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Unpredictable Movement of Wildlife in Uttarakhand, India

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Abstract
In the recent past, some cases of unpredictable movement of wild animals have been reported from different parts of the Uttarakhand State of India, wherein the species were found moving in higher elevations beyond their defined range, which have never been reported as the natural range of the species. Whether such unpredictable movement of the species in higher ridges is indicating towards a shift in their natural ranges, or some small resident and isolated population exist in the area or are dispersing individuals remains unclear. We reviewed some cases of unusual sightings of wild animals beyond their ranges in Uttarakhand Himalaya, which all are indicating that temperature variation is affecting the wildlife and consequently their capabilities to respond to changing environment.

Keywords: Wildlife, Population, Natural Ranges, Ecology, Landscape, Uttarakhand

Introduction

Uttarakhand located at the foothills of the Himalayas with lush green vegetation supports diverse range of flora and fauna (Fig 1). State has total area of 53,483 sq.km of which 64% is covered by forests. The total carbon stock of forest in the State including the Tree outside forest patches which are more than 1 hectare in size is 378.16 million tonnes which is 5.25% of total forest carbon of the country (India State of Forest Report, 2021) [18]. There are two regions, western part is Garhwal and eastern region is Kumaon. Climate and vegetation vary greatly with elevation from glaciers at the highest elevations to sub -tropical forests at the lower elevations. It is represented by Biogeographic zones 2B western himalayas and 7B Shiwalik (Rodgers and Panwar, 1988) [14]. State has mammalian diversity exceeding 75 species of which 50% are threatened (Habib *et al*, 2016) [6]. In the recent past, some cases of unpredictable movement of wild animals have been reported from different parts of the Uttarakhand State of India, wherein the species were found moving in higher elevations beyond their defined range (Table 1), which have never been reported as the natural range of the species. Whether such unpredictable movement of the species in higher ridges is indicating towards a shift in their natural ranges, or some small resident and isolated population exist in the area or are dispersing individuals remains unclear. We reviewed some cases of unusual sightings of wild animals beyond their ranges in Uttarakhand Himalaya, which all are indicating that temperature variation is affecting the wildlife and consequently their capabilities to respond to changing environment.

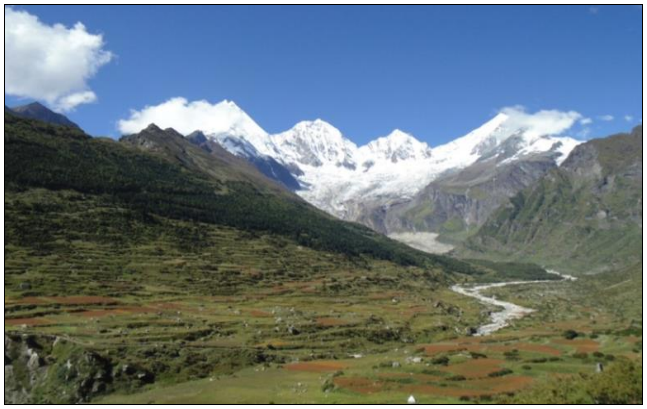

Fig 1: Askot landscape, Uttarakhand

Table 1: Unpredictable range of wildlife from the Uttarakhand State, India

S. No	Particular	Scientific name	IUCN status	Previous elevation range	New elevation range reported
1.	Tiger	*Pantheratigris*	Endangered	1000 m	3431 m and 3274 m
2	King cobra	*Ophiophagushannah*	Vulnerable	1000 m	2303 m and 2400 m
3.	Elephant	*Elephasmaximus*	Endangered	300 -1000 m	1200 m and 1450 m
4	Himalayan trinket snake	*Orthriophishodgsonii*	Least Concern	1000 - 3200 m	835 m

Case Study of Tiger

In May 2019, a tiger (*Panthera tigris*) was captured in a camera trap in Madhmaheswar area of Ukhimath forest of the Kedarnath Wildlife Sanctuary at an elevation of 3,431m, which was the highest elevation record of tiger's presence in the State, as well as in India (Pawar *et al*., 2020) [12]. Prior to this observation, in the year 2016, a female tiger was recorded at an elevation of 3,274 m from the Askot landscape in the State (Bhattacharya *et al*., 2016) [6]. Even though the Rajaji National Park has been considered as the northwestern limit of the natural distribution range of the tiger in the State (~1000 m) [Rasaily, 2012], a recent study has identified the eastern and western Himalayan zones, spread across Bhutan, India and Nepal as a potential habitat for tigers (Global Tiger Forum, India, 2019) [19].

Case Study of Elephant

Fig 2: Elephant in Rajaji National Park

Asian elephant (*Elephas maximus*) is one of the flagship species in Indian forests, which play an important functional role in maintaining forest ecosystem and biodiversity. Rajaji National Park is one of the protected habitats of the elephants in northwestern India (Fig 2), which is spread across an elevation of 302-1,000 m (ENVIS) and there were no reports of elephant's movement in the State beyond this elevation till the year 2019. However, a study has recorded the movements of adult male elephants at an elevation of about 1,200 m, which was first ever indication of the elephant's movements in higher ridges in the State (Joshi 2019) [10]. However, study revealed that such movements of the male elephants are seasonal and occur mainly to feed upon palatable crops. During the elephant population estimation 2020, the Uttarakhand Forest Department has recorded the elephant's presence at an elevation of about 1,450 m from the Almora Forest Division (Azad, 2020) [1]. A study predicted that elephants may lose nearly 40% of their habitat by the end of this century, mainly due to human-induced disturbances and global climate change in human-dominated regions. The study also predicted that these changes may lead the elephants to shift towards higher elevations, along the river valleys (Kanagaraj *et al*., 2019) [11]. Changes in movement and behaviour of elephants have been observed following severe droughts triggered by El Nino events (Sukumar, 2018) [20].

Case Study of Asiatic Black Bear

Since the last one decade, the movement of Asiatic black bear (*Ursus thibetanus*) near rural areas was found increasing due to which cases of livestock depredation (cattle lifting) are escalating. However, a recent study indicated that there are some confined residential population of the species, which do not perform altitudinal migration or hibernation, especially in foothills dominant areas (Singh *et al*., 2020) [17]. Though, the species is not known to hibernate in tropics, except females giving birth during winter (Hwang *et al*., 2007) [7], there are reports which indicates that the species perform hibernation (Sathyakumar *et al*., 2013; Furusaka *et al*., 2017) [15, 5].

Other Cases of Wildlife

The presence of mugger crocodile (*Crocodylus palustris*) was documented from the river Ganges and its tributaries near Haridwar area, which was never reported from the area (Joshi *et al*., 2011) [9]. These observations indicate that the natural range of the mugger crocodile is expanding in upper catchment of river Ganges. Similarly, an individual of king cobra (*Ophiophagus hannah*) was sighted at an elevation of about 2,400 m in State (in Mukteshwar area, Nainital district), which was an unusual sighting in such a high range (Jha, 2020) [8]. Prior to this record, the presence of king cobra was reported from 2,303 m elevation (Dolia, 2018) [3]. Considering the known distribution range of the species in the State (~1000 m), it appears that there might be a little range extension in species' distribution. In contrast, in the year 2016, two individuals of Himalayan trinket snake (*Orthriophishodgsonii*) were sighted from the Sahastra Dhara area near Dehradun at an elevation of 835 m, which was unusual since species is known to found from 1,000-3,200 m altitude in the Himalayas (Singh *et al*., 2018) [16].

Uttarakhand Action Plan on Climate Change reveals that the abrupt changes in climatic conditions in mountainous areas are affecting the regeneration of various plant species and there may be upward movement of the habitats of many species from their current locations. Similarly, the State of Environment Report highlights about the upward shifting of tree-line and decreasing trend of the quantum of rainfall. Any minor or drastic change in the local climate of an area may affect the species' distribution and thus the structure of the entire ecosystem. In the recent past, quite a few studies have put on record the evidences of species' response towards the climate change, which also includes their movements beyond their ranges, in higher or lower elevations. It is also a fact that various species have learned to respond to the changes happening in their immediate climate as part of evolution. However, do we have adequate and accurate information about such ecosystem level changes, are we ready to manage the new habitats of species

and possible conflicts, which may likely to arise in near future, etc., are some questions, which need to be think of and addressed on priority.

Conclusion

The ecological aspects of most of the species have been studied in their natural ranges, but our knowledge is still lacking for new distribution ranges of the species. Similarly, little is known about the acute causes of such upslope or down-slope movement of species. Climate change along cannot be blamed behind such unpredictable changes in the movement of wildlife. Anthropogenic activities are influencing such micro climatic condition to a great extent. We have to strengthen our knowledge on climate change at local and regional level and its effect on biodiversity. In near future, ecosystems and communities may face the consequences of climate change, coordinated efforts are needed to be adopted to mitigate the negative effects of climate change, especially in Himalayan States. Currently our focus is at understanding the impacts of climate change on ecosystem level and in the collection of datasets. Long-term studies are needed to be conducted to record the changes in climate and its consequences on species and natural habitats. Unusual sighting records of various species in middle and higher Himalaya have opened the scope to revisit our existing knowledge on the distribution of species and to start working towards a landscape level conservation model.

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