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## Richness and relative abundance of mammalian fauna in Raimona National Park, Assam, India

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### Abstract

The Ripu Reserve Forest of Assam was one of the best managed forest in India. Deforestation and encroachment were the major threats to the sustainability of this natural landscape. To arrest this trend of suicidal destruction, a large part (422 km<sup>2</sup>) of Ripu RF was legally notified as “Raimona National Park” for long term conservation of its wildlife and their habitats in the landscape. A baseline survey was carried out in 2x2 km<sup>2</sup> sampling grids systematically to assess the richness and relative abundance of mammalian fauna in the Raimona NP. Based on all the direct sightings, indirect evidences including the camera trap photo captured records, presence of a total 29 species of mammalian fauna consisting of endangered (4), vulnerable (4), near threatened (1) and least concern (20) species have confirmed in the landscape. An effective management plan is very essential for conservation of wildlife and their habitats in the park.

**Keywords:** Relative abundance, mammalian fauna, Kachugaon, Ripu RF, Raimona NP

### 1. Introduction

Global biodiversity has been under tremendous pressure of anthropogenic factors like deforestation and over exploitation of biological resources that adversely affected the ecosystem functionalities [17, 33, 37]. There is a clear link between deforestation and emergence of zoonotic virus's pandemics that cause terrific damage to human health and economy [10]. Documentation and conservation of biodiversity including ecosystem restoration at landscape level has recently emerged as a global priority for effective management planning to ensure ecosystem stability and ecological functionality [1, 2, 13, 35, 36]. Mammals are important taxa for their key ecological roles in trophic levels which potentially influence the regeneration and restoration of forest ecosystem [1, 2, 26].

Modern scientific forestry management practices since the last decade of 19<sup>th</sup> century established the Ripu Reserve Forest (RF) of Kokrajhar district in Assam as one of the best managed forest in the country. The relentless improvement in protection and conservation activities laid down by successive working plans, the management gradually reached crescendo till the end of the eighties of the 20<sup>th</sup> century when the ethno-political movement turned into a violent armed struggle in this landscape. As a result, the wildlife habitats were severely deteriorated and major part of the forest belt of Ripu RF on its southern side has been decimated altogether converting to agricultural land and homestead settlement illegally. From 1977-2007, there was a reduction of 693.76 km<sup>2</sup> of forest cover in the Kokrajhar district which was about 38% of the total forest area available in 1977 [27]. With this trend of suicidal destruction, the forest cover of the district would reduce to 638.38 km<sup>2</sup> by 2037 which amounts a loss of 43.5% of forest cover that was available in 2007 [28].

Deforestation and encroachment were the major threats to the sustainability of this natural landscape as well as to the livelihood of the agrarian families residing in the southern downstream of Ripu RF. To arrest this trend of suicidal destruction of such century old managed natural forest, a large part (422 km<sup>2</sup>) of Ripu RF has included in the protected area network and notified as “Raimona National Park” vide Govt. Notification No. FRW.02/2021/27 dated 9<sup>th</sup> June, 2021 for long term conservation of its wildlife and their habitats in the landscape. Before it gets notified as protected area, a baseline survey was carried out to assess the richness and relative abundance of mammalian fauna in the landscape.

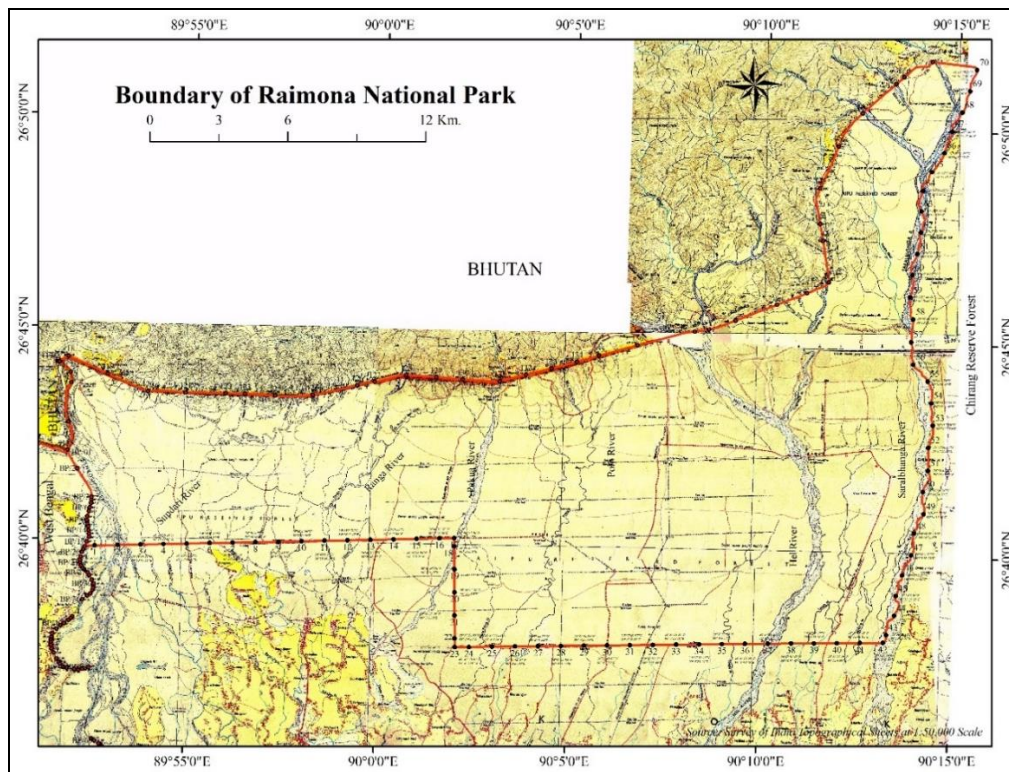
## 2. Materials and Methods

### 2.1 Study Area

The survey was conducted in the Raimona National Park (422 km<sup>2</sup>) under Kachugaon Forest Division in the Kokrajhar district of Assam, India (Fig-1). The Indo-Bhutan International border forms the northern boundary from the Sonkosh river on the west to Saralbhanga river on the east. The southern boundary runs eastwards from Sankosh river along the fire line Ride-6 up to Pekua River where it runs at 90 degrees southwards till it meets the fire line Ride-3. Thence it runs along the Ride-3 till the left bank of Saralbhanga river. The Buxa Tiger Reserve of West Bengal is

located on the west and the Phipsoo Wild Life Sanctuary of Bhutan is located on the north which are contiguous with the Raimona NP.

The study area falls under typical Bhabar belt intersected by numerous water courses [12]. The ground is gently sloping towards south with elevation varies from 85-240m above mean sea level. Sonkosh, Pekua, Hel and Saralbhanga are the four notable rivers, however innumerable rivulets and streams of which most remains waterless during the dry season. The soil over the bulk of *Bhabar* area is dry sandy loam superimposed on a bed of pebbles with only a very thin humus layer. Surface stones are fairly frequent [15, 25].



**Fig 1:** Boundary Map of Raimona National Park-BTAD, Assam

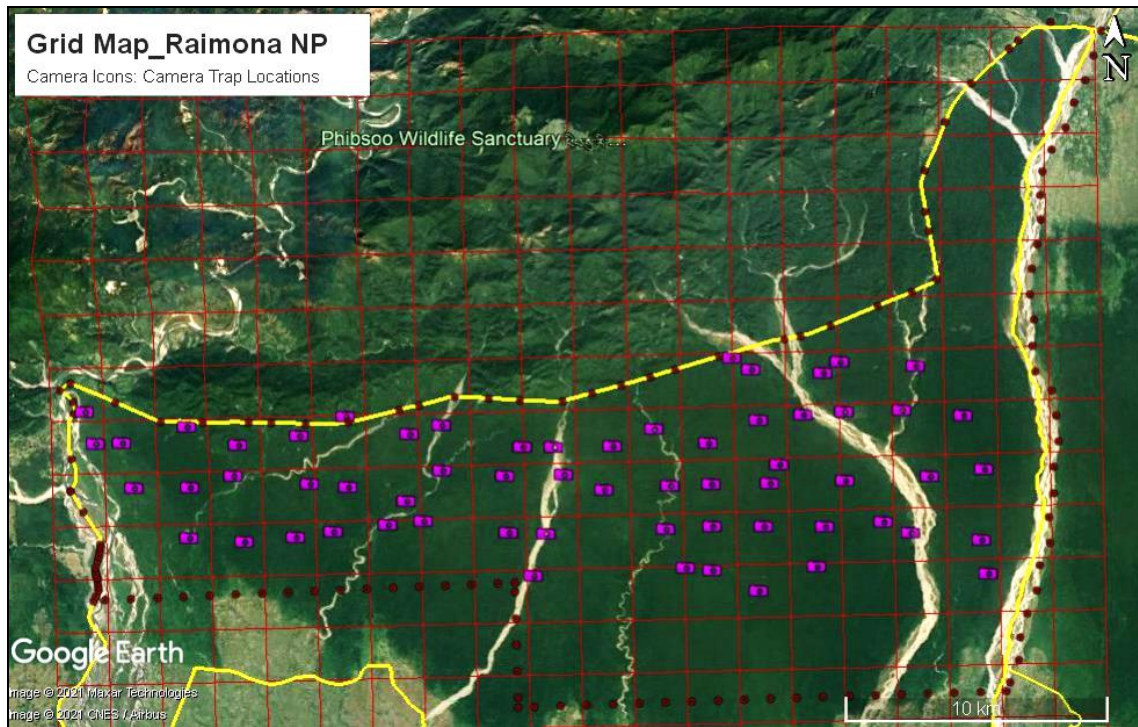
Climate of the study area can be described as moist tropical monsoon, temperature varies from 7° C to 34° C and rainfall ranges from 15mm in winter to 1162mm in monsoon [24]. Due to its unique geographical location and geology, as many as twelve different types and sub-types from the very moist sal forests, sub-Himalayan high alluvial semi-evergreen forests, moist-mixed deciduous forests, savannah forests, riparian fringing forests to khoir-sisoo forests including the wide river beds classified by Champion and Seth [5] in the Raimona NP. The faunal diversity therefore is also expected to be high.

### 2.2 Methodology

The survey was conducted in 2x2 km<sup>2</sup> sampling grids systematically following modified line transect method [3] by

a team consisting of two biologists and two local frontline staffs of forest department during day-time for two months in November and December 2020. Presence of different mammalian fauna from their indirect signs *e.g.*, scat, dung, pellet, hoofmark and pugmark were assessed in each transect. Camera trapping method [30] was also applied to gather opportunistic records of nocturnal and cryptic animals as well as other mammalian fauna present in the study area. In each sampling grid, camera traps were installed about 40-60 cm above ground near potential animal trails and water sources. Camera traps were set to operate 24 hours per day and programmed to take 2 sequential burst images for a single record without delay registering date and time for each exposure for maximum 10-15 days in each station.





**Fig 2:** Camera Trap Locations in the Grids of Raimona NP-BTAD, Assam

Recorded species were identified by following the standard field guide book for mammals [23]. After retrieving the camera traps, all the photographs were carefully observed and identified up to species level. Each photo was rated as an independent capture, if the time between consecutive photographs of the same subject was more than 30 minutes apart at a particular location [29]. Based on the principles given by Jenks *et al.* [16] the relative abundance index (RAI) of each species was calculated as  $RAI = A/N \times 100$ ; where 'A' is the total number of detections of a species by all cameras and 'N' is the total number of camera trap nights by all the cameras. Both direct sighting records and indirect evidences including the camera trap recorded photographs were analysed to assess the richness of the mammalian fauna and only the camera trap recorded photographs were analysed to estimate the relative abundance.

### 3. Results

#### 3.1 Richness of Mammalian Fauna

Sign survey for animal presence was carried out in total 81 sampling grids with 238 km transect walk in the study area. Camera traps were installed in 62 grids but only 57 camera traps yielded total 863 independent photographs for total 763 camera trap nights (Fig-2). Of all the photographs 48.32% (n=417) were wild animals, 32.91% (n=284) were domestic animals and 18.77% (n=162) were human traffic. A total 15 mammalian fauna were also sighted directly in the study area. Based on all the direct sightings, indirect evidences including the camera trap photo captured records, presence of a total 29 species of mammalian fauna consisting of endangered (4), vulnerable (4), near threatened (1) and least concern (20) species have confirmed in the Raimona NP (Table-1). Around one third of all the recorded mammalian species were threatened in the IUCN Red List of Threatened Species and 28% were Schedule-I species of Indian Wildlife (Protection) Act, 1972 (Fig-3).

**Table 1:** List of Mammalian Species found in the Raimona NP

Sl. No.	Family	Common Name	Scientific Name	IUCN Status	WPA, 1972
1	Cercopithecidae	Rhesus Macaque	<i>Macaca mulatta</i>	LC	Sch-II
2		Golden Langur	<i>Trachypithecus geei</i>	EN	Sch-I
3	Elephantidae	Asian Elephant	<i>Elephas maximus</i>	EN	Sch-I
4	Cervidae	Barking Deer	<i>Muntiacus muntjak</i>	LC	Sch-III
5		Sambar	<i>Rusa unicolor</i>	VU	Sch-III
6		Spotted Deer	<i>Axis axis</i>	LC	Sch-III
7	Bovidae	Gaur	<i>Bos gaurus</i>	VU	Sch-I
8	Suidae	Wild Boar	<i>Sus scrofa</i>	LC	Sch-III
9	Felidae	Tiger	<i>Panthera tigris</i>	EN	Sch-I
10		Common Leopard	<i>Panthera pardus</i>	VU	Sch-I
11		Jungle Cat	<i>Felis chaus</i>	LC	Sch-II
12		Leopard Cat	<i>Prionailurus bengalensis</i>	LC	Sch-I
13	Viverridae	Common Palm Civet	<i>Paradoxurus hermaphroditus</i>	LC	Sch-II
14		Small Indian Civet	<i>Viverricula indica</i>	LC	Sch-II
15		Large Indian Civet	<i>Viverra zibetha</i>	LC	Sch-II
16		Himalayan Palm Civet	<i>Paguma larvata</i>	LC	Sch-II
17	Herpestidae	Crab-eating Mongoose	<i>Herpestes urva</i>	LC	Sch-II

18		Grey Mongoose	<i>Herpestes edwardsii</i>	LC	Sch-II
19	Canidae	Wild Dog	<i>Cuon alpinus</i>	EN	Sch-I
20	Ursidae	Asiatic Black Bear	<i>Ursus thibetanus</i>	VU	Sch-I
21	Helictinidae	Ferret Badger	<i>Melogale sp.</i>	LC	Sch-II
22	Mustelidae	Yellow-throated Marten	<i>Martes flavigula</i>	LC	Sch-II
23	Leporidae	Indian Hare	<i>Lepus nigricollis</i>	LC	Sch-IV
24	Hystriidae	Indian Crested Porcupine	<i>Hystrix indica</i>	LC	Sch-IV
25	Sciuridae	Malayan Giant Squirrel	<i>Ratufa bicolor</i>	NT	Sch-II
26		Hoary-bellied Squirrel	<i>Callosciurus pygerythrus</i>	LC	Sch-IV
27		Pallas's Squirrel	<i>Callosciurus erythraeus</i>	LC	Sch-II
28		Himalayan Striped Squirrel	<i>Tamiops mccllellandii</i>	LC	Sch-IV
29	Pteropodidae	Indian Flying Fox	<i>Pteropus medius</i>	LC	Sch-IV

EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern

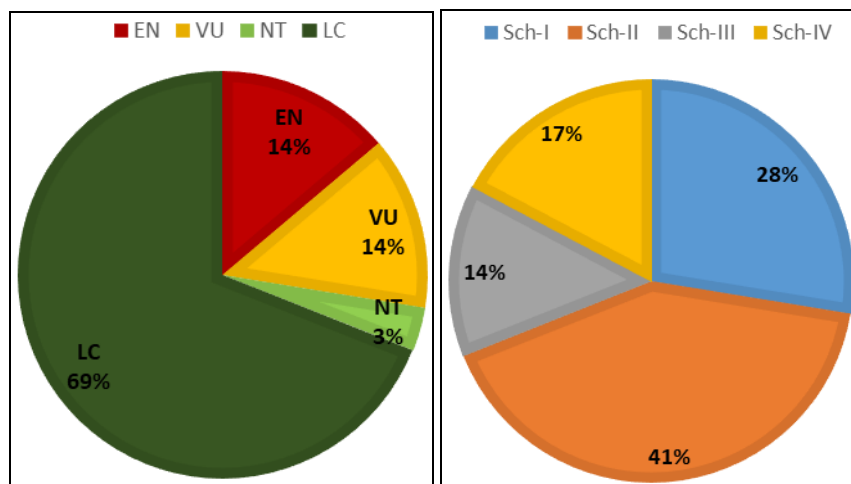


Fig 3: IUCN status (left) and schedule list (right) of Mammals found in Raimona NP

**3.2 Relative Abundance**

Among the five major prey species, barking deer (*Muntiacus muntjak*) was maximum photographed species (RAI=9.56) followed by wild boar (*Sus scrofa*; RAI=6.94), spotted deer (*Axis axis*; RAI=3.41), sambar (*Rusa unicolor*; RAI=2.1) and indian bison (*Bos gaurus*; RAI=1.96). Among the megaherbivores, asian elephant

(*Elephas maximus*) was the maximum photographed mammalian fauna with RAI=8.78 followed by indian bison. Leopard (*Panthera pardus*; RAI=1.57) was more abundant than wild dog/dhole (*Cuon alpinus*; RAI=0.13) among the major predator species in the study area (Fig-4).

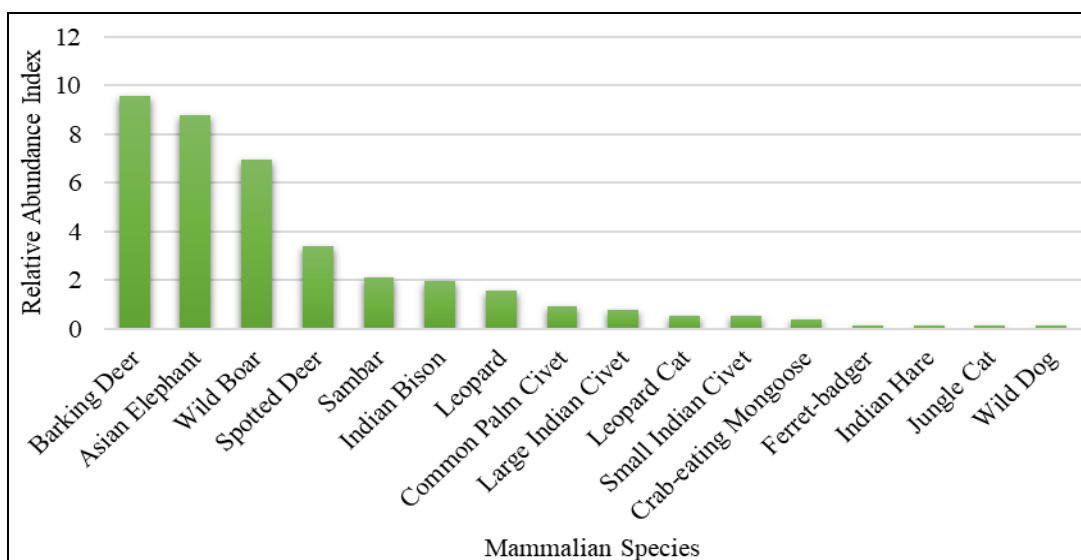


Fig 4: Relative Abundance Index of Camera Trapped Mammals in Raimona NP

**4. Discussion**

Our survey provides baseline data on richness and relative abundance of mammalian fauna found in the newly created Raimona NP. The photographic capture rates may serve as an index of relative abundance but longer studies are more

desirable [1, 34]. Though our survey was rapid but it was extensive and surveyed more than 75% of the total area. Hence, our survey using a large number of camera traps distributed across a larger area is sufficient to provide the baseline data on the richness and relative abundance of

mammalian fauna in such a large natural landscape as suggested by Carbone *et al.* [4]. The presence of 29 mammalian species has indicated a rich and diverse habitat types of Raimona NP and can compare with the other nearby protected areas like Manas NP of Assam [2, 11, 20], Buxa TR [22] and Phipsoo WLS of Bhutan [38]. Record of a total 8 Schedule-I mammalian fauna and one third threatened species depicts the priority of effective management interventions for long term conservation of these species and their habitats in the Raimona NP.

Among the two primate species, rhesus macaque (*Macaca mulatta*) was the most abundantly occurring and found in all the major habitat types of the study area. On the other hand, golden langur (*Trachypithecus geei*) was mostly recorded from the deep inside the forest. They were observed to be distributed in the moderate dense and dense habitat types having more than 60% canopy coverage forest as corroborated with the results of Choudhury [7] and Horwich *et al.* [14]. Anthropogenic pressure in the periphery of forest is expected to pushed them towards deep forest areas and discontinuity of canopy coverage due to habitat fragmentation restricted their movement in the park [6, 36].

Asian elephant was commonly encountered mammalian fauna found mostly in the mixed moist-deciduous forests in the study area and corroborated with the other authors [8, 19]. However, presence of a few number of adult tusker is a major concern for the elephant population in the Raimona NP. Records of continuous elephant poaching cases in the Greater Manas landscape for their ivory also indicates that illegal killing of wild elephants has also been going internally by the network group of poachers. Low relative abundance of other large herbivores such as indian bison, sambar and spotted deer also supports the concern of ongoing targeted hunting/poaching in the area. Record of large livestock groups and other domestic animals are also expected to be affected through competitive interactions and infections from livestock transmitted diseases [9, 21, 31]. So it may be the another reason of low relative abundance of large herbivores in the park.

Low number of large carnivore species is highly influenced by tremendous anthropogenic pressure and depletion major ungulate species in the park as the abundance of these large carnivores is determined by prey density [18]. Hence, conservation of the major prey species especially the large ungulates is vital to protect the viable population of tiger, leopard and dhole for a balanced ecosystem and ecological functionalities in the Raimona NP [2, 20]. The small carnivores recorded in the park can also be benefitted in seed dispersal mechanisms and regeneration of various forest ecosystems from the actions of such small carnivores via endozoochory [32].

## 5. Conclusion

This survey revealed that the Raimona NP is very rich of mammalian fauna. But the biotic pressure is still severe in terms of destructive logging and exploitation of biological resources. Large groups of livestock grazing and unregulated tourism in the wildlife habitats are another major threats for the park. To overcome these threats factors, legal control and proper protection of wildlife and their habitats are very crucial. It can be implemented with effective management plans and involving local communities including the local community based organisations in protection and

conservation of biodiversity of the park. Frequent sensitization programmes will also be effective in generating awareness to create the sense of pride having such a rich and diverse natural landscape among the fringe villagers.

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