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Tigers at higher elevations outside their range: What does it mean for conservation?

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Abstract

Nepal's population of endangered Bengal tigers *(Panthera tigris)* is on the rise. In recent years, the presence of tigers has been documented at higher elevations. The objective of this study is to explore the possible reasons for the tigers' presence at the higher elevations. It is critical that these high-altitude habitats for tigers be further explored and protected. The study points out the importance of the Mahabharat range and a longitudinal conservation gradient approach in Nepal. Apart from this, it is imperative to assess the density of tigers and tiger prey in the area. Even though high-altitude ecology may be suitable for tiger growth, the formulation of a high-altitude tiger conservation action plan with effective coordination between stakeholder organizations and concerned departments is of great importance.

Tigers are an apex species of the terrestrial ecosystem and exist in a precarious state throughout their range. The tiger is a globally endangered species (Goodrich et al. 2015). In the past, the tiger once existed as nine subspecies, now reduced to only six subspecies that exist in the wild. The subspecies Bengal tiger *(Panthera tigris)* has the largest population and is restricted to South Asia, namely Bangladesh, Bhutan, India, and Nepal (Global Tiger Initiative 2010). In the past century, *P. tigris* numbers have plummeted from 100,000 to below 3,500. Presently, wild *P. tigris'* habitat covers approximately 1.2 million km^2 in 13 Tiger Range Countries (TRCs) (Global Tiger Initiative 2010). Faced with decreasing *P. tigris* populations, TRCs in 2010 proposed doubling *P. tigris* populations by 2022, from a global estimate of ~3,643 in the year 2010 to ~5,845 by the year 2022 under the Global Tiger Recovery Program (Global Tiger Initiative 2010). *P. tigris* are listed as endangered on the Red List of threatened species by the International Union for Conservation of Nature (IUCN) and under Appendix I by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In Nepal the National Parks and Wildlife Conservation Act, 1973, classified *P. tigris* as a protected species.

India, along with Bhutan, Nepal, Russia and Indonesia, has successfully recovered wild *P. tigris* populations. In recent years, *P. tigris* have been recorded at higher elevations outside of their usual habitat (Figure 1). For example, presence of *P. tigris* was recorded from 3,602 m at Arunachal Pradesh and at 3,274 m in Uttarakhand in India, 4,038 m in Bhutan and 3,165 m from Nepal (Adhikarimayum & Gopi 2018; Bhattacharya & Habib 2016; Tempa et al. 2019). Similarly, the presence of *P. tigris* was documented at higher elevations in Nepal (i. e., 2,500 m) and in far-western Nepal bordering on Nanda Devi National Park in India, Uttarakhand. A camera trap also recorded *P. tigris* in Eastern Nepal at 3,165 m (Red Panda Network 2020) bordering on Singalila National Park in India, North Sikkim. *P. tigris* are not the only species that are being sighted at previously unheard-of altitudes. There have definitely been sightings of several species at higher altitudes. Scientists have also noted an upwards movement of the mountain-dwelling pika *(Ochotona roylei* and *O. macrotis)*. Within a 46-year interval, the Pika habitat has moved up by 200 m (Koju 2018). Another study, conducted on the clouded leopard *(Neofelis nebulosa)* in 2020 in the Langtang area, found the elusive animal surviving at 3,498 m (Can et al. 2020). Previously the animal had been found only at 2,300 m. Another study revealed that the house crow *(Corvus splendens)* has been moving up by 136 m annually on average from 2,000 m to 4,200 m in Mustang district in Nepal (Acharya & Ghimirey 2013). This study concluded that climate change seems to be a possible reason behind this upward movement. And this kind of movement of wildlife has not just been witnessed in the mountains of Nepal. It has also been found with the red panda *(Ailurus fulgens)*, Assam macaque *(Macaca assamensis)*, flying squirrel *(Pteromyini)*, Himalayan crestless porcupine *(Hystrix brachyuran)*, Himalayan goral *(Naemorhedus goral)*, Himalayan palm civet *(Paguma larvata)*, Himalayan serow *(Capricornis thar)*, leopard cat *(Prionailurus bengalensis)*, leopard *(Panthera pardus)*, marbled cat *(Pardofelis marmorata)*, northern red muntjac *(Muntiacus vaginalis)*, yellow-throated marten *(Martes flavigula)*, red fox *(Vulpes vulpes)*, wild boar *(Sus scrofa)*, and the Himalayan black bear *(Ursus thibetanus)* (Red Panda Network 2020).

In Nepal, *P. tigris* enjoy an exalted status because they are considered sacred and spiritually evolved. Nepalese people generally had a positive attitude toward *P. tigris* conservation and were willing to accept some losses of livestock, but not human casualties. (Bhattarai & Fischer 2014). Nepal has been a pioneer in *P. tigris* conservation since it established protected area systems. *P. tigris* are a priority species for tropical and subtropical ecosystem conservation in Nepal. Until the mid-20th century, *P. tigris* in Nepal were distributed along the contiguous lowland forests on the slopes of the Siwaliks, Bhabar and alluvial grasslands

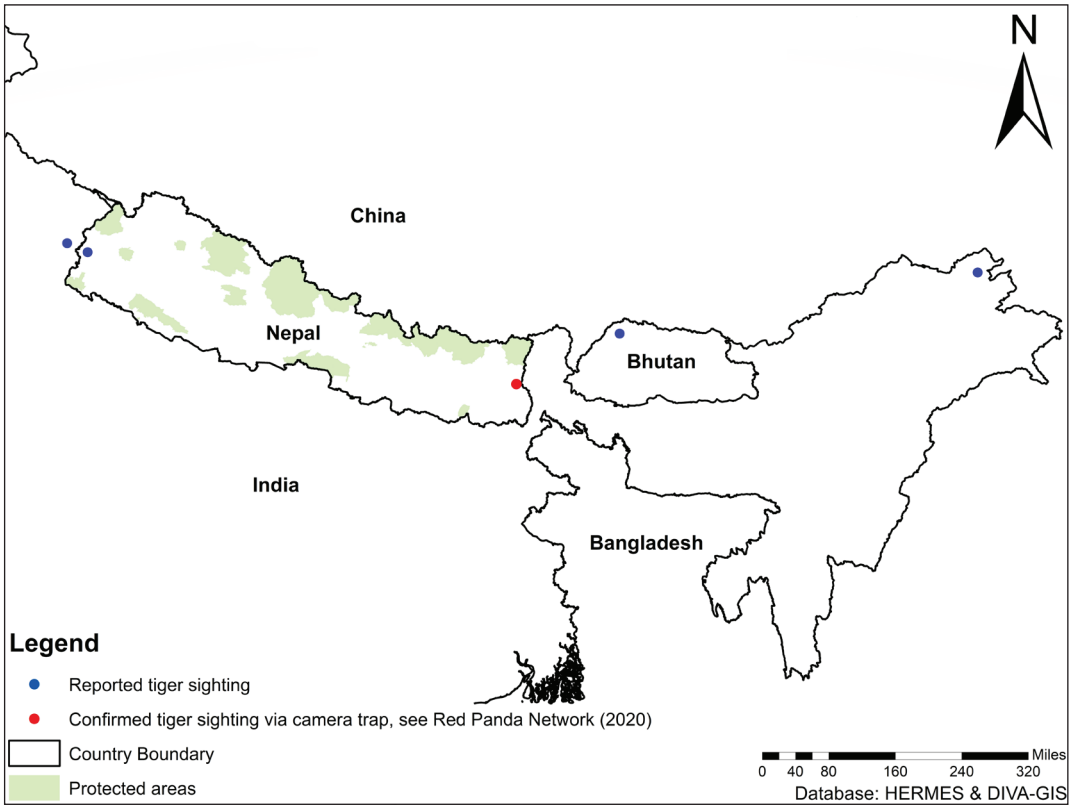

Figure 1 – Panthera tigris *sightings at high altitudes in Hindu Kush Himalaya.*

and riverine forests of Nepal (Smythies 1942; Gurung et al. 2006). *P. tigris* distribution is currently largely limited to five protected areas of the Terai Arc Landscape (TAL), including: Chitwan National Park, Parsa Wildlife Reserve, Bardia National Park, Banke National Park and Shuklaphanta Wildlife Reserve.

Conservation activities in Nepal aim to connect several protected areas with habitat corridors to facilitate the movement and dispersal of wildlife primarily along the east-west corridor at lower elevations. TAL in Nepal is critical for doubling the *P. tigris* population. In Nepal, TAL covers 24,710.13 km^2 across 18 districts and extends from the Bagmati River in the east to the Mahakali River along the western border with India. Apart from these protected areas, various national and community forests serve as *P. tigris* habitats that enable habitat interconnectivity and allow their dispersal. Previously the Bagmati River was considered the eastern boundary of *P. tigris* distribution in Nepal. In Nepal, *P. tigris* have been confined largely to the lowland habitat (below 1,000 m elevation) in the forests on the slopes of the Siwalik Range (1,000 to 1,500 m) (Miehe et al. 2016) up to the Bagmati River in the east. However, recent sightings of *P. tigris* across Nepal at higher elevations raise some critical questions that need to be addressed: a) Did these *P. tigris'* seen at higher elevations just stray from their natural habitat? b) Does individual plasticity play a role in the occurrence of these *P. tigris'* seen at higher elevations? c) Did a reduction in the prey population, scarcity of water, or elevated temperature force *P. tigris* to move higher? d) Do these higher elevations historically harbor *P. tigris* as folklore suggests?

The Nepal Himalaya is divided into six biographic and bioclimatic zones in north–south direction: 1) Terai (the northern edge of the Indo-Gangetic plain), 2) Siwalik (Churia) range, 3) Mahabharat range, 4) Midlands, 5) Himalayas, and 6) Inner Himalayas and Tibetan marginal mountains (Figure 2). Each of these zones has distinct altitudinal variation, slope, and relief characteristics, as well as climatic characteristics (Figure 3). The Mahabharat range (also known as mid-hills), south of the Himalayan range and north of the Siwalik range, is a critical physiographic region in Nepal. The Mahabharat range rises higher than the Siwalik hills and reaches an altitude of 3,000 m (Hagen 1998). The Mahabharat is an east-west running mountain range. The Mahabharat has a subtropical climate at low elevations and temperate climates at higher elevations. It is well developed in eastern and central Nepal and underdeveloped in western Nepal. Since the mid-1990s, Nepal's mid-hills have seen forest cover increase significantly as a result of community forestry. Moreover, mid-hill areas in Nepal have also witnessed a decline in human population due to out-migration and low birth rates. All these factors might have also resulted in *P. tigris* and other animals coming back in the mid-hills. Present frequent sightings of *P. tigris* in this range might not be just a fluke. All these sightings might suggest that this range is also an important hotspot for *P. tigris* and other wildlife populations that need to be protected. Or *P. tigris* might venture up into

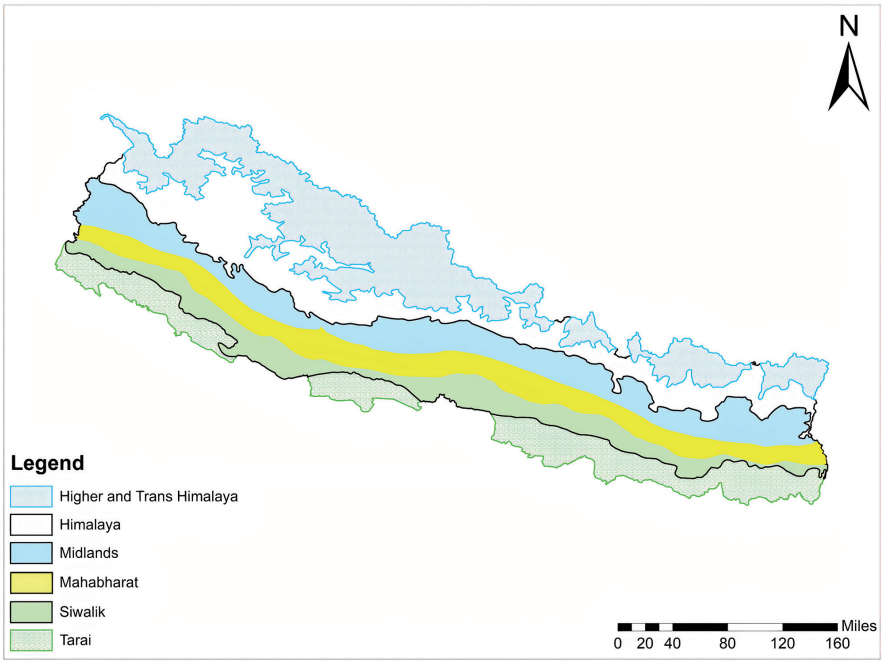

Figure 2 – Physiography of Nepal. Data source: GIS Database of Nepal available at MENRIS-ICIMOD (http://geoportal.icimod.org/downloads)

higher elevations in search of food. Additionally, a reduction in the density of prey in the Terai, scarcity of water and rising temperatures might have contributed to make *P. tigris* venture into higher elevations.

All these suggest the importance of the Mahabharat range and of a longitudinal conservation gradient approach in Nepal. Most wildlife research in Nepal focuses on Terai or the high Himalaya, with the mid-hills usually left out. Therefore it is critical that these high-altitude habitats for *P. tigris* be further explored and protected. Apart from this, a detailed assessment of the status of *P. tigris* and *P. tigris* prey densities in the region is imperative. Although high-altitude ecology may be suitable for *P. tigris* growth, the formulation of a high-altitude *P. tigris* conservation action plan is of vital importance, with effective coordination between stakeholder organizations and departments concerned. In addition, habitat corridors must be structurally and functionally connected for the long-term viability of *P. tigris* populations in the region. Apart from this, the protection of *P. tigris* requires a transboundary approach that includes actions on a landscape, local, state, national and international scale. Developing landscape-level monitoring mechanisms, mobilizing resources and intensive monitoring of *P. tigris* are essential. At international level, bilateral cooperation, regional cooperation, trans-border protection and joint assessments are needed among Nepal, India, Bhutan, Bangladesh and Myanmar in the region for sustainable *P. tigris* conservation.

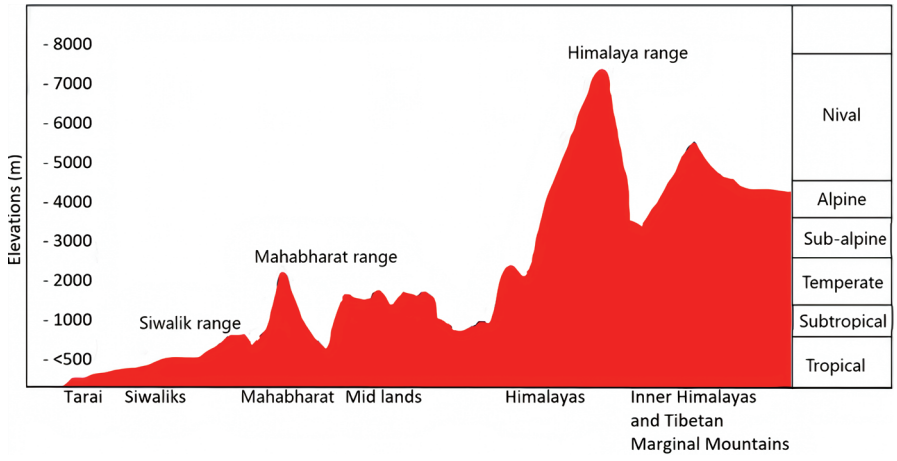

Figure 3 – Biographic and bioclimatic zones of Nepal. Adapted from Paudel et al. (2012)

References

Acharya, R. & Y. Ghimirey 2013. House Crow *Corvus splendens* heading upwards in Nepal: possible climate change impact influencing its movement. *Ibisbill* 2: 180–183.

Adhikarimayum, A.S. & G.V. Gopi 2018. First photographic record of tiger presence at higher elevations of the Mishmi Hills in the Eastern Himalayan Biodiversity Hotspot, Arunachal Pradesh, India. *Journal of Threatened Taxa* 10(13): 12833–12836.

Bhattacharya, A. & B. Habib 2016. High elevation record of tiger presence from India. *Cat News* 4: 24–25.

Bhattarai, B.R. & K. Fischer 2014. Human-tiger *Panthera tigris* conflict and its perception in Bardia National Park, Nepal. *Oryx* 48(4): 522–528.

Can, Ö.E., B.P. Yadav, P.J. Johnson, J. Ross, N. D'Cruze & D.W. Macdonald 2020. Factors affecting the occurrence and activity of clouded leopards, common leopards and leopard cats in the Himalayas. *Biodiversity and Conservation* 29(3): 839–851.

Global Tiger Initiative 2011. *Global tiger recovery program 2010–2022*. Global Tiger Initiative (GTI).

Goodrich, J., A. Lynam, D. Miquelle, H. Wibisono, K. Kawanishi, A. Pattanavibool, ... & U. Karanth 2015. *Panthera tigris*. *The IUCN Red List of Threatened Species* e. T15955A50659951.

Gurung, B., J.L.D. Smith, C. McDougal, J.B. Karki 2006. *Tiger Human Conflicts: Investigating Ecological and Sociological Issues of Tiger Conservation in the Buffer Zone of Chitwan National Park, Nepal*. A report submitted to WWF Nepal Program.

Hagen, T. 1998. *Toni Hagen's Nepal: The Kingdom in the Himalaya*.

Koju, N.P. 2018. *The ecology of Pika (Ochotona species) at Langtang National Park as an indicator of climate change* (Doctoral dissertation).

Miehe, G., C. Pendry & R.P. Chaudhary (eds.) 2016. *Nepal: An introduction to the natural history, ecology and human environment of the Himalayas*. Edinburgh, UK.

Paudel, P.K., B.P. Bhattarai & P. Kindlmann 2012. An overview of the biodiversity in Nepal. In: Kindlmann, P., *Himalayan biodiversity in the changing world*: 1–40.

Red Panda Network. *Press Release: Tiger Photographed for First Time In Nepal's Red Panda Habitat* Available at: https://redpandanetwork.org/post/Press-Release-Tiger-Photographed-for-First-Time-In-Nepal-s-Red-Panda-Habitat (accessed: 22/09/2021)

Red Panda Network 2020. *Annual report*. Available at: https://redpandanetwork.org/files/galleries/rpn-2020-annual-report-0001.pdf (accessed: 09/11/2021)

Smythies, E.A. 1942. *Big Game Shooting in Nepal*. Calcutta.

Tempa, T., M. Hebblewhite, J.F. Goldberg, N. Norbu, T.R. Wangchuk, W. Xiao & L.S. Mills 2019. The spatial distribution and population density of tigers in mountainous terrain of Bhutan. *Biological Conservation* 238: 108192.

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