Chapter 4

STATUS OF MAMMALS IN THE INNER-LINE RESERVE FOREST, CACHAR DISTRICT
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Chapter-IV STATUS OF MAMMALS IN THE INNER-LINE RESERVE FOREST, CACHAR DISTRICT

INTRODUCTION

The Northeastern Region of India, comprising the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura, can be physiographically divided into the eastern Himalaya, the northeastern hills (Patkai-Naga Hills and Lushai Hills), and the Brahmaputra and Barak valley plains. WWF has identified the entire eastern Himalaya as a prior Global 2000 Eco-region; and Conservation International has subsumed its eastern Himalaya “hotspot” into a wider Indo-Burma hotspot, which now includes all the eight states of northeast India along with the neighboring territories of Bhutan, southern China, and Myanmar (Myers et al., 2000).

Myers (1988) and Myers et al. (2000) identified global biodiversity hotspots that were areas of high biological diversity and high endemism but were under severe anthropogenic threat. The categorization of India by McNeely et al. (1990) as one of the twelve mega-diversity countries in the world paved the way for its placement on the world’s conservation map.

Myers (1988) defined the eastern Himalaya hotspot covering the Indian states of Arunachal Pradesh and Sikkim, Darjeeling District of West Bengal, and parts of Nepal, China, and Bhutan. In 2000 the eastern Himalaya biodiversity hotspot was brought
within a wider Indo-Burma hotspot covering central Nepal, the whole of northeast India, the Andaman and Nicobar Islands, Hainan Island in southern China, Myanmar, Thailand, and on to Indochina, then south to the Kra in the Malaysian peninsula (Myers et. al. 2000). This hotspot, with an area of 2,060,000 sq. kilometer, is the second largest to the Mediterranean basin.

REVIEW OF LITERATURE

The Cachar District during the British era was termed as ‘Forest district’. The forests of Cachar was once enriched with trees like Jarul \((Lagerstroemia reginae)\), Nageswar \((Mesua ferrea)\). The important evergreen trees are \(Ficus bengalensis, Syzigium jambulana, Garcinia cowa, Pterospermum acerifolum\) etc. The deciduous trees present in the Inner-line reserve forest are \(Artocarpus lakoocha, Dillenia indica, Careya arborea, Acanthocephalus cinensis, Mangifera indica, Sterospermum personatum, Dysoxylum benectariferum\) etc. Indian rubber \((Ficus elastica)\) was first discovered in Cachar in 1862. During that time various bamboo species were also present in these forest areas. The forests of Cachar during that period was enriched with some important mammals like Elephants \((Elephas sp.;\) two distinct varieties of which were then found, named as ‘Kumeirah’ and ‘Mirgid’, of whom a hybrid called as ‘Nasib’ or ‘Doasala’ was produced), Metna or Mithun \((Bos frontalis)\), Wild Buffalo \((Bubalus arnee)\), Parbatia or Sambar \((Cervus unicolor)\), Bilua or Barasingha \((Rucervus duvaucelii)\), Lainga-kbarra or Barking Deer \((Muntiacus muntjak)\) and many others. Among other wild mammals, special mention may be made about the Tiger \((Panthera tigris)\), Rhinoceros \((Rhinoceros\)
unicorns). Wild hog (*Sus scrofa*) and Black Bear (*Ursus thibetanus*) etc. Among small mammals, the important ones were monkeys (*Macaca sp.*), jackals (*Vulpes vulpes*), flying foxes (*Pteropus species*), moles (*Euroscaptor sp.*), civet cats (*Viverricula sp.*), wild cats (*Felis chaus*), hares (*Lepus sp.*), porcupines (*Hystrix sp.*) etc. In the period of 1859-69 (ten years), an average of £ 5 (five pound) was paid by the Government as rewards to the tiger killers, which reflects the enormity of the wild life. (Hunter, 1879).

During the year 1876-77 the system of Forest Administration in Cachar underwent important modification with the formation of seven (7) reserve forests: - (I) Upper Jiri, (24 sq. miles). (II) Lower Jiri, (14 sq. miles). (III) Barak, (67 sq. miles), (IV) Sonai, (18 sq. miles), (V) Katakhal, (80 sq. miles), (VI) Dhaleswari, (33 sq. miles), (VII) Inner-line, (509 sq. miles) all of which together cover a total area of 745 miles².

The objective of this chapter is to estimate the status of mammalian diversity in the Inner-line Reserve Forest, Cachar, Assam and to analyze the conservation issues on that context. Efforts have been made to collate information from field visits and survey of existing literature and have a comparative assessment of the present scenario that has been ascertained through extensive field study.

**MATERIALS AND METHODS**

A) Vegetation Sampling

The Inner-line reserve forest of Cachar covers 424 sq. km. The area lies in the southernmost part of Cachar district bordering the State of Mizoram. The reserve forest
includes twenty two forest villages, two major rivers like Rukni and Sonai along with the river Dholai. The areas covered by the reserve forest are undulating having lots of hillock along with plain and hill regions. The areas of the Inner-line Reserve Forest are categorized in 13 divisions. The forest rich cover areas are included in the two categories named as Evergreen/semi Evergreen-Dense and Evergreen/Semi Evergreen-Open forest areas depending upon the abundance of trees.

Tree and shrub density of the study area has been calculated by Quadrate method. For this, 10mX10 m quadrates were laid down for the trees and 5m X 5m quadrates were made for the shrub species. The forest areas of four representative areas were calculated by taking 10 (ten) no. of quadrates for each category. Four areas in which the quadrats were laid are laying near the Loharbond, Balichuri, Seorarthal and Pancherra extension areas. However, it needs to be mentioned that out of four areas, one spot has very undulated topography.

B) Sampling Of Mammals

For the mammalian status survey, sampling has been done throughout the Inner-line reserve forest of Cachar part. The Inner-line reserve forest has three distinct regions that are bounded by rivers, undulating plain and high hills. The first and second regions fall under Silchar sadar, Hawaithang range respectively while the third one in Metnathol-Chekkarcham region. The site for mammalian survey is selected randomly by imposing grid in the first two regions. The third region having high terrain which is almost inaccessible and hence it was beyond scope to select any site therein. Among the
ten sites selected for the mammalian survey, the site nearer to Loharbond F.V. is comparatively plain in comparison to the other nine sites. The site of Seorarthal area is an undulating plain area that is lying on the bank of river Rukni. The site of Nagathol, Balichuri, Ekarthal have undulating plain with many numbers of hillocks. Hadamma fishery area is a swampy area where several hill streams from the nearby hill anastomosed. Pancherra extension and Gamair Tilla are terrain areas. The Naxa-tila is a fully covered by small hillocks and lying most nearer to the Loharbond-Bilaipur road.

B/I) Mammalian Status Study

Population census of wild mammals in their natural habitat requires to be estimated through a combination of various methods. Some indices and some calculations are used to find out the census of mammals. The widely practiced approaches of estimating population sizes of mammals are Total Counts, Drive Counts, Roadside Counts, and Water-hole Technique. All these methods have their own advantages and disadvantages as well.

The survey methods and techniques used in various field studies have changed a lot with time and with the influential application of modern gadgets.

Selection of census method varies with a given situation like area of census (study areas), type of mammal (size, habit, and habitat), men power, gadget availability etc. Hence, before deciding to apply a particular method the following factors were taken into consideration:

1. Management objectives,
2. Size of the study area,

3. Special attributes of the animal,

4. Nature of the habitat,

5. Availability of time, field personnel and expenses etc.

**Census Methods:** All the census methods employed in the study are various categories of direct methods. For the assessment of population used a combination of various direct methods like, (1) Total count, (2) Drive count (3) Roadside count, (4) Waterhole techniques were employed. All the methods were not equally applicable to all mammalian species surveyed; hence case specific convenient methodologies were adopted.

1) **TOTAL COUNTS:** A Complete count or Total count, counts every member of a population where populations of large species occur in open areas. Direct visual counts are suitable for larger mammals like spotted deer, sambar, barasinga, wild buffalo, blackbuck, barking deer, mouse deer, nilgai, wild dog, wild pig, jackal, macaques, langurs etc. For the census, a large group of people were involved to cross the enclosure in a line and count all deer that pass in each direction. Distances between the members of the drive count were critical for success because all animals must be counted, even those hiding ones.

The counting area was conveniently divided into counting sectors of 10 to 15 Sq. kms; the sectors were serially numbered and indicated on a 4”=1 mile map. The size of the sectors was such that, it was covered by 4 to 5 enumerators, spaced at a distance of 100 meters, within three to four hours. For this purpose, it was necessary to ascertain
approximately the total distance covered in kms by an average enumerator, within a specified time limit. The following relationship was used for this:

Total distance covered in km = (Total number of steps covered)/1000 * (Distance covered in 100 steps in meter)/100

Counting of animals was done on two successive days for four hours soon after the sunrise (i.e., 6-10AM), during which the enumerators counted the animals seen by them. Simultaneous counting was done by all the enumerators by starting from a base line and maintaining a distance of 100 meters between themselves, taking note of only those animals which were seen to their left. The spacing between the enumerators was adjusted as per the visibility in the area, since it is essential for the enumerators to see each other during the count. Aligning towards the correct direction of movement was done by marking the trees perpendicularly to the base line. During the count, details regarding approximate age, sex and other related evidences have also been recorded; the figures were subsequently pooled and expressed for the area counted.

(2) DRIVE COUNTS: This is suitable for animals that are not found in the open area. Drive counts are easy if the terrain is not formidable. In the field execution, a set of persons for driving animals and a set of enumerators counting the flushed animals. The enumerators were placed equi-distantly on 'hides' on one side of the area, to prevent double counting. The distance between the 'hides' (enumerators) was fixed in such a
way that the enumerators can see one another. The counting was done on one side only (left or right of the enumerator) so as to avoid double counting.

The method essentially consists of ‘driving’ the animals in one direction simultaneously, after surrounding the area. The animals flushed out from their cover may move in any direction, therefore, ‘Stops’ were provided on the sides to make the animals move in the direction of the enumerators only. Natural barrier like water-body, elevated-hillock and human individuals standing on artificial platform, at relevant points, act as stops.

The time of commencement of the drive (beat) was fixed and the drivers moved along simultaneously for driving out the animals by using noisy beat. The animals have been flushed out by means of sound created by crackers. The enumerators, seated on machans, counted the animals.

(3) ROADSIDE COUNT: This is a common method for estimating the animal abundance along a roadside. Here, the observer, (in this case, the researcher) travelled at a fixed speed and recorded the number of animals seen per kilometer of the road, at a particular time of the day. Such counts of relative abundance have been found to be very useful and even involved less time. Therefore, it is possible to cover large areas inside the study area through this method. The advantage of roadside count is that it is useful to survey mammalian species and for confirmative indication. Such count, repeated over several years, gives a good indication of the population trend. But its
disadvantages are that it is not much useful to estimate the density of population of a species.

(4) WATERHOLE TECHNIQUE: This census technique is used where large animals are counted from a 'hide' as they visit water-sources. It is useful in the areas where during dry season water sources are known or limited or water sources are in distinct localities. In Inner-line reserve forest this technique is applied in various locations of Kanglaicherra, Mora-gang, Rukni, Pancharra, Ananda Khal in the month of February to June. This method is very useful for mammalian species identification and confirmation. The method has value as an index count.

(5) INDIRECT SURVEY IN THE VILLAGES WITHIN INNER-LINE RESERVE FOREST: In the Inner-line reserve forest 22 forest villages are recorded in the Cachar part by the forest department. Loharbond, Ekarthal, Nagathal, Balichuri, Seorarthal, Khulicherra, Pancherra, Baghewala, Kalahawar, Baghkhal khasia punji, Dhanipur, Jarultola forest villages are visited frequently for documentation. During the survey, encroached areas are observed inside the reserve forest, like Hadamma village, Pancherra extension area, Purva Naxa village, Karkat Basti. Several Caracas, different body parts of wildlife was observed in these villages during the survey period. The information on wildlife, their presence or absence was recorded separately, site wise.

The villagers of this forest village and encroached areas would provide substantial information about wildlife that was based on their regular visit to the
reserve forest and time spent within the forest. They also provided information as how and why they often visit deep inside the forest and also narrated other related aspects.

All these approaches were helpful in establishing the socio economic and cultural profile of Bengali, Dimasa, P‘nar, Kurmi and Reang community where as the Hmar people are neither informative nor want to share their experiences with person’s belong to other community. The knowledge on wildlife species obtained from the villages helped in developing the questionnaires on which several interviews were carried out. The information of the behavior and morphological characteristics of wildlife given by the villagers of Loharbond, Balichuri, Ekarthal, Nagathal, Purva-Naxa, Bag-o-bahar, Khulicherra, Seorarthal, Kalahawr, Baghkhal, Baghewala, Pancherra extension areas were noted. The Pictorial guides by Menon (2003, 2009) and Choudhury (2013) were very useful for identification, both in the field and while processing the information. Many villagers of the Bengali, P‘nar , Dimasa and Kurmi understand Hindi language. Also majority of the non-Bengali tribes understand Bengali language. The young P‘nar villagers can comfortably speak English. As a whole all the village people provided valuable information on wildlife.

B/II) Mammalian Sampling Areas

1. AREA: LOHARBOND (Lat N 24°35'17.6” Long E 092°44'04.8”, 47 msl)

This site is situated almost 40 km km away from the Silchar GPO. It lies south-easterly 2 km away from the Loharbond forest village. The village is in Silchar tehsil. It
is located under Bororjalenga grant. Majority of the population of the area belongs to ‘Kurmi’ ‘Bhumij’, ‘Singh’ and ‘Bengali’. Large populations are observed in the nearby areas and villages. This part of Inner-line reserve forest has areas of undulating plain with the presence of lesser number of hillocks. The lone natural perennial water source of this part of Inner-line reserve forest is the ‘kanglai-chhera’ or ‘kanglai-nala’. This water stream flows through the areas of this part of reserve forest. It flows from east to west. The ‘kanglai-chhara’ after crossing the Inner-line reserve forest, passes through the Katakhal reserve forest where it meets ‘Lala-chhera’. The Lala chhera is a tributary of Katakhal riverine system that meets near the Lalacherra village of Hailakandi District. Some other sources of water almost become dry during the late winter season (December-February). Such type of water sources are the ‘Lusaithal-gang’, ‘Mora-gang’ etc. Some natural ditches along with artificial ponds were observed during the survey but are not perennial. The forest areas of this region are continuous along with Katakhal reserve forest on its western side. The eastern parts of these areas have high hill region which is continuous from North to South.

The Loharbond reserve forest areas are mainly covered bushes, shrubs and grasslands. The number of trees is less in comparison to the other parts of the Inner-line reserve forest. The overall forests are characterized by grassland and bushes along with trees that present sporadically. (Table-2)

The areas inside the forest have a number of assam type houses, few stone-graveled road and some RCC structures. The canopied trees can be observed only in the southern part of Loharbond area up to the hill ranges that separates the Dholai River.
The plain areas (depending upon soil quality and availability of water sources) of this reserve forest is used for the rice cultivation during summer season. The sandy stream areas fused for vegetables cultivation during winter season.

2. AREA: EKARTHAL (Lat N 24°36'02.9" Long E 092°44'35.6", 12 msl)

This area comes under Inner-line reserve forest of Cachar part. It lies on the eastern side of the road connecting Dwarbond and Loharbond. The road distance is about 37 km away from Silchar GPO. The area includes only one forest village i.e. the Ekarthal that comes under the Silchar tehsil. The areas are covered by a number of small hillocks with small patches of plain areas. Majority of these hillocks are covered by Shrubs. Majority of these hillocks are devoid of tree. Tree population is limited in the Ekarthal area and hillocks are encroached by people. During the survey period, illegal logging and crop cultivation were observed. Natural water sources are not present in this locality and water is available only in the artificial wells and ditches in the low lying spurs of Ekarthal village. During the survey, a total of 28 village house was observed in the Ekarthal areas. The soil of these areas remains very dry during the winter season, whereas in summer the same soil become slippery and adhesive. These areas are separated from the Balichuri forest village by the tea gardens of Binode Nagar Tea estate and Kalyanpur Tea Estate. Due to illegal felling, tree population is restricted only in an around the village area and the far eastern part where the hill region started.

3. AREA: NAGATHAL (Lat N 24°35'39.6" Long E 092°45'33.5", 69 msl)
This site is situated in the eastern-most region of Inner-line reserve forest that
comes under Silchar tehsil. The areas have dominated by hillocks with the presence of
several natural water sources like 'Mora-gang', 'Bala-chhера' and 'Kanglai-chhера'
among which only later one is the perennial. The area includes only the Nagathol Forest
Village that further divided into ‘Khasi-punji’ and the ‘Kairi-punji’. The villagers of
‘Khasi-punji’ belong to P’nar (Jaintia) community and the community is the ‘Kairi’.
During the survey period a total of 150 houses are observed. The eastern part of village
has moderate cover of forest which become more dense eastwards,

4. AREA: BALICHURI (Lat N 24°36’33.1” Long E 092°45’26.0”, 68 msl)

The site lies on the eastern part of the Dwarbond to loharbond road. The area
includes Balichuri Forest villages. The village comes under Silchar tehsil. Nearer to this
village lie the Kailash Pur Tea Estate and Benode Nagar Tea estates. The areas are
covered by mid-size hillocks along with agricultural field. The majority people of these
part of the forest areas belong to the ‘Kurmi’ group of tea tribe. Majority people of the
village Balichuri is dependent on the agricultural field of the reserve forest. Also the
villagers use the timber and non-timber products of the nearby forest areas. During the
survey a total of 79 houses are observed in these region. Abundance of tree and shrub
present in these areas is given in a tabular form in Table-3.
5. AREA: HADAMMA (Lat N 24°27’11.3” Long E 092°49’33.4”, 50 msl)

These areas are a low-lying and swampy within the plain agricultural land and the neighboring hilly terrains. It was lying alongside the eastern part of Kalahawr-Dhanipur-Dholakhal road. Several small hill streams that are coming out from the eastern ward Pancherra hills meets in these areas. During winter season the water quantity become less as some of the streams or dries up. The nearby areas are used for agriculture during summer season but seldom used for the same reason during the winter period. The area is covered by Pancherra in east, Tulartol on west, Dholakhal on south and Dhanipur on North. The perennial natural water source of the area is the Panchhara stream. The Tulartol is the village having Bengali population; Dholakhal having both P’nar and Kuki Punjies (a specified area) and the other two villages are dominated by Dimasa population. Ponds and ditches are common in the vicinity of the forest village along with neighboring areas. Ponds are used as a source of water and pisciculture.

The forest covered areas are observed only in the hilly region of this part where as plain areas are used for cultivation throughout the years or pisciculture. The low lying forest areas are marshy, covered by water hyacinth. During the survey period it was observed that nearby villages used these areas for the selling of timbers and logs.
6. **AREA: SEORARTHAI** (Lat N 24°28'45.7" Long E 092°48'59.7", 55 msl)

These areas are under Seorarthal, Hawaithang Range of Dholai part. It is situated on the eastern-bank of river Rukni. The area is covered by hillock and hills on its eastern side. During the study period a newly constructed RCC road of 2.79km in length is observed, that passes through the Inner-line reserve forest from Kalahawar (eastward) to Seorarthal (westward). Construction of this road isolates the dense canopied areas of Inner-line Reserve Forest from each other which once were formed continuous. Presence of assam type household areas, large agricultural field and hilly forest areas are common in this part of Inner-line Reserve Forest. The fertile agricultural fields are used for agriculture throughout the year. The people of the nearby villages are belonging to Barman (Dimasa) and Bengali (Suklabaidya and Shil). During survey period more than 150 houses are observed in Seorarthal forest village many of whom involved in agricultural cultivation and animal husbandry. Dominant vegetation type (i.e. tree and shrub) present in the area is given in Table-4.

7. **AREA: GAMAIR TILLA** (Lat N 24°26'53.9" Long E 092°49'51.7", 120 msl)

The area is lies in between Pancherra Forest village and Panchera extension. The forest is dense in this part of Inner-line reserve forest with canopied trees. The areas are hilly having several small continuous patches indicating human interference. The hills are inclined inside the forest. During the survey several 'Pan-jhum' areas are observed but are devoid of any build-up areas. The lone water sources are the hilly sub streams of
Pancherra which later passes through Dholakhal forest village and unites with river Rukni.

8. AREA: PANCHERRA (Lat N 24°27'24.3" Long E 092°49'12.4", 60 msl)

The area is located almost 6 km away from the Kalahawar areas. The areas are covered by high hill and valleys. The hills are covered by dense evergreen tree and shrubs whereas the valleys are used for agricultural cultivation. The nearby forest villages are Pancherra, Dhanipur and Dholakhal. The Pancherra, Dhanipur are Dimasa village, whereas Dholakhal village has several punji (specified areas) which are inhabited by the P’nar and Kuki (mistakenly called as Mizo). The area includes encroached areas. The encroachment areas are inhabited by the P’nar, Dimasa, Hmar and Bengali people. It was observed that for the encroachment the innermost hilly areas are preferred.

The forest cover of this part of Inner-line reserve forest is observed only in the terrain region whereas the plain areas are used for cultivation by the people of nearby villages. Major trees and shrubs of the area is given in Table-5.

9. AREA: PANCHERRA extension (Lat N 24°26'46.2" Long E 092°50'20.3", 120 msl)

It is one of the few areas of the Inner-line reserve forest which are highly terrain. The forest cover is dense and evergreen. It is mentionable that nearby to this site are encroached by Dimasa, P’nar and Hmar population. All these encroached areas are of
Inner-line reserve forest, Cachar Part. During the survey period several pan jhum areas are observed. In encroached areas the Dimasa, P'nar and Hmar people leaves almost togetherly but their cultural differences can be observed easily. The Hmar people cultivates in the 'slash and burn' (Jhum cultivation) in the hilly areas. The P'nar also involves in Pan-jhum cultivation in the foot-hills and high hill region of this areas. The people of this region are total dependent on the Bhaga-market for selling their self-made product and items as well as buying. On the contrary Dimasa are involved in agricultural cultivation and animal husbandry.

10. SITE: NAXATILLA ((Lat N 24°33'19.9" Long E 092°44'08.9", 62 msl)

This area is adjacent to Inner-line reserve forest, Cachar and Hailakandi. This part of forest is an important transitional zone for the animals of Inner-line reserve forest of Cachar and Hailakandi part along with Katakhal reserve forest. Some part of it comes under Matijuri range of Hailakandi. The areas surveyed are laying south-west side next to the Loharbond Forest village. Some part of the site lays eastern-ward of Loharbond to Pratap-pur road. During the beginning of the survey (2009) these areas was covered by dense forest and a small motorable road was existed that goes to Pratap Pur via Purva-Noagaon. The road was functional during the drier season only as during rainy season it was useless. On 2011, the small road was widened by clearing the forest and cutting the small hillock. These make the roadway areas plain and accessible to human. After 2012, a new wide road emerged out that connect the Dwarbond to Lalacherra. The villagers of Lalacherra region of Halilakandi district along with Lala,
Samarikona, Phaisen, even of Katlicherra region of south Hailakandi use the road frequently to make a short cut and for direct transportation to SMC (Silchar Medical College). The widening of the road creates fragmentation of the forest in many areas where once it was continuous.

RESULT

A) VEGETATION SAMPLING

The abundance of the trees and shrubs are given in the tables.

The reserve forest has ninty one (91) tree species (Bora and Garkoti, 2011). Among them, *Cynometra polyandra* Roxb. (Ping Kath), *Dysoxylum binectiferum*(Roxb.)Hook.f.ex Bedd. (Rata Kath), *Palaquium polyanthum* Benth. (Kurta Kath), *Tetrameles nudifera* R.Br. (Tula Kath), *Artocarpus chama* Buch.- Ham (Chamkathal), *Castanopsis purpurella* (Miq.) N. P. Balakr (Kutus nut), *Semecarpus anacardium* Linn. (Bhallat, Bhalla nut), *Spondius pinnata* (Linn.f.) Kurz (Amra) are the dominant tree species of the Inner-line reserve forest.


Description about the vegetation (i.e., trees and shrubs) in each representative areas are given in Table-2, 3, 4 and 5.
Table 2: Abundance of (A) Tree and (B) Shrub in Loharbond area

(A) Abundance of Tree

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<td>10mx10m</td>
<td>14</td>
<td>14.0</td>
</tr>
<tr>
<td>Total no of trees</td>
<td></td>
<td></td>
<td></td>
<td>108</td>
<td></td>
</tr>
</tbody>
</table>

(B) Abundance of Shrub

<table>
<thead>
<tr>
<th>Quadrats</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Quadrats size</th>
<th>Total</th>
<th>Abundance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadrats 1</td>
<td>N24°35'17.5&quot;</td>
<td>E 092°44'33.4&quot;</td>
<td>5mx5m</td>
<td>14</td>
<td>14.4</td>
</tr>
<tr>
<td>Quadrats 2</td>
<td>N24°35'17.3&quot;</td>
<td>E 092°44'33.9&quot;</td>
<td>5mx5m</td>
<td>16</td>
<td>16.0</td>
</tr>
<tr>
<td>Quadrats 3</td>
<td>N24°35'17.0&quot;</td>
<td>E 092°44'34.3&quot;</td>
<td>5mx5m</td>
<td>10</td>
<td>10.0</td>
</tr>
<tr>
<td>Quadrats 4</td>
<td>N24°35'16.8&quot;</td>
<td>E 092°44'34.6&quot;</td>
<td>5mx5m</td>
<td>14</td>
<td>14.0</td>
</tr>
<tr>
<td>Quadrats 5</td>
<td>N24°35'16.5&quot;</td>
<td>E 092°44'34.9&quot;</td>
<td>5mx5m</td>
<td>14</td>
<td>14.0</td>
</tr>
<tr>
<td>Quadrats 6</td>
<td>N24°35'16.1&quot;</td>
<td>E 092°44'35.4&quot;</td>
<td>5mx5m</td>
<td>12</td>
<td>12.0</td>
</tr>
<tr>
<td>Quadrats 7</td>
<td>N24°35'15.6&quot;</td>
<td>E 092°44'35.9&quot;</td>
<td>5mx5m</td>
<td>17</td>
<td>17.0</td>
</tr>
<tr>
<td>Quadrats 8</td>
<td>N24°35'15.4&quot;</td>
<td>E 092°44'36.2&quot;</td>
<td>5mx5m</td>
<td>15</td>
<td>15.0</td>
</tr>
<tr>
<td>Quadrats 9</td>
<td>N24°35'15.2&quot;</td>
<td>E 092°44'36.7&quot;</td>
<td>5mx5m</td>
<td>16</td>
<td>16.0</td>
</tr>
<tr>
<td>Quadrats 10</td>
<td>N24°35'15.0&quot;</td>
<td>E 092°44'37.1&quot;</td>
<td>5mx5m</td>
<td>16</td>
<td>16.0</td>
</tr>
<tr>
<td>Total no of Shrubs</td>
<td></td>
<td></td>
<td></td>
<td>144</td>
<td>14.4</td>
</tr>
</tbody>
</table>
# Table 3: Abundance of (A) Tree and (B) Shrub in Balichuri area

## (A) Abundance of Tree

<table>
<thead>
<tr>
<th>Quadrats</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Quadrats size</th>
<th>Total</th>
<th>Abundance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadrats 1</td>
<td>N 24°36'33.1&quot;</td>
<td>E 092°45'26.4&quot;</td>
<td>10mx10m</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Quadrats 2</td>
<td>N 24°36'33.2&quot;</td>
<td>E 092°45'26.7&quot;</td>
<td>10mx10m</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Quadrats 3</td>
<td>N 24°36'33.3&quot;</td>
<td>E 092°45'27.0&quot;</td>
<td>10mx10m</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Quadrats 4</td>
<td>N 24°36'33.4&quot;</td>
<td>E 092°45'27.2&quot;</td>
<td>10mx10m</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Quadrats 5</td>
<td>N 24°36'34.0&quot;</td>
<td>E 092°45'25.3&quot;</td>
<td>10mx10m</td>
<td>08</td>
<td></td>
</tr>
<tr>
<td>Quadrats 6</td>
<td>N 24°36'34.3&quot;</td>
<td>E 092°45'25.5&quot;</td>
<td>10mx10m</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Quadrats 7</td>
<td>N 24°36'34.6&quot;</td>
<td>E 092°45'25.8&quot;</td>
<td>10mx10m</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Quadrats 8</td>
<td>N 24°36'34.8&quot;</td>
<td>E 092°45'26.1&quot;</td>
<td>10mx10m</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Quadrats 9</td>
<td>N 24°36'35.0&quot;</td>
<td>E 092°45'26.4&quot;</td>
<td>10mx10m</td>
<td>07</td>
<td></td>
</tr>
<tr>
<td>Quadrats 10</td>
<td>N 24°36'35.2&quot;</td>
<td>E 092°45'26.7&quot;</td>
<td>10mx10m</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

Total no of Trees: 117

## (B) Abundance of Shrub

<table>
<thead>
<tr>
<th>Quadrats</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Quadrats size</th>
<th>Total</th>
<th>Abundance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadrats 1</td>
<td>N 24°36'33.1&quot;</td>
<td>E 092°45'26.3&quot;</td>
<td>5mx5m</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Quadrats 2</td>
<td>N 24°36'33.2&quot;</td>
<td>E 092°45'26.6&quot;</td>
<td>5mx5m</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Quadrats 3</td>
<td>N 24°36'33.3&quot;</td>
<td>E 092°45'26.9&quot;</td>
<td>5mx5m</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Quadrats 4</td>
<td>N 24°36'33.4&quot;</td>
<td>E 092°45'27.1&quot;</td>
<td>5mx5m</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Quadrats 5</td>
<td>N 24°36'33.9&quot;</td>
<td>E 092°45'25.1&quot;</td>
<td>5mx5m</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Quadrats 6</td>
<td>N 24°36'34.2&quot;</td>
<td>E 092°45'25.4&quot;</td>
<td>5mx5m</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Quadrats 7</td>
<td>N 24°36'34.5&quot;</td>
<td>E 092°45'25.7&quot;</td>
<td>5mx5m</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Quadrats 8</td>
<td>N 24°36'34.7&quot;</td>
<td>E 092°45'25.9&quot;</td>
<td>5mx5m</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Quadrats 9</td>
<td>N 24°36'34.9&quot;</td>
<td>E 092°45'26.2&quot;</td>
<td>5mx5m</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Quadrats 10</td>
<td>N 24°36'35.1&quot;</td>
<td>E 092°45'26.6&quot;</td>
<td>5mx5m</td>
<td>21</td>
<td></td>
</tr>
</tbody>
</table>

Total no of Shrubs: 247

Abundance: 24.7%
Table 4: Abundance of (A) Tree and (B) Shrub in Seorarthal area

### (A) Abundance of Tree

<table>
<thead>
<tr>
<th>Quadrats</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Quadrats size</th>
<th>Total</th>
<th>Abundance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadrats 1</td>
<td>N 24°28'45.9&quot;</td>
<td>E 092°48'60.3&quot;</td>
<td>10mx10m</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Quadrats 2</td>
<td>N 24°28'46.2&quot;</td>
<td>E 092°48'60.5&quot;</td>
<td>10mx10m</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Quadrats 3</td>
<td>N 24°28'46.5&quot;</td>
<td>E 092°48'60.9&quot;</td>
<td>10mx10m</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Quadrats 4</td>
<td>N 24°28'46.8&quot;</td>
<td>E 092°48'61.2&quot;</td>
<td>10mx10m</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Quadrats 5</td>
<td>N 24°28'47.1&quot;</td>
<td>E 092°48'61.5&quot;</td>
<td>10mx10m</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Quadrats 6</td>
<td>N 24°28'45.5&quot;</td>
<td>E 092°48'59.5&quot;</td>
<td>10mx10m</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Quadrats 7</td>
<td>N 24°28'45.4&quot;</td>
<td>E 092°48'59.4&quot;</td>
<td>10mx10m</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Quadrats 8</td>
<td>N 24°28'45.2&quot;</td>
<td>E 092°48'59.3&quot;</td>
<td>10mx10m</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Quadrats 9</td>
<td>N 24°28'45.0&quot;</td>
<td>E 092°48'59.2&quot;</td>
<td>10mx10m</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Quadrats 10</td>
<td>N 24°28'44.8&quot;</td>
<td>E 092°48'59.1&quot;</td>
<td>10mx10m</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Total no of Trees</td>
<td></td>
<td></td>
<td></td>
<td>192</td>
<td>19.2</td>
</tr>
</tbody>
</table>

### (B) Abundance of Shrub

<table>
<thead>
<tr>
<th>Quadrats</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Quadrats size</th>
<th>Total</th>
<th>Abundance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadrats 1</td>
<td>N 24°28'45.8&quot;</td>
<td>E 092°48'60.1&quot;</td>
<td>5mx5m</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Quadrats 2</td>
<td>N 24°28'46.0&quot;</td>
<td>E 092°48'60.4&quot;</td>
<td>5mx5m</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Quadrats 3</td>
<td>N 24°28'46.4&quot;</td>
<td>E 092°48'60.7&quot;</td>
<td>5mx5m</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Quadrats 4</td>
<td>N 24°28'46.7&quot;</td>
<td>E 092°48'61.1&quot;</td>
<td>5mx5m</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Quadrats 5</td>
<td>N 24°28'46.9&quot;</td>
<td>E 092°48'61.3&quot;</td>
<td>5mx5m</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Quadrats 6</td>
<td>N 24°28'45.6&quot;</td>
<td>E 092°48'59.5&quot;</td>
<td>5mx5m</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Quadrats 7</td>
<td>N 24°28'45.3&quot;</td>
<td>E 092°48'59.4&quot;</td>
<td>5mx5m</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Quadrats 8</td>
<td>N 24°28'45.3&quot;</td>
<td>E 092°48'59.3&quot;</td>
<td>5mx5m</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Quadrats 9</td>
<td>N 24°28'45.1&quot;</td>
<td>E 092°48'59.2&quot;</td>
<td>5mx5m</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Quadrats 10</td>
<td>N 24°28'44.9&quot;</td>
<td>E 092°48'59.1&quot;</td>
<td>5mx5m</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Total no of Shrubs</td>
<td></td>
<td></td>
<td></td>
<td>358</td>
<td>35.8</td>
</tr>
</tbody>
</table>
Table 5: Abundance of (A) Tree and (B) Shrub in Pancherra area

(A) Abundance of Tree

<table>
<thead>
<tr>
<th>Quadrats</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Quadrats size</th>
<th>Total</th>
<th>Abundance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadrats 1</td>
<td>N 24°26'46.2&quot;</td>
<td>E 092°50'20.6&quot;</td>
<td>10mx10m</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Quadrats 2</td>
<td>N 24°26'45.9&quot;</td>
<td>E 092°50'20.8&quot;</td>
<td>10mx10m</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Quadrats 3</td>
<td>N 24°26'45.6&quot;</td>
<td>E 092°50'21.1&quot;</td>
<td>10mx10m</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Quadrats 4</td>
<td>N 24°26'45.5&quot;</td>
<td>E 092°50'21.4&quot;</td>
<td>10mx10m</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Quadrats 5</td>
<td>N 24°26'45.3&quot;</td>
<td>E 092°50'21.7&quot;</td>
<td>10mx10m</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Quadrats 6</td>
<td>N 24°26'46.0&quot;</td>
<td>E 092°50'19.9&quot;</td>
<td>10mx10m</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Quadrats 7</td>
<td>N 24°26'45.8&quot;</td>
<td>E 092°50'19.7&quot;</td>
<td>10mx10m</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Quadrats 8</td>
<td>N 24°26'45.5&quot;</td>
<td>E 092°50'19.4&quot;</td>
<td>10mx10m</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Quadrats 9</td>
<td>N 24°26'45.2&quot;</td>
<td>E 092°50'19.1&quot;</td>
<td>10mx10m</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Quadrats 10</td>
<td>N 24°26'44.8&quot;</td>
<td>E 092°50'18.7&quot;</td>
<td>10mx10m</td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>

Total no of trees 276 27.6%

(B) Abundance of Shrub

<table>
<thead>
<tr>
<th>Quadrats</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Quadrats size</th>
<th>Total</th>
<th>Abundance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadrats 1</td>
<td>N 24°26'46.3&quot;</td>
<td>E 092°50'20.4&quot;</td>
<td>5mx5m</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Quadrats 2</td>
<td>N 24°26'46.1&quot;</td>
<td>E 092°50'20.7&quot;</td>
<td>5mx5m</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Quadrats 3</td>
<td>N 24°26'45.8&quot;</td>
<td>E 092°50'21.0&quot;</td>
<td>5mx5m</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Quadrats 4</td>
<td>N 24°26'45.5&quot;</td>
<td>E 092°50'21.3&quot;</td>
<td>5mx5m</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Quadrats 5</td>
<td>N 24°26'45.5&quot;</td>
<td>E 092°50'21.6&quot;</td>
<td>5mx5m</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Quadrats 6</td>
<td>N 24°26'46.1&quot;</td>
<td>E 092°50'20.1&quot;</td>
<td>5mx5m</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Quadrats 7</td>
<td>N 24°26'45.9&quot;</td>
<td>E 092°50'19.8&quot;</td>
<td>5mx5m</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Quadrats 8</td>
<td>N 24°26'45.7&quot;</td>
<td>E 092°50'19.5&quot;</td>
<td>5mx5m</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Quadrats 9</td>
<td>N 24°26'45.4&quot;</td>
<td>E 092°50'19.3&quot;</td>
<td>5mx5m</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Quadrats 10</td>
<td>N 24°26'45.1&quot;</td>
<td>E 092°50'18.9&quot;</td>
<td>5mx5m</td>
<td>26</td>
<td></td>
</tr>
</tbody>
</table>

Total no of Shrubs 249 24.9%

80
It was calculated that the tree abundance is more in the Pancherra areas in comparison to the other three areas. The abundance of tree and shrub in the areas are given in the Fig: 18.

Fig.18: Comparison of Abundance of Trees and Shrubs in four areas
B) MAMMALIAN POPULATION STUDY IN TEN REPRESENTATIVE AREAS

Area-1 LOHARBOND: In this area as many as twenty two mammals have been reported, out of which nineteen have been directly observed. Among the mammals three species belong to Schedule-I and eleven are enlisted in Schedule-II of the Wildlife (Protection) Act, 1972. IUCN listed endangered species in this area are three in numbers, while two species are vulnerable along with another two as near-threatened. Likewise mammals belonging to Appendix I, II and III of CITES are one, five and six respectively. (Table-6)

Area-2 EKARTHAL: In this area as many as sixteen mammals have been reported, out of which ten have been directly observed. Among the mammals, one species belong to Schedule-I and nine are enlisted in Schedule-II of the Wildlife (Protection) Act, 1972. Only one species is of endangered category as per IUCN list. Two species are of near-threatened category. Likewise mammals belonging to Appendix II and III of CITES are three and five respectively. (Table-7)

Area-3 NAGATHAL: In this area as many as fifteen mammals have been reported, out of which eight have been directly observed. Among the mammals, single species belong to Schedule-I and seven are enlisted in Schedule-II of the Wildlife (Protection) Act, 1972. Other mammals are of Schedule III, IV and V. IUCN listed endangered species observed in this area are one in number, while another one species is of vulnerable category. Another species of this area is enlisted as near-threatened. Likewise mammals belonging to Appendix I, II and III of CITES are one, two and four respectively. (Table-8)
Area-4 BALICHURI: In this area as many as sixteen mammals have been reported, out of which seven have been directly observed. Among the mammals one species belongs to Schedule-I and eight are enlisted in Schedule-II. Other mammals are of Schedule III, IV and V. IUCN listed endangered species in this area are one in number, one species is vulnerable along with another one species as near-threatened. Likewise mammals belonging to Appendix II and III of CITES are two and five respectively. (Table-9)

Area-5 HADAMMA: In this area, mammalian species existing are less in no. in comparison to the other areas observed during the period of 2008-13. As many as six mammals were directly observed. Among the mammals, four species belong to Schedule-II and two of schedule-III category. All the species are of least concern (as per IUCN) and two of them are in Appendix III of CITES. (Table-10)

Area-6 SEORARTHAL: In this area as many as twenty two mammals have been reported, out of which thirteen have been directly observed. Among the mammals six species belong to Schedule-I and ten are enlisted in Schedule-II. Other mammals are of Schedule III, IV and V. IUCN listed endangered species in this area are three in numbers, while three species are vulnerable along with another three species as near-threatened. Likewise mammals belonging to Appendix I, II and III of CITES are four, five and five respectively. (Table-11)

Area-7 GAMAIRTILLA: In this area, mammalian species existing are least in number in comparison to the other areas observed. As many as five mammals were directly observed. Among the mammals, two species belong to Schedule-II and two of
schedule-III category. All the species are of least concern (as per IUCN). Likewise single species is enlisted in each of the Appendix II and III of CITES. (Table-12)

**Area-8 PANCHERRA:** In this area as many as seventeen mammals have been reported, out of which eleven have been directly observed. Among the mammals three species belong to Schedule-I and eight are enlisted in Schedule-II. IUCN listed endangered species in this area are two in numbers, while one species is vulnerable along with another one species as near-threatened. Likewise mammals belonging to Appendix I, II and III of CITES are three, two and four respectively. (Table-13)

**Area-9 PANCHERRA EXTENSION:** In this area as many as twenty mammals have been reported, out of which eleven have been directly observed. Among the mammals three species belong to Schedule-I and nine are enlisted in Schedule-II. IUCN listed endangered species in this area are two in numbers, while one species is vulnerable along with another two species as near-threatened. Likewise mammals belonging to Appendix I, II and III of CITES are one, four and five respectively. (Table-14)

**Area-10 NAXATILLA:** In this area as many as eighteen mammals have been reported, out of which eight have been directly observed. Among the mammals three species belong to Schedule-I and ten are enlisted in Schedule-II. Other mammals are of Schedule III, IV and V. IUCN listed endangered species in this area are two in numbers, while two species are vulnerable along with another one species as near-threatened. Likewise mammals belonging to Appendix I, II and III of CITES are two, three and five respectively. (Table-15)
TABLE 6: LOHARBOND (lat. N 24°35'17.6" / Long. E 092°44'04.8")

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TABLE 11: SEORARThAL (lat. N 24°28'45.7" / Long. E 092°48'59.7")
TABLE 12: GAMAIRTILLA (lat. N 24°26'53.9" / Long. E 092°49'51.7")

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<td>Remnants Found</td>
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<td>1</td>
<td><em>Macaca mulata</em></td>
<td>Sch-II(I)</td>
<td>L.C.</td>
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<tr>
<td>2</td>
<td><em>Hoolock hoolock</em></td>
<td>Sch-I</td>
<td>EN</td>
<td>Appendix I</td>
<td>----</td>
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<td>3</td>
<td><em>Nycticebus bengalensis</em></td>
<td>Sch-I</td>
<td>VU</td>
<td>Appendix I</td>
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<td>4</td>
<td><em>Muntiacus muntjak</em></td>
<td>Sch-III</td>
<td>L.C.</td>
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<td><em>Hystrix brachyura</em></td>
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<td>8</td>
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<td>L.C.</td>
<td>Appendix III</td>
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<tr>
<td>9</td>
<td><em>Paradoxurus hermaphroditus</em></td>
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<td>10</td>
<td><em>Viverra zibetha</em></td>
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<td>N.T.</td>
<td>Appendix III</td>
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<tr>
<td>11</td>
<td><em>Dremomys lokriah</em></td>
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<tr>
<td>12</td>
<td><em>Callosciurus pygerythrus</em></td>
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<td><em>Lepus nigricollis</em></td>
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<td>L.C.</td>
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<td>L.C.</td>
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<td><em>Vulpes bengalensis</em></td>
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<td>L.C.</td>
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<td>16</td>
<td><em>Herpestes javanicus</em></td>
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<td><em>Lutrogale perspicillata</em></td>
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<td>VU</td>
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<tr>
<td>18</td>
<td><em>Pteropus giganteus</em></td>
<td>Sch-I</td>
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**Abbreviations used:**

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<th>WPA</th>
<th>IUCN</th>
<th>CITES</th>
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<tbody>
<tr>
<td>S= Schedule (I, II, III etc) / P= Part of schedule I or II</td>
<td>EN= Endangered/ NT= Near threatened/ VU= Vulnerable/ LC= Least Concerned</td>
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DISCUSSION:

The Inner-line Reserve Forest is the largest reserve forest of Southern Assam. This reserve forest is continuous with the neighboring state of Mizoram. The reserve forest is continuous along with three other reserve forest of the valley. The Barak, Sonai and Katakhal reserve forest are the adjoining forest areas of the Inner-line reserve forest. The Cachar part of the reserve forest has four distinct areas. The first one is the western part of the forest that lies in between the Katakhal reserve forest and the river Dholai. The second part is the forest patches in between the Dholai and the river Rukni. The third part of forest lies in between river Rukni and the Sonai river. The fourth part is the far eastern side area that lies in between river Sonai and the Bordering River Barak.

The areas of the Inner-line Reserve Forest are covered by evergreen and semi-evergreen forest areas. Some of the areas of the forest have altitude of more than 100 msl. The reserve forest includes twenty two forest village (Cachar Part) and several encroached areas.

Vegetation of Inner-line reserve forest is dominated by trees and the shrubs in both the forest plains and hills, and a few low lying areas are observed during the survey period. It was observed that forest covers are dense in the hilly and hillock areas as plain areas are used for agriculture. The forest areas that lie nearer to the motorable road are not dense in comparison to the remote forest areas. Forest covers densities of four areas were measured by quadrate method, two under Silchar division (Loharbond and Balichuri) and other two under Hawaithang division (Seorarthal and Panchera Extension). It was observed that the tree abundance is lesser in Silchar division in
comparison to the Hawaithang division. The abundance is found to be lowest in Loharbond area. The forest areas of Pancherra extension are observed to be denser in comparison to the other three areas with a tree abundance of 27.6 %. (Fig.-18)

The abundance of mammalian species inside the Inner-line Reserve Forest was estimated through the methodologies as mentioned earlier in this chapter. However, some indirect reporting were also documented through questionnaire survey. It has been observed that many species of primates occur in the fragmented canopied areas where as the medium sized herbivores and small carnivores are observed throughout the forest covered areas. *Macaca mulata* were observed throughout the Inner-line reserve forest and are frequent near the forest village areas and agricultural land. It was observed that they often come down from the trees in search of food. Among the large carnivores of the forest *Viverricula Indica, Paradoxurus hermaphroditus, Viverra zibetha, Canis aureus, Vulpes bengalensis* are observed throughout the Inner-line reserve forest. Also these carnivores are being adapted to haunt in and around the forest villages areas in search of prey. It was further observed that the village people often kill in course of reitaliation killing since they often attack domesticated livestock like fowl, duck, sheep, lamb and the young of the cow and buffalo. Also the Riang people (locally called ‘Bhumihin’, as they visit the forest areas in search of a suitable place for Jhum cultivation.) along with the Kuki people (some of them are inhabited in Purvanaksha village) kill the carnivores like *Herpestes sp.*, *Manis sp.* for their fulfillment of meat requirement. During the survey, it was also observed that the young children of such
villages plays with the stuffed/remnants of various mammalian species like *Herpestes sp.*, *Dremomys lokriah*, *Viverricula indica* etc. (PLATE-3/A)

During the study, it has been observed that herbivores are captured or killed by village people using iron trap, pipe guns, bow-arrow or some other piercing and slushing devices. In Jogirbond area one such sambar (*Cervus unicolor*) was killed that once came out from the Mora-gang areas under the Loharbond forest village. Later the animal dead body was rescued by the forest personal from Silchar. (PLATE-3/B)

*Muntiacus muntjaks* are observed killed in the Balichuri and Loharbond area. One such animal was kept in captivity in the Seorarthal and Bag-o-bahar forest village; though the later fall under Katakhal reserve forest but since that area is adjoining Inner-line reserve forest hence frequent movement of animals take place through corridors. In the same way one slow loris (*Nycticebus bengalensis*) was observed in captivity in Pancherra extension. In the Seorarthal-Khulicherra area one *Capricornis rubidus* (Red Serow) was rescued by the villagers in injured condition (Left hind leg is cut due to Iron-Jaw trap, also one cut mark on the right neck). (PLATE-3/C, 4/A, 4/B)

During the survey it was found that *Canis aureus*, *Vulpes bengalensis*, *Viverricula indica*, *Viverra zibetha* and *Herpestes sp.* are preyed upon the domesticated animals like Sheep, Lamb, Dog, Duck, fowl etc. The large herbivores like sambar (*Cervus unicolor*) are observed in some localities of Inner-line reserve forest but their distribution is not found continuous. Among the ungulates the Barking Deer (*Muntiacus muntjak*) is observed frequently. During the survey the remnants of this animal is observed in many forest villages of the reserve forest. The apes of the reserve forest is observed in
the canopied forest and found that such types of areas are decreasing. The Hoolock Gibbon (*Hoolock hoolock*) and Slow Loris (*Nycticebus bengalensis*) are observed less inside the reserve forest. In addition, Western Hoolock Gibbons are also observed in the adjoining areas of Inner-line reserve forest where dense forests cover exists. (PLATE-4/C)

Large carnivores are seldom observed inside the Inner-line reserve forest. In the hilly regions of Pancherra extension (also in Hadamma areas) the inhabitant reported about the occurrence of Sun Bear (*Helarctos malayanus*) on theis easter wards hill side. *Platinista sp.* was once available in the reserve forest in various deep riverine areas locally called the D'har but during the survey period only photographs observed. Also several species of flying fox are observed one of which (*Pteropus giganteus*) is consumed by tribal people as they believes that it is helpful in curing the disease asthma.

The mammalian species available inside the Inner-line reserve forest is diverse type. The ten sites are observed throughout the survey period and enlisted areawise. In the forest of Loharbond areas four species of Primates are observed. *Macaca mulata* and *Macaca assamensis* are quite frequently observed in the Loharbond area and often raids the agricultural field of the forest villages and the neighbouring areas. *Trachypithecus phayrei* and *Hoolock hoolock* although were not observed in and around the forest village area, but their presence could be registered indirectly through 'call's in the far eastern part of the Loharbond towards Mora-gang where canopied forest exists. *Muntiacus muntjak* is also observed in this area along with one juvenile during the year of late 2009 in Loharbond and Bag-o-Bahar forest areas. A species of *Cervus unicolor* which was
come out from Loharbond forest area of Inner-line reserve forest was killed by the neighboring villagers at Jogirbond area in the year 2012. It was observed that the forest village people (mainly the tribes, not the Bengalis and Kurmis) have a tendency to kill the wildlife for the collection of meat, skin, horns etc. Meats of wild mammals (civets are less prefered) are consumed, whereas skin and horns are kept in house hold areas like a trophy of winning battle. Among the areas surveyed the Loharbond forest areas and Seorarthal have highest no of species diversity, and 22 species are recorded in and around these areas. The unique species observed here were Hoolock hoolock, Trachypithecus phayrei, Cervus unicolor, Viverra zibetha etc. The Muntiacus muntjak, Sus scrofa, Manis pentadactyla, Viverricula indica, Canis aureus, Vulpes bengalensis etc are observed in almost all the places of Inner-line reserve forest except in the fishery and ‘jhum’ areas. In Seorarthal village remnants of Barasingha (Cervus duvauceli) is observed. Also Pteropus giganteus are observed in many places inside the reserve forest. The villagers of Seorarthal and Loharbond reported about Lutrogale perspicillata, that hampers pond fisheries of forest village areas. The species is also reported in Kanglaicherra and river Rukni.

The species diversity in the Hadamma fishery areas and Gamairtilla are less in number and 6 species are recorded in each. The Hadamma fishery is a low lying area with a degraded forest cover, and in Gamair Tilla area the trees are extensively used for Pan jhum by the P'nar tribes of the neighboring Panacherra extension village (also called Hadamma by the Dimasas of that areas).
The mammalian species diversity in Pancherra extension and Pancherra are almost similar. During the survey 20 and 17 mammalian species are recorded in the areas respectively. Ekarthal and Balichuri, 16 species are recorded in each area. The common species found in these areas are Muntiacus muntjak, Viverricula sp., Canis aureus, Vulpes bengalensis etc. The primate population is less and among them only *Macaca mulata* are observed in both the areas. The *Macaca assamensis* though reported by the village people of the Ekarthal areas.

In Nagathal, 15 mammalian species are recorded. Among the primates, *Macaca mulata* and *Nycticebus bengalensis* are recorded. Among others *Muntiacus muntjak*, *Viverricula sp.*, *Canis aureus*, *Vulpes bengalensis* are mentionable.

In Naxatilla area 18 mammalian species are recorded. Among them *Macaca mulata*, *Hoolock hoolock*, *Nycticebus bengalensis*, *Muntiacus muntjak*, *Sus scrofa*, *Viverricula indica*, *Manis pentadactyla* are mentionable.

*Macaca mulata* is found throughout Inner-line reserve forest and increasingly commensal with humans, resulting in some fragmentation of the distribution (Molur et al., 2005). This species is diurnal and omnivorous, and alternatively arboreal and terrestrial. It resides in a range of habitats, including temperate coniferous, moist and dry deciduous, bamboo, and mixed forests, mangroves, scrub, rainforest, and around human habitations and developments, including cultivated areas, temples, and roadsides (Choudhury 2001b; Srivastava and Mohnot 2001). The species is listed on Schedule-I of Part-I in the Indian Wildlife (Protection) Act, 1972 (amended up to 2002).
Macaca assamensis is diurnal and omnivorous, and at times both arboreal and terrestrial. It prefers dense forest (Choudhury, 2001a), and does not usually occur in secondary forest. This species is found from the floodplains to the high mountains, up to 2,800 meter, and sometimes even 3,000 meter in the summer (Choudhury, 2001b), and perhaps up to 4,000 m (Srivastava and Mohnot, 2001). This species is listed in Appendix II of CITES (Chetry et al., 2003). It is legally protected in all countries of occurrence. For the populations that reside in India, the species is listed under Schedule II, part I of the Indian Wildlife (Protection) Act, 1972 (amended up to 2002) (Chetry et al., 2003).

Trachypithecus payrei is an endangered species according to the IUCN. The species is rarely seen inside the reserve forest and is restricted in some specified location of south eastern part of.

Hoolock hoolock is also an endangered species according to IUCN. The species is observed only some isolated canopied forest of Inner-line reserve forest. This species is listed on CITES Appendix I and on schedule I of the Indian Wildlife (Protection) Act of 1972. Overall, it is found in 30 protected areas in India (Choudhury, 2001a). In all northeastern part, Indian primate populations are affected by harvesting of bamboos for paper mills, oil mining and exploration, and coal mining, which deplete habitat and cause pollution and disturbance (Choudhury, 2001b). Habitat fragmentation and loss are major threats for Hoolock hoolock in India (Molur et al., 2005).

Nycticebus bengalensis which is an arboreal, nocturnal species that inhabits tropical evergreen rainforest, semi-evergreen forest, and moist deciduous forest,
observed in the Pancherra extension areas and also reported in the nearer Gamair Tilla areas. The species is vulnerable according to the IUCN. In India, it is listed in Schedule I, part I, under the Indian Wildlife (Protection) Act, 1972 amended up to 2002. The species has been recently transfer from Appendix II to Appendix I of CITES (Nekaris and Nijman, 2007).

*Cervus unicolor* was observed in the Loharbond areas of Inner-line reserve forest (later killed at Jogirbond areas by village people). The species is vulnerable (IUCN Status). In India, Sambar occurs widely in many areas having different habitat types. Large populations occur in well-secured protected areas; but nowhere the species are regionally abundant now (Sankar and Acharya, 2004). It has been recorded in 208 protected areas. Its distribution outside protected areas is now highly scattered.

The remnant of Barasingha (*Rucervus duvaucelii*) is observed in Seorarthal village. The species is vulnerable according to the IUCN. Habitat used by Sambar (*Cervus unicolor*) differs with Barasingha. Their differences are reflected in hoof morphology. Species of Brasingha (*Rucervus duvaucelii branderi*) of Central India occupy open sal (*Shorea robusta*) forest; whereas the species of Northern Indian part (*Rucervus duvaucelii duvaucelii* and *Rucervus duvaucelii ranjitsinhi*) are true swamp deer, inhabiting flooded tall grassland (Dunbar Brander, 1927; Johnsingh et. al., 2004).

*Muntiacus muntjak* is the species observed throughout the reserve forest and is ‘Least Concern’ according to IUCN. In some areas of Inner-line mainly in Seorarthal, Pancherra extension and Bag-o-bahar areas, this mammal is being observed in captive condition.
The Red Serow (*Capricornis rubidus*) was observed in the southernmost part of the Inner-line reserve forest. This part of the forest includes hillocks and terrain areas. Also this part has continuous patches with the high hill regions of the North Mizoram. People of this part of reserve forest like the Mizo, Hmar and Kuki tribes placed animal trap for haunting the wild animal. One such incident was highlighted in manifestation of anthropogenic activity inside the forest.

The *Capricornis rubidus* or the Red Serow (also called as Burmese Serow) is ‘Near threatened’ species according to IUCN. Taxonomy of serows is not completely resolved. Six species of Capricornis: (I) *Capricornis crispus* (Japanese Serow, restricted to Japan) (II) *Capricornis milneedwardsii* (Chinese Serow, but also occurring in south-east Asian countries) (III) *Capricornis rubidus* (Red Serow, restricted to Myanmar) (IV) *Capricornis sumatraensis* (Sumatran Serow, in Indonesia, Malaysia and southern Thailand) (V) *Capricornis swinhoei* (Formosan Serow, restricted to Taiwan, Province of China) and (VI) *Capricornis thar* (Himalayan Serow, along the Himalayan range) are reported till date (Wilson & Reeder, 2005).

In Inner-line reserve forest the animal is observed in much lesser altitude. The probable reason behind the phenomenon may the leg injury of the animal. Due to the hind leg amputation, the animal come down to a lesser altitudinal places and died.

*Hystrix brachyura* is another ‘Least-Concern’ (IUCN status) mammal found throughout the Inner-line reserve forest. It can be found in various forest habitats, and in scrubby, open areas close to forest. It can be found in agricultural areas, but needs to
have rocky outcrops or other areas in which it can create a den or dig burrows. It is protected by Schedule II of the Indian Wildlife (Protection) Act, 1972.

*Sus scrofa* is ‘Least Concern’ mammalian species according to IUCN. It was observed throughout the Inner-line reserve forest. This species is frequent in many parts of reserve forest and hunted for its meat.

*Manis pentadactyla* according to IUCN an endangered species. The species has been recorded in northeastern India from Sikkim eastward (Tikader, 1983). The remnants of this species are observed in many areas inside Inner-line reserve forest.

*Viverricula indica* or the Small Indian Civet, a ‘least concern’ species according to IUCN is observed everywhere in the Inner-line reserve forest and also the nearby villages. In India animals are caught for captivity for collection of ‘civet’, a fixative used internationally in the perfume industry and domestically for various purposes; even in areas of heavy collection, the animals remain common in the degraded forest, scrub and agricultural landscapes covering most of peninsular India. This species is hunted for its meat and scent (Gupta, 2004).

*Paradoxurus hermaphrodites* or the common Indian Civet is also ‘least concern’ species according to the IUCN. The species has a widespread distribution India (Krishnakumar and Balakrishnan, 2003). It is often victimized as a pest (Gupta, 2004).

*Viverra zibetha* a ‘near threatened’ species according to IUCN status is a observed in various parts of Inner-line reserve forest. Its diet consists of a wide range of animals,
including fish, birds, lizards, frogs, insects, scorpions (and other arthropods) and crabs, as well as poultry and garbage (Lekagul and McNeely, 1977). The population status of this mammal in India is listed on CITES Appendix III.

*Dremomys lokriah* along with *Callosciurus pygerythrus* are the two squirrel species observed in the Inner-line reserve forest. According to the IUCN both the species are in 'least concern' categories. *Callosciurus pygerythrus* is listed in the Schedule II of the Indian Wildlife (Protection) Act, 1972.

*Lepus nigricollis* or the Indian hare is distributed throughout India, except the high reaches of the Himalayas and mangrove areas within the Sundarbans in the state of West Bengal. The geographic distribution extends into eastern Pakistan, southern Nepal, Sri Lanka, and Bangladesh excluding the Sundarbans (Flux and Angermann, 1990). It is thought to occur in Bhutan as well, but exact locations are not known (Chakraborty *et. al.*, 2005). This species can be found at elevations ranging from 50-4,500 m (Chakraborty *et. al.*, 2005). Major threats for *Lepus nigricollis* include habitat destruction and conversion of prime forest areas for agricultural purposes, as well as intensive hunting by locals for meat. Individual hares, especially the young ones living in the forest areas, are subjected to predation by carnivorous mammals and birds. *Lepus nigricollis* is also threatened by domestic predators, competition from livestock, and human set forest fires (Chakraborty *et. al.*, 2005).

*Canis aureus* and *Vulpes bengalensis* are also observed throughout the Inner-line reserve forest and also the neighbouring village areas that are situated outside the boundaries of forest areas. They are observed throughout the undulating plain, hillock
and high hill regions of Inner-line reserve forests. *Canis aureus* is included in CITES Appendix III (in India). Jackals are enlisted on Schedule III of the Wildlife Protection Act (1972) of India and are afforded the least legal protection (mainly to control trade of pelts and tails). *Vulpes bengalensis* populations of India are listed on CITES Appendix III. The Indian Wildlife (Protection) Act, 1972 as amended up to 1991; prohibits hunting of all wildlife and enlisted the Indian Fox in Schedule II.

*Herpestes javanicus*, a ‘least concern’ species as per IUCN status, are found in the reserve forest. This mammal is enlisted under CITES Appendix III in India (as *Herpestes javanicus auropunctatus*).

*Herpestes edwardsii* or Indian Grey Mongoose is listed on CITES Appendix III in India (Wozencraft, 2005). In 2002 in India, the government upgraded the Mongoose species, to Part II of Schedule II of Wildlife (Protection) Act, 1972. This species is observed in some areas inside the Inner-line reserve forest.

*Platanista gangetica* an ‘Endangered’ cetacean as per IUCN status is reported in ‘Rukni’ river. According to the fisherman, these mammals were found in the various parts of ‘Rukni’, ‘Sonai’ and the river ‘Barak’ that flows through the far eastern boundaries of the Inner-line reserve forest. It is recorded in the Kalni-Kushiyara River of Bangladesh (Smith et al., 1998). They are killed and their body oils are used as fish bait by the fisherman. Deliberate killing for meat and oil was a traditional and widespread practice until at least the early 1970s (Pilleri and Zbinden, 1973-74). Field trials have shown that shark or fish oils would be efficient substitutes for dolphin oil as a fish attractant and some fishermen in the middle Ganges are now using oil made from fish.
scraps as an alternative, most apparently continue to use dolphin oil by preference or because suitable alternatives are not widely available in either the Ganges or Brahmaputra systems (Mohan and Kunhi 1996, Smith et al., 1998, Bairagi 1999, Sinha 2002).

*Lutrogale perspicillata* is also reported in the Loharbond and Seorarthal areas. The species is vulnerable as per IUCN status. The species is distributed throughout South Asia and Southeast Asia. Its distribution is continuous from Indonesia, through Southeast Asia, and westwards from southern China to India and Pakistan (Medway 1969, Hussain 1993). Since 1977, the smooth-coated otter is listed on Appendix II CITES.

*Pteropus giganteus* is a 'Least concern' species as per IUCN, and observed in many places in the Inner-line reserve forest. This mammal is listed as vermin under Schedule V of the Indian Wildlife (Protection) Act, 1972.

*Rousettus leschenaultia* is a 'Least concern' species as per IUCN status and classified as a vermin under Schedule V of the Indian Wildlife (Protection) Act, 1972.

*Taphozous longimanus* is another 'least concern' chiropteran and reported from Inner-line reserve forests.

In a view, mammalian fauna of Inner-line reserve forest is yet diverse and are dominated by several species such as *Macaca mulata, Pteropus giganteus, Dremomys lokriah, Canis aureus* etc. Dominance indices of various mammalian species are given in figure 19.
Fig. 19: Berger Parker index of dominance of different mammals of Inner-line Reserve Forest, Cachar.
A. Stuffing of *Viverricula indica* at Naxatilla

B. *Cervus unicolor* killed at Jogirbond

C. *Muntiacus muntjak* in captivity

(clockwise from top left)
A. *Nycticebus bengalensis* in captivity at Pancherra

B. Injured *Capricornis rubidus* (left leg amputed)

C. Antlers of *Cervus duvauceli*
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