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Status, Distribution, and Threats of Red Panda (*Ailurus fulgens* Cuvier, 1825) in Nepal

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ABSTRACT

One of the world's most appealing species is the Red Panda (*Ailurus fulgens*). Red pandas were earlier extensively distributed around Eurasia, but they're still only found in Nepal, Bhutan, India, Myanmar, and China. The pandas had a high fatality rate and minimal reproduction (usually one cub/female/year). The red panda is the only species of its kind in the world that is still living in the inaccessible Tibetan cultural sites including Langtang and other Himalayan slopes, rendering its protection vital to the preservation of Nepal's natural assets and the world's biodiversity. The purpose of this article is to describe the status, distribution, and threats of red pandas in Nepal which could be a turning point for carrying out additional studies and red panda conservation. Various articles, books, and reports that were published between 1979 and 2021 were evaluated for this purpose using Google Scholar, Research Gate, etc. For the review, we pursued 59 pieces of paper. Despite being extremely vital from preservation, technical, and socioeconomic basis, this species has seen a drop in its wild population. Globally there are less than 10,000 individuals left and in Nepal, there are about 317-552 individuals. Natural hazards also pose a risk to the habitat of exotic species like the Red Panda, in addition to human expansion, infrastructure development, scenic spots, habitat alteration, and modes of interaction.

INTRODUCTION

The red panda, a species of carnivore native to the Himalayas, is similar to a raccoon in terms of size and look (Williams, 2004). The Himalayan red panda dwells in Tibet, the western Yunnan Province of China, Nepal, Bhutan, India, Myanmar, and Laos (Hu, 2020). Located only in temperate and subtropical forests in the eastern Himalayas, the red panda (*Ailurus fulgens*) is a threatened species (Choudhury, 2001). They live in bamboo-understory temperate broadleaf woods (Acharya et al., 2018). Red pandas are said to like locations with dense forest (tree canopy cover of over 30%), a lot of bamboo cover (>37%), bamboo height (2.9 m), and are located within 100 to 200 meters of water sources (Dorji et al., 2012; Pradhan et al., 2001a). These creatures have been discovered in regions with yearly rainfall averaging 3500 millimeters and temperatures between 10 and 25 degrees Celsius (Lama, 2019). Even though they are typically

thought of as a solitary species, during the breeding season, they are often seen in small groups, possibly with their mothers and young (Hu, 1991; Robert et al., 1989). Bamboo leaves and shoots make up more than 83 percent of a red panda's diet (Yonzon et al., 1991b), so these animals receive bamboo leaves from elevated sources such as shrub branches, fallen logs, or tree stumps (Wei et al., 2000). Red pandas' activity changes all year according to seasonal differences in temperature, nutritional preferences, and the presence of young (Panthi, 2009). They move vertically as the seasons change. They move higher to enjoy direct sunlight in the winter and descend to the forested area along the streamside to avoid direct sunlight in the summer (Panthi, 2011).

They extend or brush their backs and bellies against a stationary object, such as a rock or tree, and lick their entire body and limbs (Robert and Gittleman, 1984a). They also clean their face with a paw. The Red Panda is completely protected under

Nepal's National Park and Wildlife Conservation Act of 1973. This act provides significant protection for biodiversity throughout Nepal's network of protected areas (Sharma et al., 2010). Nepal is home to around 1.9 percent of the world's Red Panda population, with 314 individuals estimated based on habitat appropriateness (Yonzon et al., 1997c). A recent Population and Health Viability Assessment workshop produced the most robust information on red panda status in Nepal including Chitwan-Annapurna Landscape (CHAL) (Jnawali. et al., 2012b). This study estimated the total potential red panda habitat available in Nepal is 2652 km², much lower than previous estimations of 20,400 km² (Mahato., 2010) and 17,400 km² (Kandel et al., 2015). Red pandas don't hurt people or their possessions such as livestock predation, crop losses, or human injuries (Acharya et al., 2016), and cultural beliefs in some parts of Nepal can impact people's attitudes toward red pandas in a favorable way (Sharma et al., 2019). The red pandas have a high mortality rate, which is likely one of the causes of their delayed population recovery in the wild (Robert and Gittleman, 1984b). Parasites have become a critical problem in the conservation of threatened species because they can significantly affect the demographics of the wildlife population (Thompson et al., 2010).

Climate is crucial in defining species distributions and examining the influence of meteorological factors across a vast geographic area to provide insight into a suitable habitat for certain species (Morelle & Lejeune, 2015). Amidst being identified as Endangered on the IUCN Red List and pervasive conservation efforts over the last decade (Glaston, 2015), the species persists to face some menaces, including habitat loss and fragmentation due to livestock grazing and fodder acquisition, timber harvesting, ailments, and predation for its fur coats (Yonzon, 1991a; Sharma and Belant 2010). Acknowledging the environmental and anthropogenic factors that affect the population dynamics of wildlife is a key concern in ecological research (Thapa et al., 2020). Similar to this, improved knowledge of habitat components and their management are crucial tools for wildlife protection under a variety of conservation regimes (Khadka and James, 2016). Nepal has minimal knowledge of red pandas despite them being a significant species. Due to the species' habitat in

difficult isolated mountainous terrain and its limited distribution, the ecology of red pandas is less well studied. The results of this study looked at the existing population status and distribution, and issues that could influence the red panda's protection and management. This will broaden the knowledge gap regarding past research and surely helps to compare data in the future.

MATERIALS AND METHODS

All of the information gathered for this manuscript were from secondary sources. For getting the required papers, mainly two sources were used i.e. Google Scholar, ResearchGate, and other online portals. In the same way, other reports were used to gain relevant data. Mainly those articles selected contain information on Red pandas. The keywords such as *Ailurus fulgens*, *Threats to Red Panda*, *Distribution of Red Panda*, *Population of Red Panda*, *Red Panda in Nepal*, etc. were used to search the mentioned sources. From these two websites, a total of 152 resource materials were downloaded. The duplicates in the downloaded resource materials were then picked out. The analysis covered information on the red panda's population status, distribution, and threats. Each author carefully read the chosen writings several times to retrieve the data necessary to achieve our goals; those who didn't were eliminated. To create the manuscript, the obtained information was gathered and evaluated numerous times. The distribution was prepared with Arc GIS 10.0.Map. For the goals of the study, 56 pieces of literature including research papers and reports, were used.

RESULTS AND DISCUSSION

Population Status

Based on the entire habitat area and the lowest reported average density, it is estimated that there are between 16,000 and 20,000 red pandas throughout the world (Choudhury, 2001). According to DNPWC and DFSC (2018), globally there are less than 10,000 mature individuals. Nepal is the residence of around 1.9 percent of the world's Red Pandas population, with an estimated 314 individuals based on ecological compatibility (Yonzon et al., 1997). According to Jnawali et al (2011) and DNPWC and DFSC (2018), in Nepal, there are about 317-582 individuals. Nepal's 24 districts are the major red panda habitats, and 34%

of the population lives in highlands (Bista et al 2016; DNPWC and DFSC 2018) covering 24,000 km². The study performed in May 2013 in three Village Development Committees (VDCs) in the Jumla district namely, Godhemahadev, Malikathata, and Tamti, was a significant step in providing crucial information about this species' distribution and favored habitats (Bhatta et al., 2014). With only 10,000 mature individuals surviving, the Red panda is classified as endangered on the IUCN Red List and it is chiefly threatened by forest loss as a consequence of the pressure from a growing population (Dorji et al., 2012). A European Endangered Species Programme (EEP) was launched in 1985, and as a result of improved breeding practices, the Red pandas' population start to rise in the world (Kappelhof and Weerman, 2020). The Red panda's territory is threatened by the collapse and disruption of their habitat (Pradhan et al., 2001b; Wei et al., 1999; Yonzon et al. 1991).

Even though this species is vital for conservation, research, and trade, its wild ecosystem has been dropping (Karki et al., 2021). Nearly 70% of the overall Red panda habitat in Nepal is outside of protected areas, according to the national Red panda census from 2016 (MoFSC, 2016). Red pandas have been the topic of a very limited number of research studies, the majority of which have concentrated on Langtang National Park (LNP) in Nepal's Chitwan-Annapurna Landscape (CHAL) (Bista et al., 2017). Langtang National Park in Nepal recorded an 83 percent- mortality rate for cubs and a 47 percent -mortality rate for adults (Yonzon and Hunter, 1989). According to Chalise and M.K. (2013) even though the Nepal Government has also created a Red Panda Conservation Action Plan for LNP, some areas of LNP are declared by DNPWC as Red panda conservation areas (2008-2013). An individual who kills or intends to kill a red panda receives a monetary fine of up to NRs. 40,000, a jail term of one to ten years, or both (Sharma et al., 2009). Predation has significantly lowered the red pandas' abundance in the past and is still doing so today, making them an endangered species.

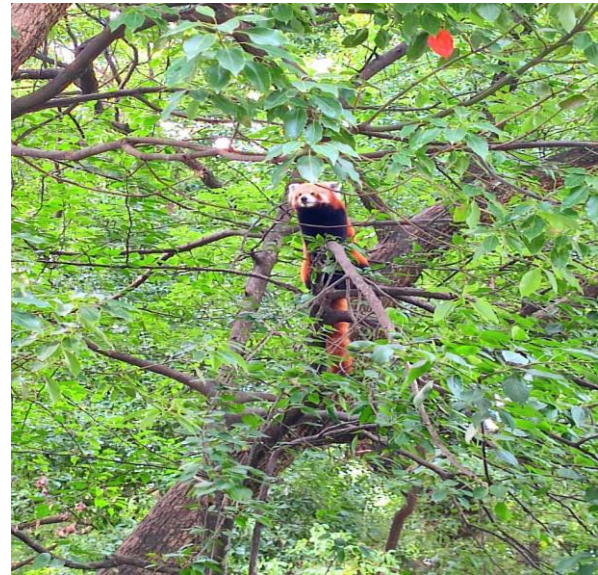


Figure 1. Red panda in Central Zoo, Nepal by Prasamsa Shrestha

Distribution

Red pandas are present in the Mountainous region of India, Nepal, China, Bhutan, Myanmar, and Laos while depending on the type of forest, Nepal offers 912 sq. km of prospective habitat for red pandas (Yonzon, 1989a). Red pandas are expert habitat users who prefer to remain in bamboo-rich forests (Su et al., 2021). The red panda, which dwells at heights between 2,200 to 4,800 m, is a typical high-altitude animal (Roberts and Gittleman, 1984). Despite their common perception that they are a loner species, they can be observed in small groups during the mating season, most commonly a mother and her young. (Hu, 1991; Roberts and Kessler, 1979). As they need not travel long journeys to get water, the red pandas in eastern Nepal choose locations with large trees and access to water sources, which may be beneficial in the sense of saving energy (Bista et al., 2017; Pradhan et al., 2001).

Since both geographic and biological factors contribute to determining species richness (Benton, 2009), the factors that impact habitat selection are complex and vary by species (Thapa et al., 2020). The main biomes of Red pandas in Nepal are mountainous protected areas such as Langtang National Park (LNP), Makalu Barun National Park (MBNP), Rara National Park (RNP), Sagarmatha National Park (SNP), Annapurna Conservation Area (ACA), Gaurishankar Conservation Area (GCA), Kanchenjunga Conservation Area (KCA), Manaslu Conservation Area (MCA), and Dhorpatan

Hunting Reserve (DHR) (Jnawali et al., 2011; Jnawali et al., 2012; Yonzon, 1989b). In eastern Nepal, this species may be found at altitudes of

2800–3000 m, whereas in central Nepal, it can be located at 2800–3900 m (Yonzon and hunter, 1991).

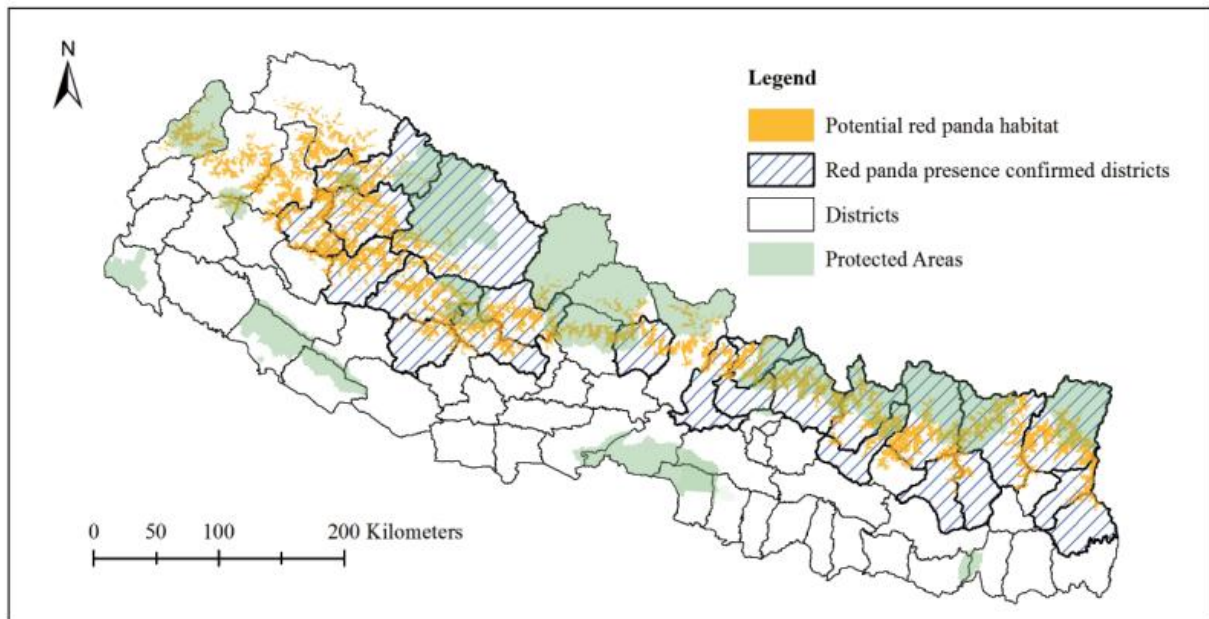


Figure 2. Potential red panda habitat and presence confirmed districts in Nepal (Source: Bista et al., 2016)

The 11 subgroup regions that make up the identified Red Panda ecology are the Kanchanjunga-Ilam Complex, Sankhuwasabha East, Sankhuwasabha West, Sagarmatha, Gaurishankar, Langtang, Annapurna-Manaslu Complex, Dhorpatan, Rara, Api Nampa, and Khaptad. (Dangol and Chalise, 2018). Red pandas dwell in temperate forests ranging from evergreen broadleaved forests to pine forests, however tree species such as *Abies spectabilis*, *Rhoderndron arboreum*, *Acer* spp., *Betula* spp., and *Quercus* spp. offer little to their feed while boosting habitat accessibility and connectivity (Panthi et al., 2012; Thapa and Basnet, 2012). In 2016, the Government of Nepal conducted a countrywide review as part of the flagship species studies for observing Red pandas' dispersal. Red pandas are identified in 24 out of 37 probable districts, as per data that only confirms their presence at the district level (Thapa et al., 2020). Red pandas have been sighted in five major districts: Rasuwa, Myagdi, Baglung, Nuwakot, and Dhading, with a total of 132 indirect signs and three direct sightings noted (Bista et al., 2017). The existence of large numbers of cattle, herders, and roaming canines in Langtang National Park substantially destroys Red pandas and the Red pandas' environment, which leads to the Red panda

population's current collapse (Yonzon and Hunter, 1991b).

Threats

Due to their small stature and gloomy coloring, they are quite excluded. Red pandas have no negative consequences for people (Glatston, 1994), but they are at risk because of anthropogenic pressures. These problems are split into two categories direct dangers, such as habitat destruction and poaching, and indirect dangers, such as a low level of awareness, a lack of red panda-specific conservation strategies, limited protection, etc. (Ghose and Dutta, 2011). Due to their declining population worldwide and the fact that sickness is seen as a major threat to the health and survival of the cubs raised in captivity, the red panda has been designated as endangered species (Liu et al., 2022). Across its range, the Red panda is being threatened by some potential issues that are all related directly or indirectly to human influence (Conrad, 2021). The destruction of the Red Panda's ecology, slaughtering for meat and fur, and clandestine collection for commerce as mascots are all threats to the Red panda's existence (Pilia et al., 2020). In China, Red panda fur is commonly worn, mainly by the grooms, at unique local ceremonies like marriages (Thapa, 2010).

The largest threat threatening wild Red pandas in China include habitat loss and population scattering, hunting, marketing and exhibition, tourism and road development, and bamboo flowering (Wei et al., 2022). In Nepal Red panda's forest habitat is now under threat as a result of loss, and fragmentation throughout its range. Commercial logging and the requirement for firewood are the key drivers of approval for human settlement (especially in the cooler Himalaya), farming, jhum (slash-and-burn shifting cultivation) by tribal groups, farm animals grazing, monoculture tree plantations, and major development projects. (Chaudhary, 2001). According to Lama (2019), the main threats to red pandas in Nepal's Simsim Community Forest in Papung VDC of Taplejung district are grazing and bamboo cutting.

The disturbances caused by livestock grazing are primarily blame for a decrease in the home of Red pandas' (Lama et al., 2020). Mountain inhabitants demand more wood for heating at higher altitudes due to colder winter temperatures. Ringal bamboo (*Arundinaria maling*), which is exploited as the primary building frame of houses and goths (huts used for livestock herding), is gaining popularity due to the rising populations of people and livestock (Williams et al., 2011). Since Himalayan bamboos are exposed to fires, deforestation, and environmental degradation all of which can be aggravated by changes in regional and global weather patterns blended with ongoing habitat destruction and segmentation would cause a greater loss of bamboo from the area (Stapleton, 1996). Red panda numbers shrink as a result of bamboo depletion. More investigation should be done to investigate the Red panda's richness, distribution pattern, and linkages with diverse habitat characteristics throughout the possible districts.

CONCLUSION

Originally, the Red panda lived in temperate forests in Nepal, Sikkim (India), Bhutan, northern Burma, and a small portion of southern China. Red pandas in Nepal are only situated in the north region of the nation, at an elevation between 2500 and 4200 meters. Globally, there are about less than 10,000 mature individuals left, and in the case of Nepal, there are only 317-552 individuals. This study identified the red panda distribution in four

national parks, including LNP, MBNP, RNP, and SNP, as well as four conservation areas, including ACA, GCA, KCA, and MCA. Rasuwa, Myagdi, Baglung, Nuwakot, and Dhading seem to be the top five districts wherein Red pandas have been seen. Red pandas appear to be influencing contemporary society, especially outside of their native range states. Their name and appearance are now incredibly influential in global art, culture, and trade. Red pandas are deemed to be most at risk from habitat loss, which in some regions of Nepal is linked to a disturbance from livestock grazing. To enable monitoring and execution of conservation activities, it is vital to investigate the Red Panda's status in Nepal. As a result, effective educational and awareness initiatives, compensation and general liability policies to alleviate the conflict between humans and pandas, and effective habitat management of the species are all incorporated with the blended efforts of the government, NGOs, and INGOs. The best responses to issues about poaching and illegal hunting in the Himalayas might be extensive conservation awareness and rigorous law enforcement. To assess and identify the most suitable habitat, extensive research on red pandas is recommended. To safeguard the long-term survival of this species in habitats at local and regional scales, there is an urgent need to start national collaboration and coordination in research, a common data hub, and policy implementation.

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