Wildlife Conservation Beyond the Greater Himalayas in India: A Review

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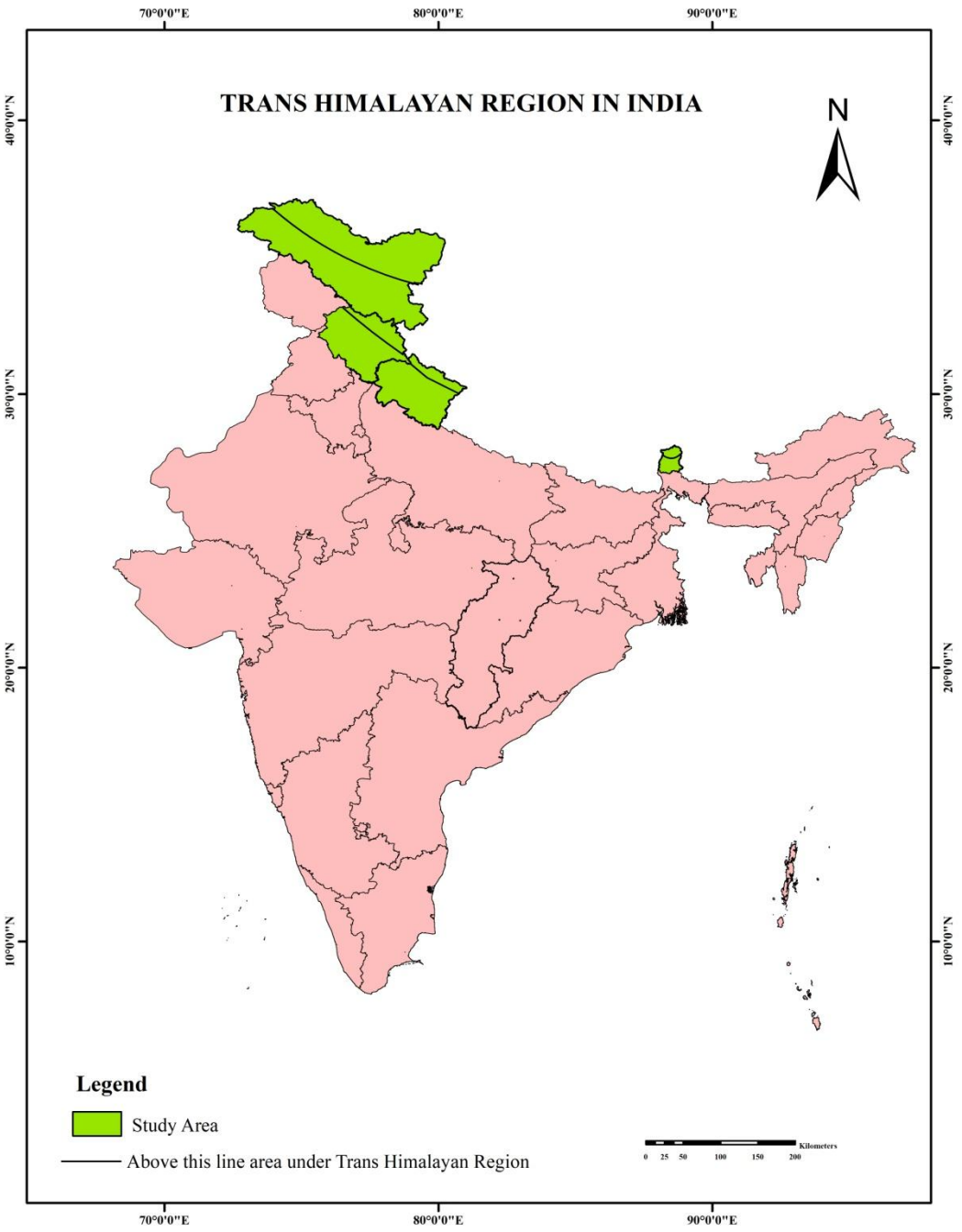
ABSTRACT
This paper focuses on the key concerns regarding the conservation status of vertebral fauna in the Trans Himalayas. This paper discusses the difficulties of managing and preserving wildlife in an environment that is changing swiftly. Main causes of wildlife extinction, conservation programmes and conflicts between wildlife and humans are mainly discussed in this paper. Habitat fragmentation, climate change, predator and prey interactions are the major challenges. Conservation and wildlife management carries immense importance in the climatically sensitive Trans Himalayan range. This paper highlights the importance of species conservation, planning and stewardship of conservation efforts. It is remarkably important to have a complete data of such species that represent such unique ecosystems. Although a huge advancement has been made to conserve the endangered population on earth, but management and conservation in Trans Himalayas remain elusive.

Keywords: Climate, Conservation, Habitat, Trans Himalayas and Wildlife

INTRODUCTION

A mountain region situated to the north of Great Himalayas is known as Trans Himalayas. Trans Himalayas are geologically different from rest of the Himalayan ranges because they have extreme cold temperature and arid landscapes with very sparse vegetation. The Trans Himalayas are often referred to as a "vaguely defined mountain region" without clear ridges or central alignment and not separated by rivers. The Trans Himalayas are a notable mountain range spanning China, India and Tibet. The Trans Himalayas is also referred to as the Tibet Himalayan region since a significant part of the Trans Himalayan range is located in Tibet, to the north of the Great Himalayas (Mani., 1962). In India Trans Himalayan range extends for 1,86,000 sq. km and is comprised of 3 major biotic provinces i.e. Ladakh mountains, Tibetan plateau and Sikkim. It accounts for approximately 5.7% of country's landmass (Rodgers et al.,2000).

Trans Himalayas have very few faunal diversities and are home to many species like snow leopard (*Panthera uncia*), Tibetan fox (*Vulpes ferrilata*), red fox (*Vulpes vulpes*), ibex (*Capra ibex*) and blue sheep (*Pseuodisnayaur*) etc (Namgail.,2009). The majority of the area appears to be devoid of trees, except for the vicinity of river beds where a few cultivated tree species like Poplar and Salix can be observed. In India large sections of Trans Himalayan region have been declared as protected areas to conserve the biodiversity such as Changthang wildlife sanctuary, Hemis national park in Ladakh and Pin valley national park, Kibber wildlife sanctuary in Himachal Pradesh [Saberwal.,1996]; Mishra and Rawat1998; Bhatanagar, 2008). The Tso Lhamo plateau situated in Sikkim state is locally famous for its thriving pastures, however its worth for threatened wildlife is still obscured and it has not been promulgated as a protected area yet (Chanchani, 2008). The Himalayan range is made up of a vast mountain ecosystem that is highly susceptible to the aftermath of contemporary climate crisis (Aryal et al., 2014). This specific area is experiencing a faster rise in temperature compared to other areas of the globe, and the Trans Himalaya is warming even more swiftly than the rest of the Himalayas (Gautam et al.2013). The calefaction is responsible for the range shifting of many species in Himalayas (Subba et al. 2018) such as extending their range (Shrestha et el. 2014) or shrinking their range extent (Hu et al. 2015). These alterations impact the food chain and can lead to the species dwindling. The vigorous changes in forest composition also affect the crucial habitats of animals (Chhetri et al., 2017). Therefore, it is mandatory to address the conflicts and disruptions that are negatively impacting the wildlife in the Trans Himalayas.



Wildlife Conservation and its threats

The wildlife conservation is a practice of protecting wild species along with their habitat. To ensure the preservation of wildlife, it is essential to assess existing threats and maintain records of past and ongoing conservation efforts (Margules and Usher 1981). The wildlife conservation is a serious s challenge in Trans Himalayan region and is facing many threats due to both anthropogenic activities as well as natural factors.

1. Habitat loss: Even though the Trans Himalayan region being remote in nature is somewhat difficult to access but even then, it has experienced human-caused biodiversity loss. The growing human population's demands have resulted in the conversion of grasslands for agriculture and settlements, causing extensive habitat fragmentation and this loss of habitat is notable threat to the biodiversity (Segan et al. 2016). The 19th century explorers record show significant amount of ungulates population (Burrard 1925) as compared to the present populations of ungulates. This decrease of population is probably due to habitat degradation resulting from increasing livestock population and hunting (Fox et al. 1991; Schaller 1998). The snow leopard is a significant species that predominantly inhabits human-dominated, unprotected regions of its habitat (Johansson et al. 2016). However, inadequate tourism management not only restricts the habitat of native species but also poses serious environmental concerns in the future. There is limited literature available related to biological effects of practices such as overgrazing, biomass collection and the expansion of farming areas (Shahabuddin and Prasad 2004). The Trans-Himalayan region is also disrupted by military presence along its international borders, as many border areas are in dispute with Pakistan and China. The construction of impenetrable fences and the presence of military personnel hinder the movement of various species, such as the Kashmir markhor (*Capra falconeri*) (Ranjit Singh et al.,2005). Awareness about the factors that affect

habitat of animals, such as shift of few ground covers have helped in conservation plotting and formulating new designs for revival of species (Lindenmayer 2000).

2. Illegal hunting and poaching of endangered species: The snow leopard frequently encounters dangers like illegal hunting for its luxurious fur and other body parts, as well as retaliatory killings by herders. Conflict with local communities due to livestock predation remains the primary threats to carnivores such as the snow leopard and Tibetan wolf. In the past, the illegal hunting and poaching had caused a decline in certain crucial species of the Trans-Himalayan region, like the Tibetan gazelle (*Procapra picticaudata*) (Fox et al. 1991).

3. Climate change: Ecological models help us understand how animal species are impacted by climate change (Subba et al. 2018).Given the present scenario of climate change and ongoing human activities, there is a growing concern about the potential impact on vulnerable species in the Himalayas for their survival (Abdelaalet al.2019).Due to climate change, numerous species that inhabit bottomland areas are moving to more high elevations to make use of warmer temperatures and prolonged periods without snow (Sharma et al. 2009; Aryal et al.2014 ; Lamsal et al. 2017).
Other menaces to biodiversity include mining, construction of roads, dams and trails in natural habitats of wildlife species for recreational purposes. Lately, the rising number of development projects, like the building of national highways and hydroelectricity projects, have gained significant popularity in almost all Himalayan regions (Dutta2008).

Conservation Measures
1. Recognizing ecologically significant landscapes, documenting the variety and abundance of species in those areas. Several factors, like the selection of specific vegetation patches for feeding can assist in conservation planning and management (Lindenmayer 2000). Reducing livestock grazing frequency and identifying suitable slopes can help restore habitats i.e. hot and less frosted land where wind helped in blowing snow at high rate during spring and winter season assisted in the recovery of Tibetan gazelle whose number had declined in the past in Ladakh (Bhatnagar et al. 2007).

2. Awareness among the people is prerequisite for wildlife conservation. Because the oblivious attitude towards conservation problems among the people is considered to be the major threat to wildlife conservation in the Himalayan region (Mc Carthy and Chapron 2003). However, in 2006, a multipronged conservation education programme was launched in Spiti valley and Ladakh to increase the social tolerance for wild carnivores specifically (Trivedi et al. 2006).

3. Creating alternate employment opportunities: Most of the high-altitude mountains, villages and agriculture farms in Trans Himalayan range do not possess required amount of land for grazing. Seasonal accessibility of only few pastures at different altitudes cause extensive use of land due to herd mobility for food and other ecological benefits. This system helps to a certain extent (Bhasin 1988; Nori and Daves 2007; Raj 2017) but alternate employment opportunities should be generated for local communities to reduce the anthropogenic burden on natural resources (Raj et al. 2020).

4. Predator prey relationship: In Trans Himalayas where very limited number of species are present it becomes utmost important to understand the prey predator relationship and their coexistence. Because, in prey dominating areas predators may coexist by depleting the number of prey species (Karanth and Sunquist 2000; Odden et al. 2010) while in the predators' rich areas competition among themselves increases (Koshkarev, 1989; Harihar et al., 2011). For example, the chasing snow leopard generally prefers steep and rugged terrain (Jackson and Hunter 1996) while the wolf uses a vast topography ranging from open valleys to spinning hills (Viripaev and Vorobiev 1983) here the difference in the habitat and diet may lead to some level of separation among these sympatric large carnivores. Assessment of prey-predator interactions will definitely help to the ongoing conservation efforts in Trans Himalayan range (Jumabay et al., 2013).

5. Community based conservation- Wild animals and human cherish a long standing, multiplex and dynamic relationship (Bhatia et al., 2021). However, this relationship has very negative impression when it is comes to the top predators like snow leopard and wolf. Wolves are considered as indicator and umbrella species of the Trans Himalayan region (Suryawanshi et al., 2013). Indeed, the communities that coexist with giant carnivores often bear the cost of living alongside the dangerous predators (Salafsky and Wollenberg2000; Treves and Karanth 2003). So, conservation efforts for these carnivores are often regarded as unfair practices among locals (Mishra et al., 2017). So, it is necessary to engage native communities as fellow partners in conservation projects to achieve sustainable and successful conservation results (Holmes, 2007; Lejano et al. 2007; Bennett et al. 2017). Therefore, a primary strategy called PARTNERS (Presence, Aptness, Respect, Transparency, Negotiation, Empathy, Responsiveness and Strategic support) is being implemented for community-based conservation (Mishra et al. 2017).

6. Project snow leopard: This project was launched in 2009 by Ministry of Environment and Forests, Government of India. Ministry of Environment and Forest has released a repository named Project snow leopard which includes all important landscapes in the high-altitude Himalayas in Ladakh, J&K, Uttrakhand, Himachal Pradesh, Sikkim and Arunachal Pradesh. The project encompasses all snow leopard habitats that hold biological significance, irrespective of ownership. Protected areas for snow leopard in the Trans Himalayan range includes Kibber wildlife Sanctuary, Pin valley national park in Lahaul Spiti (H.P.) and Hemis National Park in Ladakh. The snow leopard project showed positive results as species status of snow leopard was downlisted from endangered to vulnerable according to IUCN red list (McCarthy et al. 2017). The snow leopard is a key apex predator in the mountainous regions of Asia, particularly in the Tibetan Himalayas. Its diet primarily consists of wild sheep and goats that inhabit the challenging terrains at high altitudes (Nyhus et al. 2003). Hence, conservation of vegetation patches also becomes decisive to determine the food habits of large carnivore like snow leopard.

Conclusion
The ongoing development projects in the Trans Himalayan region and the intrusion of human activities in wildlife habitats have become a huge risk to this distinctive and exceptional ecosystem. Currently, this area is continuously facing the challenges of rising tourism, expanding agricultural land, introducing non-native species and grazing of livestock. Hence it becomes utmost important to have a complete data of such species that represent such unique ecosystems. Indeed, for any

conservation program to succeed, it is essential to make genuine efforts to protect the delicate wildlife of that area.No doubt, conflicts arise between wildlife conservation programs and local communities in many parts of the Trans Himalayan region and one major reason for resentment among people is the limited availability of grazing land for livestock. Additionally, frequent attacks on herds by wolves, snow leopards and dogs due to successful conservation efforts further contribute to such conflicts. Indeed, the responsibility of protecting and conserving Trans Himalayan wildlife does not solely fall on government departments. It is crucial to involve local communities in implementing practical measures for conservation. The participation of local communities is vital as a significant portion of the population residing in this range follows Buddhism, which promotes love, compassion and tolerance towards all living beings. Policy makers should recognize this opportunity and actively involve these individuals in establishing a harmonious relationship with the unique wildlife of high altitudes. Having a comprehensive understanding of how wildlife utilizes their habitats, their distribution, and their current status in the Trans Himalayas would greatly aid in the development of effective conservation plans. As the emission of greenhouse gases continue to escalate, global warming is expected to alter wildlife habitats. Therefore, closely monitoring these species will contribute to the development of improved practices for effective ecosystem restoration.To ensure compliance with regulations in protected areas, it is essential to enforce strict penalties for rule violations. Additionally, effective policy implementation and organizing seminars to raise awareness about the benefits of wildlife and the dire consequences of endangered species extinction are crucial.

Bibliography

1. Bhatnagar V.Y. Relocation from Wildlife Reserves in the Greater and Trans-Himalayas: Is it Necessary? Conservation and Society.2008; 6(3): 263–270.

2. Abdelaal M. Fois M. Fenu G. Bacchetta G. Using MaxEnt modelling to predict the potential distribution of endemic plant *Rosa Arabica Crep*. in Egypt. Ecological Informatics.2019; 50: 68-75. https://doi.org/10.1016/j.ecoinf.2019.01.003.

3. Aryal A. Brunton D. Raubenheimer D. Impacts of climate change on human-wildlife-ecosystem interactions in the Trans-Himalaya region of Nepal. Theoretical and Applied Climatology2014; 115:517–529. https://doi.org/10.1007/s00704-013-0902-4.
4. Aryal A. Brunton D.Raubenheimer D. Impacts of climate change on human-wildlife-ecosystem interactions in the Trans-Himalaya region of Nepal. Theoretical and Applied Climatology 2014*;* 115:517–529. https://doi.org/10.1007/s00704-013-0902-4
5. Bennett N.J. Roth R. Klain S.C. Chan K. Christie P. Clark D. Conservation social science: understanding and integrating human dimensions to improve conservation. Biological Conservation. 2017; 205: 93-108.
6. Bhasin V. Himalayan Ecology: Transhumance and social organization of Gaddis in Himachal Pradesh. Kamal Raj Enterprise, New Delhi; 1988.
7. Bhatia S. Suryawanshi K. Redpath S. M. Namgail, S. Mishra C. Understanding people's relationship with wildlife in trans- Himalayan folklore. Frontiers in Environmental Science. 2021; 9: 595169.
8. Bhatnagar V.Y. Namgail T. Takpa J. Bagchi S. A stratergy for Conservation of the Tibetan Gazelle *Procaprapicticaudata* in Ladakh. Conservation and society. 2007; 5(2): 262-276.
9. Burrad G. Big game hunting in the Himalayas and Tibet. H. Jenkins, London. 1925; 320 pp.
10. Chanchani P. Sighting of Manul in Tso Lhamo, North Sikkim. Cat News. 2008; 42:18–19.
11. Chhetri B. Badola H.K. Barat S. Ecological study of *Styr Tragopan* (Tragopan satyra) in Sikkim-India: a threatened bird species of Eastern Himalaya. International Journal of Recent Scientific Research. *2017;* 8(9): 20362-20368. http://doi.org/10.24327/IJRSR
12. Dutta A.P. Reservoir of dams. Down to Earth. 2008; 16(24): 32–39.
13. Fox J.L. Nurbu C. Chundawat R.S. The mountain ungulates of Ladakh, India. Biological Conservation. 1991; 58: 167-190.
14. Guatam M.R. Timilsina, G.R. Acharya K. Climate change in the Himalayas: Current state of knowledge. The World Bank;2013.https://openknowledge.worldbank.org/handle/10986/15875
15. Harihar A. Pandav V. Goyal S.P. Responses of leopard *Panthera pardus* to the recovery of a tiger *Panthera tigris* population. Journal of Applied Ecology. 2011; 48: 806–814.
16. Holmes G. Protection, politics and protest: understanding resistance to conservation. Conservation and Society.2007; 5: 184-201.
17. Hu X.G. Jin, Y Wang X.R. Li, Y Yin, T. Predicting Impacts of Future Climate Change on the Distribution of Widespread Conifer *Platycladusorientalis*; 2015http://doi.org/10.1371/journal.pone.0132326.
18. Jackson R. Hunter D. Snow Leopard Survey and Conservation Handbook. 2nd edition. International Snow Leopard Trust, Seattle, USA, and U.S. Geological Survey, Colorado, USA; 1996.
19. Johansson O. Rauset G.R. Samelius G. Mc Carthy,T. Andren H. Tumursukh, L. Mishra C. Land sharing is essential for snow leopard conservation. Biological Conservation. 2016; 203: 1–7.

20. Jumabay U.K. Wegge P. Mishra C. Sharma K. Large carnivores and low diversity of optimal prey: a comparison of the diets of snow leopards *Panthera uncia* and wolves *Canis lupus* in Sarychat-Ertash Reserve in Kyrgyzstan. Fauna & Flora International 2013; 48(4): 529–535
21. Karanth K. Sunquist M.Behavioral correlates of predation by tiger *(Panthera tigris*), leopard (*Panthera pardus*), and dhole *(Cuon alpinus)* in Nagarahole, India. Journal of Zoology. 2000; 250: 255–265.
22. KoshkarevE.P. The Snow leopard in Kirgizia (the structure of the habitat, ecology, conservation).Frunze.Publishing house "Ilim". 1989; 99 pp.
23. Lamsal P. Kumar L. Atreya K. Pant K.P. Vulnerability and impacts of climate change on forest and freshwater wetland ecosystems in Nepal: a review. Ambio.2017; 46: 915–30. https://doi.org/10.1007/s13280-017-0923-9
24. Lejano R. P. Ingram H. M. Whiteley J. M. Torres D. AgdumaS. J. The importance of context: Integrating resource conservation with local institutions. Society and Natural Resources. 2007; 20: 177-185.
25. Lindenmayer D.B. Factors at multiple scales affecting distribution patterns and their implication for animal conservation - Leadbeater's possum as a case study. Biodiversity and Conservation.2005; 9: 15–35.
26. Mani M.S. Introduction to high altitude entomology: Insect life above the timber-line in the North-West Himalaya (No. 595.7). Methuen Publishing Ltd;1962.
27. Margules C. Usher M.B. Criteria used in assessing wildlife conservation potential: A review. Biological Conservation.1981; 21(2): 79-109.
28. McCarthy T.M. and Chapron G. Snow leopard survival strategy-108. International Snow Leopard Trust and Snow Leopard Network, Seattle, USA; 2003.
29. McCarthy, T. Mallon D. Jackson R. Zahler P. McCarthy, K. *Panthera uncia*. The IUCN Red List of Threatened Species 2017.
30. Mishra C. Rawat G.S. Livestock grazing and biodiversity conservation: Comments on Saberwal. Conservation Biology.1998; 12: 712–71
31. Mishra C. and RawatG.S. Livestock grazing and biodiversity conservation: Comments on Saberwal. Conservation Biology.1998; 12: 712–71
32. Mishra C. Young J. C. Fiechter M. Rutherford B. Redpath S.M.Building partnerships with communities for biodiversity conservation: Lessons from Asian mountains. Journal of Applied Ecology. 2017; 54: 1583-1591.
33. Namgail T. Mountain Ungulates of the Trans-Himalayan Region of Ladakh, India. International Journal of Wilderness.2009; 15: 35-39.
34. Nori MDavies, J. Change of Wind or Wind of Change? Climate Change, Adaptation and Pastoralism, IUCN, Nairobi; 2007.
35. Nyhus P. Fischer H. Madden F. Osofsky S. Taking the bite out of wildlife damage: the challenges of wildlife compensation schemes. Conservation Science and Practice. 2003; 4: 37–40.
36. Odden M. Wegge P. EliassenI T. Do tigers displace leopards? If so, why? *Ecological Research*. 2010; 25: 875–881.
37. Raj A. Dorjey A. Islam M.A. Livelihood Dependence on Highland Pastoralism (Doksa) in Trans-Himalayan Region of Zanskar, Ladakh. International Journal of Environment and Climate Change. 10(12): 67-76.
38. Ranjitsingh M.K. Seth C.M. Ahmad R. Bhatnagar Y.V.Kyarong S.S. 2005. Goats on the border: A rapid assessment of the Pir Panjal markhor in Jammu and Kashmir: Distribution, status and the threats. Report by the Wildlife Trust of India, New Delhi, India; 2005.
39. Rodgers W.A. Panwar H.S. Mathur V.B. Wildlife Protected Area Network in India: A Review (Executive Summary). Wildlife Institute of India, Dehradun; 2000.
40. Saberwal V. K. Pastoral politics: Gaddi grazing, degradation and biodiversity conservation in Himachal Pradesh, India. Conservation Biology. 1996; 10: 741–749.
41. Salafsky N. Wollenberg E. Linking livelihoods and conservation: a conceptual framework and scale for assessing the integration of human needs and biodiversity. World Development.2000; 28: 1421-1438.
42. Schaller G.B. Wildlife of the Tibetan Steppe. University of Chicago Press, Chicago, USA; 1998.
43. Segan D.B. Murray K.A Watson J.E. A global assessment of current and future biodiversity vulnerability to habitat loss- climate change interactions. Global ecology and Conservation. 2016; 5: 12-21.
44. Shahabuddin G. Prasad, S. Assessing ecological sustainability of non-timber forest produce extraction: the Indian scenario. Conservation and Society. 2004; 2: 235–250.
45. Sharma E. Sharma G. Liang L. Subba J.R. Tanaka K. Sikkim Himalayan-agriculture: Improving and scaling up of the traditionally managed agricultural systems of global signifcance. Resource Science. 2009 ;31(1): 21–30
46. Shreshtha U.B.Bawa K.S. Lumbsch H.T. Impact of climate change on potential distribution of Chinese caterpillar fungus (*Ophiocordyceps sinensis*) in Nepal Himalaya; 2014.https://doi.org/10.1007/978-3-319-28977-9.
47. Subba B. Sen S. Ravikanth G. Nobis M.P. Direct modelling of limited migration improves projected distributions of Himalayan amphibiana under climate change. Biological Conservation.2018;227: 352-360.
48. Suryawanshi K. R. Bhatnagar Y. V. Redpath S. Mishra C. People, predators and perceptions: patterns of livestock depredation by snow leopards and wolves. Journal of Applied Ecology. 2013; 50:550-560.
49. Treves A. Karanth K.U. Human- carnivore conflict and perspectives on carnivore management worldwide. Conservation Biology. 2003; 17: 1491-11499.
50. Trivedi P. Bhatnagar Y.V. Mishra C. Living with snow leopards: a conservation education strategy for the Himalayan high altitudes. NCF Technical Report No. 12. Nature Conservation Foundation and International Snow Leopard Trust, Mysore; 2006.
51. Viripaev V. Vorobiev G.The Wolf in Kirghizia. Frunze: Science, 95 pp; 1983.