



## DIVERSITY AND ECOLOGY OF MAMMALS IN KALATOP-KHAJJAR WILDLIFE SANCTUARY, DISTRICT CHAMBA (HIMACHAL PRADESH), INDIA

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### ABSTRACT

During the present investigation a detailed taxonomic and ecological study was conducted in Kalatop-Khajjar Wildlife sanctuary of Chamba District also known as the Mini Switzerland of Himachal Pradesh. Study revealed the presence of 16 species of mammals belonging to 14 genera, 12 families and 6 orders. Out of a total of sixteen species thirteen have been placed under Indian Wildlife Protection Act 1972. Two species are vulnerable according to National Red Data.

**KEYWORDS:** Wildlife sanctuary, National Red Data, Himachal Pradesh, taxonomic and ecological etc.

### INTRODUCTION

Mammals are distinct vertebrates with mammary glands and adaptive plasticity as they widely exploit the resources of earth from one pole to the other and mountain top to deep Ocean. The global mammalian fauna is represented by 4629 species under 1135 genera, 136 families and 26 orders (Wilson and Reeder, 1993). Of these, 390 species belonging to 180 genera, 42 families and 13 orders are found in India. Out of 180 genera, 61 are monotypic and 105 are represented in our country by a single species. Of the 390 species, 175 are threatened with extinction to various levels, and on that basis 75 have been listed in Schedule I, 73 in Schedule II, 8 in Schedule III and 19 in Schedule IV of the Wildlife (Protection) Act 1972 (Agrawal, 1998).

Chakraborty *et al.* (2005) has reported 107 mammalian species belonging to 77 genera, 25 families and 9 orders from Himachal Pradesh. Despite smaller area of only 1.7 % of total geographical area of India, the State harbours 27% of mammalian species of India. Out of 107 species of mammals found in the state, 21 have been included in Schedule I of the Indian Wildlife (Protection) Act, 1972. Recently Sharma and Saikia (2009) has updated the information on mammalian fauna of Himachal Pradesh and reported the presence of 111 species.

Mammalian fauna of Himachal Pradesh is an admixture of Palaearctic and oriental elements since the state lies in transition zone of two biogeographical realms. Brown Bear, Lynx, Alpine Weasel, Mountain Noctule etc. are some of Palaearctic representatives of State which probably reached from Hindukush Mountain and Russian Uzbekistan (Roberts, 1977). Some of the representatives of Oriental fauna of the State include Leopard Cat, Yellow Throat Marten, Himalayan Palm Civet, Indian Pangolin, Grey Goral, Barking Deer, Bandicoot Rat, Bush Rat, Flying Fox, False Vampire, Fulvous Leaf-nosed bat, Musk Shrew etc. However being a part of Himalayan range, no special level of endemism is found in the state with respect to mammalian species (Chakraborty *et al.*, 2005)

Kalatop-Khajjar wildlife sanctuary located in western part of Chamba District lies in the catchments of the Ravi

River. It is one of the oldest preserved forests of the State (notified on 01.07.1949), situated at 32° 26' North Latitude and 76° 32' East Longitude and the altitude of the sanctuary varies from 1185 to 2768 meters. It supports one of the densest forests of deodar in Himachal Pradesh. Temperature of the area varies from -10° C to 35°C. Out of a total sanctuary area of 2,026.89 hectares, 1962.84 hectare is dense forest of Deodar, Rhododendron, Oak, Pine etc. The area receives mean annual rainfall of 800 mm, most of which occurs in July-September month during monsoons. In addition, some rainfall alongwith snow is a characteristic feature of the sanctuary area.

Except a few enlistments like Thakur *et al.* (2002 a), Thakur *et al.* (2002 b) and Sharma *et al.*, (2004) present study area of Kalatop-Khajjar has not so far been explored for the presence of faunal elements. In addition, a large number of tourists visit the sanctuary every year due to its ascetic value and natural beauty resulting in human interaction with the wildlife. Therefore present study has been undertaken to know the diversity and ecological of mammals present in Kalatop-Khajjar Wildlife sanctuary.

### MATERIALS AND METHODS

Study area can broadly be divided into three main types depending upon the vegetation and human intervention like dense forests, lake meadow and human settlements. Dense forest consists of mature mixed Blue Pine and Deodar forests, with some Oak and Rhododendron. Undergrowth in the forest is well developed, dense in places and with a good cover of grass in November. There is a small lake fed by slim streams which rests in the centre of large glade of Khajjar. The average depth of this lake is around 13 feet as per district gazetteer. There are some human settlements in the interiors of the sanctuary as well as on periphery.

The mammalian populations were sampled by using a combination of direct and indirect methods. The direct methods utilized sighting of animals as the main data whereas indirect methods relied on quantification of

indirect evidences such as pellet groups, scats, pug marks and hoof marks in a predetermined sampling unit. The mammals were separated into two main groups based on size i.e. large and small mammals since sampling strategies for both groups differ considerably. The direct evidences of all large and medium sized mammals were made by using line transects method (Burnham *et al.* 1980). The entire procedure of line transect sampling was performed by walking on local footpaths due to difficult terrain of the study area. The footpaths were monitored in morning and evening hours which generally coincide with maximum activity period of animals. Some of the transects, as advised by the locals where chances of sighting of nocturnal mammals like Bats and Carnivores were more, have been explored during late evening and night hours. Transects were walked and monitored with the help of team of local villagers who scanned either side of transect to detect animals.

The indirect evidences such as scats, pellet groups were also employed to study the presence of some mammals. All indirect evidences such as pellet groups, scats were quantified as to species and their number. Different groups of shepherd, local people and Forest Department's

employees were also approached to know the presence of different animals.

The small mammal communities comprising of rats, mice, shrew, squirrels, bats etc. are one of the most vital groups as far as management of any landscape unit is concerned. Data on abundance, distribution and diversity of these groups were collected by general trapping. Sherman traps were deployed in different forest compartments for capturing the rodent species. The traps were set in either morning hours and checked in evening or they were deployed in evening and checked the following morning.

## RESULTS AND DISCUSSION

Present study revealed the presence of 16 species of mammals belonging to 14 genera, 12 families and 6 orders from the Kalatop-khajjiar Wildlife sanctuary. Order wise analyses of the data revealed that order Carnivora supported maximum of 6 species followed by Artiodactyla (3 species), and Chiroptera, Primates and Rodentia (2 species each). Moreover a single species belonging to order Insectivora was also reported (Table-I).

**TABLE 1:** Systematic list of mammals of Kalatop-Khajjiar Wildlife Sanctuary, District Chamba

Order – Insectivora Family – Soricidae	CITES	WPA (1971)	National Red Data
1. <i>Suncus murinus</i> (House Shrew)	-	-	-
Order – Chirptera Family – Vespertilionidae			
2. <i>Myotis muricola</i> (Nepalese Whiskered bat)	-	-	-
3. <i>Myotis blythii</i> (Lesser Mouse eared bat)	-	-	-
Order – Primates Family – Cercopithecidae			
4. <i>Macaca mulatta</i> (Rhesus Monkey)	II	II	-
Family – Cercopithecidae			
5. <i>Semnopithecus ajax</i> (Hanuman Langur)	I	II	-
Order – Carnivora Family – Canidae			
6. <i>Vulpes vulpes</i> (Himalayan Fox)	III	II	-
Family – Mustelidae			
7. <i>Martes flavigula</i> (Yellow throated marten)	III	II	-
8. <i>Mustela sibirica</i> (Himalayan Weasel)	III	II	-
Family – Ursidae			
9. <i>Ursus thibetanus</i> (Black Bear)	I	II	-
Family – Hynaeidae			
10. <i>Hyaena hyaena</i> (Striped Hyena)	-	III	-
Family – Felidae			
11. <i>Panthera pardus</i> (Leopard)	I	I	Vulnerable
Order – Artiodactyla Family – Cervidae			
12. <i>Muntiacus muntjac</i> (Barking deer)	-	III	-
Family – Bovidae			
13. <i>Nemahedus sumatraensis</i> (Serow)	I	I	Vulnerable
14. <i>Nemahedus goral</i> (Goral)	I	III	-
Order – Rodentia Family – Sciuridae			
15. <i>Petaurista petaurista</i> (Flying Squirrel)	-	II	-
Family – Muridae			
16. <i>Mus musculus</i> (House Mouse)	-	V	-

Family wise analysis of data revealed that families Vespertilionidae, Cercopithecidae, Mustelidae and Bovidae were represented by two species each whereas, Ursidae, Hynaeidae, Felidae, Cervidae, Sciuridae, Muridae, Soricidae and Canidae were represented by one species each. Of the sixteen species of mammals, 11 species belonged to the category of large mammals and 5 species to the category of small mammals.

Nine species has been listed as threatened in Convention in Trade of Endangered Species (CITES) under different schedules. Five species namely *Semnopithecus ajax*, *Ursus thibetanus*, *Panthera pardus*, *Naemorhedus sumatraensis* and *Naemorhedus goral* have been placed in schedule I, *Macaca mulatta* in Schedule II and *Vulpes vulpes*, *Martes flavigula* and *Mustela sibirica* under schedule III. Out of a total of sixteen species thirteen have been placed under Indian Wildlife Protection Act 1972. Two species *Panthera pardus* and *Naemorhedus sumatraensis* have been kept under schedule I. Same species are considered as vulnerable species according to National Red Data.

Mammals were reported from all three parts of study area i.e. dense forest, human settlement and lake meadow of the study area. Species like Leopard, Yellow Throat Marten, Himalayan Weasel, Black Bear, Striped Hyena, Barking Deer, Flying Squirrel, Himalayan Fox, Serow and Goral were recorded from the forest area. Himalayan Fox was reported from the grassy slopes outside the lake on village footpaths. Prater (1980) has also described the similar type of habitat for this animal. Himalayan Fox has been reported from grasslands. They take shelter in burrows dug in the ground, under or among rocks, and where there is vegetation among reeds and bushes. It prefers a dry rather than moist climate (Prater, 1980). Marten was reported from the forest where it makes its den in any convenient shelter, among rocks, under roots of trees, in hollows of stumps and many times it occupies burrows of other animals. Himalayan Weasel which generally lives in forests, in open grass and scrub, take shelter amongst rocks, under roots of trees, in hollow stumps or logs and quite often in the burrow of some other animals has been reported from the rocky slopes which were present on the way to Khajjiar Lake. No direct sighting of Black Bear were made during the present study, however, interview with local residents and some indirect evidences like destruction of maize crop by bear pointed towards the presence of good population of this species in the Khajjiar area. These evidences are supported from the previous study of the Prater (1980) who described that Black Bear lives in rock caves and hollows of trees. It comes out at dusk for feeding. Likewise, Leopard was not sighted directly during the present study but many indirect evidences supported the presence of this animal in the area. During the course of present study, two 'Kills' were reported on different occasions and near to these kills 'Pug Marks' were observed. Leopard is not restricted only to dense forests or heavy covers and thrives well in open country among rocks and scrubs. Primarily nocturnal, but can hunt in day time being more tolerated to sun light. Many locals complained that their pet animals were attacked by Leopard in the night. Some groups of Gorals have been regularly recorded throughout the course of study mainly during morning and evening hours in grassy slopes and forest habitat. Existence of Striped Hyena has been confirmed by observation of Pug Marks

and local residents including Forest personnel. This species is not very vocal as compared to Spotted Hyena (Negi, 2005).

Mammals of the study area have different feeding habits. Animals like Fox, Marten, Weasel, Hyena and Leopard are typical carnivorous and prey upon other small animals or eggs of birds. Animals like Black Bear are omnivores and its diet comprises more than 90% of plant materials (Hwang *et al.*, 2007). Present study indicated that crops of locals were invaded by black bear. They feed on plantations, where they damage trees by stripping the bark and eating cambium, and in cultivated areas (Mizukami *et al.*, 2005, Gong and Harris 2006, Vinitpornawan *et al.*, 2006). In some places the diet contains a sizeable portion of meat (Hwang *et al.*, 2002). Other animals like Rhesus Monkeys, Hanuman Langurs, Barking Deer and Goral are primarily herbivorous, generally feed on leaves, fruits, buds and flowers but sometimes also feed on insects, tree bark and gum (Jerdan, 1984). During present study it was found that feeding habits have been modified with availability of food and human development in the area. Leopard which is essentially a carnivorous animal, feeds on monkeys and ungulates in the normal wild state, has come out of the forest and lives near the human settlements. Leopards are forced to come out of its habitation in search of monkeys which is never safe for this large animal in view of encounters with human. On many occasions as the present study reported Leopards attack the domestic animals of local inhabitants. Similarly, during shortage of food in the forest, there is very less leftover for hyenas to eat which compel this animal to search for alternative source of food.

Present study indicated that ecological equilibrium of the study area was no more in a balanced stage due to developments and human interventions. With the passage of time natural food plants of Monkeys and Langurs have decreased in the forest and these animals have come out of their natural habitat and forced to live near or around human population. Similar observations have been made in some studies conducted in different parts of country in recent past. Southwick & Siddiqi (1994) reported that in the northern parts of our country normally 86% of rhesus monkey population depends entirely upon human settlements for their food however only 14.4% of the rhesus macaques live in isolation from humans and do not rely on them at all for food. It was observed that Leopard prefers easily available food in the form of domestic animals and stray cattle therefore natural check on monkey was not there. Feeding habits of monkeys and langurs in present study area have also changed. Now they have become more dependent on human left outs like baked or cooked food available near the human population, offered by tourists and leftover of the hotels. During present study it has been recorded that Rhesus and Langurs usually raids the crops of the natives and cause huge economic losses to them. A new kind of conflict has developed between the ecology of these animals and local farmers. Various incidences of violence of monkeys against tourist were commonly recorded.

Similarly, with increasing intervention of man into forest incidences of encounters between man and bear has also increased in the present study area of Kalatop-Khajjiar. Most of the places are remote and there are no access to the vehicle so local people has been using the forest path

and sometime it gives rise to bear-human interface. With decreasing food resources bears are forced to raid maize and other crops of farmers. It was observed that the amount of the destruction of the crop was much higher than they actually eat. Earlier when the food resources were available in the forest this kind of raids of crops were rarely observed as informed by people. Although Monkeys, Langurs and Bears are in conflict with humans but no incidences of their killing was recorded from the area.

Another important concern of ecology noticed during the present investigation was of stray cattle and cows. These are in huge numbers and can be seen grazing in and around the Khajjiar lake. Further, population of these stray animals is increasing day by day. This leads to increased addition of faecal matter in the lake which is leading to eutrophication of lake. Many times these stray animals enter forest for grazing and destroy undergrowth of forest. With ever increasing number of tourists reaching the Khajjiar every year, number of hotels is increasing. This is good for general socio economic development of the area but has adverse impacts on ecological health. Many tourists visit deep in the forests and enjoy tracking in the hills. Hotels and tourists produce a large quantity of non degradable garbage which accumulate in and around the lake and also deep into the forest. This non degradable litter also interfere which the rejuvenation of forest organic mass which impacts floral and faunal diversity.

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