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Semnopithecus ajax an endangered but comparatively unknown species, searching for its place in nature

Vikram Singh* and DR Thakur**

**Post Doctoral Fellow, Department of Biosciences, ** Professor Department of Biosciences*
Himachal Pradesh University Shimla, India

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ABSTRACT

Kashmir grey langur *Semnopithecus ajax* (Pocock, 1928) is a newly assigned species of langur which is endangered due to it is restricted in its range with an extent of occurrence of less than 5,000 square kilometres. In India they are mostly present in an area of occupancy of less than 500 square kilometres, being to a valley surrounded by high peaks in Chamba. Its occurrence is difficult to determine owing to taxonomic uncertainty. In this review paper we are trying to bring in the present status of this species along with potential threats.

Keywords: *Semnopithecus ajax*, Habitat, Langur, Endangered, conservation

INTRODUCTION

India has long been known as one of the rich primate areas of the world, both in species diversity and population abundance. Fourteen species of nonhuman primates occur in India-six species of macaques, five of langurs, two of looses, and one species of gibbon (Southwick & Lindburg, 1986). In population abundance, Rhesus and Semnopithecus (Hanuman langur) are considered as largest population of non human primates sharing this distinction with baboon of Africa.

Genus Semnopithecus is widely studied and harbours a range of species belonging to various geographical and ecological regions. *Semnopithecus entellus* is the representative species which range from Sri Lanka to the Himalayas in Indian subcontinent in habitats extending from semi desert and subtropical forest to subalpine scrub (Bishop1977, 1979; Brandon-Jones *et al*., 2004; Koenig & Borries 2001, Roonwal & Mohnot, 1977).

Earlier *Semnopithecus* was considered a subgenus of *Presbytis* by Szalay & Delson (1979) but lately was separated from *Presbytis* by Groves (1989). Previously, only *Semnopithecus entellus* was recognized as a species, the remainder all being treated as subspecies. According to the Orlando C.A.M.P. workshop, ten sub species of grey langur were identified, these were *S. entellus achates* (plains langur), *S. e. ajax* (dark-eyed himalayan langur), *S. e. anchises* (Deccan hanuman langur), *S. e. entellus* (Bengal hanuman langur), *S. e. hector* (grey langur), *S. e. hypoleucos* (dark-legged Malabar langur), *S. e. schistaceus* (central Himalayan langur), *S. e. dussumieri* (Dussumier's Malabar langur), *S. e. priam* (Madras grey langur) and *S. e. thersites* (grey langur) (Walker & Molur, 2004). However, in 2001, it was recommended that several distinctive former subspecies should be given full species status; accordingly seven species were recognised (Groves, 2001, 2005). These are as follows:

Semnopithecus schistaceus (Hodgson, 1840)
Nepal grey langur

Semnopithecus ajax (Pocock, 1928)
Kashmir grey langur

Semnopithecus hector (Pocock, 1928)
Tarai grey langur

Semnopithecus entellus (Dufresne, 1797)
Northern plains grey langur

Semnopithecus hypoleucos (Blyth, 1841)
Black-footedgrey langur

Semnopithecus dussumieri (I. Geoffroy, 1843)
Southern plains grey langur

Semnopithecus priam (Blyth, 1841)
Tufted grey langur

It is generally very difficult to identify and differentiate the individual species from each other; mostly people consider all species *Semnopithecus entellus*.

Himalayan Grey Langur is a species of langur formerly considered as a sub species of *S. entellus*. This is a newly assigned species of langur and its distribution is uncertain especially in India. Though it is being reported from Himachal Pradesh, India (Great Himalayan National Park, Kallatop-Khajjiar and Manali Wildlife sanctuaries) and State of Jammu Kashmir (Kishtwar National Park), Nepal (Lang Tang National Park of Central Province) (Walker & Molur, 2004) still there are chances of its confusion with common Hanuman Langur.

Species name of the Himalayan Grey Langur i.e. Ajax is derived from the Greek whose reference is there in Trojan war where two character having name Ajax was there but as Pocock (1928) compared *Pithecus entellus* ajax with *P. e. Achilles* he presumably had in

*Corresponding Author's E-mail: vikramresearchhpu@gmail.com

mind the bravest and handsome of the Greeks after Achilles, Ajax, king of Salamis and son of Telmon. Ajax well matched hector in many combats then ran amok and killed Achilles' divine armour was awarded to Odysseus posthumously. In opposition to the generic name, Ajax is a masculine nominative singular proper noun and therefore it is declined to agree in gender with that of the genus.

Characteristics of *Semnopithecus ajax*

Dark-eyed Himalayan grey langur *Semnopithecus ajax*, can be distinguished from other species of *Semnopithecus* found in the lower altitudinal areas, by its larger size and outer sides of both the fore and hind limbs covered with silvery-dark coloured hair suffused with brown back darkest on the hand and forearm (Roberts, 1997; Wilson & Reeder, 1992). The long tail of this langur always forms a broad arc over their back curving towards the head when on the ground (Jay, 1965). Himalayan Grey Langur belongs to the family Cercopithecidae and subfamily Colobinae, which includes all the old-world monkeys with folivorous feeding habit (Roberts, 1997; Thorington & Anderson, 1984).

Taxonomy

Genus: *Semnopithecus* Desmarest, 1822
1822. *Semnopithecus* Desmarest, *Mammalogie, in Encycl. Meth, 2 (Supp.)*: 532
Semnopithecus ajax, Pocock, 1928
1928. *Semnopithecus ajax* Pocock , *J. Bombay Nat. Hist. Soc*., 32: 480.

The unique characteristics of the Himalayan Grey Langur, *Semnopithecus ajax*, distinguishes the species from its congeners, *Semnopithecus hector* and *Semnopithecus schistaceus*. The lateral flowing silky white upper coat, tinged with yellowish brown hair starkly contrasts the tightly wound dark greyish coat of *Semnopithecus schistaceus* and of the pale coated, low altitude *Semnopithecus hector*, re-establishing Pocock's (1928) description and attesting its endemism as argued by Groves (2001). This understanding of the specific identity of *Semnopithecus ajax* opens venues for more species specific research in the region and paves way for species specific conservation. Understanding the taxonomy is indispensable to establishing distribution data, conservation threats and human-primate relationship.

Distribution

Himalayan Grey Langurs is reported from a varied habitat including quite dry savannah and tropical rain forests. They inhabit between 2200 − 4000 m asl (above sea level) in the subtropical, tropical moist temperate, alpine, coniferous, broadleaved forests and scrublands (Nowak, 1999; Hilton & Taylor, 2000; Roberts, 1997). From India subcontinent their distribution is reported from Pakistan, India and Nepal. In India Himalayan Grey Langur is found in Himachal Pradesh (Great Himalayan National Park, Kallatop-Khajjiar and Manali Wildlife sanctuaries) and State of Jammu Kashmir in Dachigam National Part (Kishtwar National Park). They are found in Lang Tang National Park of Central Province in Nepal (Walker & Molur, 2004).

In Pakistan, these langurs are confined to Pak occupied Kashmir and District Mansehra, Pallas Kohistan, Bankad Dubair and Pattan (Roberts, 1997). In Pak occupied Kashmir these beautiful monkeys are distributed in Neelum Valley (Machiara National Park and Salkhala Game Reserve), Jehlum Valley (Moji Game Reserve and surroundings), and Hillan and Phalla game reserves in District Bagh (Ahmed, 1999; Baig, 2004; Dar, 2006).

Habitat Unitisation

The Langurs are generally ecologically adoptable to a varied habitat but *S. ajax* is having a limited range of occupancy in peculiar habitat. They are found in moist and dry coniferous forests mixed with deciduous trees and subalpine scrubs. Nowak (1999), Hilton and Taylor (2000) and Roberts (1997) also reported that the species inhabited between 2,200- 4,000 m asl in the subtropical, tropical moist temperate, alpine, coniferous, broadleaved forests, including scrublands. However during the summer season they migrate upwards into the subalpine scrub forests and in some localities even further into the alpine zone. In most of the habitats, they prefer moist temperate forests with dominant deciduous vegetations (Minhas *et al*., 2010).

Zoogeographical distribution of be *S. ajax* appears to be debatable. Further research is required to ascertain its particular localities. A systematic survey is required to map the range of this species along its present known range as well as along the adjoining sectors in the north-western Himalayan region both in India and Pakistan (CAMP, 2003).

Population Density

Most of the informations about the population density of Langur are available about the genus *Semnopithecus* as it is studied extensively in the Indian subcontinent, especially the species *Semnopithecus entellus* (Hanuman langur). Less information is there specifically about *Semnopithecus ajax* as only few studies are there on this endangered animal mainly due to late recognisation of species and partly due to its limited habitat zone. The mean troop size of the *S Semnopithecus ajax* is 72.77 and mean band size is 42.66 (Minhas *et al*., 2012). The density of the Kashmir gray langurs is 16.01/km^2 which is slightly less than the overall population density of other langur species i.e. 16.32 individuals/km^2.

Mir *et al*. has reported that in Dachigam national Park group density of *Semnopithecus ajax* varied from 0.50± 0.13 groups/km2 to 1.21 ± 0.18 groups/ km^2 and the average group size of langurs did not show much variation across seasons. They noted that the density of *Semnopithecus ajax* was lower than densities of grey langurs reported from other food abundant habitats of the country. The overall population density of langurs is about 16.32 individuals/km^2 in Dachigam which is almost same as the density of Kashmir gray langurs (16.01/ km^2) reported from similar Himalayan ecosystem of Machiara National Park, Pakistan (Minhas *et al*., 2012). Bagchi *et al*. (2003) estimated 21.7 individuals/km^2 in

Ranthambore, Edgaonkar (2008) reported 28.3 individuals/km^2 in Bori-Satpura tiger reserve, Narasimmarajan *et al*. (2012) reported 42.92 individuals/km^{2}from Melghat Tiger Reserve, Maharashtra and the highest density of 82.5 individuals/km^2 was estimated in Pench tiger reserve by Majumder *et al.* (2010).

There is not significantly variation in the density of Langurs across different seasons, only a marginal fluctuation in density is there which can be attributed to the movement of langurs from upper areas including some adjacent protected areas towards lower comparatively less hostile areas of Dachigam National Park in the winter months (Mir *et al*, 2015) . Same kind of trend showing the fluctuation in the population density due to the migration of troops is also reported by Minhas *et al*. (2012) from Machiara National Park.

Each langur troop maintains its distribution and movement with a little overlap. Home range size varies in different habitats. The same troop differs in its ranging pattern temporarily or permanently during different times of the day or in seasons of the year spatially across different habitats. In bisexual troops the average home range is from 2.33 km2 to 5.47 km^2 (233-547 hectares) whereas all male bands extensively ranged between 4.0 km^{2}and 6.0 km^{2}area (400-600 hectares).

The langur population is distributed in uni-male bisexual troops, multi-male bisexual troops and all male bands. Each troop is composed of an adult male (uni-male bisexual) and occasionally of more than one adult male (multi male bisexual), several adult females and their immature offsprings. A male band was composed is only males of different age classes excluding the breast feeders.

All the troops show very strong attachment to their particular distribution areas. In bisexual troops, the average home range varied from 2.33 km^{2}to 5.47 km^2 (233-547 hectares), while all male bands utilized more extensive space with an average of 4.0 km^2 and 6.0 km^2 area (400-600 hectares). All male bands usually use larger home ranges than the bisexual troops, which coincides with the findings of Rajpurohit (2005) in Jodhpur India. Chhangani & Mohnot (2006) hold a number of factors responsible for variation in the langur home range size; including availability and abundance of food, presence of agricultural crops and provisioned food, group size and composition, population density, predator pressure, agricultural activity and human interference. Most of these factors (excluding presence of agricultural crops and provisioned food) are considered to be the causes of variation in langur home range. Similarly, the troop size and home range are directly linked to each other. The smaller troop size encompasses smaller home range. The home range increases with increase in the group size since the larger troops have to travel long to fulfil their daily food and other requirements as compared to the smaller ones. Similar results were reported by Rajpurohit (1987), Bhaker (2001), Rajpurohit *et al.* (2004) and Rajpurohit (2005).

The availability of resources and competition among the individuals of the troop results in the variation of home range size. In comparatively rich environments, langur home range, however, may not depend on the troop size (Horwich, 1972) as all the requirements are fulfilled within a smaller area.

Foraging

They are arboreal and diurnal species and prefer to jump from tree to tree through the branches when foraging but some may become accustomed to living close to the human settlements (Tritsch, 2001). At the end of the day all the individuals gather around the sleeping sites and on the onset of darkness they climb up the trees for the sleeping purpose. All focal groups use 2-11 large and small trees of various species for the roosting within their home ranges. Most of the troops generally use different number of sleeping sites, where in they mostly roost on the 3-7 trees of *Betula utilis* and *Quercus incana* in three sites during the summer season while *Aesculus indica*, *Abies pindrow* and *Juglans regia* are used at the five roosting sites (Minhas *et al*, 2010).

They are usually found in the moist temperate coniferous habitats with mixed deciduous forests. However during the summer season they migrate upwards into the subalpine scrub forests and in some localities even further into the alpine zone. In most of the habitats, they prefer moist temperate forests with dominant deciduous vegetations. In mani localities S. ajax enter and raid the cultivated areas but in Machiara National Park They are never observed penetrating into the cultivated areas in or around the villages, however they are observed many times in the cultivated fields inside the forest areas during the winter. langurs sometimes overlapped the habitats of rhesus monkeys during the winter months and they are never observed together in the summer since during these months the rhesus monkeys are usually found in the vicinity of the cultivated areas while the langurs are found penetrating into the high altitudinal areas mostly overlapping the habitats of musk deer in subalpine scrub forests. Most of the langur troops are in the areas where adequate water is available (Minhas *et al*., 2010).

Seasonal variations

Semnopithecus ajax devotes more time to foraging in comparison to resting in a day. They spent least time in resting and the second highest time was spent on foraging activity. There is also variation of foraging activities of the langurs in different seasons. In winter season, the Kashmir langur spend an average 34.32 % of their time in carrying out various social activities like grooming, playing and agonistic activities, followed by time spent on foraging (25.44 %), moving (21.81 %), and the least time is spent in resting which accounted for 18.41 % of their daily activities (Mir *et al*., 2015).

This variation in the forging behaviour can be attributed to the various aspects one of them is availability of food**.** This is supported by various studies like Schneider *et al*. (2010) which explains that in general the time budgets of the folivorous colobines are largely influenced by their diet. So food availability has a crucial role to determine time budget of these primates. They usually spend majority of their time resting and considerably less time feeding and moving (Clutton-Brock 1977; Stanford 1991; Fleagle 1999). *Semnopithecus ajax* spends

relatively more time in carrying out social activities followed by foraging and then the locomotion. However, least time is allocated to resting. A clear reason behind this is scarcity of food due to heavy snow cover during winter. Feeding time in winter may also be high due to more energy consumption for thermoregulation at lower temperatures (Hill 2006) and they might be on negative energy budget during the winter thereby requiring food more often, and thus spend more time foraging. There are other studies also which have concluded that primates respond to snow coverage and low temperature by maximizing feeding efficiency and attempting to ingest more food (van Doorn *et al*., 2010; Majolo *et al*., 2013). Increased feeding time as a response to low food availability has been documented for various primates living in temperate regions (Guo *et al*., 2007; Sayers and Norconk 2008; Mendiratta *et al.,* 2009; Sayers *et al*., 2010).

This foraging behaviour is also varied according to the age group and sex o the individual as there is a significant difference in the amount of time spent by male, female and juvenile langurs in social activities and feeding but there was no significant difference in time spent in resting and moving.

Male individuals spent maximum time feeding (32.50 %) followed by moving (26.25 %), resting (23.75 %) and social behaviour (17.50 %) while female individuals spent 35.48 % of daily time in various social activities followed by foraging activity (27.64 %), resting (21.19 %) and moving (15.66 %). Juveniles spend maximum (50 %) of their day time carrying out various social activities, which included playing, followed by locomotion (23.52 %), feeding (16.17 %) and resting (10.29 %) (Mir *et al*., 2015). In some other studies also it is revealed that juveniles spent considerably more time in social behaviours than adults. The same is true for the white-headed langur (*Trachypithecus poliocephalus*) (Li and Rogers 2004), and is associated with their physical and behavioural development and socialization (Poirier *et al*., 1978).

Feeding

The observation for food and feeding activities is essential for the understanding of a species and its ecological adaptation to the environment. The search for food is very crucial part of the lives of langur like the other animals as it is vital for the maintenance and reproduction of the animals.

The Himalayan Langurs are mainly folivorous species; they are mainly classified as folivorous species, as they have multi-chambered stomach, specialized for the digestion of leaves (Amerasinghe *et al*., 1971; Minhas *et al*., 2010). They also consume fruits, flowers, cultivated crops, seeds with high levels of the toxins, like, strychnine (Strychnos non-vomica) and distasteful vegetation avoided by other creatures. The animal is exclusively herbivorous, feeding mainly on young leaf buds, shoots and other vegetations (Roberts, 1997), but observations in the open scrub forests of Jodhpur reveal that the insects may also constitute a regular part of their diet and that insectivory is particularly prevalent in the monsoon months of July−September (Srivastava, 1991). Moore (1985) in a study of langur all-male bands also observed five episodes of active insect predation.

Similarly Dark-eyed Himalayan grey langur also mostly feed on a combination of fruits, buds, leaves, stems, barks, roots and flowers and also observed eating insects. In one of the study in Machiara National Park, 37 species of plants were found to be part of eating habits of langurs of the focal troops. Of these, *Betula utilis*, *Polygonum alpinum*, *Skimmia laureola*, *Juniperus communis*, *Rheum emodi*, *Ribes alpestre*, *Quercus incana*, *Jurinea dolomiaea* and *Prunus cornuta* constitute major share of langur's diet (Minhas *et al*., 2010). Mir *et al*., reported that in Dachigam national park Langurs feed upon 13 plant species belonging to 12 families found naturally in their habitat. In many other studies at various habitats they are reported to consume 36 − 87 species (Rahman, 1973; Starin, 1973; Yoshiba, 1967; Ripley, 1970; Haldik & Haldik, 1972; Mohnot, 1974).

They prefer mature leaves compared to the other parts of the plants. They consume 36.12% mature leaves, 27.27 % young leaves, 17.00 % fruits, 2.19 % flowers, 1.28 % stems and 9.45 % bark of the plants (Minhas *et al*., 2010). Similarly Rajpurohit (2005) observed during one year an average of 6 % leaves, 23 % fruits and 7 % flowers.

Among the leaves, about two thirds (38.5 %) of total feeding time were devoted to mature leaves and about 27.5 % on young leaves. Similarly, the average yearly diet of langurs reported by Rahman (1973) consisted of 85.4 % leaves. Yoshiba (1967) observed that langurs spent 94.6 % of their feeding time on leaves, 1.7% on fruits and 1.2 % on flowers. In other studies by Ripley (1970), Haldik and Haldik (1972), the langurs consumed about 71.9% − 83.7 % of leaves, 7.9% −12.5% of fruits and 7.9% − 6.8 % of flowers.

This dietary behaviour of the *Semnopithecus ajax* is in compliance to the other species of langur as Stanford (1991) reported that Capped langurs (*Presbytis pileata*) in Madhupur National Park in north-central Bangladesh also consumed 42 % mature leaves of their annual diet. Thus from the above studies it can be concluded that the langurs almost consumed more leaves (about 85 %) and are exclusively herbivorous.

Several physiological and behavioural adaptations are behind the preference of this large amount of leaves in the feeding habits. This helps them to survive on their relatively un-nutritional diet through most of the day and gain energy by steady foraging for long periods of time that involves little movement (Rajpurohit, 2005). Flowers are particularly important source of food during flowering seasons which may also aid animals through a vulnerable stage of life (Daubenmire, 1971).

Langurs are also observed to feed occasionally on body lice (*Pediculus* spp) picked up from the bodies of the other individuals during grooming and other insects obtained from bark removal or stone turning. They also consume insects as Moore (1985) has also reported that langurs preyed and consumed insect pupae and eggs of birds during several observations. He concluded that the insect-eating by langurs was best explained by an energy/ nutrient maximization model, rather than as a consequence of any special characteristic of meat itself. Insectivory in langurs is also reported by Srivastava (1991) and Rajpurohit (2005) in the Jodhpur langur population.

Feeding habits of *Semnopithecus ajax* in Dachigam national park are slightly different as their food consumption includes of various plant parts such as bark, leaf buds, fruit, leaves, and seeds that varied with species consumed but Bark constituted 37.4 % of their diet followed by leaf buds (24.2 %), fruits (17.1 %), leaves (13.8 %) and seeds (7.5 %). Also, more than 50 % of langur diet is made up by *Aesculus indica*, *Ulmus wallichiana* and *Quercus robur* during the winter season.

This species is highly flexible in its feeding habits according to the availability of food in response to harsh winters in its habitat. They rely highly upon low quality diet in food scarce conditions of winter in order to avoid energy crises as tree bark constituted of 37.4 % diet of langurs in DNP. This high dependence upon bark clearly shows their flexibility in food preference **(**Mir *et al*., 2015). They shift their diet to low quality non-folivorous diet comprising mainly of bark as there are no or fewer green leaves available in winter months. Sayers and Norconk (2008) also emphasized on their ecological generalist behavior and reported similar results from Nepal where leaf buds comprised a major portion of the Himalayan gray langur diet in winter, particularly from *Cotoneaster frigidus* and *Sorbus cuspidata,* and ripe fruit, e.g., *Berberis aristata* and *C. frigidus*. They also reported langurs feeding upon bark from more than five woody plants in winter season, which usually was avoided in other seasons. Bark helps to increase the health quality of primates by providing other benefits in addition to substitute for preferred folivorous diet in the lean season. Study of Vuorela (2005) supported the same as they revealed that bark of *Pinus pinaster* and found it as a rich source of pro-cyanidin oligomers, which are bioactive sources of plant phenolics. These are effective against the formation of the pro-inflammatory mediator prostaglandin (E2). Vuorela (2005) concluded that pine bark phenolic extracts are safe and bioactive for possible food applications including functional foods intended for health benefits.

Conservation Ecology

The International Union for the Conservation of Nature and Natural Resources (IUCN) in 2000 classified the '*Semnopithecus entellus ajax'* as Lower Risk; near threatened and now due to improved information and taxonomic revision [CRB1ab(iii,v) +2 ab (iii,v) ver.3.1 (2001)], this subspecies was reassessed in 2004 and is now regarded as "Critically Endangered" (IUCN, 2006). It is considered endangered due to it is restricted in its range with an extent of occurrence of less than 5,000 square kilometres. In India they are mostly present in an area of occupancy of less than 500 square kilometres, being to a valley surrounded by high peaks in Chamba. This area is affected by human activities causing continuous decline in habitat quality and space. They have very small population estimated 250 mature individuals (Groves & Molur, 2008).

This species is listed on CITES Appendix I, and Schedule II Part I, of the Indian Wildlife Protection Act, 1972 amended up to 2002 (Molur *et al.* 2003). Its occurrence in protected areas is difficult to determine owing to taxonomic uncertainty. The following areas are in need of research: taxonomy, life history, survey studies, limiting factor research, behavioral ecology.

Threats

All the primate taxa including langurs in the Indian subcontinent are under severe threats. The major and common threats throughout the region are the habitat loss and degradation through human encroachment, overgrazing, building roads through forests, lopping, deforestation, agriculture, fire, unavailability of food, predation by carnivores (leopards and tigers) and attack of several viral and bacterial diseases. Present and future threats are mainly due to agriculture and development practices (Biswas & Sankar, 2002; Bagchi *et al*, 2003; Nandi *et al*, 2003; Nowak, 1999).

Although habitat of these langurs is stable but is predicted future decline by 10% during the next years due to forest clearance for agriculture, tourism, hydro project construction and encroachments. There has already been a decrease in habitat quality due to such alterations (Hilton & Taylor, 2000).

In recent years, Himalayas has come under a strong threshold of development. Natural ecosystems/ habitats have been over-exploited and even destroyed by the rapidly increasing human population and tourist inflow. A number of endemic and restricted range species found in the area/region are facing threat to their existence (Vedwan & Rhodes, 2001). In Chamba district which is major habitat for *S. ajax* in India, various minor and large hydro electrical project are being constructed resulting in the mass scale of habitat destructions as well as other ecological damages. Its population is restricted to a very small area and is continuously declining throughout the range.

Conflict

Conflict between humans and primates is common and increasing (Estrada *et al*., 2012; Nijman, 2010; Sharma *et al*., 2011). Throughout the state of Himachal Pradesh nonhuman primate (monkeys and langurs) are in conflict with human as they raid cropes of farmers causing them economic loss. Expansion of human population and developmental work leads to habitat loss. 47% panchayats in district Chamba of Himachal Pradesh are affected by monkey crop damage. Feeding habits of monkeys and langurs have 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. In the recent past it has been recorded that Rhesus and Langurs usually raid 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 (Singh & Banyal, 2012). *Semnopithecus ajax* is reported many times in the cultivated fields inside the forest areas during the winter. Similar situation is there in their natural habitat of *Semnopithecus ajax.*

Reducing conflict between wildlife and people is considered a top conservation priority, particularly in landscapes where high densities of people and wildlife co -occur (Treves & Karanth, 2003; Dickman, 2010). Increased visibility for conflict incidents may be

attributed to actual increase in incidents taking place or just greater reporting by affected local people (Treves and Naughton-Treves, 1999). Dearth of knowledge about conflict loss and compensation distribution contributes to poor allocation of conservation resources (Linkie *et al*., 2007; MacDonald-Madden, 2008). Failure to address emerging issues with conflict losses and distribution of compensation may lead to escalation of tensions between people and wildlife, and promote retaliatory actions leading to extirpations of species (Bulte & Rondeau, 2005; Treves *et al*., 2011). Preventing conflict and improving distribution of compensation are important to fostering co-existence in landscapes that surround protected areas and function as critical buffers for wildlife (Madden, 2004; Karanth *et al*., 2012).

Conservation

At the ecosystem level primates including dark eyed Himalayan langurs exerts a very important feedback control on the vegetation itself and also essential to maintain homeostasis of the forest ecosystem, especially critical for forest regeneration and survival. Primate could also be projected as 'flagship' or 'umbrella' species in forest ecosystem and by protecting 'primates', a large number of species including its habitat could be protected. On the other hand primate often performs ecological services that are important to maintain tropical habitat as seed disperser, pollinator, seed predator as well as food for top predator. Primates form an integral part of biodiversity and a cognizable link between humans and nature. This bond of kinship still exists between primates and humans in the region, which can be used to benefit biodiversity conservation by focusing on primates as flagship species (Southwick & Lindburg, 1986).

Though most of the localities which harbours *Semnopithecus ajax* are the protected areas still special efforts are required to protect and conserve threatened species. Concrete identification of species is required in most of the areas. The identification can be ascertained by using molecular techniques along physical characteristics. As languor is common in the Indian subcontinent therefore people including experts from the field are less sensitive towards *Semnopithecus ajax*. Two protected habitat i.e. Machiara National Park and Dachigam National Part (Kishtwar National Park) falls in politically disturbed area. Machiara National park is in Pak Occupied Kashmir where there is very scope for scientific inputs. The following management actions for the conservation of this species are needed: wild population management, monitoring, public education, and limiting factor management (Molur *et al*., 2003). Overall density of langurs is low the conservation of this langur population should become a priority now, to avoid decline in population of this endemic primate.

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