Endangered Hispid Hare (*Caprolagus hispidus* - Pearson 1839) in the Royal Manas National Park, Bhutan

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Camera trap exercise in Budunakhola grassland

Abstract

The endangered hispid hare (*Caprolagus hispidus* - Pearson 1839) has only been sighted in a few isolated pockets in the tropical grassland ecosystems of southern Asia. Knowledge of the current status and distribution of the species is limited. Historical samples, anecdotal sources, and sign surveys have suggested that the hispid hare could occur along the southern foothills of Bhutan. This is the first study to systematically assess its presence in the region. To optimize the detection of this elusive animal, camera traps were set up in the Royal Manas National Park (RMNP), Bhutan, spread over three different grassland areas. To maximize the probability of capturing images of the hispid hare, camera traps were randomly placed in batches in three different grassland areas chosen based on the preliminary sign survey. Over the survey period from March through May of 2015, 11 images of hispid hare were captured from a single camera trap station, confirming the presence of this poorly known species in RMNP. Furthermore, the confirmed presence of this endangered species suggests that sustainable management of this grassland habitat could be important for its future survival since the condition of grasslands has been waned over the years due to uncontrolled burning of grasslands, invasion of grassland by woody plants, and weed species.

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Introduction

The hispid hare, which was believed to be extinct, was rediscovered in the Barnadi Wildlife Sanctuary in the Assam State of India in 1971 (Tessier-Yandell 1972; Maheswaran 2002). One of only two lagomorph species which is globally endangered in IUCN-B2ab - ii, iii, v category (Maheswaran 2006; Maheswaran & Smith 2008; IUCN 2017), listed in CITES and the United States Endangered Species Act. India and Nepal have listed it in the schedule I of the Indian Wildlife (Protection) Act of 1972, and National Parks and Wildlife Conservation Measures Act of 1973 respectively. As one of the lesser studied endangered small mammal species in the world (Maheswaran 2006), knowledge of its distribution is limited (Bell et al. 1990). Till date, it has been recorded from a few isolated pockets in the tropical grassland ecosystems of India, Nepal, and Bangladesh (Bell et al. 1987; Nath et al. 2010). Several studies have suggested that the hispid hare might occur along the very narrow belt of the southern foothills of Bhutan (Pearson 1839; Chapman & Flux 1990; Nath et al. 2010). The hispid hare is an endangered animal (IUCN 1974, 1996, 2017) since its population has never reached a satisfactory level throughout its range countries and further, only a few isolated pockets of tall grassland habitat which are within national parks, wildlife reserves and sanctuaries sustain its population (Bell et al, 2010). Besides, there is no doubt that the species has been declining dramatically in recent years as a result of the loss of its prime habitat (Maheswaran 2006) to the expansion of human settlement and agriculture. Further, livestock overgrazing and unmanaged grassland burning during the dry season to promote early and fresh grass growth have resulted in the reduction of the availability of habitat for the grassland-depended species (Bhatta 1999; Aryal and Yadav 2010). Unlike other hares and rabbits, the hispid hare is morphemically distinct having a coarse and bristly coat in dark brown on the dorsal surface. It has short ears, approximately 56mm and brown tail approximately 30mm in adult animal (Bell 1987).

Almost all the studies report that the hispid hare restricts in the small home range inside dense cover of unburned tall grasses commonly referred as thatch or elephant grass. These grasses are an early succession of riverine communities developed on the new alluvium deposit during monsoon. Besides, the above grass community, a study by Tandan et al, 2013, in Bardia National Park, Nepal, has found that hispid hare forage on 23 different plants species and Dhungel (1982) reported eleven principal tall grasses species in Chitawan National Park, Nepal, which dominate in different times of the year. The most preferred forage species were *Imperata cylindrical*, *Desmostachya bipinnata* and *Cynodon dactylon* (Tandan et al, 2013). The hare restricts its movement to limited spaces and was reported 8200m^2 for male and 2800m^2 for female (Bell et al., 2010). It is a small mammal species having the mean body weight of 2.38 kg (average male and female) (Maheswaran 2006).

The mortality of this hare species was attributed to predation and diseases, which result from the extreme fluctuation of environmental factors, limited resources, and innate dispersal (Bell et al, 2010). Due to their intermediate size, it had been preyed by a community of small to medium size predators such as weasels, foxes, coyotes, cats, civets, and even large birds (Chapman and Flux, 1990) though no human consumption were reported.

A study in Royal Suklaphanta Wildlife Reserve found that hispid hare breeds during January and February, and a single fetus was found in pregnant female and four nipples were noticed in all female captured in this study (Bell et al, 2010). In 1976, a single infant was born to a female capture in Assam (Oliver 1980). These

captured animals did not survive for long in the Assam State Zoo in Guahati (Bell et al, 2010).

Behavioural ecology of the hispid hare suggests that the species is both structurally and behaviorally more of a rabbit than a hare (Bell 1986). Further, it was noticed that fecal deposit were in a cluster and each cluster comprised of 1-68 droppings of equivalent sized pellets, thereby indicating the repeated use of the same site by a single individual (Meheswar 2006). One of the biggest challenges in the movement ecology of animals has been to get reliable and long-term data and the use of non-invasive camera traps have become a popular, reliable, and now conventional method that offers researchers an opportunity to study wildlife in an economic and over a longer period than traditional methods (Kellyet at, 2017). Further, camera traps have helped discovered many rare, elusive, and nocturnal terrestrial animals (Tobler et al, 2008). Till date, only historical samples, anecdotal sources, and sign surveys have suggested that the hispid hare could occur along the southern foothills of Bhutan but no in situ image as yet been captured. The objective of this study was to provide baseline information on the presence of this rare and elusive animal in the RMNP through in situ images by using non-invasive camera traps and to identify and document potential threats to its survival.

Materials and methods

Study area

The RMNP, with an area of 1057Sq. Km. (90° 35' E to 91°13'E and 26° 46'N to 27° 08'N) (Figure 2) is located at the intersection of the Indo-Gangetic and Indo-Malayan biogeographical realms (Nath et al. 2010), constituting a unique ecosystem of international significance (RMNP 2015). It shares its border with Manas Tiger Reserve, India, a World Heritage Site, in the south and Jigme Singye Wangchuck National Park (JSWNP) in the north. In addition, the RMNP connects with two other parks within the country through potential biological corridors.

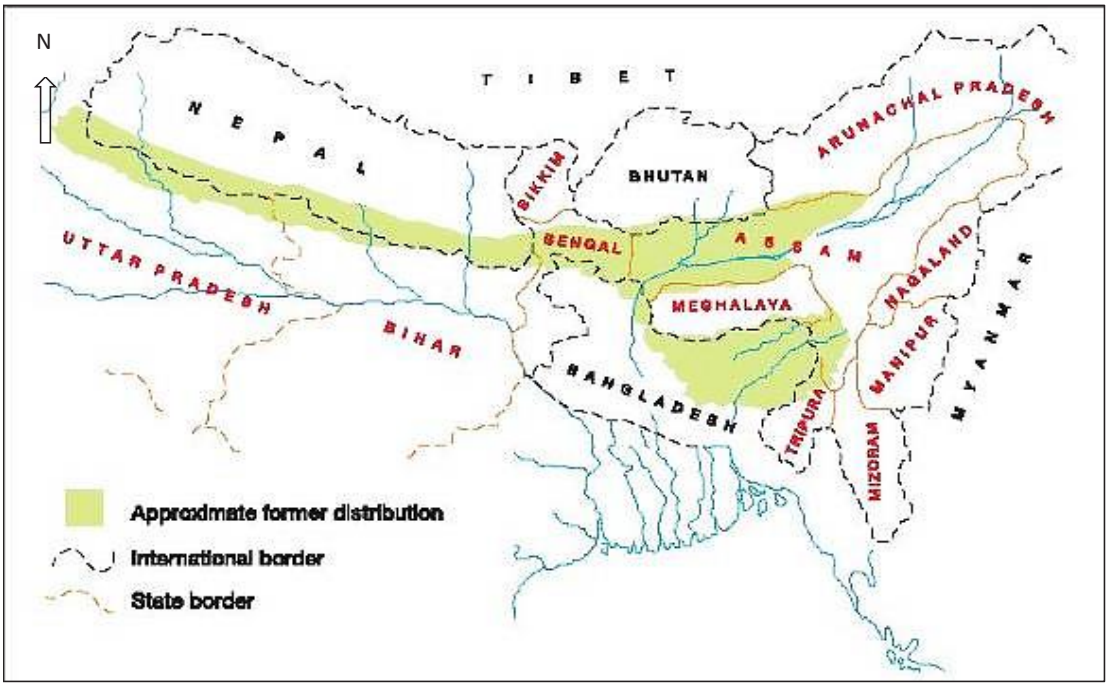

Figure 1: Map showing the approximate former distribution of hispid hare (Chapman and Flux, 1990)

These connections form larger landscapes, which are beneficial for conservation.

The RMNP is made up of pockets of dry and swampy grasslands, including Shangbatar, Kanamakura, Kukulung, Sukunjan, Badligurung, Suldinadi, Specialthang, Budunakhola Base, Rabang, Gurusala, and Deomari. The dominant grass species in the grassland habitats are *Imperata cylindrical*, *Oplismenus* spp. *Paspalum* sp. *Saccharum* sp. *Thysanolaena latifolia* and *Narranga* sp.. These swampy grasslands of this riverine habitat remain partially flooded during the monsoon season, providing water to the southern portion of the landscape (Nath et al. 2010).

The RMNP covers an area from moist sub-tropical to cool temperate climate (RMNP, 2015) and it is widespread in altitude, ranging from 87m in the southern foothills (Tempa et al, 2011) to 2714m in the north (RMNP, 2015; Nidup, 2015). It has an annual rainfall measure between 20mm to 4400mm, with an annual maximum temperature ranging from 20°c to 40°c during May to August and 5°c to 20°c towards winter during October to February (RMNP, 2015).

Method

To maximize the probability of capturing images of hispid hare, cameras traps were randomly placed along existing animals' trails in three different grassland areas where hispid hare pellets were observed during preliminary sign survey. Since the species are small in body size, elusive, and nocturnal, there is no adequate research conducted for this species by a camera

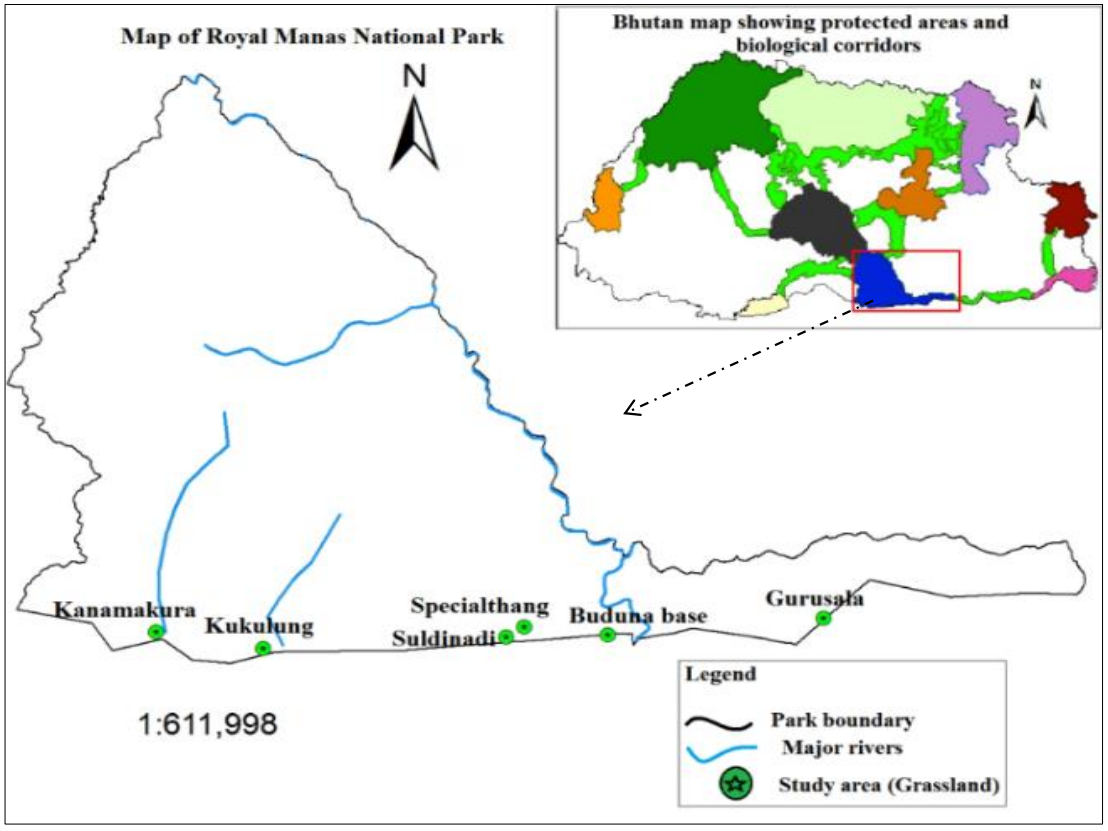

Figure 1: Map of the Royal Manas National Park showing the study area (grassland) in green dots

trap. Prior to this study, camera traps have not been used to study hispid hare throughout its range country except in Nepal by Aryal and Yadav (2010). Fifteen camera traps (Passive infra-red Reconyx HC500 Hyperfire, RECONYX, Inc., Wisconsin, USA) were placed in Kukulung, Gurusala, and Budunakhola Base for one month each during March, April, and May of 2015.

In this study, location, the height of the camera traps from the ground, and distance between camera traps was determined by referring to the animal's body size, home range, and openings (corridors) of the grassland. Past experiences in tiger and prey camera trap survey (Tempa et al., 2011, 2013) were also referred.

The camera traps were placed at least 2-3cm off the ground in open areas and within tall grassland, it was placed at 7-9cm height to optimize imaging of any hispid hare in view. At least a distance of 200m was maintained from one camera station to another in order to maximize coverage. To ensure proper camera function and performance, traps were serviced every five to 10 days.

Result and discussion

Of six different surveyed grasslands (Table 1), only in three grassland areas: Budunakhola base; Gurusala; and Kukulung, pellets of the hispid hare were observed. These three grasslands were located along the seasonal streambed, which is usually moderately flooded during monsoon season. It is said to be the preferred habitat of the species (Nath et al. 2010) (Figure 3). Over the course of three months, one month at each of three sites, 11 images of hispid hare were captured from a single camera trap station at Budunakhola Base in May, confirming its presence in the RMNP (Table 2). Eleven images captured were on five different occasions during the night and in every occasion, only a single hispid hare was captured (Figure 4). Though the behavioural pattern of hispid hare has not been well documented, this study suggests the species is elusive, nocturnal, and solitary.

Cameras placed in the other two types of grasslands did not capture any image; the possible reason for this pattern could be unsuitable habitat since cameras were placed following the burning of grasslands and this study is consistent with the observation made by (Chapman & Flux (1990). When the dry grasslands are burnt, hispid hares shift their shelter to cultivated fields and the embankments of seasonally dried streams and a similar observation was reported from a study carried out in Jaldapara Wildlife Sanctuary by Maheswaran in 2006. Towards the end of April to mid-May, the grasses become tall and green (Chapman & Flux 1990) and provide the best palatable food and habitat for the hares.

Table 1: Types of grassland where the *hispid* hare survey was conducted

		Grassland type	
Sl. No.	**Name of grassland**	**Monsoon season**	**Lean season**
1	Kanamakura	Swampy	Completely dry
2	Kukulung	Swampy year round	
3	Suldinadi	Partially swampy	Completely dry
4	Specialthang	Dry year round	
5	Budunakhola	Swampy	Completely dry
6	Gurusala	Partially swampy	Completely dry

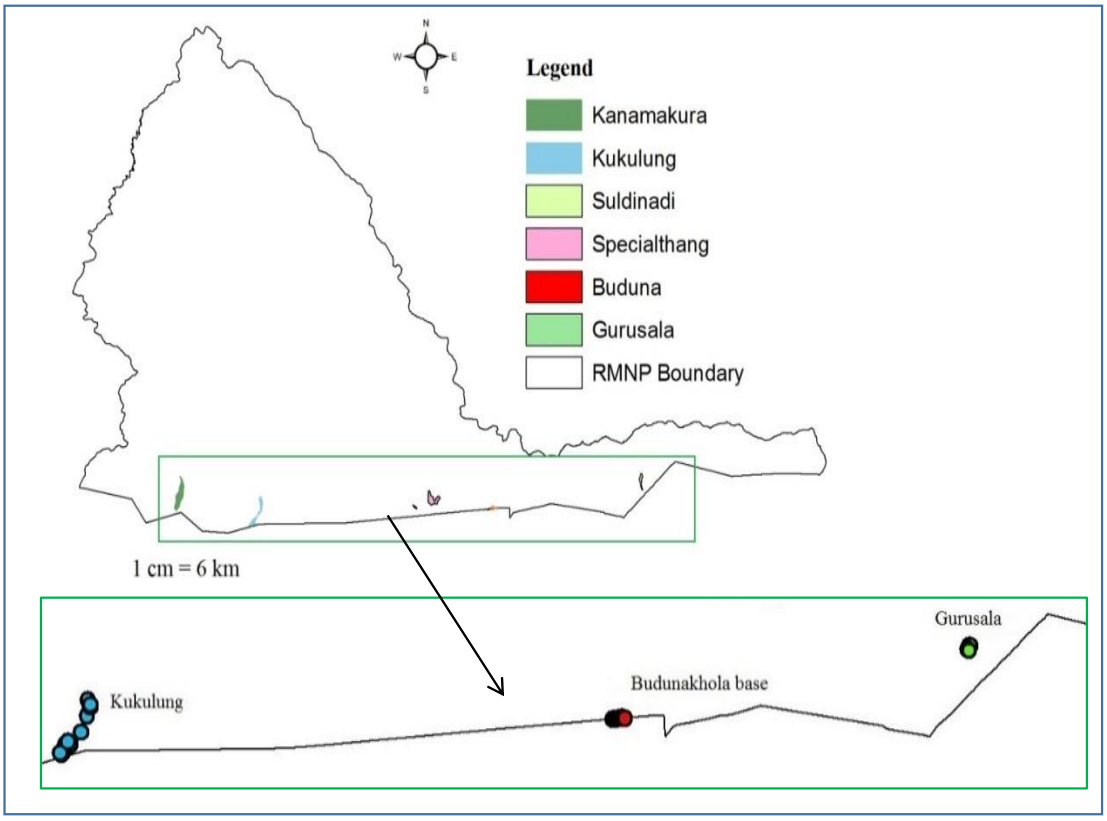

Figure 3: RMNP map showing the study locations of six grasslands (above) and below showing the points of indirect signs of *hispid* hare in three different locations

Figure 4: First wild camera trap image of *Hispid* hare from Royal Manas National Park.

Table 2: Capture history of 11 individuals of the hispid hare in a camera trap in 5 occasions in Budunakhola base. Three days pooled into one occasion for 30 days

	Number of occasions									
Camera trap No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Hh_01	0	0	0	0	0	0	0	0	0	0
Hh_02	0	0	0	0	0	0	0	0	0	0
Hh_03	0	0	0	0	0	0	0	0	0	0
Hh_04	0	0	0	0	0	0	0	0	0	0
Hh_05	0	0	0	0	0	0	0	0	0	0
Hh_06	0	0	0	0	0	0	0	0	0	0
Hh_07	0	0	0	0	0	0	0	0	0	0
Hh_08	0	0	0	0	0	0	0	0	0	0
Hh_09	0	0		0			0			0
Hh_10	0	0	0	0	0	0	0	0	0	0
Hh_11	0	0	0	0	0	0	0	0	0	0
Hh_12	0	0	0	0	0	0	0	0	0	0
Hh_13	0	0	0	0	0	0	0	0	0	0
Hh_14	0	0	0	0	0	0	0	0	0	0
Hh_15	0	0	0	0	0	0	0	0	0	0

Major threat identified in this Study was annual uncontrolled burning during the dry season by cattle herders from across the country and even by foresters for early and new growth of grasses (this was experienced by the author during his five years stay at the RMNP). Also similar study conducted in the Manas National Park, India, and Shuklaphanta Wildlife Reserve, Nepal, by Nath et al. 2010 and Aryal 2012 respectively reported that dry season forest fire was the major threat for habitat destruction of small mammals. Besides habitat destruction, the current trend of burning grasslands coincides with the breeding season of hispid hare (Bell et al. 2010). Further, it disrupts the normal breeding of the species (Maheswaran 2006). In addition to that, succession of grasslands into woodlands by *Bombax ceiba, Dillenia pentagyna* and *Lagerstroemia parviflora*, and invasion of weeds by *Chromolaena odorata, Leea umbriculifera and Clarodendrum sp.*. were also recorded. Fodder collection for captive elephants were also found to be a threat to the survival of hispid hares as evidenced from other studies such as Maheswaran (2006) and Nath et al. (2010). Apart from natural predation by small cats, foxes, weasels, coyotes, civets, and large birds, no human predation was reported nor encountered during the current study. Besides, no thatch grass harvest were found in the park area.

Conclusion

Hispid hares require grasslands for foraging, breeding, and beating in areas of tall grass that are left un-burnt for several years (Johnsingh & Manjrekar 2015). To date, hispid hares have been found in just three isolated pockets of

grassland of the RMNP. Furthermore, much of the grassland habitat remaining in the region has been fragmented and connectivity limited by forested areas and rivers (Tandan et al. 2013). These openings, therefore, play a negative role in the protection of hispid hare, especially for migration. Evidence of the occurrence of the hispid hare found during the three-month study period certainly necessitate further research for the rest of the seasons to ascertain the distribution and preferred habitat. The management of this limited grassland habitat should be prioritized and initiatives should be taken to raise palatable grass for captive elephant by the Park officials. Elsewhere in Jaldapara Wildlife Sanctuary, similar action been taken by the authority yielded positive habitat for the species (Maheswaran 2006). Moreover, the majority of the people, including forestry personals, are unaware of this endangered elusive animal including. Detail study and conservation advocacy should be carried out in the remaining area along the southern foothills of Bhutan to ensure the protection of this endangered animal.

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