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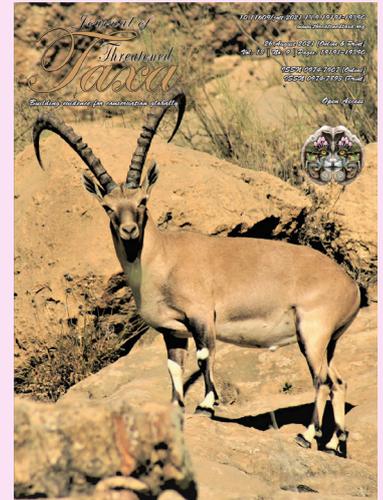
COMMUNICATION

PHOTOGRAPHIC EVIDENCE OF RED PANDA *AILURUS FULGENS* CUVIER, 1825 FROM WEST KAMENG AND SHI-YOMI DISTRICTS OF ARUNACHAL PRADESH, INDIA

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INTRODUCTION

The Red panda *Ailurus fulgens* Cuvier, 1825 is a small carnivorous mammal with reddish-brown fur, placed under the monotypic family *Ailuridae*. Red Pandas are predominantly solitary and arboreal, and feed primarily on bamboo leaves plus seasonal supplements that include bird eggs, grubs, lichen, acorns, insects, and fruit (Yonzon & Hunter 1991; Choudhury 2001; Pradhan et al. 2001). Red Pandas are most active during the spring and summer-autumn during the day, and they rest for longer hours during winter as an adaptation to cold environmental conditions to conserve heat (Zhang et al. 2011). Such traits make it difficult to locate them during field surveys. Prime Red Panda habitats occur in temperate forests and bamboo mixed subtropical forests with a high density of fallen logs, high canopy cover, bamboo & shrub cover, and relatively steep slopes in close proximity to water sources (Thapa et al. 2018a).

The Red Panda is listed as 'Endangered' under the IUCN Red List of Threatened Species (Glatston et al. 2015). It is also listed in Appendix I of CITES, a category accorded to species threatened with extinction and whose trade is prohibited. In India, they are protected under Schedule I of the Indian Wildlife Protection Act (1972) (indiacode.nic.in). Red Panda numbers have been reported to be less than 15,000 in the wild (Wang et al. 2008; Glatston et al. 2015). Red Pandas are threatened due to poaching for their pelts and fur which is used for various clothing in China and elsewhere (Wei et al. 1999b, Dorji et al. 2012; Glatston et al. 2015). They are hunted by feral dogs, or get trapped in snares set up for other animals (Ghose & Dutta 2011; Dorji et al. 2012; Chakraborty et al. 2015). Anthropogenic pressure, large-scale deforestation, habitat loss, degradation around human settlements and consequently the expansion of agricultural areas has led to their decline in China, and these factors are probably applicable to the rest of the general red panda population (Yonzon & Hunter 1991; Glatston 1994; Wei et al. 1999b; Choudhury 2001; Pradhan et al. 2001).

Global distribution of Red Panda

Red Pandas have a narrow range of occurrence. Their distribution spans from Api Nampa Conservation Area and Khaptad in western Nepal to India, Bhutan, Myanmar towards southcentral China of Sichuan and Yunnan province, encompassing the southern portion of Tibet, with Xiangling mountains being their easternmost extent (Glatston et al. 2015). Red Pandas occur in low densities, disjunct ranges, disconnected populations,

and patchy distributions across the Himalaya-Hengduan mountains biodiversity hotspot (Glatston et al. 2015; Hu et al. 2020; Thapa et al. 2020). Their habitat consists of the sub-tropical and temperate forests of the Himalayan and Hengduan mountains, particularly in areas consisting of dense bamboo undergrowth (Yonzon & Hunter 1991; Wei et al. 1999a; Choudhury 2001; Pradhan et al. 2001; Chakraborty et al. 2015). Two subspecies are recognised, *A. f. fulgens* and *A. f. styani* west and east of the Nujiang River (Wei et al. 1999b), but a recent genetic study has identified Yalu Zangbu river as the geographic boundary, delineating the evidence for two phylogenetically different species and populations of Chinese Red Pandas and Himalayan Red Pandas (Hu et al. 2020).

Distribution of Red Panda in India

In India, Red Pandas are found in the temperate belt of Sikkim, West Bengal and Arunachal Pradesh at altitudes ranging from 2,500 m to 5,000 m, and they have also been reported from sub-tropical Meghalaya at altitudes generally ranging from 1,500 m to 4,800 m, although Red Panda occurrence has also been recorded at lower elevations (Duckworth 2011; Glatston et al. 2015). The presence of a wild population in Meghalaya is debated (Duckworth 2011) and recent studies, including wildlife surveys using camera-traps, have not found evidence of occurrence (Ghose & Dutta 2011; Mukherjee et al. 2019). Kashmira Kakati (pers. comm. 15.v.2020) suggests that the older reports of Red Pandas may have been escaped or released pets of Nepali immigrants who had settlements in these areas.

Records of Red Panda occurrence from Arunachal Pradesh

Arunachal Pradesh has around 11,300 km² of potential Red Panda habitat - the largest habitat in India, followed by Sikkim and West Bengal (Choudhury 2001; Ghose & Dutta 2011). As shown in Table 1, moving from west to east Red Pandas have been recorded in Tawang, West Kameng, East Kameng, Upper Subansiri, Lower Subansiri, Upper Siang, East Siang, Shi-Yomi (formerly West Siang), Dibang Valley, Lohit, Anjaw, and Changlang districts of Arunachal Pradesh. TRAFFIC's recent assessment for this species reported poaching and snaring in West Kameng, Shi-Yomi, Anjaw, and Dibang Valley districts of Arunachal Pradesh (Badola et al. 2020) thereby indicating that the species occurred in these districts. For the 20 districts surveyed in TRAFFIC's assessment, information on illegal trade of Red Panda skin or fur does not necessarily indicate presence of red panda in those districts unless it was confirmed as

a hunting or poaching incident from the district itself (Merwyn Fernandes, pers. comm., 29.xii.2020).

An ongoing study and work being carried out within one of WWF-India's priority areas known as the Western Arunachal Landscape (WAL), which spans across Tawang and West Kameng districts will help furnish additional information on the status of Red Panda in these areas (Kamal Medhi, pers. comm., 06.v.2020). By mobilizing strong support from local communities this work has already led to the delineation of 115 km² as habitat to conserve the Red Panda in West Kameng district. This area forms part of Mandala-Phudung-Khellong community-conserved area in the West Kameng district of Arunachal Pradesh (Chauhan 2019).

The state of Arunachal Pradesh is located in the eastern Himalaya and lies in a transition zone (Mani 1974; Rodgers & Panwar 1988) between the Himalayan (CEPF Ecosystem Profile 2005), and Indo-Burmese biodiversity hotspots (Myers et al. 2000) in India. Arunachal Pradesh along with other northeastern states of India is experiencing large-scale changes in land use and land cover due to shifting cultivation, illegal deforestation and indiscriminate felling of trees, which ultimately contributes to degradation of natural ecosystems (Roy & Tomar 2000; Tripathi et al. 2016). This state is experiencing rapid infrastructure economic developments on an unprecedented scale (Rahman 2014), and the trajectory of this development varies within the districts of Arunachal Pradesh (Sharma & Chakraborty 2016). The tourism potential of Arunachal Pradesh can provide stable economic and employment opportunities across the state (CES 2013). These developments invariably contribute to loss of forest cover and habitat degradation amidst socio-economic development of Arunachal Pradesh in the present time. According to India's State of Forest report Arunachal Pradesh has been experiencing habitat degradation and loss of forest cover over the years (FSI, State of Forest 2019).

Most of the land in Arunachal Pradesh has been under the traditional ownership of communities since decades. Such forests under community governance are called unclassed forests, which form 60% of the state's forest cover (FSI, State of Forest 2019). A recent study on the habitat suitability of the region for Red Pandas also identifies large portions of viable red panda habitat outside protected areas (Thapa et al. 2018b). The three locations where red pandas were recorded during this study are located within such unclassed forests. Habitat degradation and habitat loss have been major threats to Red Panda populations historically (Yonzon & Hunter

1991; Wei et al. 1999b; Pradhan et al. 2001), and this trend seemingly has not changed over the years.

STUDY AREA AND METHODS

The Red Panda photographs were obtained during a larger study on the status of tiger habitats in high-altitude ecosystems of Bhutan, India, and Nepal (Global Tiger Forum 2019) with the objective to strengthen tiger conservation in high-altitude habitats in these three countries. For this study, literature review, questionnaire surveys, sign surveys, and camera trapping were conducted primarily in order to determine tiger presence across the study area. In India, the field surveys were conducted across the four states of Uttarakhand, Sikkim, northern West Bengal and Arunachal Pradesh from March 2019 to July 2019. The entire study area of 38,915km² in India was overlaid with 25km² grids. Specific forest divisions in all four states were identified for field surveys through workshops and consultations with the state forest departments during the early stages of this study.

In Arunachal Pradesh, as part of the larger study, seven administrative districts consisting of a total of 13 forest divisions (territorial and wildlife divisions) were surveyed. Questionnaire responses were received for 215 grids (of 25km² each) whereas sign surveys were carried out for a total length of 181 km covering 62 grids (of 25 km² each); each sign survey trail was 3 to 5 km in length. Camera traps were deployed in 47 grids (of 25km² each); with two pairs of cameras (4 cameras in total) placed in each 25km² grid.

RESULTS

We report here three locations in Arunachal Pradesh (Figure 1) where Red Pandas were recorded through camera-trap photo captures. A total of three photographs of Red Pandas in India were obtained from this study.

During May–June 2019, camera trap photographs of Red Pandas 'thungmodongkar' (Mon language, with different local dialects) were obtained from two locations in the Dirang range of Bomdila Forest Division; one on the Jantsangpo trail (at 27.330 N, 92.158 E, 3,352 m altitude, Image 1), and the other along the Kishusegep trail (at 27.350 N, 92.183 E, 3,278 m altitude, Image 2). The survey team found red panda scat on the Kishusegep trail, and there was a rocky stream present

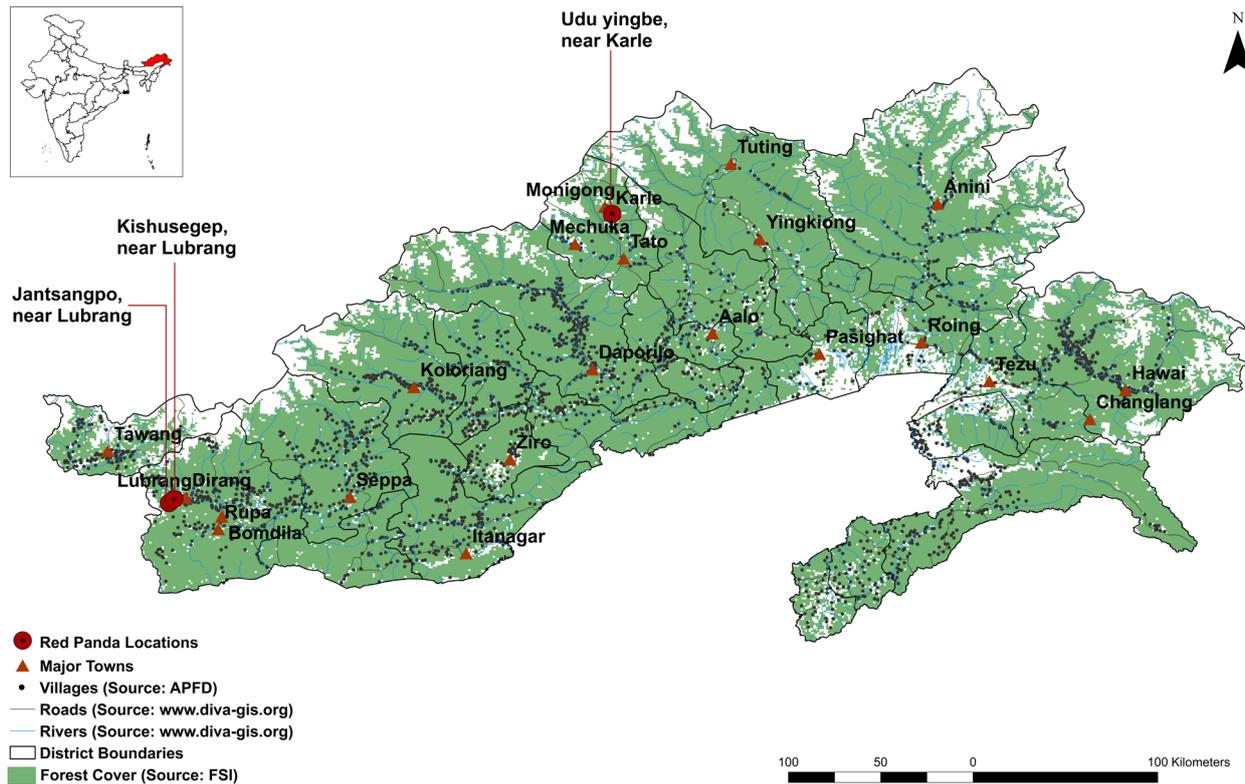


Figure 1. Map of Arunachal Pradesh depicting the locations where red pandas were photo captured on the camera traps. Inset: Location of the state of Arunachal Pradesh in India. Map created in ArcMap 10.7.1.

along the Jantsangpo trail. Both of these locations are around the Lubrang village of West Kameng district. Barking Deer *Muntiacus muntjack* and Yellow-throated Marten *Martes flavigula* were also photographed at the Red Panda *Ailurus fulgens* trap locations. This area predominantly consisted of different Bamboo sp., *Quercus* sp., *Acer* sp., and *Castanopsis* sp., as part of the vegetation of temperate broad leaved forests.

In June 2019, a Red Panda 'kopuling' (Adi language, with different local dialects) was photographed (at 28.747 N, 94.317 E, 2,478 m altitude, Image 3), at an approximate aerial distance of 1.5 km from Karle village in the Udu Yingbe locality, on the hilly route from Karle to Tayong. This village is part of the Mechuka range (also spelt Menchukha) of Along Forest Division, in the Shi-Yomi district. Wild Boar *Sus scrofa*, Mithun / Gayal *Bos frontalis*, Kalij Pheasant *Lophura leucomelanos*, humans, cattle, and domestic dogs were also photographed along with the Red Panda at this location. There was a stream running along the trail. The vegetation type consisted of temperate broad leaf forest species dominated by Bamboo sp., *Quercus* sp., *Castanopsis echinocarpa* ('Hirang' in local dialect), and *Rhus semialata* or *R. chinensis* ('Taam' in local dialect). Upon enquiry by the

team member who surveyed the area, the local guide reported human use of these habitats on a regular basis in the form of logging of wood and Bamboo using motorized saw, or manually using axes (locally known as 'daav'), typically used for local distribution.

The first record of red panda from the Monigong area (Shi-Yomi District) was its sighting on an oak tree along a steep hillside in the year 1999 (Ghose & Dutta 2011). Monigong is the last village of Arunachal Pradesh on this front - towards the Indo-Chinese border, and hence a landmark village, due to which these hilly ranges are known as Monigong hills or Monigong area. The hills surrounding Karle, Tayong and Jorang villages which are located near Monigong village were surveyed during this study. This photograph of the Red Panda is the second record from the hills of Monigong area, obtained near Karle village, Shi-Yomi district in Arunachal Pradesh.

DISCUSSION

The photographic evidence of Red Panda obtained through this study from three locations in Arunachal Pradesh confirms the presence of this species near



Image 1. Camera trap photograph of Red Panda from Jantsangpo trail area of Bomdila Forest Division, West Kameng district, Arunachal Pradesh.



Image 2. Camera trap photograph of Red Panda from Lubrang area (Kishusegep trail), Bomdila Forest Division, West Kameng district, Arunachal Pradesh.



Image 3. Camera trap photograph of red panda near Karle village, Along Forest Division, Shi-Yomi district (formerly West Siang), Arunachal Pradesh.

**Table 1. District-wise presence of Red Panda reported in Arunachal Pradesh.**

District of Arunachal Pradesh	Type of Records	Source
Tawang	Kills recorded as part of field interview surveys with communities, known to be traded locally.	Mishra et al. 2006
	Sightings on 4 occasions between 1990 to 1997, skin being sold in Tawang market till 1998.	Ghose & Dutta 2011
	At Pangchen valley through direct sightings, droppings, and feeding signs as part of a field survey.	Chakraborty et al. 2015
	Interview and field surveys.	Choudhury 2001
West Kameng	Kills recorded as part of field interview surveys with communities, known to be traded locally.	Mishra et al. 2006
	Pelt shown as stuffed toy in market area.	Badola et al. 2020
	Mandla-Phudung, directly through sightings, kills, carcasses) and indirectly through evidence of scats, pugmarks, scratch marks, pelts and secondary information confirmed by the local communities; Nyukmadung, Ramacamp, Ramalingam camp, Chaku, Bompu, Sundarview, Nafra in the 1980s; Eagle Nest Pass and Dirang in 1990s.	Ghose & Dutta 2011
	Multiple live sightings, droppings, and reports of hunting red pandas between 1980 to 2000.	Srivastava & Dutta 2010
	Two photographs obtained in 2019 as mentioned in the current paper; in the vicinity of Lubrang village.	Global Tiger Forum 2019 (details outlined in the current paper).
	Photographed at Chug Valley.	Choudhury 2020, Tribuneindia.com, 2 October 2020
	Presence indicated through interviews and field surveys in Sessa Orchid Sanctuary, Eagle Nest Wildlife Sanctuary.	Choudhury 2001
East Kameng	A record of one individual killed in 1999.	Ghose & Dutta 2011
	Interview and field surveys.	Choudhury 2001
Upper Subansiri	Interview and field surveys.	Choudhury 2001
Lower Subansiri	One individual rescued near Kebi village.	Business-standard.com, 29 February 2016
	Presence indicated through interviews and field surveys in Talley Valley Wildlife Sanctuary.	Choudhury 2001
Upper Siang	Interview and field surveys.	Choudhury 2001
	Presence indicated through interviews and field surveys in Mouling National Park.	Choudhury 2001
East Siang	Interview and field surveys.	Choudhury 2001
Shi-Yomi (formerly West Siang)	One sighting record and one kill record, Monigong area.	Ghose & Dutta 2011
	One photograph obtained in 2019 as mentioned in the current paper; in the vicinity of Karle village.	Global Tiger Forum 2019 (details outlined in the current paper)
	Pelt found in market area.	Badola et al. 2020
Dibang Valley	One kill, one skin and a live sighting record.	Ghose & Dutta 2011
	Hunting recorded.	Sharma 2017
	Pelt recorded during survey.	Badola et al. 2020
	Presence indicated through interviews and field surveys in Dibang Valley Wildlife Sanctuary, Mehao Wildlife Sanctuary.	Choudhury 2001
Lohit	Two sighting records, one in 1984, and another of 8 individuals in 1992.	Ghose & Dutta 2011
	Presence indicated through interviews and field surveys in Kamlang Wildlife Sanctuary.	Choudhury 2001
Anjaw	One poaching incident recorded.	Badola et al. 2020
Changlang	Presence indicated in Namdapha Tiger Reserve.	Ghosh 1985
	Interviews and field surveys.	Choudhury 2001

Lubrang village (Bomdila Forest Division, West Kameng district, Western Arunachal Pradesh) and Karle village (Along Forest Division, Shi-Yomi district, formerly West Siang, central-eastern Arunachal Pradesh). This is the

first photographic and hence confirmatory evidence of red panda presence near Karle village, in Shi-Yomi district of Arunachal Pradesh. These locations are part of the unclassed forests of Arunachal Pradesh,

and are managed by the State Forest Department administratively as Forest Divisions.

Habitat suitability analysis predicts that Eastern Arunachal Pradesh harbours more suitable habitat for red pandas as compared to Western Arunachal Pradesh (Thapa et al. 2018b). While the Pangchen valley in Tawang district and the Chug valley in West Kameng district of Western Arunachal Pradesh have received some focus for community-based conservation efforts for Red Pandas (Srivastava & Dutta 2010; Chakraborty et al. 2015) districts in central and eastern Arunachal Pradesh have received less focus and there is very limited information available beyond the historical survey reports mentioned in Table 1.

Red Pandas are habitat specialists (Yonzon & Hunter 1991; Pradhan et al. 2001). In Bhutan their presence most often overlaps with the rural human population which is undergoing rapid socio-economic development (Dorji et al. 2012). Site-specific habitat degradation in high-altitude areas of Arunachal Pradesh probably occur due to anthropogenic disturbance in relation to firewood collection (mostly *Rhododendron* sp.) and unregulated grazing by local communities (Kalita & Khan 2013; Dutta et al. 2013; Paul et al. 2019). As observed in this study, site-specific habitat degradation is prevalent and such anthropogenic activity overlap with red panda habitat seems to be the case for some areas of Arunachal Pradesh as well.

It seems that Red Pandas have persevered in the forests of Arunachal Pradesh, but information on the population status and trends are lacking. Hunting by the local tribals in Arunachal typically has its roots in the need for basic subsistence, trade and commerce, and also for customary, religious and cultural practices (Aiyadurai et al. 2010; Selvan et al. 2013). Even though hunting is prevalent in many regions of Arunachal Pradesh, the hunting of Red Pandas has seldom come to light (Choudhury 2001; Aiyadurai et al. 2010; Srivastava & Dutta 2010). Encountering Red Panda is considered a good omen as per traditional beliefs in Arunachal (Janaki et al. 2020). There are very few records of illegal trading and limited demand of Red Panda parts from recent years (Badola et al. 2020). Enquiries regarding the presence of red panda in the survey locations of the current study did not indicate hunting as a threat. During the field survey, interaction with local people suggested that sightings of the Red Panda had become rare over time (Christi Sylvia pers. comm., 06.v.2020). This could be attributed to site-specific habitat disturbances, especially due to people's subsistence-related dependence on Bamboo vegetation and surrounding habitats. An intensive state-

wide assessment for the population of Red Panda which could also uncover potentially connected or isolated habitats such as the ones identified by this study is recommended.

There is a stark difference in socio economic development of the West Kameng district of western Arunachal Pradesh and Shi-Yomi district that lies in central-eastern Arunachal Pradesh. The West Kameng district has many popular tourist destinations. But within Shi-Yomi district, while the Mechuka village and its hilly ranges are a popular nature and culture-based tourist destination with an economy driven by beautiful homestays, the Monigong village and its hilly ranges on the other hand lacks basic infrastructure, although it harbours the same scenic surroundings. The locals of this area rely on the surrounding forests for subsistence and most of them currently work as daily wagers labouring to build roads in this region. As observed during the study period, most large-scale infrastructure work in this region pertained to developing the linear infrastructure – the highways and roads. However, interaction with local people suggested a dire need for developing this remote region further (Christi Sylvia, pers. comm., 06.v.2020).

While development is inevitable and even necessary to a certain extent, largely to improve the livelihood of the marginalised communities of Arunachal Pradesh; nevertheless, grassroots-scaled, community-based conservation work and sustainable tourism initiatives that limit habitat destruction are recommended. Inclusive conservation has proved effective in Arunachal Pradesh time and again (Athreya 2006; Dutta et al. 2012; Rane & Datta 2015). Managerial interventions for maintaining high-altitude habitat biodiversity in the state as well as maintenance of community-owned forests is important for securing the in situ conservation of Red Panda, with benefits to communities for their stewardship under payment for ecosystem services (PES). This may also be complemented by ex situ conservation efforts for Red Panda, with an aim for their future re-introduction into wild habitats.

Community stewardship is crucial to promote the existence of a peculiar species like the Red Panda that thrives on bamboo, a flora on which dependency of the people of Arunachal Pradesh is also high. Inclusive conservation could ensure the continued persistence of this species in this state that boasts of the largest Red Panda habitat in India.



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