



## **Wildlife habitat evaluation and mammalian checklist of Nameri National Park, Assam, India**

**Malabika Kakati Saikia, Saikia PK.**

### **Abstract**

The studies on the habitat characteristics, classification of habitat and preparation of mammalian checklist were done in Nameri National Park from **1999-2010**. Study revealed that the habitat of Nameri National Park was dominated by Moist-mixed semi-evergreen (163.22 km<sup>2</sup>) forest followed by short and tall grasslands (15.7 km<sup>2</sup>). The entire forest habitat was classified into eight distinct classes based on satellite imagery and ground survey methods viz., (a) Mixed moist-evergreen forests, (b) Mixed moist semi-evergreen forests, (c) Grasslands, (d) Scrubland/Degraded forests, (e) Cultivated land, (f) Miscellaneous forests, (g) Riverine forests and (h) Deciduous forests. The Mixed moist evergreen forest covers only 0.20 km<sup>2</sup> in Nameri National Park. The park has supported high diversity of mammalian fauna owing to dense vegetation structures. Altogether 54 mammalian species has been encountered in the park during study period. The concentration of Asiatic Bison and wild Elephants was another important finding of the present study. Yet again, the park harbours various endangered and threatened mammalian and avian faunas.

**Keywords:** Habitat characteristics, Mammals, Diversity, Conservation problems, Asiatic Wild Elephant, Bison, Eastern tree Shrew.

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## INTRODUCTION

Nameri National Park is a part of oldest Nadiar reserve forest of Assam that constituted way back in 17 October, 1878 (Das, 1998, 1995). Since then, the habitat was protected without any major damages. The forest is unique for its topographical position and as well as undulating terrain, hill streams and river networks. The latitudinal variations of the park has also encourages the floral and faunal diversity. The Park also harbours large number of flood-plain and foothill species of wild fauna and flora viz., Himalayan Sloth Bear-*Melursus ursinus*, Wild Dog-*Cuon alpinus*, Yellow throated Martin-*Martes flavigula*, White winged Wood Duck-*Cairina scutulata* etc. for fauna and *Salix tetrasperma* Roxb., *Garcinia paniculata* Roxb., *Magnolia pterocarpa* Roxb., *Canarium benghalense* Roxb. etc. for flora. Nameri is also significant for its high concentration of endangered Royal Bengal Tiger-*Panthera tigris*, Indian Bison-*Bos gaurus* and Asian Elephant-*Elephas maximus*. The habitat diversity of Nameri National Park has encouraged supporting various endemic and endangered flora and fauna. The Pakhui Sanctuary of Arunachal Pradesh adjoined the park on the northeastern boundary and facilitates to increase the transitional wildlife species.

Formerly as reserve forest, Nameri was declared as a Wildlife Sanctuary in September, 1985 covering an area of 137 km<sup>2</sup> and later, the area was expanded to 212 km<sup>2</sup>. On September 9, 1998, it was further declared as a National park with an area of 200 km<sup>2</sup>. However, no detailed study has been carried in Nameri prior to this study, especially on wildlife and their habitats. It has got importance only after the formal discovery of endangered White-winged Duck in 1995 by the park authority.

The key objectives of the present study were to collect the mammalian data and habitat characteristics of Nameri National Park.

## MATERIALS AND METHODS

### Study area

Nameri National Park is situated about 40 km away from the Tezpur town of Sonitpur district, Assam. It lies between 27° 35' to 26° 50' N Latitude and 92° 39' to 93° 0' E Longitude. The Pakhui Sanctuary adjoins the park on its northeastern side. It is situated on the north bank of river Brahmaputra of Assam. It is a narrow strip lying between Kameng district of Arunachal

Pradesh and the river Brahmaputra. The National park is bounded by Kameng division of Arunachal Pradesh in North, Lakhimpur district in East and Nadiar Reserve Forest in South. The gradient of the plain is slightly high along the foot of the Himalayas, which fall in a narrow strip of 1-5 km all along the northern boundary in east west direction. The belt is known as bhabar and contains pebbles, copper boulders, sand and silt in an unassorted manner. Very dense tropical forests covers the belt. The terrai belt is extremely flat and contains swamps here and there, as the water, which comes down from the hills, percolate down in the bhabar belt and reappear in the terrai zone. The soil of the terrai zone, therefore remain damp, making it suitable for breeding ground of various ground dwelling invertebrates. The terrai plain is chiefly composed of tall grassland. The area is criss-crossed by the river Jia-Bhoroli and its tributaries including many small and medium sized streams viz., Diji, Dinai, Doigrung, Nameri, Dikorai, Kolia Juli, Bogijuli, Raidang Juli, Khari, Bordikorai etc. Each tributary has undergone branches above two in many points into streams as such, it is virtually impossible to keep track in each of the streams. Dotted the area is few beels during rainy season. The River Jia-Bhoroli and its tributaries became turbulent when the incessant rain in the upper reaches during the rainy season. Most of the streams very often changed their courses, because they could not carry the entire volume of water, which rush down to them as a result of heavy rainfall in the Himalayan foothill. Soil type of Nameri national park is mostly of sub-montane. The sub-montane soil is a characteristic of Bhabar zone (Mani 1974).

The climate of Nameri national park does not differ materially from that of the Sonitpur district. It experiences a cold winter and a cool and pleasant spring. High humid atmosphere and abundant rain also characterized the climate. The season can be classified in to pre-monsoon (March to May), monsoon (June to September), re-treating monsoon (October to November) and winter (December to February). The period extending from the middle of November till the end of February is cool and pleasant. The northeast monsoon, which marks of the commencement of the cold season, sets in with the beginning of November. These winds prevail until about the end of April, generally interrupted in March by heavy winds from the southwest. Towards the end of November, the land begins to dry up but the low areas remain damp



until about the end of January. The cold weather of winter marks its appearance in the month of December and continues up to the months of February. In March, the temperature begins to rise but the continuous copious showers of early April effectively prevent it to a great extent. The southwest monsoon starts with beginning of June and ceases in October. In the period between May and September, the rainfall is fairly heavy, the air checks with moisture. In October the temperature begins to fall and nights become fairly cool, but the winter actually begins in the middle of November. The average annual rainfall does not materially fluctuate very much from year to year. The average rainfall in the study area from 1971 to 2006 is 2,141.54 mm. More than 70% annual rainfall is received in the study area from May to September. Maximum temperature of 28.5°C during November and minimum temperature during December and January is 11°-12° C. Highest daily maximum temperature during April is 35° C. During July August the temperature sometimes rises up to 36° C in sunny days (Department of Environmental Science, Gauhati University, 2006).

## METHODS

The survey was conducted between October, 1999 through February, 2010. For convenience of study, three major camping locations were pre-selected prior to surveys in study area. Those were Potasali, Bogijuli and Sijusa Camps. The areas of Potasali through Doigrung to Bhalukpungs were covered from Potasali Camp. Again, the area from Potasali to Bogijuli, the areas in between Balipung, Khari, Tomaljuli and Bagijuli were also covered from this station. The camping site Sijusa has helped to conduct the surveys of entire area of Pakhui, Bogijuli and Khari's jurisdictions. In centrally, the Bogijuli camping station helped to conduct detailed investigations of Khari area.

Greater parts of field survey trips were made on foot, however, few Elephant backs and rubber boats (as rafting) were also used whenever found suitable, particularly during dense forest and riverine tract surveys respectively. A total of eight field trips were made in various seasons of the year in 2001, 2002, and 2003, during entire study period and each visit was of eight days on average. Both day and night surveys were made for diurnal, corpuscular and nocturnal species. The species were identified using the books of Chaudhury (1997). The individual study days were divided into three

parts such as (1) morning- (sunrise to 1100 hours) (2) after-noon (1430 to 1800 hours) and (3) evening (1830 to 2100 hours). Occasionally, these time samplings were not followed, in case when long distances needed to be covered on foot in a day (e.g. 20- 30 km/day). The evening surveys were made only for corpuscular and nocturnal mammals. The information of various mammals species were recorded either from direct sighting records, indirect evidences of animals, such as foot print, pug marks, fresh kills, live dens, nest holes and records from local inhibitors (**See Plate 1 & 2**).

The vegetation of Nameri national park was surveyed in detailed and the important habitats were located on the 1:50,000 top sheet using compass bearing. The plant species were identified as per Kanjilal et al. (1934), Kanjilal et al. (1936), Kanjilal et al. (1939) and Kanjilal and Bor (1940) and as well as comparing the museum specimens of Gauhati University Botanical department.

The mammals sighted locations were marked in toposheets. Total vegetation was inventoried and analyzed using Land sat thematic and Indian Remote Sensing Satellite data, available in Assam Remote Sensing Application Center (ARSEC). The data of forest types and land use patterns were analyzed and plotted on the map with the help of experts from ARSEC. Maps of habitat classifications were prepared from Landsat thematic mapper imagery, one for dry and one for wet period. Field studies of habitat classifications were also carried out and data were incorporated on the map using Geographical Information System algorithms to obtain quantitative habitat statistics. Habitat classification was done on visual basis with the help of GIS and later prepared the habitat data base map.

Most of the plant species data were collected with the help of expert plant taxonomists at the field itself and confusing plants species were collected for herbarium sheet preparation intended for laboratory identifications. The species were identified by comparing the Museum Herbarium sheets of the Department of Botany, Gauhati University. The vernacular names of the plants species were noted down at the field by own or with the help of local people and accompanied expert forest personnel's (plants name written after Latin name in parentheses are vernacular names, see results) for future convenience.



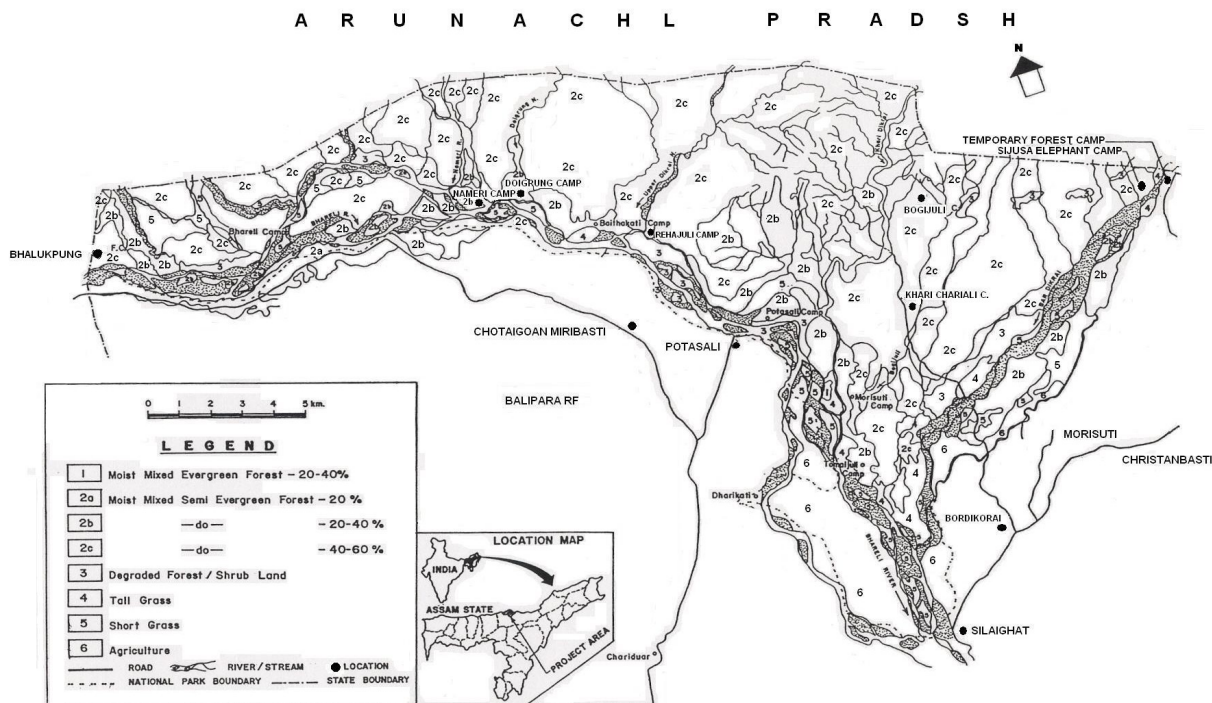
## RESULTS AND DISCUSSIONS

### Habitat Characteristics

The study shows that the habitat of Nameri national park is very remarkable regarding the vegetation characteristics, compared to other wildlife-protected areas of Assam. The area supports certain species similar with the Indo-Chinese origin. Undulating hilly slopes and low terrain has characterized the habitat types of Nameri. The percolation of water at lower elevation and depressed terrain zones are a common phenomenon, leading to formation of a numerous swamps and streams here and there. The presence of semi-aquatic plants species and *Alpinia allughas* (Retz.) Rosc., in almost all the study area has indicated the presence of wet alluvial soil in the study area. The density of forest cover was very high and every so often locally become more thickened owing to greater diversity of climbers, herbs and shrubs species. The upper canopy layer was completely closed in some areas caused by thickly foliated branches. The forest hill streams flowed criss-crossed manner and has passed through several Cane and Bamboo growths. Sporadically, more than one such stream has amalgamated in flat swampy zones of the forest, chiefly in the northeastern and southeastern parts of the study area. The forest floor has characterized by heavy deposition of leaf-litters and humus and

encouraged high forest regeneration. The fertile soil of the forest floor has supported various bottom dwellers, viz., invertebrates, insects, birds and mammals. Yet again, during pre-monsoon, monsoon and re-treating monsoon seasons, ground zone of forest have supported high diversity of herbs, grasses, shrubs and climbers. Mostly are edible for wild herbivores and even human beings. In Nameri national park, plentiful non-conventional human food resources are also available. The concentration of Barking Deer and Wild Boars were found to be very high, indicating the availability of herbivores food plants species in study area. The humidity of forest area was also found to be high (average 80%) indicating the suitability of forests habitat for insects.

The habitat of Nameri national park have classified into eight distinct classes viz., (a) Mixed moist-evergreen forests, (b) Mixed moist semi-evergreen forests, (c) Grasslands, (d) Scrubland or Degraded forests, (e) Cultivated land, (f) Miscellaneous forests, (g) Riverine forests and, (h) Deciduous forests. Among them, the habitat class Mixed moist semi-evergreen forest has covered as high as 163.22 km<sup>2</sup>, Mixed moist evergreen forest covers only 0.20 km<sup>2</sup>, Grassland covers 15.7 km<sup>2</sup>, Degraded or Scrublands covers 9.18 km<sup>2</sup> and the Cultivated land covers only 9.64 km<sup>2</sup> of the total study area (see Map No. 1).





**(a) Mixed moist Evergreen forest:** Evergreen forest patches are very less (found only 0.2 km<sup>2</sup> in the park) and are only 0.1% of the total study area (Smaller than 0.01% patches of evergreen forests has also sighted, but it was too small to detect by imagery). The lone evergreen forest patches were present near Jia-Bhoroli river in Morisuti Camp (see Map No. 1). This evergreen forest was mainly dominated by *Duabanga grandiflora* (Roxb. ex. DC) Walp., *Tetramelos nodiflora* R. Br., *Eugenia jambolana* Lam., *Mesua ferrea* L., *Euphorbia* sp. and *Terminalia* sp. etc.

**(b) Mixed moist semi -Evergreen forest:** Mixed moist semi-evergreen forest covers (163.22 km<sup>2</sup> of the total forest area) are almost 67.49% of the total land cover of study area. Of the total mixed moist semi-evergreen forest, 134.98 km<sup>2</sup> areas has forest density of 40-60%, 28.20 km<sup>2</sup> area was about 20-40% and only 0.04 km<sup>2</sup> area has 20% forest density (Map No.-1):

**(c) Grasslands:** The open Grassland area covers (15.7 km<sup>2</sup> of the total forestland of the national park) in the study area was 7.8 % in total, which includes both tall and short grasses. The Grassland patches were scattered along the bank of Jia-Bharali and Bordikorai rivers. Of all the total grassland area 10.36 km<sup>2</sup> was short grassland and 5.34 km<sup>2</sup> were tall grasslands. Thus, the tall grassland covers only 2.65%, whereas, short grasslands cover about 5.20% of the total studies area. The dominant grass species were *Erianthus ravennae* L. P. Beauv., *Thysanolaena maxima* Roxb., *Imperata cylindrica* (L.) P. Beauv., *Arundo donax* L., *Schizostachyum dwlooa* (Gamble) R. Majumder, *Saccharum spontaneum* L., *Vetiveria zizanioides* (L.) Nash and *Phragmites karka* Trin. Ex.steud. etc.

**(d) Degraded forests or Scrubland:** Degraded forest habitat was very less in study area indicating the potentiality of the wildlife habitat. Prior to establishment of National park, a total of 9.18 km<sup>2</sup> wildlife habitat has degraded owing to illegally cut down by local people. Now, this area has colonized by various shrubs species. Few tree saplings have seen to grow within scrubland. The area under degraded forest was about 4.59% of the total National Park land cover. Several isolated tree species were also present in the degraded forest patches, viz., *Dillenia indica* L., *Ficus* sp. and *Ziziphus jujuba* Lamk. The other shrubs species that has colonized in the study area were *Eupatorium odoratum* L., *Lantana camera* L., *Clerodendrum serratum*., *Melastoma malabathricum* L., *Citrus*

*documana* L. etc. Again, various undergrowth vegetation is also available in degraded forest.

**(e) Cultivated Lands:** The cultivated land was found in the southern boundary of study area along the Jia-Bharali river bank, where both the rivers, Bor Dikorai and Jia-Bharali has united and the area was 9.64 km<sup>2</sup>. This area might be existed in outside the boundary demarcation in past and has presently added to park. According to national park authority, there was no cultivated land in Nameri national park thus it is confusion. However, the percentage of the agricultural land was only 4.84% of the total land cover of study area.

**(f) Riverine Forests:** Riverine forest covers only 0.001sq-km area of the park. These types of forests are of initial stage and just have started to success the sandy riverbeds of Bordikorai. The riverine forest mainly dominated by *Dalbergia sisoo* Roxb. and *Acacia catechu* Willd. growing near Sijusa Camp site.

**(g) Deciduous Forests:** Pure deciduous forest patches are also less than 0.001 sq. km of the total Park's land cover. This forest is represented by small-dotted patch of *Bombax ceiba* L. growing near Khuti site of Potasali forest Camp.

**(h) Miscellaneous Forests:** The forest area, which cannot be classified as a separate group due to very smaller in patch but sighted in the Park, is categorized as miscellaneous forests. These are Cane and Bamboo forests. The *Calamus* sp. and *Bambusa* sp. associated with various species of climbers are available within the forest. The Cane and Bamboo species are mainly found abundantly in the forest area near Bogijuli and Khari Camp.

#### **(i) Plant species compositions**

##### **Tree Species**

The vegetation of the park includes various species of evergreen, deciduous semi-evergreen trees and Cane and Bamboo species along with shrubs, grass and climbers. The major tree species comprise of *Gmelina arborea* (Gomari), *Dillenia indica* L. (Owtenga), *D. pentagyna* (Bajio Ow), *Magnolia griffithii* (Gahori Chapa), *Manglietia caveana*, *M. hookeri*, *M. iinsignis*, *Michelia champaca* (Tita-sapa), *M. menispurensis*, *Talauma hodsonii* (Bor-homthuri), *T. phellocarpa*, *Milusa roxburghiana*, *Polyalthia jenkinissi*, *Crataeva roxburghii*, *Bixa orellana*, *Flacourtia cataphracta*, *F. sumatrana*, *Xylosoma longifolium*, *Garcinia pedunculata*, *G. khasiana*, *G. cawa*, *Mesua ferrea*, *Eurya accuminata*, *Sachima wallichii*, *Shorea assamica*, *Vatica lanceaefolia*, *Hibiscus*



*macrophylla*, *Bombax malabaricum* (Simul), *Kydia calycina* (Pichola), *K. glabrescens*, *Reevesia wallichii*, *Stercularia alata*, *S. roxburghi*, *S. villosa*, *Columbia floribanda*, *Grewia micricos*, *Echinocarpus assamica*, *Elaeocarpus fenitrus*, *E. robustus*, *E. sikkimensis*, *Aegle marmelos* (Bel), *Citrus macnocalpa*, *Micromelum minutum*, *Ailanthus grandis*, *Dysoxylum procerum* (Bandardima), *D. reticulatum*, *Chisocheton binectariferum*, *Aphanamixis polystachya*, *Erythralum vagum*, *Microtropis discolor*, *Ziziphus mauritiana* (Bogori), *Z. ruqosa*, *Aesculus assamica*, *Nephalium langana*, *Sapindus ukurossi*, *Turpinia pomifera*, *Megnifera indica* (Am), *M. sylvatica* (Bon Am), *Semicarpus anacardium*, *S. parainii*, *Acrocarpus fraximifolias*, *Cassia fistula* (Sonaru), *Cassia nodosa* (Bilati Sonaru), *C. seamia*, *C. sophera* (Medelua), *Saraca indica* (Siris), *Dalbargia assamica*, *D. sisso* (Sisso) *D. robusta*, *Adenanthera paronia*, *Albizia lebeck*, *A. lucida* (Moj), *A. mariophylla*, *Albizia procera* (Koroi), *A. odorantissima*, *Parkia roxburghii*, *Docynia indica*, *Eriobotrya benghalensis*, *Terminalia chebula* (Silikha), *T. myriokarpa* (Hollock), *Eugenia fruticosa*, *E. cymosa*, *E. jambolana* (Jamuk), *E. jambos* (Jamuk), *Psidium guajava* (Madhuri), *Memecylon cerasiforme*, *M. edula*, *Tetrameles nodiflora* (Bhelow), *Brassiopsis speciosa*, *Radina longifolia*, *Adina cordifolia*, *Anthocephalus cadamba* (Kadam), *Cephalantus occidentalis*, *Vitex negundo* (Pachatia), *V. pinnata*, *Hymenodictyan excelsum*, *Wendlandia puberula*, *Vernonia arboria*, *Ardisia humilis*, *Styrax serrulatum*, *Symplocos caudata*, *S. lancifolia*, *S. racimosa*, *S. spicata*, *Alstonia scholaris* (Sotiana), *Wrightia coccinia*, *W. tomentosa*, *Ehretia wallichiana*, *Tournefortia viridiflora*, *Oroxylum indicum*, *Stereospermum chelonoides*, *Callicarpa arboria* (Bonmola), *Amoora wallichii* (Amari), *Duabanga grandiflora* (Khokon), *Sterculia foetida* (Odal), *Stereospermum chelonoides* (Paroli), *Acacia catechu* (Khair), *Artocarpus lakoocha* (Dewa Cham), *A. chaplasi* (Sam), *Ficus benghalensis* (Bor Goch), *F. benjamina* (Lata jori), *F. hispida* (Dimoru), *F. lamponga* (Mota dimoru), *F. mysorensis* (Dhoba bor), *F. racemosa* (Dimoru), *F. rumphii* (Jori), *Streblus aspera* (Saura), *Sarchochlanys pulcherrima* (Mesaki), *Engelhardtia spicata* (Lewa), *E. polystachia* (Sal bih), *Baccaurea sapida* (Leteku), *Barringtonia acutangula* (Hidol), *Bauhinia variegata* (Kanchan), *Blumea lacera* (Kukursuta), *Boswellia serrata* (Dhuna), *Crataeva religiosa* (Barun), *Glycosmis arborea* (Chauldhoa), *holarrhena antidysenterica* (Dudhkhari), *Impatiens balsamina* (Damdeuka), *Lagerstroemia speciosa* (Ajar), *Laportea crenulata* (Dom Sorat), *Phyllanthus emblica* (Amlakhi), *Syzygium cumini* (Kala Jam), *Syzygium jambos* (Golapi Jamun), *Syzygium malaccense* (Pani Jamun), *Trewa nodiflora* (Bhelkora), *Wrightia tomentosa* (Dudhkhori), *Oroxylum indicum*, *Actinodaphne angustifolia* (Baghnala), *Beilschmiedia assamica* (Kathalpatia), *Cinnamomum bejolghota* (Patihunda), *Litsaea monopetala* (Shualu), *L. salicifolia* (Diglati), *Machilus bombiciana* (Som), *Aprusa dioica* (Bor Heloch), *Bridelia retusa* (Kunhir), *Croton gonfra* (Goch Mahudi), *C. tiglium* (Koni-bih), *Mallotus philippinensis*, *M. albous* (Morolia), *Quercus serrata* (Hingori), *Q. semiserrata* (Doba Singori), *Q. indicum* (Hingori), *Caryota urens* (Sewa), *Livistoma jenkinsiana* (Tokow), *Salix tetrasperma* (Pani Hizol/Bher).

**(ii) Climbers:** The main climber species comprises *Delima sarmentosa* (Ow-lata), *Stephania harnondifolia* (Tubuki lata), *Zanthoxylum hamiltonianum* (Tej-muri), *Mucuna prurita* (Bandor kakua), *Entada scandens* (Ghila), *Cuscuta reflexa* (Akashi lata), *Piper griffithii* (Choi Pan), *P. longum* (Pipoli), *Illegeria khasiana* (Kerkeri lata), *Dioscorea hamiltoni* (Bonoria alu), *Smilax macrophylla* (Tikoni boral), *Calamus erectus* (Jati bet), *C. gracilis* (Wahing bet), *C. latifolius* (Motha bet), *Pinaga gracilis* (Raidang Bet), *Pothos cathartii* (Hati-poita), *P. scandens* (Kawri Lata) etc.

**Mammalian diversity**

A total of 54 species of mammalian fauna belong to nine orders and 21 genera (Table-1; Figure 1) have been recorded in Nameri National Park, of which, 15 species were Schedule-I, 25 species Schedule-II of Indian Wildlife Protection (Act), 1972 (Arora, 1997). Of all the 40 numbers of Scheduled species, the species Pygmy Hog-*Sus salvanius* Hodgson has designated as critically endangered status by IUCN under threatened species category, eight species have designated as endangered category, viz., Assamese Macaque-*Macaca assamensis assamensis* (McClelland), Capped Langur- *Trachypithecus pileatus tenebricus* (Hinton), Royal Bengal Tiger- *Panthera tigris tigris* Linnaeus, *Panthera pardus* Linnaeus, Asiatic Wild Elephant- *Elephas maximus* Linnaeus, Indian Bison - *Bos gaurus* Smith H, Particoloured Flying



Table 1 Checklist of Mammalian fauna in Nameri national park, Sonitpur, Assam.

Order/Family/ English Name	Scientific Name	Observed Methods	Status (IWPA/ CITES/ IUCN)	% Occurrence	PA
<b>A. Order: Primate</b> <b>a. Family: Loridae</b> 1. Slow Loris	<i>Nycticebus bengalensis</i> (Lacepede, 1800)	Visual	Schedule-I; Appendix-II, DD	0.56	.006
<b>b. Family: Cercopithecidae</b> 2. Rhesus Macaque	<i>Macaca mulatta mulatta</i> (Zimmermann, 1780)	Visual	Schedule-II; Appendix-II, LR	<b>8.33</b>	.083
3. Assamese Macaque	<i>Macaca assamensis</i> <i>assamensis</i> (McClelland, 1839)	Visual	Schedule-II; Appendix-II, EN	1.94	.019
4. Capped Langur	<i>Trachypitecus pileatus</i> <i>tenebricus</i> (Hinton, 1923)	Visual	Schedule-I; Appendix-I, EN	1.94	.019
<b>B. Order: Carnivora</b> <b>c. Family: Felidae</b> 5. Royal Bengal Tiger	<i>Panthera tigris tigris</i> Linnaeus, 1758	Visual/Pug marks	Schedule-I; Appendix-I, EN	1.94	.019
6. Leopard	<i>Panthera pardus</i> Linnaeus, 1758	Reported/ Pug marks	Schedule-I; Appendix-I, EN	0.83	.008
7. Clouded Leopard	<i>Neofelis nebulosa</i> Griffith, 1821	Visual	Schedule-I; Appendix-I, VU	0.28	.003
8. Jungle Cat	<i>Felis chaus fulvidina</i> Thomas, 1929	Visual	Schedule-II; Appendix-II	0.83	.008
9. Leopard Cat	<i>Felis bengalensis</i> <i>horsfieldii</i> Grey, 1842	Visual	Schedule-I; Appendix-I	1.11	.011
10. Golden Cat	<i>Felis temminckii</i> Vigors & Horsfield, 1827	Visual	Schedule-I; Appendix-I, LR	0.28	.003
<b>d. Family: Canidae</b> 11. Golden Jackal	<i>Canis aureus</i> Linnaeus, 1758	Visual	Schedule-II	0.56	.006
12. Bengal Fox	<i>Vulpes bengalensis</i> Shaw, 1800	Visual	Schedule-II, DD	0.83	.008
13. Wild Dog	<i>Cuon alpinus</i> Pallas 1811	Animal sign/ Kills / Forest Report	Schedule-II; Appendix-II, VU	1.11	.011
<b>e. Family: Viverridae</b> 14. Large Indian Civet	<i>Viverra zibetha zibetha</i> Linnaeus, 1758	Visual	Schedule-II; Appendix-III	1.94	.019
15. Small Indian Civet	<i>Viverricula indica</i> Desmarest, 1817	Visual	Schedule-II; Appendix-III	1.67	.017
16. Binturang	<i>Arctictis binturang</i> Raffles, 1821	Visual	Schedule-I; Appendix-III	.28	.003
17. Common Palm Civet	<i>Paradoxurus</i> <i>hermophroditus</i> Pallas, in Schreber, 1777	Visual	Schedule-II; Appendix-III	.83	.008
18. Masked Palm Civet	<i>Paguma larvata</i> Hamilton -Smith, 1827	Visual	Schedule-II; Appendix-III	1.94	.019
19. Spotted Linsang	<i>Prinodon pardicolor</i> Hodson, 1841	Visual	Schedule-I; Appendix-I	.28	.003
<b>f. Family: Herpestidae</b> 20. Indian Grey Mongoose	<i>Herpestes edwardsi</i> Geoffroy, E. 1818	Visual	Schedule-IV; Appendix-III	3.61	.036
21. Crab-eating Mongoose	<i>Herpestes urva</i> Hodgson, 1836	Visual	Schedule-IV	.56	.006
22. Small Asian Mongoose	<i>Herpestes javanicus</i> Geoffroy, E. 1818	Visual	Schedule-IV	.56	.006



<b>g. Family: Mustelidae</b> 23. Common Otter	<i>Lutra lutra</i> Linnaeus, 1758	Visual	Schedule-II; Appendix-I	<b>6.39</b>	.064
24. Smooth Indian Otter	<i>Lutrogale perspicillata</i> Geoffroy, 1826	Visual	Schedule-II; Appendix-II, VU	1.39	.014
25. Himalayan Yellow Throated Martin	<i>Martes flavigula</i> Boddaert 1758	Visual	Schedule-II; Appendix-I	0.56	.006
<b>h. Family: Ursidae</b> 26. Himalayan Black Bear	<i>Selenarctos thibetanus</i> Cuvier, G. 1823	Reported by local people	Schedule-II; Appendix-I, VU	0.83	.008
27. Sloth Bear	<i>Ursus ursinus</i> Shaw & Nodder, 1791	Reported from forest guard	Schedule-I; Appendix-III, VU	0.28	.003
<b>C. Order: Proboscidea</b> <b>i. Family: Elephantidae</b> 28. Asiatic Elephant	<i>Elephas maximus</i> Linnaeus, 1758	Visual	Schedule -I, Appendix-I EN	<b>6.39</b>	.064
<b>D. Order: Artiodactyla</b> <b>j. Family: Suidae</b> 29. Wild Boar	<i>Sus scrofa</i> Linnaeus, 1758	Visual	Schedule-III	<b>5.28</b>	.053
30. Pygmy Hog	<i>Sus salvanius</i> Hodgson, 1847	Past report	Schedule-I, Appendix-I, CR	0.28	.003
<b>k. Family: Cervidae</b> 31. Sambar	<i>Cervus unicolor</i> Kerr, 1792	Visual	Schedule-III	0.83	.008
32. Indian Muntjak	<i>Muntiacus muntjak</i> Zimmermann, 1780	Visual	Schedule-III	<b>11.11</b>	.111
33. Hog Deer	<i>Axis porcinus</i> Zimmermann, 1777	Visual	Schedule-III, LR	1.67	.017
<b>l. Family: Bovidae</b> 34. Indian Bison	<i>Bos gaurus</i> Smith , 1827	Visual	Schedule-I, Appendix-I, EN	3.33	.033
<b>E. Order: Rodentia</b> <b>m. Family: Hystricidae</b> 35. Chinese Porcupine	<i>Hystrix brachyura subcristata</i> Swinhoe, 1871	Visual	Schedule-IV	0.83	.008
<b>n. Family : Pteromyidae</b> 37. Common Flying Squirrel	<i>Petaurista petaurista</i> Pallas 1766	Visual	Schedule-II; Appendix-II	0.56	.006
38. Particoloured Flying Squirrel	<i>Hylopetes alboniger</i> Hodgson, 1836	Visual	Schedule-II; Appendix-II, EN	0.28	.003
<b>o. Family: Sciuridae</b> 36. Malayan Giant Squirrel	<i>Ratufa bicolor</i> Sparman, 1778	Visual	Schedule-II; Appendix-II	2.22	.022
39. Himalayan Hoary-bellied Squirrel	<i>Callosciurus pygerythrus</i> Geoffroy, 1831	Visual	Schedule-II; Appendix-II, VU	2.22	.022
40. Pallas's Squirrel	<i>Callosciurus erythraeus</i> Pallas, 1779	Visual	Schedule-II; Appendix-III	1.11	.011
41. Orangebellied Himalayan Strped Squirrel	<i>Dremomys lokriah</i> Hodgson, 1836a	Visual	Schedule-II; Appendix-III	0.83	.008
42. Himalayan Stripped Squirrel	<i>Tamiops meccellanidii</i> Horsfield, 1840	Visual	Schedule-II; Appendix-III	0.56	.006
<b>p. Family: Thyzomydae</b> 43. Lesser Bamboo Rat	<i>Canoys badius</i> Hodgson, 1841a	Visual	Schedule-V	1.39	.014



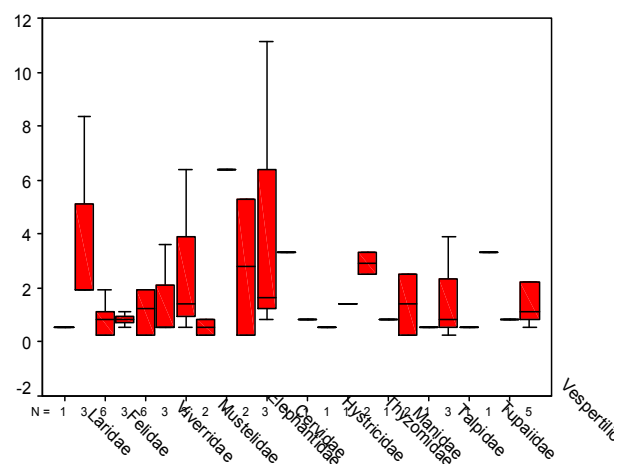
<b>q. Family: Muridae</b> 44. Indian Mole Rat	<i>Bandicota bengalensis</i> Grey, 1835	Visual	Schedule-V	2.50	.025
45. Large Bandicoot Rat	<i>Bandicota indica</i> Bechstein, 1800	Visual	Schedule-V	3.33	.033
<b>F. Order: Pholidota</b> <b>r. Family: Manidae</b> 46. Chinese Pengolin	<i>Manis pentadactyla</i> Linnaeus, 1758	Visual	Schedule-I; Appendix-II	0.83	.008
<b>G. Order:</b> <b>Lagomorpha</b> <b>s. Family: Leporidae</b> 47. Hispid Hare	<i>Caprologus hispidus</i> Person, in McClelland, 1839	Past Records	Schedule-I; Appendix-II,EN	0.28	.003
48. Indian Hare	<i>Lepus nigricollis</i> Cuvier, F. 1823	Visual	Schedule-II;	2.50	.025
<b>H. Order: Insectivora</b> <b>t. Family: Talpidae</b> 49. Eastern Mole	<i>Talpa micrura micrura</i> Hodgson, 1841b	Visual	Schedule-II;	0.56	.006
<b>u. Family: Soricidae</b> 50. House Shrew	<i>Suncus murinus murinus</i> Linnaeus, 1766	Visual	Schedule-II;	3.89	.039
51. Mole Shrew	<i>Anourosorex squamipes</i> Milne-Edwards 1872	Visual	Schedule-II;	0.83	.008
<b>s. Family: Tupaiidae</b> 52. Northern Tree Shrew	<i>Tupaia belangeri</i> <i>assamensis</i> Wroughton, 1921a	Visual	Schedule-V	0.56	.006
<b>I. Order: Chiroptera</b> <b>t. Family:</b> <b>Pteropodidae</b> 53. Indian Flying Fox	<i>Pteropus giganteus</i> <i>giganteus</i> Brunnich, 1782	Visual	Schedule-V Appendix-II	3.33	.033
<b>u. Family:</b> <b>Vespertilionidae</b> 54. Least Pipistrelle	<i>Pipistrellus tenuis</i> Temminck, 1840	Visual	Schedule-V	0.83	.008

Abbreviation: IWPA: Indian Wildlife Protection Act, 1972; CITES: Convention on International Trade in Endangered Species; IUCN: International Union for Conservation of nature and natural resources; CR: Critically endangered; EN: Endangered; VU: Vulnerable; LR: Low Risk; DD: Data Deficient, PA: Proportional abundance.

Squirrel- *Hylopetes alboniger* Hodgson, Hispid Hare- *Caprologus hispidus* Person, in McClelland, eight species have Vulnerable category, viz., Clouded Leopard- *Neofelis nebulosa* Griffith, Wild Dog- *Cuon alpinus* Pallas, Smooth Indian Otter- *Lutrogale perspicillata* Geoffroy, Himalayan Black Bear- *Selenarctos thibetanus* Cuvier, Sloth Bear- *Ursus ursinus* Shaw & Nodder and Himalayan Hoary-bellied Squirrel- *Callosciurus pygerythrus* Geofroy. Whereas, the Slow Loris- *Nycticebus bengalensis* (Lacepede) and Bengal Fox- *Vulpes bengalensis* Shaw have declared as data deficient category of IUCN Red data book. The descriptions of certain important wildlife species sighted in Nameri National Park have given below:-

**Asian Elephant**

The population of Asian Wild Elephant in Nameri National park was found to be highly concentrated in the location of Khari-Bagijuli area, Potasali-Balipung area and as well as in Sijusa



**Mammalian Family**

**Figure 1: Box plots shows the proportional abundance of mammalian family in the study area based on survey data (see table1).**



Camp sites. The availability of water and food resources in the park attracted the Asian Elephant throughout the year. A total of 70 elephants have sighted throughout the Park during study period. Elephant population has regularly goes out from the Park to the neighboring Arunachal Pradesh, neighboring village area and tea garden areas. During the year of 2001, above 20 elephants have poisoned killed by local miscreant. The killing of such large numbers of wild elephants using poison as a tool is the first instances so far, in Assam.

#### **Indian Bison**

The Large numbers of Indian Bisons were found to harbors in Nameri National Park next to Manas National Park (personal observation of the authors during 1999-2006). The Estimated population of Wild Bison, (based on sightings record) was around 200-250 individuals. According to local cattle farmer, the male Bisons occasionally conflicted with domestic cattle for food. The accessibility of undergrowth grasses and as well as other palatable food resources, the park has supported large numbers of Bisons and thus Nameri is one of the important strongholds for its conservation. Besides Nameri, the other known distribution localities of bison population in Assam are the Manas National Park and Biosphere Reserve, Kaziranga National Park, Dibru-Saikhowa Biosphere Reserve, Rajapara RF, Rani-Garbhangra RF, Bornadi WLS, Sunairupai WLS, Chakrasila WLS (no present information), Garampani WLS, Dhansiri RF of Karbi Anglong District, N. C. Hills, Cachar and Karimganj RF, Nambor and Garampani RF, and Umranshu RF of Assam.

#### **Royal Bengal Tiger**

Although, the total area covered by Nameri National Park is 200 km<sup>2</sup>, the tiger population was found to be relatively higher owing to availability of its prey base population viz., Sambar, Indian Muntjak and Wild Boar. The estimated population of tiger in Nameri National Park is around 14 individuals, based on Pug Marks study. The tiger has frequently hunted domestic cattle and domestic Buffalo too from the cattle camps situated within the park boundary.

#### **Pygmy hog and Hispid Hare**

No direct encounters of pygmy Hog (*Sus salvanius*) and Hispid Hares (*Caprologus hispidus*) have been made, but the indirect evidences of palates groups were found. Again, both the species had reported during 1979-80 field surveys trips by Oliver (1980).

#### **Northern tree shrew**

The Northern tree shrew (*Tupaia belangeri assamensis*) has earlier reported to distributed in the hill forests of Nagaland and south of river Brahmaputra (Chaudhury 1997), but recent surveys at Nameri has confirmed the presence of this arboreal species. The recent sighting of this species in Nameri National Park was a new record in North bank of river Brahmaputra and as well as in Assam. It was recorded in Sijusa, which was in much lower altitude than the earlier sighted records of Chaudhury (1997). However, the sighting location at Sijusa was situated in a slightly higher altitude than the other parts of the study area and also a boundary line between Nameri and Pakhui Sanctuary, no other sightings of Northern tree shrew has been made throughout the park. Lone pair was sighted on a branch of tree top.

#### **Common Otter**

The Common Otter was found to be very frequent in Nameri National Park. During survey period altogether 129 individuals of Common Otters were sighted in six different troops along the sides of Jia Bharali, Bar Dikorai, Marisuti, Balipung and Khari river bank. The highest numbers of 35 Common otters were sighted in Marisuti area near Balipung Tower, followed by 25 numbers in Bardikorai River, 25 in Khari river bank, 17 in Marisuti area, 15 in Jia Bharali near Nameri antipoaching Camp and 12 in Jia Bharali near Bhalukpung area. The high diversity and abundance of hill stream and other fish species in river network of Nameri National Park supports substantial numbers of Otter population in study area.

Nameri National Park is a unique wildlife protected area within northeastern region, which has reflected from the presence of high diversity of mammals, birds (Saikia and Saikia 1999) and as well as endangered species. However, few important areas of the Park habitat have been destroyed after final notification of Nameri as a National Park (for the purposes of road construction etc.). The remains of this destruction were still at large at the forest floor in northeastern and southeastern parts of the national park. Again, the park has good future prospects for the conservation of Asiatic elephant, Royal Bengal Tiger, Indian Bison of mammals and White Winged Wood Duck and Hornbill species of birds. Apart from mammal diversity, the park also supported 363 species of avian fauna (Saikia and Saikia 1999) Although, the



Nameri National Park is unique regarding the habitat diversity and as well as availability of wildlife species, a number of conservation threats are still at large and ultimately interfering the conservation of wildlife therein. The major problems can be categorized as such (1) Destruction of Forest, (2) Collection of Forest Resources, (3) Poaching, (4) Lack of Adequate Infrastructure and (5) Over Grazing.

### **Threat to Nameri National Park**

#### **Destruction of Forest**

Most of the ecologically and economically important large tree species has been cut down near Sijusa, before declaration of Nameri as a national park, resulting of a reduction of food plant and nesting tree species of Hornbills and other seed eating (Frugivorous) birds. This factor is still at large in some localities, particularly adjacent to the Pakhui sanctuary of Arunachal Pradesh and along the side of Bordikorai River. The local people has illegally entered in to the forest area during night hours and cut down some large ecologically important tree species. The Velew tree *Tetramelos nudiflora*, has been cut down in southeastern and northeastern boundary of the park in large-scale basis. Again, cut down of the major food plant species of Hornbills, such as the Ameri *Amoora wallichii*, and the *Ficus* sp., definitely effect the Hornbill populations. Along the side of Bordikori River under Khari and Tomaljuli control, few areas of forest patches were completely eradicated, except few individually standing trees like *Ficus religiosa*, *F. bengalensis* and *Dilenia indica*. The local people were reportedly involved along with some tree smugglers for the purpose of agricultural practice. The area was previously exists under the control of territorial forest division, and during that period itself, all the destruction process have been taken place. Although, the intensity of forest destruction is reduce after declaration of National Park, but it could not completely removed such detrimental factor of habitat destruction owing to insufficient infrastructure available of the park authority. The existing forest guards of the park have trying their best to control it, but could not be success at all, owing to long distance between two campsites. The tree feelers are generally entered in to the park during night hours. The Cane and Bamboo forest was previously available in Bogijuli and Khari area. Those were greatly damaged by the illegal Cane and Bamboo collectors. The cane collectors were not only collected large quantity of

Cane but has damaged large Cane areas through cutting down here and there without collect it, due to inconvenience of remove it from the attaching vegetation or other unknown reason.

#### **Collection of Forest Resources**

The Local people has traditionally collected certain forest resources, viz., leaves of the Palm trees (Tokow leaves), tree Resin (Dhuna), *Imperata* grasses, Cane and fire wood etc. During this resource collection, they have generally destroyed various other valuable tree species. The reserve forest authority in past has not been restricted those activities, hence, they are still entering in to the forest area to collect such resources which leading to destruction of natural forest vegetation. During collection trip, people frequently cleared the trespassing route by cutting down of vegetation for easy movements and even burned down the forest floor during dry season. Occasionally, the resource collectors are staying overnight inside the forest area and thus carried out various destruction activities. The occasional forest fire resulting from the illegal resource collectors sometimes creates havoc and burned down large area and destroyed numbers of huge tree species. Such forest fire was observed during study period near Sijusa area, adjacent to Assam-Arunachal border, which caused to half-burned and completely broken down of above ten huge species of Fig trees.

#### **Poaching of Wildlife**

However, no poaching of wildlife was observed during study period, but it was a regular phenomenon since 1996 in Nameri National Park. Most of the wildlife poachers were entered in to the park from the Arunachal side, where there is no such restriction for the local people. The poachers came from the Arunachal Pradesh normally entered in to the park illegally and killed Grey Pheasants, Wild Boar and Barking deers. In general, the poachers have constructed permanent 'Machan' near water hole and stayed for wild animals. Such 'Machans' are available in Pakhui Sanctuary of Arunachal Pradesh. After declaration of Nameri as a National Park, the poaching activity was more or less stopped, but owing to strategic location of the park within the interstate boundary, poaching cannot be ignored completely. Again, the concentration of wild animals are high in Nameri national park near Pakhui Sanctuary due to regular poaching at neighboring Arunachal Pradesh and animal get protected themselves at Nameri forest. Hence, the poachers frequently entered the park



illegally from Arunachal side to the Nameri national park at various points in far distances of anti-poaching camp of Nameri National Park.

#### **Lack of Adequate Infrastructure**

The anti-poaching camps of Nameri national park are only 14 in number (3 newly established) and were situated within a far distance from each other, particularly in the eastern boundary. Recently, a new anti-poaching camp was established near Sijusa, where there was no camp earlier. From Sijusa through Tomaljuli along Bordikorai River bank, a large stretches of above 20 km distance is completely open without any anti-poaching camp. Although, the Bogijuli and Khari camps are present between these zones, it is far from each other. This forest area is very critical, because, most of the illegal people entered in to the park from this side. Again, along the border of Assam-Arunachal Pradesh from Sijusa elephant camp to Bhalukpung anti-poaching camps, there have been no such anti-poaching camps in it. From this side alone, most of the illegal people have entered in to the park from Arunachal Pradesh. Apart from that, the permanent staffs of the park are only 32 (Das, 1995, 1998, 1999), who have engaged in anti-poaching activities. This is a very minimum and chairs 3 people average in each camp. Of course, small numbers of casual staffs are also employed in the park for anti-poaching activities and majority of them were serving the park above 10 years, but not enrolled permanently. All the casual staffs should be upgraded to permanent, because, they are doing very hard work to protect the Nameri since more than 15 years. The main transportation within the park is on foot and to aid of the forest guard there are 14 trained elephant, which is also not sufficient. To maintain the trained elephants, there are altogether 29 Mahouts and Grass collectors (Ghasi), they were also working as a purely temporary basis. In anti-poaching camps, the forest staffs and firearms are not sufficient to properly manage the park. There must be at least three fixed relaying stations and 20 wireless sets along with sufficient firearms at Nameri national park. But, presently there is only one fixed station along with four wireless sets available I study area.

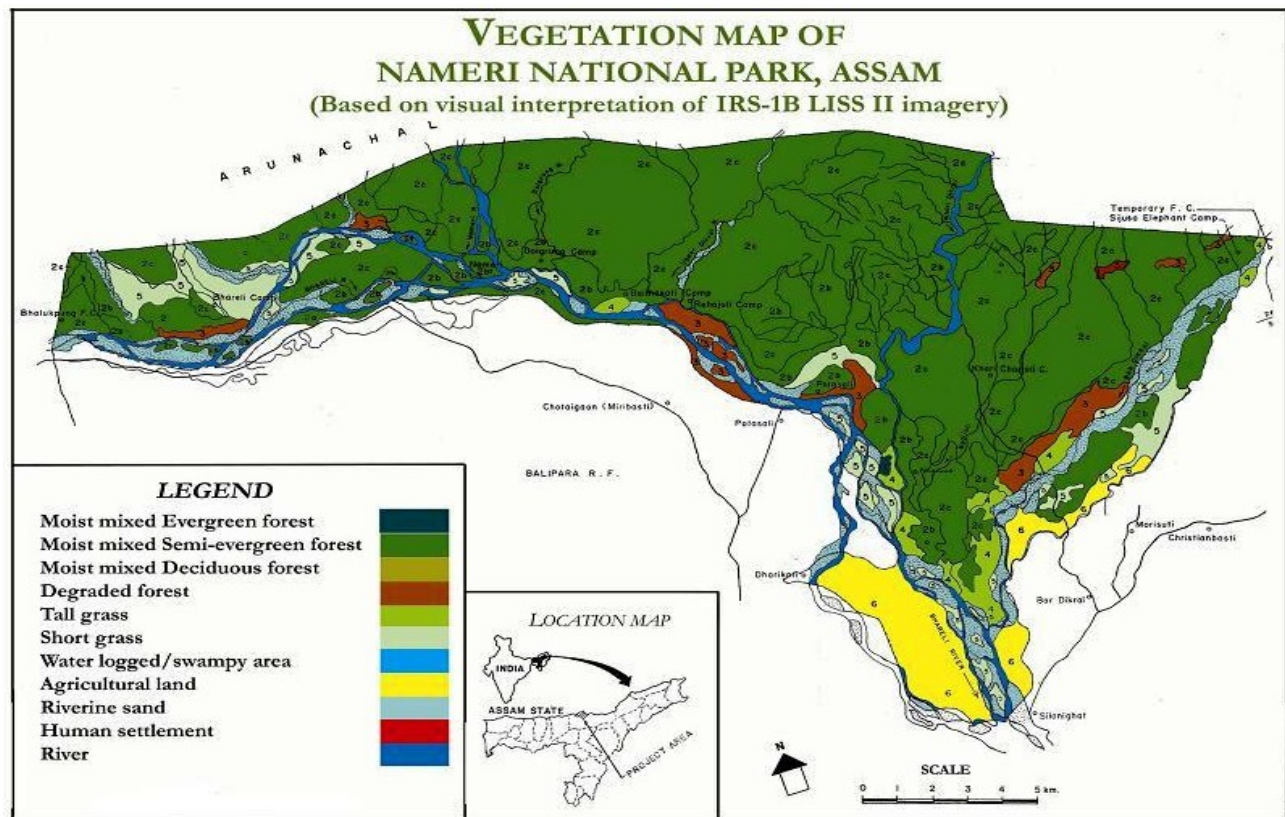
Yet again, the Nameri national park is extremely 'malaria' prone area and the interior forest guard have to go far distance on foot and country boat for collecting their daily needs, they must be supplied all important items including food, medicine, clothes field boots etc. for a long

period at departmental cost. Otherwise they have to go by vacating their camp more than one day to collect their food materials and necessary items. During my survey period's one person was drowned to death during return with his foodstuff, and another person was died due to malaria. According to information are available, this types of casualties are regular phenomenon due to its topographical condition of the park.

The existing anti-poaching camps of Nameri National Park were far away from each other, which reduce the protection efforts of forest personals. There must be at least three more camp in the southeastern boundary of the park to increase protection efforts. Again, in the northern boundary from Sijusa to Bhalukpung, where there is no any antipoaching camp, new camp should be incorporated; otherwise poachers and illegal people may take that advantage. The number of forest guards must be increase and the appropriate arms should be providing to the guard, so that they can get encouragement to protect the park resource from the illegal people.

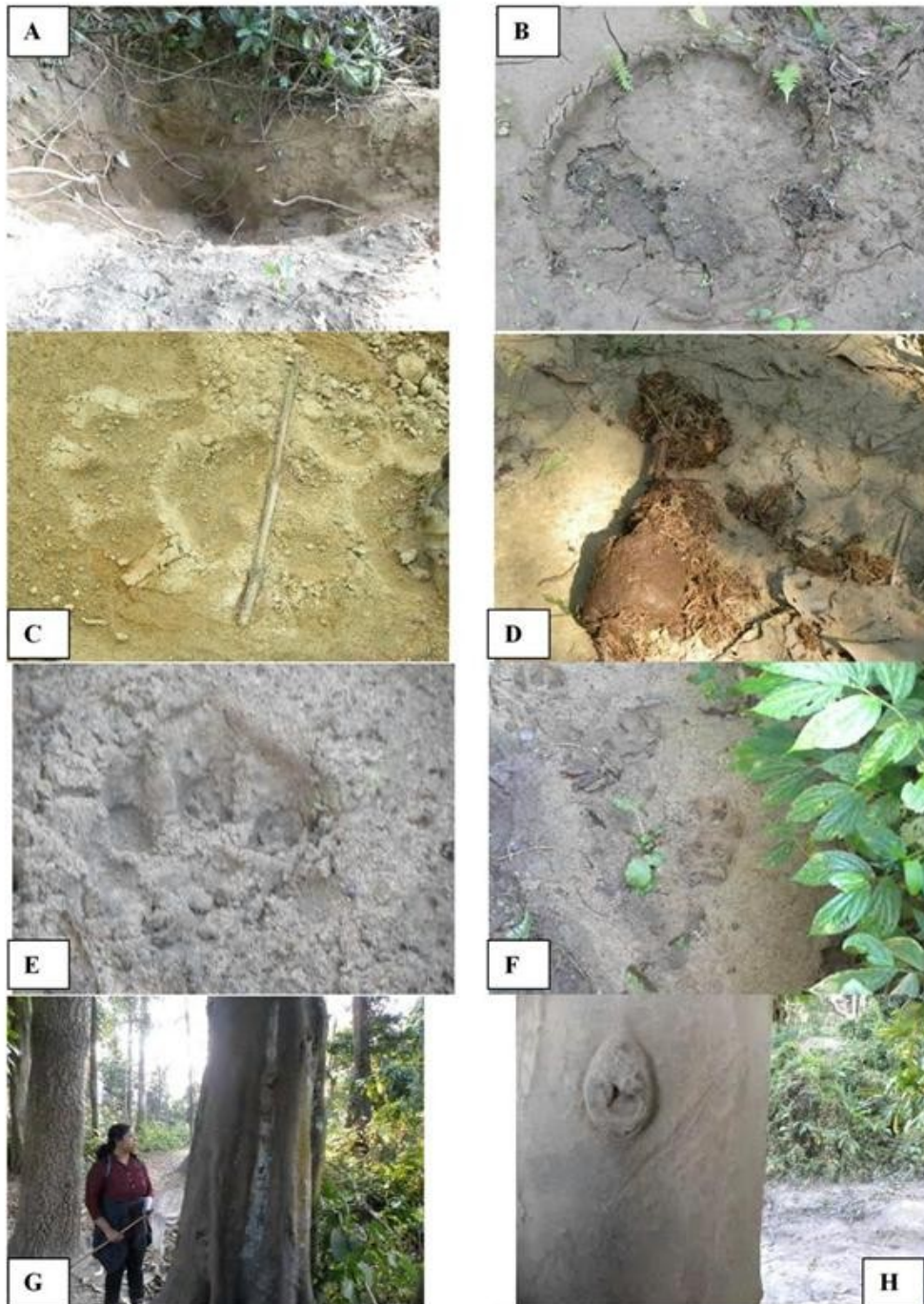
#### **ACKNOWLEDGEMENT**

The survey of mammalian fauna and habitat characteristics would not have been possible without the support and participation of Mr. R. K. Das, DFO, Western Assam Wildlife Division and Mr. Pankaj Sharma Range Officer, Nameri National Park. We gratefully thank them for their outstanding help to this work. We also thank to Mr. P. Lahon Principal Chief Conservator of Forest and Chief Conservator of Forest (Wildlife), who gave us permission to conduct the work. We wish to Oriental Bird Club for financial support to conduct the avian study. Again we also thank to Mr. Sharma and P. Baruah, Assam Remote Sensing Application center to provide us Satellite Imagery for habitat study. Again the Authors are grateful to all forest guards, Mahouts, Beat officer for their support during fieldwork and night camping inside the Jungle.



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**Plate 1:** Indirect Survey Methods (Occupational Survey) of mammalian fauna in Nameri NP: **A:** Digging sign of Wild boar; **B, D, G & H:** Fresh Sign of wild Elephant; **C:** Adult Tiger Pug Mark; **E:** Hoof marks of Chamber; **F:** Hoof marks of Barking Deer; **H:** Nail mark of adult Tiger.



**Plate 2:** **I:** Entrance of Nameri National Park Near Sijusa; **J:** Entrance to Potasali Forest Camp; **K & L:** Various habitat types of wild mammals near Bhalukpung Forest Camp; **M & N:** Potential habitat for wild Gaur; **O:** Habitat for Giant Squirrel; **P:** Potential habitat for Elephant population.