IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS)
e-ISSN: 2278-3008, p-ISSN:2319-7676. Volume 10, Issue 4 Ver. V (Jul - Aug. 2015), PP 06-12
www.iosrjournals.org

Status, Diversity and Ecology of Mammals of Trans-Himalayan Rakchham-Chhitkul Wildlife Sanctuary in Baspa (Sangla) Valley, District Kinnaur, Himachal Pradesh, India

Rakesh Kumar Negi and H.S. Banyal
Abhilashi University, Chailchowk, Mandi, H.P. - 175028, India
Corresponding Author: Prof. H.S.Banyal,

Abstract: *The exploration of Rakchham- Chhitkul Wildlife Sanctuary present in the Baspa (Sangla) valley situated in remote tribal district of Kinnaur in Himachal Pradesh, India revealed the presence of a diverse population of 23 species of mammals belonging to 20 genera, 11 families and 5 orders. It was noticed that order Carnivora being the most diverse order with 12 species followed by orders Artiodactyla and Rodentia with 4 species each. 2 species of order Primate and a single species of order Logomorpha were observed in the sanctuary. The mammalian species reported presented an assemblage of unique and threatened species of mammals. The analysis of data revealed that twelve species have been listed in CITES, while out of the twenty three species reported eleven species have been placed under different schedules of Indian Wildlife (Protection) Act 1972. A total of six species reported from the study area were found to be declared threatened by IUCN.*

Keywords: *Mammals, Trans-Himalayan, Rakchham-Chhitkul Wildlife Sanctuary, Baspa(Sangla) Valley, District Kinnaur.*

I. Introduction

Himalayan mountains are the most magnificent and youngest mountain systems in the world which form a broad continuous arc for nearly 2600 Km along the northern fringes of the Indian subcontinent making a physical barrier between the high plateaus of Tibet and Central Asia and the Indian plains extending from river Indus in the west to river Brahmputra in the east. The proportion of endemic taxa is substantial in the entire Himalayan Range and this ecoregion has been designated as a global biodiversity hotspot.

The Trans-Himalayan landscape is a high elevation land ranging from about 2,900m to over 6,000m peaks with average altitude of about 4,000 m. The area is characterized by extreme cold, low precipitation and rugged terrain of mountains. Due to cold climate, inaccessible habitat and lack of expertise, the faunal diversity of these regions of Himalayas is poorly studied. In this paper the efforts were made to evaluate the status, diversity and ecology of mammals who successfully adapted to such extremes of climate.

Mammals are homoeothermic viviparous distinct vertebrates with adaptive plasticity as they widely exploit the resources of earth and occur in all sorts of habitats from polar regions to the tropics including the densest forests and driest deserts. Some have secondarily become aquatic and live in the sea. They are dominant animals today and have the capacity to learn because of better developed brain. The instinctive behaviour predominant in other animals has been largely replaced by learned behaviour in mammals. The global mammalian fauna is represented by 5416 species belonging to 154 families and 29 orders (Wilson and Reeder, 2005). Of these 428 species, 7.81% of the global mammalian species are reported from India, representing 48 families and 14 orders (Sharma et al., 2014) and about 291 species belonging to 39 families and 13 orders have been recorded so far from Indian Himalaya. The Indian Trans-Himalayas contributes 40 species, 77 species are from North-West Himalaya, 102 species from Western Himalaya and 172 species are from Eastern Himalaya (Sharma et al., 2014). Himachal Pradesh despite being a smaller state with only 1.7% of total geographical area of the country, contributes 27% of mammalian species with 107 species belonging to 77 genera, 25 families and 9 orders (Chakraborty et al.,2005). A total of 21 species from Himachal Pradesh figure in Schedule I of the Indian Wildlife (Protection) Act, 1972. An updated information on mammalian fauna of Himachal Pradesh reports the presence of 111 species (Sharma and Saikia, 2009).

Present study has been conducted in Rakchham- Chhitkul Wildlife Sanctuary located in the Baspa (Sangla) valley with geo-coordinates of latitude $31^0$14’22” N - $31^0$28’37”N and longitudes $78^0$17’31”E - 78^0 31’30”E covering an area of about 304 Km^2 in the northeast corner of Kinnaur, a tribal district of Himachal Pradesh, India (Fig. 1). The Baspa river originates near the Indo-Tibet border forms this valley from Chhitkul to Karchham where it joins the Sutlej river. The Baspa (Sangla) valley is characterized by lofty peaks the upper most part of the mountain peaks are covered by perpetual snow cover. These rugged, precipitous peaks represent two of the world’s greatest mountain ranges. The mountain ranges on the right bank of Baspa river form the part of Great Himalayan range while those on the left bank form the Dhauladhar ranges separating Baspa valley

from Uttarakhand state of India and parts of Shimla district of the Himachal Pradesh. The altitude of Baspa valley ranges from 2,800 masl to 5,486 masl. The temperature varying from -15°C to 18°C, mean rainfall 463 mm and annual snowfall 1,130 mm. The parts of the sanctuary up to altitude 3,450 m get good precipitation in the form of rain or snow but beyond that the precipitation is mainly in the form of snow. The forest type of this sanctuary includes Lower Western Himalayan Temperate Forest, Upper Western Himalayan Temperate Forest and Sub-Alpine Birch-Fir Forest. The sanctuary area is fed with numerous snow-fed perennial and seasonal streams. The Govind Pashu Vihar a wildlife sanctuary of Uttarakhand is adjacent to Rakchham-Chhitkul sanctuary and on its eastern boundary lies the Tibetan plateau of China. The valley is famous for many of its passes connecting Tibet and Shimla District of Himachal Pradesh.

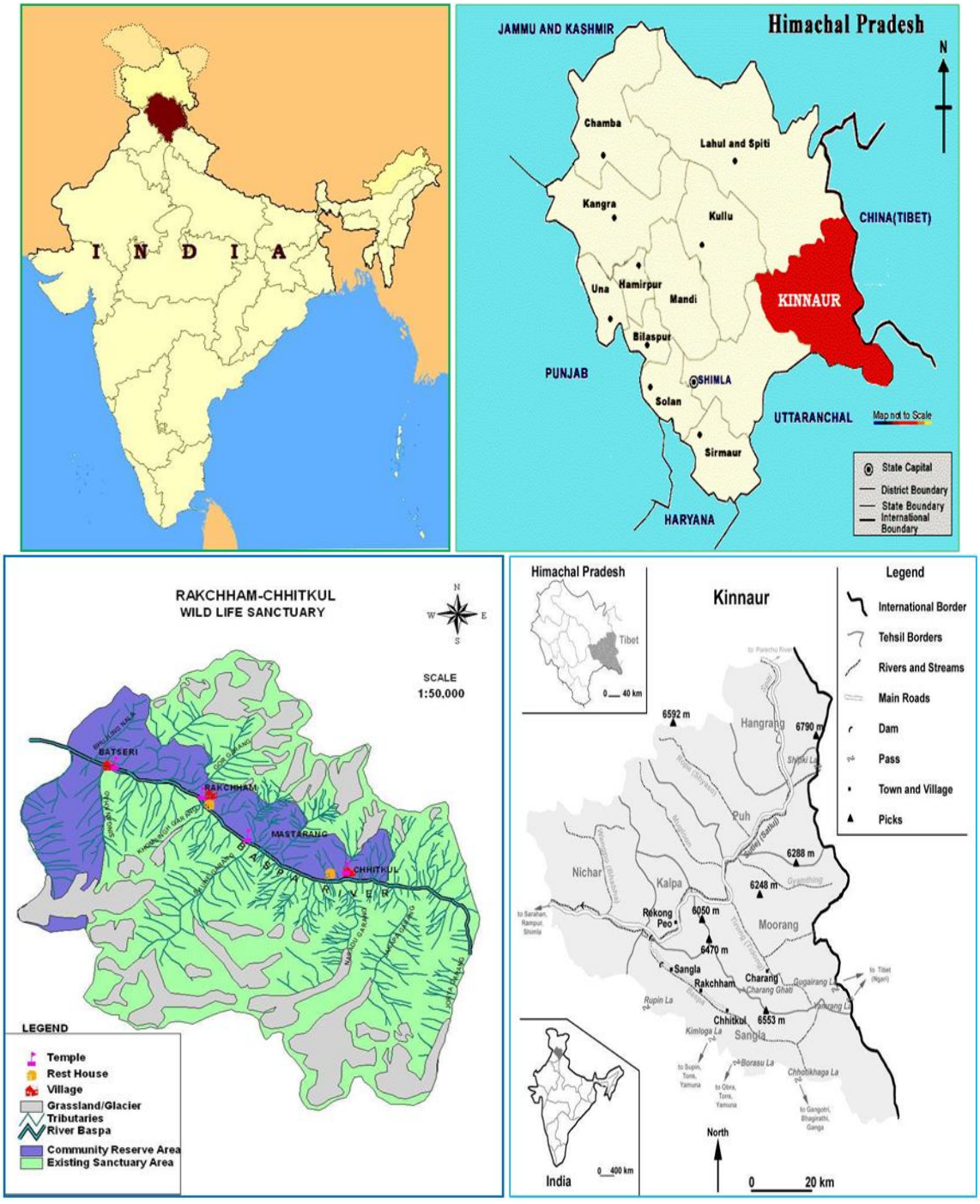

Fig.1: Map of Baspa valley, the study area in District Kinnaur, Himachal Pradesh, India (Source: mapsofindia.com and diagrammatic map of Baspa Valley).

Many investigators have conducted studies on diversity of mammals in different parts of the Himachal Pradesh (Blanford, 1881-91; Winter-Blyth, 1951; Prater, 1980; Rodgers and Panwar, 1988; Negi, 1992; Chakraborty et al., 2005, Sharma and Saikia, 2009; Singh and Banyal, 2013; Singh et al., 2014). In the past, a few attempts have been made to study the mammalian fauna of Trans-Himalayan region. Bhatnagar (1993) gave a general account of the wildlife of Pin Valley National Park. Studies on habitat utilization, feeding ecology and conservation of Asiatic Ibex conflicts between pastoralism and wild herbivores and the ecology of Snow leopard were also conducted in parts of Trans-Himalayan region in Himachal Pradesh and Ladakh (Bhatnagar, 1997; Chudawat. 1994; Manjrekar, 1997; Johnsingh et al., 1999; Mishra, 2000; Sharma et al., 2008). However, the present study area of Rakchham-Chhitkul wildlife sanctuary has received very little attention of the field biologists due to severe cold climate, inaccessible habitat and lack of local expertise. Only a few studies have been conducted on diversity and ecology of avian fauna of this sanctuary area (Wynter-Blyth, 1948; Narang, 1989; Negi and Banyal, 2015). The present study provides a preliminary list of mammals observed in the sanctuary for the first time and will act as baseline literature for further studies in this area.

II. Material And Methods

Stratification Of The Study Area

The study area is present at the cusp of Great Himalayan and Trans Himalayan range thus presenting vast altitudinal, geological and ecological gradient. Apart from the altitude, the major environmental differences are between the north-facing slopes and the south-facing slopes corresponding respectively with the left bank and the right bank of the Baspa River. The left bank of river Baspa is bestowed with thick forests of Tosh, Spruce, Blue pine, deodar etc. The forest of the area is divided into different zones like forests of lower areas dominated by lower level fir like Tosh extending from Sangla to Khrogla (3000-3300m), a little above these the forests are dominated by Deodar extending from Khrogla to Mustarang (3300-3500m) and the higher reaches of the forest dominated by Blue pine extending from Mustarang to Nagasti (3500-4000m) beyond which lies the large tract of alpine meadows (4000-5500m). This sanctuary is famous for the tract of Betula (Bhojpatra) tree beyond 3000m till the tree line. Most of the villages are situated on the right bank except village Batseri which is situated on the left bank of river. The study area was divided into regions concomitant with areas of different villages in the valley. These villages are located at different altitudes. Various habitats like forest, pastures, human habitations and agricultural fields in the Rakchham- Chhitkul Wildlife Sanctuary were selected for the present study. In addition to altitude the stratification was based on other factors like resources, size of the area and time frame etc. Some areas are traditionally famous for the presence of certain wildlife especially earmarked like Homnalo near village Rakchham meaning Nullah or vale of bears (Hom means bears in Chhitkuli and Kinnauri) and Brennalo in the forest of Chhitkul meaning Nullah or vale of Musk deers.

Collection Of Data

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 were explored during night hours also. 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 and Pikas 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 was 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 deployed in evening and checked the following morning. After taking photographs the animals were released. The photographs were identified and informations on the species mentioned were taken from Prater (1971) and Alferd et al. (2002).

III. Results

Present study revealed the presence of 23 species of mammals, belonging to 20 genera, 11 families and 5 orders. It was noticed that order Carnivora is the most diverse order with 12 species followed by order Artiodactyla and order Rodentia with 04 species each. The order Primate has 02 species followed by order Logomorpha with only 01 speceis representation. Further family wise analysis of the data revealed that families Felidae and Mustelidae were represented by 04 species each followed by family Bovidae with 03 species. The families Cercopithecidae, Canidae, Ursidae, Muridae were represented by 02 species each whereas families Moschidae, Cricetidae, Sciuridae and Ochotonidae were represented by a single species each. The mammals were reported from all the different altitudinal zones of the sanctuary area. Species like, Macaca mulatta, Semnopithecus ajax and Naemorhedus goral were restricted to the lower altitudinal areas of the sanctuary extending from areas of Sangla to the pastures of Rakchham (3000-3300m). They were reported from both banks of Baspa river. Species like Canis lupus chanco, Vulpes vulpes, Panthera pardus, Felis libyca, Prionailurus bengalensis, Martes foina, Martes flavigula, Bos grunniens, Alticola roylei, Rattus rattus, Mus musculus and Marmota himalayana had a wide distribution in the sanctuary and reported from almost all the altitudinal range and different habitats like forests and areas near to human settlements in sanctuary. The species which are confined to higher altitudes (3400-4700m) of the sanctuary include Uncia uncia, Mustela ermine, Ursus arctos, Ursus thibetanus, Moschus chrysogaster, Pseudois nayaur and Ochotona roylei.

Table:1 Systematic list of mammals observed in Rakchham-Chhitkul Wildlife Sanctuary, Baspa (Sangla) Valley, District Kinnaur, Himachal Pradesh (India).

Order: Primates Linnaeus, 1758 **Family: Cercopithecidae Gray, 1821**					
S. NO.	**COMMON NAME**	**SCIENTIFIC NAME**	**IUCN REDLIST CATEGORY**	**IW(P)A SCHEDULE**	**CITES APPENDIX**
1	Rhesus Macaque	Macaca mulatta Zimmermann, 1780	LC	II	II
2	Himalayan Gray Langur	Semnopithecus ajax Pocock, 1928	EN	II	I
Order: Carnivora Bowdich, 1821 **Family: Canidae Fischer de Waldheim, 1817**					
3	Tibetan Wolf	Canis lupus chanco Gray, 1863	_	_	_
4	Red fox	Vulpes vulpes Linnaeus, 1758.	LC	II	_
Family: Felidae Fischer de Waldheim, 1817					
5	Leopard	Panthera pardus. Linnaeus,1758	NT	_	I
6	Snow Leopard	Uncia uncia Schreber, 1775.	EN	I	I
7	Desert cat	Felis libyca Forster	_	_	_
8	Leopard cat	Prionailurus bengalensis Kerr, 1792	LC	I	II
Family: Mustelidae Fischer de Waldheim, 1817					
9	Stone Marten	Martes foina Erxleben, 1777	LC	II	III
10	Himalayan Yellow throated marten	Martes flavigula Boddaert, 1785	LC	II	III
11	Himalayan Weasel	Mustela sibirica Pallas, 1773	LC	_	III
12	Ermine	Mustela erminea Linnaeus, 1758.	LC	_	_
Family: Ursidae Fischer de Waldheim, 1817					
13	Brown Bear	Ursus arctos Linnaeus, 1758	LC	I	I
14	Asiatic Black Bear	Ursus thibetanus G.Cuvier,1823	VU	I	I
Order: Artiodactyla Owen, 1848 **Family: Moschidae Gray, 1821**					
15	Musk Deer	Moschus chrysogaster Hodgson, 1839	EN	I	I
Family: Bovidae Gray, 1821					
16	Himalayan Goral	Naemorhedus goral Hardwicke, 1825			
17	Bharal	Pseudois nayaur Hodgson, 1833	LC	_	I
18	Yak	Bos grunniens Linnaeus, 1766			

Order: Rodentia **Family: Cricetidae Fischer, 1817**					
19	Royle High Mountain Vole	Alticola roylei Gray,1842	NT	–	–
Family: Muridae Illiger, 1811					
20	House Rat	Rattus rattus (Linnaeus, 1758)	–	–	–
21	House mouse	Mus musculus Linnaeus, 1758)	LC	–	–
Family: Sciuridae Hemprich, 1820					
22	Himalayan marmot	Marmota himalayana Hodgson, 1841	LC	II	–
Order: Logomorpha Brandt, 1855 **Family: Ochotonidae Thomas, 1897**					
23	Pika	Ochotona roylei (Ogilby, 1839).	LC	–	–

Abbreviations: IUCN: International Union for Conservation of Nature and Natural Resources; **EN**: Endangered; **VU**: Vulnerable; **NT**: Near Threatened; **LC**: Least Concern; **IW(P)A**: Indian Wildlife (Protection) Act, 1972. **CITES**: Convention on International Trade in Endangered Species of Wild Fauna and Flora.

IV. Discussion

The present study is in correlation with some earlier studies on mammals reported from different parts of Himachal Pradesh and Trans-Himalayan region of the state. Sharma et al., (2008) documented the presence of 9 species belonging to 8 genera spread over 3 orders from Pin Valley National Park located in the Trans-Himalayan region in Lahaul and Spiti district of the state. Sharma and Saikia (2009) reported the presence of 21 mammalian species belonging to 19 genera and 9 orders from Simbalbara Wildlife sanctuary. Singh and Banyal (2012) investigated the taxonomic and ecological study of mammals in Kalatop- Khajjiar Wildlife Sanctuary in Chamba district and reported the presence of 16 species of mammals belonging to 14 genera, 12 families and 6 orders. Sharma and Saikia (2013) have reported the presence of 19 species of mammals comprising of 17 genera, 11 families and 4 orders from Pangi valley of Chamba district of state. Singh et al. (2014) studied the mammalian fauna of Prashar Lake and its surrounding area in Mandi District (Himachal Pradesh) and reported the presence of 13 species belonging to 13 genera, 12 families and 6 orders. Present study revealed the presence of 23 species of mammals belonging to 20 genera, 11 families and 5 orders. It was noticed that Order Carnivora is the most diverse order with 12 species. Order Carnivora is most well represented in the state of Himachal Pradesh (Chakraborty et.al.,2005) species wise and this holds true in the present study area as well with 04 families and 12 species.

Among the Primates reported from the study area Semnopithecus ajax dominates the mammalian fauna. A troop of the Semnopithecus ajax with a population of about 50-70 individuals was observed in Kale Kotang pasture of Rakchham village. They spend the entire summer months there and migrate to lower heights during winters. Occasionally they invade the orchards of local people destroying the apple crops. This species has been recently declared as endangered by IUCN and their reporting from this part of the world is a first record. Out of the two species of bears found in the sanctuary area the Ursus arctos is more elusive and prefers to stay in the thick forested areas while the other species Ursus thibetanus sometimes comes close to human settlements destroying the crops and orchads of the local people. As observed by Singh et al., (2014) in Parashar Lake area, the bear is omnivorous in diet and feeds on the plantations and damage the trees by stripping the bark and eating cambium in cultivated areas. They especially prefer the crop of Fagopyrum esculentum over Fagopyrum tataricum, the two species of buckwheat which are grown chiefly in this sanctuary area. During the present study they were encountered three times in the Homnalo area in Rakchham traditionally known to harbour this species. Their prevalence in this region may be attributed to presence of large number of caves in this area which act as perfect shelters and habitats throughout the year even during hibernation period in the winter months. Similiarly the earmarked area of Brennalo in the forests of Chhitkul was actually found to harbour the Moschus chrysogaster. The reason for this could be attributed to the fact that this particular area is rich in Rhododendron campanulatum that acts as perfect hide for this animal. During the present study direct sighting of the species was recorded twice, but indirect evidences were recorded on every visit to this specified area. The blue sheep, Pseudois nayaur is unique mountain ungulate that is somewhat between sheep and goat, as it displays the characteristics of both. This species was also reported from the alpine reaches in the areas of village Chhitkul (3500-4500m) right from the Mustarang area to Dumti area, during spring to autumn and they probably migrate to Uttrakhand side during the winters. Contrary to Moschus chrysogaster which prefers thickly forested areas, Pseudois nayaur prefers the more open, barren and rocky areas. It appears that these are the most populous among the species of mammals found in this sanctuary area. Similarly, Mustela erminea were also

reported from the alpine regions of the study area. It is a kind of Himalayan weasel, the forepaws and usually hind paws are conspicuously white contrasting with leg and tip of the tail being black. Alticola roylei is endemic to India and has been declared as endangered by IUCN. The most elusive of all mammals being Uncia uncia also reported from the study area mostly by indirect evidence. It was also observed by direct sighting once in the month of June 2013 when the whole region experienced unexpected and heavy snowfall of about five feet in the summer month and this species was observed in the area of Thingsyaring in Chhitkul village. The most common wild prey species of snow leopard was blue sheep although they also prey upon the domesticated animals like sheep and goats of the local people which graze in alpine zone during the warm months, i.e. from late May to early October. It was noted that in this sanctuary area, pastoralism still is a major economic resource, which includes flocks of sheep and goats and is based on seasonal migration as they spend summer in the pasture of the alpine zones of Chhitkul and winter in the forests of Sirmaur district of Himachal Pradesh. It was reported that leopard as well as snow leopard follows these flocks during their migration.

Most of the Mammalian species of the study area are given protection under different Schedules of Wildlife (Protection) Act, 1972 and also listed in IUCN Red List of Threatened Species and CITES (Convention in Trade of Endangered Species). Twelve species have been listed in CITES under different schedules, seven species namely Semnopithecus ajax, Panthera pardus, Uncia uncia, Ursus arctos, Ursus thibetanus, Moschus chrysogaster and Pseudois nayaur have been places in schedule I, two species Macaca mulatta and Prionailurus bengalensis in Schedule II whereas three species namely Martes foina, Martes flavigula and Mustela sibrica have been placed in schedule III. Out of the twenty three species reported eleven species have been placed under different schedules of Indian Wildlife (Protection) Act 1972. A total of five species namely Prionailurus bengalensis, Uncia uncia, Ursus arctos, Ursus thibetanus and Moschus chrysogaster have been kept under Schedule I**,** while six species namely Macaca mulatta, Semnopithecus ajax, Vulpes vulpes, Martes foina, Martes flavigula,and Marmota himalayana have been placed under Schedule II. A total of six species reported from the study area were found to be declared threatened, therefore, placed under different catogories by IUCN. Of these Semnopithecus ajax, Uncia uncia and Moschus chrysogaster are placed in Endangered, Ursus thibetanus as Vulnerable while Panthera pardus and Alticola roylei are listed as Near Threatened (Table 1). Most species recorded from the sanctuary area are altitudinal migrants moving to higher elevations during summer months and retreating to lower heights during harsh winters.

Biodiversity plays an important role in maintaining ecosystem sustainability and other ecosystem services like clean water and air, pollination, food, fuel, medicine etc. that are essential for human well-being. Thus human depends completely on biodiversity for its survival. Excessive anthropogenic pressures, causing habitat modification and destructions in recent times have been resulting in loss of biodiversity affecting fragile ecosystem like this sanctuary the most drastically. Presence of unique and endangered species like Uncia uncia, Ursus arctos, Ursus thibetanus, Moschus chrysogaster, Pseudois nayaur, Martes foina, Martes flavigula, Mustela sibrica, Mustela erminea and Ochotona roylei in the present study area is encouraging but at the same time a large human population is dependent on forests for their livelihood, either fully or partially in the sanctuary exerting pressure on natural resources. This study brought to light the diversity, abundance and distribution of mammalian fauna of Rakchham-Chhitkul wildlife sanctuary providing vital information and a baseline data for the future research and conservation planning which it requires at the earliest as it represents a fragile and sensitive ecosystem where increasing anthropogenic activities are beginning to show its baleful effect on the total biodiversity including mammalian fauna.

Acknowledgements

RKN is grateful to Chairman, Department of Biosciences, H.P. University, Shimla for the necessary technical facilities required for this study.

References

[1]. Alfred, J.R.B., Sinha, N. K. and Chakraborty, S.(2002). Checklist of Mammals of India. Published by Director, Zool. Surv.India, Kolkata. Rec. zool. Surv. India, Occ.Paper. 199: 1-289.
[2]. Bhatnagar, Y.V.(1993). Pin Valley National Park and its Wildlife. The Himalayan Journal,50: 202-204
[3]. Bhatnagar, Y.V. (1997). Ranging and habitat utilization by the Himalayan Ibex(Capra ibexsibrica) in Pin Valley National Park.Ph.D. thesis submitted to Saurashtra University, Rajkot, India.
[4]. Blanford,W.T.(1888-1891). Fauna of British India-Mammalia. Taylor and Francis, London,xx 617pp.
[5]. Burnham, K.P.; Anderson, D.R. and Laake, J.L. (1980). Estimation of density from line transect sampling of biological populations. Wildlife Monograph No. 72,The Wildlife Society, USA. 202 pp
[6]. Chakraborty, S.; Mehta, H.S. and Pratihar, S.,(2005). Mammals. In: Fauna of West Himalaya
[7]. (Part 2). (ed.:The Director). Zoological Survey of India, Kolkata, 341-359.
[8]. Chudawat,R.S. (1994). Ecological studies of snow leopard and its associate prey species in the Hemis High Altitude National Park. Ph.D. Dissertation, University of Rajasthan, Jaipur, India. 167pp
[9]. Habib, B., Shrotriya, S. and Jhala, Y. V. (2013): Ecology and Conservation of Himalayan Wolf. Wildlife Institute of India – Technical Report No. TR – 2013/01, pp 46. Manjrekar,N.1997, Feeding ecology of Ibex(Capra ibex sibrica)in Pin Valley National Park,

[10]. Himachal Pradesh. Ph.D. theisi submitted to Saurashtra University, Rajkot. Narang, M.L., (1989). Birds of Sangla Valley. Newsletter for Birdwatchers 29 (5-6): 8
[11]. Negi R. K. and Banyal, H.S., (2015). Avifauna of Rakchham- Chhitkul Wildlife Sanctuary District Kinnaur, Himachal Pradesh, India IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS) Volume 10, Issue 2 Ver. IV pp 18-25
[12]. Negi, S.S. (1992) Himalayan Wildlife Habitat and Conservation. Indus Publishing Company.pp. 47: 40-63.
[13]. Prater, S.H.,(1971). The Book of Indian Animals. Bombay Natural History Society, Bombay.Oxford University Press. 324 pp.
[14]. Rodger, W.A. & Panwar H.S.,(1988). Planning A Wildlife Protected Area Network in India—
[15]. Vols I & II. Wildlife Institute of India, Dehradun, 341pp.
[16]. Schaller G.B.,(1977). Mountain Monarchs.Wild sheeps and goats of Himalayas. University of Chicago press, Chicago. 425pp.
[17]. Sharma D.K., and Saikia U., (2009). Faunal Diversity of Simbalbara Wildlife Sanctuary, Conservation Area Series, Zoo. Surv. India.,41:103-118.
[18]. Sharma D.K., and Saikia U., (2013).Mammalia.In: Faunal Diversity of Pangi Valley(District Chamba, Himachal Pradesh. The Director (Ed.) Vol. 3, Zoological Survey of India, India pp: 107-120.
[19]. Sharma, G., Kamalakannan, M. and Venkataraman, K.,(2014). A Checklist of Mammals of India with their distribution and conservation status. Zool. Surv. India, Kolkata, India. 123pp.
[20]. Sharma G, Kamalakannan M., Debashree Dam and Akhlaq Husain (2015). Status and Conservation of Mammalian Diversity in Indian Himalaya Biological Forum – An International Journal 6(2): 273-299.
[21]. Singh, J. Thakur M.L. and Banyal,H.S. (2014). Avifauna of Prashar lake and its surrounding area in Mandi District (Himachal Pradesh), India. Asian Journal of Biological Sciences 7 (2): 47-56.
[22]. Singh, V. and. Banyal, H.S (2013). Avian Fauna of Khajjiar Lake, District Chamba, Himachal Pradesh, India. Proceedings of the Zoological Society, 66 (2):130-136.
[23]. Wilson, D.E. and Reeder, D.M. (eds.). 2005. Mammal Species of the World: A Taxonomic and Geographic Reference-Third Edition. Johns Hopkins University Press, Baltimore, MD. 2: 1-2141.
[24]. Wynter-Blyth, M.A., (1948). An expedition to Sangla in Kunawar. J. Bombay Nat. Hist. Soc. 47 (4): 565-585.