CHAPTER -III

MATERIALS AND METHODS

Study area:
Location and area

The Poba Reserve Forest is the only protected area in Dhemaji district of Assam which is located at the extreme eastern corner on the north bank of Brahmaputra in Jonai sub-division of the district. The RF covering a total area of ca. 10,129.14 hectares falling both in Assam and Arunachal Pradesh. Major part of an area of ca 6790.02 hectares is in the Dhemaji district of Assam and the rest of ca 3339.12 hectares in the East-Siang district of Arunachal Pradesh. The RF is located in between North latitudes 20°45'04" to 27°52'53" and East longitudes 95°15'36" to 95°20'39". The RF is surrounded by the Silli River in the north, Bankujan River in the south, Lali River in the east and the Leku River in the west (Map I and II).

Physiography and drainage

PRF consists of plains and hilly areas. Altitude varies from 100-275 m above sea level. The RF is surrounded by Silli, Bankujan, Lali and Leku river. A few perennial water bodies are also dotted the area. Along the interstate boundary between Assam and Arunachal Pradesh which start from a point Latitude 27°19'06" North and Longitudes 95°51'37" in a straight line to the point at Latitude 27°51'53" North and Longitudes 95°19'59" East, thence along Silli river to a point at Latitude 27°51'45" North Longitude 95°19'23" East. Thence along the right bank of Silli river downwards to the junction to where the Bankujan takes off from Silli river, at latitude 27°45'59" North and longitudes 95°19'38" East. Thence to Lali river it meets Silli river.

(Source: Department of Forest, Assam)

Geology and soil: Geologically, PRF is recent origin and belongs to the Archaean Group. The area is in the Brahmaputra Valley of Assam and present configuration of which is the result of uplift and subsidence of different blocks of Precambrian Crystalline. The Pleistocene deposits are represented by grey and buff coloured fine to medium grained semi consolidated sandstone alternating with bands of grey to dark grey siltstone and clay found in discontinuous patches. The geological formation consists of recent river
deposits or Newer Alluvium consisting of clay, fine and silts and followed by Pleistocene older or high level alluvium of clay coarse sand, shingle gravel and boulder deposits.

The soil of the RF is acidic in nature and texture is alluvial. The $pH$ value ranging from 6.75-6.92. Mostly composed of clay loam with fine sand and silt.

**Table 1**: Soil analysis of PRF.

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<th>Sl. No</th>
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<tr>
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<td>Bulk density</td>
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</tr>
</tbody>
</table>

(Source: CSIR NEIST, Jorhat, Assam)

**Climate**

The type of vegetation meet within an area depends on the climate, soil and biotic factors. Temperature, rainfall and relative humidity govern the climate. The climate of the RF is warm and humid with dry cold season. During the study period (2010-2012) the average annual rainfall ranges between 2500-1501 mm with heavy precipitation during the month of May to August. The average maximum temperature was 37°C and average minimum temperature was 6°C (as in Fig. 1). The average relative humidity varies from 53%- 92% respectively (as in Fig. 2). The very low rainfall is experienced during the months of November to January (as in Fig. 3).

On the basis of the trend, tendency and distribution of temperature, rainfall, fogs and thunder storms, the weather of the RF can be grouped in to four conspicuous seasons: Winter season, Premonsoon season, Monsoon season and Retreating monsoon season.

**Winter season**: The month of December to February constitute the winter season. December to January are the driest months while January is the coldest.
MAP I. LOCATION MAP OF THE STUDY AREA. (Source: NESAC, Shillong, Meghalaya)
MAP II: MAP OF POBA RESERVE FOREST. (Source: NESAC, Shillong, Meghalaya)
month. The average temperature ranges between 6°-8.25°C. During this period foggy days are more and rainfall is less and irregular.

**Premonsoon season:** The month of March, April and May constitute the premonsoon season in the area. From March, the land surface is steadily heated and the temperature rises from the April, the fogs disappear and characterized by occasional thunderstorms. During the period average temperature ranges between 11.25°-37°C.

**Monsoon season:** The period between June to September constitute the monsoon season. With the onset of monsoon in early June, heavy rainfall occurs and the temperature is considerably lowered. The average temperature ranges between 20.5°-36.5°C and average rainfall in the area is about 15mm. Thunderstorms are the most conspicuous character of this season.

**Retreating monsoon season:** After the withdrawal of monsoon in the last week of September, the cool northeasterly winds starts blowing from the first week of October. Rainfall abruptly decreases. With the advancement of the season the ground cooling begins and morning fogs disappear.

**VEGETATION**

The vegetation and forest type of Assam has already been outlined by workers like Griffith 1847, Hooker 1904, Kanjilal *et al.* 1934-40, Sengupta 1937, Das 1942, Rowntree 1953, Kingdon Ward 1960, Puri 1960, Rao and Panigrahi 1961, Rajkhowa 1961, Cham Untitled Folderpion and Seth 1968, Das and Rajkhowa 1968, Rao 1974, Hajra 1980, Borthakur *et al.* 2001, etc. But there has not been any specific mention about the vegetation of PRF in particular. Of late, Boruah *et al.* (2003) from Assam Remote Sensing Application Centre, Guwahati on the basis of Satellite Remote Sensing Technique classified the vegetation cover of the RF into five types i.e. moist mixed semi-evergreen forest, moist mixed deciduous forest, degraded forest, tall grasses and small grasses. Based on field observations and depending on the physiography and climate, the overall vegetation and forest types of the RF can be broadly classified into-

1. Tropical evergreen
2. Tropical semi-evergreen
3. Tropical moist deciduous
4. Riparian forest and
5. Grassland.
6. Hydrophytes or Aquatic Vegetation

1. **Tropical Evergreen forest**: This type of forest is occurred in the hilly regions situated along the northern boundary of PRF. Tree species like *Altingia excelsa* Norenha, *Artocarpus chama* Buch.-Ham., *A. lacucha* Buch.-Ham., *Canarium bengalensis* Roxb., *Dysoxylum binectariferum* Hook.f. et Bedd., *Mesua ferrea* L., *Stereospermum chelonoides* (L.f) DC. and *Michelia doltsopa* DC., *Vatica lanceaeefolia* Blume are form the main canopy and primarily dominate this forest type. Smaller trees and shrub species including *Bauhinia purpurea* L., *Cinnamomum bejolghota* (Buch.-Ham.) Sweet., *Ixora acuminata* Roxb., *Saurauia roxburghii* Wall., *Pavetta indica* L., are also common. Various climbers and lianas like *Acacia oxyphylla* Graham ex Craib., *Combretum roxburghii* Spreng., *Pothos scandens* L., *Thunbergia grandiflora* Roxb. are associated with the trees. Several species of Palm like *Calamus spp.* and *Pinanga gracilis* Blume are common in damp slopes. Along the river bank *Cyathea gigantea* (Wall.,ex Hook.) Holtt. and *Angiopteris evecta* (Frost.) Haffm. are also commonly found.

2. **Tropical Semi evergreen forest**: Tropical semi-evergreen forest is the most common type of forest found in the RF. The common tree species in this forest type are *Albizia lebbeck* (L.) Benth., *A. procera* (Roxb.) Benth., *Dillenia indica* L., *Gmelina arborea* Roxb., *Magnolia hodgsonii* (Hook. f and Thomson) Keng, *Phoebe cooperiana* Kanjilal and Das, *P. goalparensis* Hutch., *Toona ciliata* Roem., *Tetrameles nudiflora* R. Br., *Sterculia villosa* Roxb., etc. Other small tree species viz. *Bauhinia purpurea* L., *Callicarpa arborea* Roxb., *Mallotus philippensis* (Lam.) Muell.- Arg. are also grown profusely in this forest. Epiphytic plants such as *Aeschynanthus acuminata* Wall. ex DC., *Asplenium nidus* L., *Cymbidium aloifolium* Sw., *Dendrobium aphyllum* C.E.C.Fisch., *D. moschatum* (Buch.-Ham.) Sw., *D. nobile* Lindl., *Hoya parasitica* Wall. are commonly available in most of the tree species. The undergrowth of this forest is very rich and diverse. Species like *Alpinia nigra* (Gaertn.) Burtt, *Clerodendrum viscosum* Vent., *Coffea bengalensis* Roxb., *Costus speciosus* (Koen.) Sm., *Holmskioldia sanguinea* Retz., *Leea*
crispa L., Litsea spp. Morinda angustifoia Roxb., Phlogacanthus thyrsiflorus (Roxb.) Nees are very common.

3. Tropical Moist deciduous forest: Moist deciduous forest is dominated by many species like Bischofia javanica Blume, Bombax ceiba L., Dalbergia sissoo Roxb. ex DC., Duabanga grandiflora (Roxb. ex DC.) Walp., Lagerstroemia speciosa (L.) Pers. Pterospermum acerifolium (L.) Willd., Pterygota alata (Roxb.) R.Br., Sterculia villosa Roxb., Trewia nudiflora L., Zizyphus mauritiana Lamk. etc. Antidesma acidium Retz., Boehmeria macrophylla D. Don., Buddleja asiatica Lour., Clerodendrum serratum (L.) Moon., C. viscosum Vent., Litsea salicifolia (Roxb. ex Nees) Hook. f., Maesa indica (Roxb.) Wall., Mussaenda roxburghii Hook. f., etc are also growing in association with these tree species. Here Mikania micrantha Kunth., Dioscorea pentaphylla L., Smilax perfoliata Lour., Stephania japonica (Thunb.) Miers. etc. are also found to associate with the tree and shrub species. The ground cover is mainly composed of under shrubs, herbs, with different fern species etc. Characteristic floristic elements of the ground cover are Ageratum conyzoides L., Alternanthera sessilis (L.) R. Br. ex DC., Impatiens tripetala Roxb., Chenopodium album L., Cassia sophora L., Eranthemum strictum Colebr. ex Roxb. Solanum ferox L., Solanum torvum Sw., Spilanthes paniculata DC., Urena lobata L., etc. Fern species commonly found in this forest are Diplazium esculentum (Retz.) Sw., Pteridium aquilinum (L.) Kunh., Equisetum spp.

4. Riparian Forest: As the RF is criss-crossed by many rivers, the riparian forest are primarily confined to various riverbanks and dominated by species like Albizia lebbeck (L.) Benth., Alstonia scholaris (L.) R. Br., Bischofia javanica Bl., Bombax ceiba L., Dalbergia sissoo Roxb. ex DC., Dillenia indica L., Duabanga grandiflora (Roxb. ex DC.) Walp., Lagerstroemia speciosa (L.) Pers. are found along with Leea asiatica (L.) Rids., Homonoia reparation Lour., Alpinia nigra (Gaertn.) Burtt, Typha elephantina Roxb. and Tamarix dioica Roxb. Various grass species are also common in this forest.

5. Grassland: Grassland comprises less than 10% of the total area of the RF and found in narrow stripes along the rivers. The common grass species that are growing abundantly are Arundo donax L., Imperata cylindrica (L.) P. Beauv., Phragmites karka Trin., Saccharum spontaneum (Nees) Haines,

6. Hydrophytic or Aquatic Vegetation: This type of vegetation occurs in perennial stagnant water bodies, ponds, beels, nalas, etc. A number of waterbodies locally known as Beel, Duba, Nala etc. have intersected in the plain forest areas of the RF. During rainy season almost all are full of water and water levels decreases slowly as winter season begins. Aquatic angiospermic herbs viz. Nymphaea nouchali Burm. f., N. pubescens Willd., Nelumbo nucifera Gaertn., Trapa natans L., Typha elephantina Roxb., Eichhornia crassipes (Mart.) Solms, Pistia stratiotes L., Lemna perpusilla Torrey, HydriUa verticillata (L.f.) Roye, Ottelia alismoides (L.) Pers, Vallisneria spiralis L., Potamogeton crispus L., Monochoria hastata (L.) Solms, Ipomoea aquatica Forssk., ete occur in different water bodies of the RF. Some other species viz. Alpinia nigra (Gaertn.) Burtt., Aeschynomene indica L., Alternanthera philoxeroides (Mart.) Griseb., Rotula aquatica Lour., Homonoia riparia Lour., Ludwigia adscendens (L.) Hara, Frimbristylis bisumbellata (Forsk.) Bub., Polygonum spp., Arundo donax L., Phragmites karka (Retz.) Steud., Saccharum spontaneum L., etc are growing in the marshy or swampy areas of the RF. Some tree species viz. Antidesma acidum Retz., Barringtonia acutangula (L.) Gaertner are also common in the swampy ares. Salvinia natans (Linn.) Allion., Azolla pinnata Roxb.
Fig. 1. Monthly average temperature (°C) 2010-12.

Fig. 2. Monthly average Relative humidity (%) 2010-12.

Fig. 3. Monthly average Rainfall (mm) 2010-12.
Field and herbarium methods

The present account on floristic diversity of PRF includes all higher plants of aquatic, marshy or semi aquatic, terrestrial, epiphytic, parasitic in nature, including Pteridophytes present in the territorial boundary of the park. The work is based on extensive collection made regularly from all parts and corners of PRF. The area visited periodically covering all the seasons during 2010-2012.

In the field, while collecting the plants, the morphological characters which cannot be studied from the dried specimens like colour, arrangements of plant parts, habit, habitat, etc. have been recorded in the field book. Aquatic plants were collected and preserved in F.A.A for dissection along with dry specimen. All the herbaceous plants, grasses and sedge were collected along with their root system.

The whole process of collection, pressing and preparation of herbarium specimens was in accordance to the conventional herbarium techniques (Jain and Rao 1977). The filed data has been incorporated on the herbarium sheets and the specimens, on which this study is based, deposited in herbarium house GUBH located at department of Botany, Gauhati University.

Provisional identification of the specimens were made by comparing own field descriptions and observations with the descriptions available in authentic literatures, counter checked and confirmed by consulting authenticated herbarium sheets preserved in ASSAM herbarium, Shillong, Herbarium of Arunachal Field Station (ARUN), Herbarium of State Forest Research Institute, Itanagar, Arunachal Pradesh. All the earlier collections deposited at GUBH have also been consulted during the study.

In presenting the account of the floristic diversity of PRF, the families of Flowering plants are arranged according to Bentham and Hooker’s System (1862-1883) of classification with modification adopted in Kew and British Museum (Natural History) and Pteridophytic families are arranged according to Pichi-Sermolli’s Classification (1977).

The taxonomic treatment includes explicit keys to families, genera and species along with detailed description for each species. The descriptions of species were made from either herbarium and/or from live specimen or from
both. The arrangement of genera under each family and species under each genus are arranged alphabetically.

ICBN (International Code of Botanical Nomenclature) and other recent monographic and revisionary works on different taxa have been consulted for updating the nomenclature of the taxa. Original citations of both accepted names and synonyme (s) are provided.

For the correct names of the taxa, several works (Raizada 1948, 1959, 1966 and 1968; Bennet 1987 and Karthikeyan et al. 1989) have been consulted and in some cases Flora of India (1993-1995) has been followed.

Distribution of the species in the world and in India are worked out from literature and provided after the description of each species. Flowering and fruiting and occurrence in the park are also mentioned along with each species. Uses are also mentioned wherever applicable. Status of RET and Endemic, Monotypic and Primitive species are provided. Local name such as Assamese, Bodo, Mishing, Mikir, etc are also provided along with some species. Illustrations based on both voucher specimens and live materials of some selected species are also provided. Habitat photograph of some species are also included.

In the text the following abbreviations, wherever necessary, are used:

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