necessary photographs were taken with T-70 camera fitted with zoom lens.

(iii) Rodent traps: Small carnivore mammals of order Carnivora were collected by rodent traps.

### Terms used for determination of local status

(i) Common (C): Fairly well distributed and sighted or evidence recorded once a day in the habitat in which it occurs.

(ii) Uncommon (UC): Well distributed and sighted, or evidence recorded once a week.

(iii) Occasional (O): Restricted distribution and sighted, or evidence recorded infrequently.

(iv) Rare (R): Fewer than 10 sightings or evidence recorded or single sight records/year for 1 period. (Srinivasulu and Nagulu, 2002).

### Observations

#### Order: Carnivora

1 - Zoological Name: *Panthera pardus* (Linnaeus)

Common name: Leopard or Panther

Material examined: none

Habits and habitat: it is the largest carnivore in the study area. Leopard is able to live in any type of habitat. It is not restricted to forests and was observed to thrive in open country as among rocks and scrub. A panther can eat anything it can overpower with safety-cattle, deer and Monkey, the smaller beasts of prey and larger rodents, like porcupines. Many a times, it preys on domestic animals, calves, sheep and goats, donkeys and quite commonly on dogs. In the study area, leopard was not seen in the wild but was seen in captivity in Manda Park. People were also asked about the presence or absence of animal, the interviews revealed its presence in that area and becomes a cause of conflict with man due to its attack on their livestock in the villages. Nomadic people like Gujjar and Bakarwals also reflected the instances of the killing of their animals by panther in the Nandani, Surinsar, Nagrota Reasi, Baba Siar, Mangalpagot and the kills of ghorals in Trikuta hills are enough to ensure the presence of the wild beast in the area.

Distribution: Whole of India except Sikkim, Sri Lanka, Burma and China.

Distribution in study area: As the animal was not sighted in wild, in study area during study period but the interviews of the local people in the study area reveal its presence in the Nandani, Ambgarota, Akhnoor, Surinsar, Nagrota, Reasi, Baba Siar, and Mangalpagot. The presence of the kills of ghorals in Trikuta hills are enough to ensure the presence of the wild beast in the area.

2 - Zoological Name: *Viverricula Indica*

Common name: Small Indian Civet

*Viverra indica* Desmarest, 1817, Nov. Dict. Hist. Nat., 7: 170 (India).

*Viverra bengalensis* Gray, 1830 ill. Indian Zool., 1: p 14 (Calcutta, West Bengal).

*Viverricula indica mayuri* Pocock, 1933, J. Bomb. Nat. Hist. Soc., 36: 632 (Maha Oya, Eastern Province Srilanka).

*Viverricula indica baptistae* Pocock, 1933, J. Bomb. Nat. Hist. Soc. 36:643 (Hasimara, Bhutan Duars, West Bengal).

Material examined: 2 (1♂; 1♀) but only one was in good condition and the other was crushed so badly that its morphometric data could not be taken. (Table 1)

General Habit and Habitat: This species prefers scrubby forests or bushy grasslands. It lives in the holes or under the rocks and is a nocturnal animal. It feeds on birds, squirrels rats, fruits. They live near human habitation in villages and even attack poultry. They, travel down the hills for search of water, and encounter accidents while crossing roads at night. They don't bother jumping

**Table 1.** Morphometric data of examined material.

<b>Morphometric Data:</b>	<b>Value</b>
Total length	77.5cm
Tail length	27.5cm
Body length	50.0cm
Head length	10.0cm
Pinna length	5.0cm
Neck length	10.0cm
Distance between eye and ear	3.7cm
Distance between hind and forelegs length of foreleg	17.5cm 10.0cm
No. of digits in forelimb	4
No. of digits in hindlimb	4
Distance between ears	3.7cm
Head width	5.0cm
Distance between eyes	2.5cm
Distance between eye and nose	3.5cm
Body diameter	13.7cm
Length of largest canine	2.2cm

**Table 2.** Morphometric data of examined material

<b>Morphometric Data</b>	<b>Length (cm)</b>
Head length	6.4
Head and body length	39.2
Tail length	34.0
Eye diameter	1.2
Ear length	2.3
Forefeet length	6.66
Hindfeet length	7.7

into the deep wells for quenching thirst. This shows water is limiting factor in the area.

Known distribution: Peninsular India, north to Jammu (Except Rajasthan) east to Manipur, Srilanka (Chakraborty, 1983).

Distribution in study area: It is found in Akhnoor, Samba, R.S. Pura, Sidhra, Nandani, Nagrota, Ram Nagar wild life sanctuary, Bantalab Bishnah, Reasi, Adhkwari, Mata Vashnoo Devi Bhawan.

3 - Zoological Name: *Herpestes edwardsii nyula* Hodgson.

Common name: Common Mongoose

*Mangusta (Herpestes) nyula* Hodgson, 1836, *J. Asiat. Soc. Beng. V*, p. 236.

*Mongos mungo mungo* Wroughton 1915, *J. Bomb. Nat. Hist. Soc.*, XXIV, p. 52.

*Herpestes edwardsii idwardsii* Thomas and Wroughton, 1921, *J. Bomb. Nat. Hist. Soc.*, XXVII, p. 547.

*Herpestes edwardsii nyula* Pocock, 1915, *J. Bomb. Nat. Hist. Soc.*, XXIV, p. 52.

Material examined: 1 Male (Table 2)

Habit and Habitat: These are found generally in out skirts of city or in the city where there is open land in which long grasses

and shrubs are present. Mongoose are common in study area and feed on the sparrows, rodents, lizards, frogs and insects. They may live singly but generally two individuals are seen. The largest group seen were sighted in Roopnagar and Rehari area which consisted of four young ones and both parents. They were seen searching for something in debris and when alarmed they ran into nearby bushes.

Known Distribution: Northern India, From Nepal to Assam north of Ganges and from Kutuh to Bengal south of river (Pocock, 1941)

Distribution in study area: Found in Bantalab, Bari-Brahmina, Greater Kalash, Roop Nagar, Rajpura and Akhnoor, Jhajjar Kotli, Mangalpangote, Katra, Banganga, Adhkwari and Reasi.

4-Zoological Name: *Herpestes auropunctatus*(Hodgson)

Common name: Small Indian Mongoose.

*Mangusta auropunctata*, Hodgson, 1836. *J. AS. Soc. Beng.*, V, p. 235

*Herpestes nepalensis*, Gray, 1837, *Charlesw. Mag. Nat. Hist. i*, p. 578.

*Herpestes auropunctatus*, Blanford, 1888, *Mamm. Brit. Ind.* p. 121.

*Herpestes javanicus auropunctatus*, Pocock, 1937, *J. Bomb. Nat. Hist. Soc.* XXXIX, p.241.

Material Examined: During the period of one year only one specimen was seen in the out skirts of Paloura, which was seen crossing the road and trying to frighten the cow.

Morphometric Data: As it was neither captured nor found dead, so morphometric data is not present with this work.

Habit and Habitat: Much is not know about habit and habitats. During the study period only one animal was seen in the outskirts of Ploura, which was seen trying to frighten the cow.

Known Distribution: East of Manipur and South of Ganga as for south as Chilka Lake in Orissa; Bhutan; Bangladesh (Chakraborty, 1983).

Distribution in study area: Only in Jammu, only single animal was seen during study period.

5 - Zoological Name: *Canis aureus aureus* Linnaeus.

Common name: Asiatic Jackal

*Canis aureus*, Linn., 1758, *Syst. Nat.*, 10<sup>th</sup> ed. 1:40 (Province of Lar, Iran)

*Canis indicus Kola*, Wroughton, *J. Bomb. Nat. Hist. Soc.* XXIV, P.651, 1916.

*Canis aureus aureus*, Pocock, *Proc. Zool. Soc.* 1938, p. 37(Footnote).

Material examined: An accidently killed male.

Colour: Redish brown with some hairs having black tip. Ventrally whitish in colour.

Habit and Habitat: Jackals live in forests as well as in open plains. They have been observed near villages, towns, in cultivation among the dense grass and scrub. They are nocturnal but they have also been seen active during day. Villagers report their frequent attacking on poultry and lambs. They make a peculiar howling during evening hours. Group leader gives the first call which is followed by other members of the group in a chorus. A jackal was seen eating carcasses near the sidhra bridge, four other jackal were seen on the slopes of Surinsar and were photographed. Distribution in Study area: It is found in the outskirts of Jammu City, like Sidhra, Janipur, Bantalab and Villages of Nagrota, Surinsar, Nandani, Samba and Akhnoor and in Trikuta hills Katra, Reasi Adhkuwari and Bangangaetc.

Known distribution: South Eastern Europe, South western Asia, throughout India and Ceylon, extending some ways into Burma and south eastern Siam (Prater, 1971).

## RESULTS AND DISCUSSION

Order Carnivora is represented by 5 species belonging to 4 genera and 4 families. Local status of the order Carnivora reveals that two species are rare and rest three species are uncommon. The national/global status showed that one species is vulnerable, one species is Lower Risk near threatened (LRnt) and the rest three are Lower Risk least concerned (LRlc) (Table 3)

Leopard is rare in the study area due to habitat loss by deforestation and fragmentation and due to scarcity of prey species in the area. Leopard is reported from whole of South Asia by Pocock (1939). Brander (1982) reported that male mostly remains with female. This observation could not be confirmed during study period.

Small Indian Civet is uncommon in the study area. It is nocturnal and found throughout the study area (Akhnoor, Sidhra, Surinsar, Nagrota, Samba, R.S. Pura, Katra, Reasi, and throughout the Trikuta hills). It prefers scrubby

forests and bushy grasslands, it lives in holes, under rocks and near human habitation. Negi (1992) reported that it prefers habitat with tall grasses. In the study area they face the scarcity of water. This is evident from the fact that during the study period two cats were found dead in the artificial water tanks in the Environmental Park. Thus water in this area is acting as the limiting factor. Civets being carnivores have larger home range and fragmentation of their habitat due to construction of roads lead to the frequent accidental killings. Chakraborty (1983) reported it from Peninsular India and Sri Lanka, thus has wide range of distribution.

Common Mongoose *Herpestis edwardsii* is uncommon in study area. They are generally found in pairs, but sometimes singly. Parents prefer to stay with young ones and two groups of six each (two parents and four young ones) which lived in Roopnagar and Rehari area of Jammu city were seen many times during study period. Pocock (1941) reported from North India, Nepal. They live in bushes and holes. Negi (op cit) reported its living in termite mound.

Small Indian Mongoose (*H. auropunctatus*) is very rare and is seen only once during the study period. It is smaller in size as compared to Common Mongoose, in looks it is replica of common mongoose. It lives in forests, bushes and grasses near human habitation. Chakraborty (1983) reported it from Manipur, South of Ganga, Orissa, Bhutan and Bangladesh.

Indian Jackal (*Canis aureus*) is found through out the district, it has been seen solitary and in groups of two and four. A single Jackal was observed eating carcasses of cattle on the bank of river Tawi near Sidhra Bridge. They also lift, fowls and lambs from the villages. Negi (1992) also reported the lifting of poultry by Jackal. Brander (1982) reported that Jackal chiefly consort in pairs and lives round the villages. These findings of Fitzwater and Prakash (1989) regarding the damage to poultry were confirmed during present study as were found lifting hens from the villages.

## Factors affecting carnivore mammals in the study area

### Urbanization

With the increase of human population and urbanization wildlife habitats have been destroyed for one or other reason such as making houses, Government buildings and parks. Horizontal expansion of the cities and towns such as Roop Nagar, Bantalab, Janipur, Sidhra Bypass, Narwal and Kotbalwal in Jammu and Katra and Reasi in Trikuta Hills, has resulted in the shrinkage of wildlife habitats as all these areas were known for their wilderness. Not only expanding cities are responsible for shrinkage of wildlife habitats, but forests are destroyed for road makings and establishing factories etc. The construction work of the Railway Tract From Jammu to

**Table 3.** Showing checklist, Local status and National or Global status of mammals of Study Area.

Family	Common name	Zoological name	L. status	N/ G. status
a) Felidae	Leopard	<i>Panthera pardus</i> (Linnaeus)	R	VU
b) Canidae	Asiatic jackal	<i>Canis aureus</i> (Linnacus)	UC	LRlc
c) Viverridae	Small Indian civet	<i>Viverricula indica</i> (Desmaresti)	UC	LRnt
d) Herpestidae	1. Common mongoose	<i>Herpestes edwardsii</i> (Nyula Hodgson)	UC	LRlc
	2. Small Indian mongoose	<i>Herpestes auropunctatus</i> (Hogson)	R	LRlc

Common-C; Uncommon-UC; Occasional-O; Rare-R;VU-Vulnerable; LRnt-Lower Risk near threatened; LRlc- Lower Risk least concern ed. National or Global status derived using the 1994 IUCN Red list criteria.

Kashmir has added to the miseries of not only Carnivore mammals but whole flora and fauna. The second tract to Mata Vashnoo Devi has restricted the movement of the all mammals.

Not all the species of the mammals are declining due to urbanization but few species which are commensal and which have increased in number such as *Rattus rattus*, *Mus musculus*, *Bandicota indica*, *Bandicota bengalensis* and monkeys. Other species such as those belonging to Artiodactyla, Carnivora Lagomorpha are thought to have declined to a considerable extent due to urbanization.

With the increase in population and luxury way of life, noise is being continuously produced by various means such as transport, factories etc which definitely effects the secretive and shy organisms.

Due to the construction of roads, wildlife habitats are much affected, as it is divided into many smaller areas. This poses a great threat to wild mammals of the study area. The most affected among mammals due to habitat fragmentation and urbanization is the carnivore mammals as they have larger home ranges, they require larger areas for their activities. Habitat fragmentation reduces the area available to carry out their day-to-day activities. Thus, they flee from the area to explore newer areas for their habitation which result at times in loss in population and conflict with man. As the result of habitat fragmentation the mammals while crossing the busy roads meet frequent accidents. This can be backed by the fact that during the study period 5 civets, 3 mongooses and one jackal were found crushed in road accidents.

Dearth of water is another reason for dwindling mammalian fauna. Most of the wild habitat is of Kandi Character, Jammu foot hills lack permanent water bodies and to meet the requirement of water, they have to come down to the river for drinking water. Water scarcity as a reason for the decline of the mammals in general Carnivore mammals in particular can be drawn from the fact that during the study period two civets were found dead in the artificial constituted cemented ponds in the Environmental park on Sidhra bypass road on 3<sup>rd</sup> Febuary, 2004 and 15<sup>th</sup> January, 2005. These ponds

were nearly 2 m deep having 30 to 40 cm water and with almost vertically walls which made it difficult for the civets to come out after drinking and thus resulting in their drowning. Fragmentation of habitats and scarcity of water in higher slopes, coupled with deforestation resulting in loss of habitat, has led to obvious decline in population size and species diversity.

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