3.1 Botanical History of the state and Literatures review

Meghalaya have been a focal point of floristic attraction for a number of botanists and horticulturists. The history of these early collectors has been summarised by Burkill (1965) and for Meghalaya by Balakrishnan (1981-83). The first plant collector from this region seems to be M.R. Smith who held a magisterial post in Sylhet in the present Bangladesh. Some of his collections were later studied by William Roxburgh. Some other early collectors from this part included Buchanan-Hamilton (1820), David Scott (1826-30), Sir Francis Jenkins (1834-35), Gibson (1837) and T. Lobb (1848). Apart from his own collections, Sir Francis Jenkins was also the driving force behind the famous Assam Tea delegation, which included N. Wallich and W. Griffith. The former collected a number of representative plants from Khasi Hills in order to establish the occurrence of wild tea plant in this region (Wallich, 1820-32; Griffith, 1847).

The largest plant collections made from this region are those of J.D. Hooker and T. Thomson, who spent about 7 months in 1851 for collecting for their flora "Flora of British India". A set of most of their collections are deposited in CAL herbarium. Their collections and observations made on the flora of this region resulted in a number of monumental publications (Hooker, 1854, 1872-97, 1904).

C.B. Clarke had made significant contributions in studying the flora of Meghalaya and adjoining areas towards the completion of Hooker’s 'Flora of British India' (1872-97). Gustav Mann, a conservator of forests in Assam (1863-81) was the first to make organised collection mainly for understanding the rich forest flora of North-Eastern India. He was succeeded by U.N. Kanjilal, P.C. Kanjilal, A. Das, C. Purkayastha and R.N. De, all forest officers and resulted in the publication of 'Flora of Assam' (934-40). Apart from contributing an account of grasses of Assam for Kanjilal’s ‘Flora of Assam’, N.L. Bor (1982) has made elaborate collections particularly grasses from North-Eastern states of India. He


A review of literature reveals that the earlier few plant collection trips were made from Garo hills were by Kumar & al. (1980), Rao and Shanpru (1980), Rao & Haridasan (1982 & 1983), Haridasan and Rao (1985-87), Chauhan (1983), Das and Deori (1983), Mohanta & al. (2010), Singh & al. (2011). Apart from floristic works, some ecological works have also been done in the area by Sharma (2003), Prabhu (2004), Tripathi & al. (2008), Ralte (2004), Ashutosh (1998), Singh and Mudgal (1999 & 2000), Singh and Singh (2002), Barik (2006) and Kumar (2006). However, no detail floristic studies of Garo Hills in general and NBR has been made so far.

### 3.2 Field and Herbarium methods

The present work on 'Arboreal Flora of Nokrek Biosphere Reserve, Meghalaya' included trees, scandent shrubs, lianas, creepers, climbers, epiphytic and parasitic species including epiphytic Pteridophytes present within the boundary of Nokrek Biosphere Reserve. The work is based on extensive field
collection made regularly and periodically covering all the seasons during 2007-2010 from all parts of NBR.

While collecting herbarium specimens in the field, the morphological characters like colour (flowers & fruits), arrangements of plant parts, habit, habitat, ecology and occurrence, local names and data on ethno-botany were recorded in the field books. Live plants collected were grown in garden attached to Botanical Survey of India, Eastern Circle, Shillong and Experimental Botanic Garden at Barapani for detail morphological and phenological studies. In this regards methodologies of field and herbarium techniques suggested by Jain & Rao (1977) were followed.

The taxonomic judgements are based on critical studies of 1498 field numbers represented by about 4200 herbarium specimens collected from NBR during 2007 - 2010. Eight survey and exploration trips covering 108 days were undertaken to different parts of the biosphere reserve (Map 6). The detail of the field tours undertaken and area surveyed during the course of study is given in Table 8.

**Table 8. Detail of the field tours undertaken during the course of study (w.e.f. January 2007-June 2010).**

<table>
<thead>
<tr>
<th>Field Tour undertaken</th>
<th>Period of visit</th>
<th>Total field numbers collected and area examined</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st field tour</td>
<td>21.02.2007 to 12.03.2007</td>
<td>Collected 453 herbarium specimens and 24 live plants. Area surveyed during this tour is: Daribokgre, Khalakgre, Nokrek National park, Nokrek Peak, Chandigre, Oragitok, Tura Peak and Rongokma.</td>
</tr>
<tr>
<td>2nd field tour</td>
<td>29.06.2007 to 18.06.2007</td>
<td>Collected 177 herbarium specimens and 17 live plants. Area surveyed during this tour is: Bandari fall, Chigisingre, Chokpot side, Ridigsi fall, Oragitok view point, Foot hills of Tura Peak, Durabandagre, Rongpingre and surrounding areas of the above villages.</td>
</tr>
<tr>
<td>3rd field tour</td>
<td>19.10.2007</td>
<td>Collected 326 herbarium specimens and 09 live plants.</td>
</tr>
</tbody>
</table>
4th field tour 08.04.2008 to 24.03.2008
Collected 241 herbarium specimens and 12 live plants.

Area surveyed during this tour is: Daribokgre, Beyond Oragitok, Rongsingiri, Nokrek peak, inside Nokrek National park, Nokrek peak from Williamnagar side, Sisubibra, Dilchim stream, Dolwarigre, Simasang from Daribokgre site and surrounding areas of the above villages.

5th field tour 07.02.2009 to 26.01.2009
Collected 165 herbarium specimens and 14 live plants.

Area surveyed during this tour is: Nibokgre, Sabokgre, ingmandalgre, Ningsangiri, 20 km beyond Simsanggre, inside 10 km Rongrengiri, Bansamgre and surrounding areas

6th field tour 14.05.2009 to 07.04.2009
Collected 126 herbarium specimens and 08 live plants.

Area surveyed during this tour is: on way to Patalgre, Patalgre, Nabogre, Rongsingiri, williamnagar side, Khalakgre, Bawegre, Sabokkgre and adjoining areas of the cited villages.

7th field tour 28.10.2009 to 23.10.2009
Collected 13 herbarium specimens and 02 live plants.

Area surveyed during this tour is: Citrus gene Sanctuary, Chandogre, Nokrek Peak and adjoining areas, Durabandagre, Mandalgre and adjoining areas, 8 km along Simsang river, Chandigre, Khalaggre, approach from Williamnagar side, Chokpot side and adjoining areas

8th field tour 25.05.2010 to 02.06.2010
Collected 21 herbarium speciens

Area surveyed during this tour is: Nokrek Peak, Citrus Sanctuary, Adugiri, Mandalgiri and adjoining areas.
Map 6. Nokrek Biosphere Reserve showing area surveyed during study period
(w.e.f. January 2007 to December 2010)
The whole process of collection, pressing and preparation of herbarium specimens was done in accordance to the conventional herbarium techniques (Jain & Rao, 1977). The field data has been incorporated on the herbarium sheets and the specimens, on which this study is based, deposited in the ASSAM herbarium at the Eastern Circle of Botanical Survey of India, Shillong and the herbarium of Botany Department in Gauhati University.

3.3 Evaluation of Data

For preliminary identification of the collected plant samples the existing herbarium collections deposited in ASSAM were consulted, and species lists were prepared both family-wise and genus-wise.

Considering the importance of interesting species and their distribution, following herbaria were consulted:

1. North-Eastern Hill University (NEHU), Shillong.
2. Forest Research Institute (DD), Dehradun.
3. Botanical Survey of India (ASSAM), Shillong.
4. Botanical Survey of India (BSD), Dehradun.
5. Gauhati University (GU), Gauhati.
6. Central National Herbarium (CAL)

Herbarium deposited at NEHU and ASSAM were consulted thoroughly due to possibility of getting old collections from the area of present study deposited there.


For studying the epiphytic Pteridophytes, literatures dealing with the Indian Pteridophytes, such as that of Baker (1887), R.H. Bedome (1865-1870), Bir (1987), Baishya & Rao (1982), R.D. Dixit (1984), S.Singh & G.Panigrahi (2005), C.R. Fraser-Jenkin (2008) and S.K.. Borthakur (2001) were consulted.

### 3.4 Presentation of the Present Account

In presenting the account of the ‘Arboreal Flora of Nokrek Biosphere Reserve, Meghalaya’ the families of the flowering plants are arranged according to Bentham & Hooker’s System (1862-1883) of classification with modification adopted in Kew and British Museum (Natural History). The Gymnospermous families are arranged as per Melchior and Werdermann’s System of classification (1954). The Pteridophytic families are arranged according to Pichi-Sermolli’s classification (1977, 1981) with slight modification. First few fern-allies families are enumerated followed by true ferns.

Taxonomic treatment includes artificial keys to families of Dicots, Monocots and Pteridophytes. Each family name is followed by the number of genera in a family and their distribution in the World, India, Meghalaya and in NBR. This is followed by key to genera under the family, citation of the genera and number of species in the genera. The arrangement of genera under each family and species under each genus are arranged alphabetically. Within genera includes the key to species (if more than one). Accepted name of the species is followed by original citation, followed by basionym (if any) and synonym (s).
Local names of the plants, if any, viz., Garo (G), Khasi (K), Jaintia (J), English (Eng.) are provided.

For correct name of the taxa and citation, works of Raizada (1948 & 1968), Bennet (1987), Karthikeyan & al. (1989) have been consulted. Accepted and valid names of plants were checked in Index Kewensis, Tropicos & Authors name by Brumitt & Powell (1992). Taxonomic Literature and its supplement by Stafleu & Cowan, Vol. I-VII (1976-1988) were consulted. Recent publications of Botanical Survey of India such as Flora of India, Vol. 1, 2, 3, 4, 5, 12 & 13 (1993-1995), Flora of Mizoram (2002), Fern and Fern-allies of Arunachal Pradesh (2005) and Materials for Flora of Arunachal Pradesh (2008) were also consulted.

The descriptions of species were made from herbarium and/or from live specimens or from both. The data recorded in the field during field work were also incorporated while making description.

Phenology (period of flowering and fruiting), habitat, occurrence in NBR, associated species (whenever possible). Distributions of the species in the World and in India are worked out from literatures and provided after the description and habitat of the species, while specimens examined are provided after the distributional note. Information gathered on uses from local inhabitants are also provided wherever possible. Status of RET, endemic and new record for the state and in Garo Hills are provided at the end. Photographs and/or illustration numbers are also provided in the text after completion of citation. Illustrations were made either from voucher specimens deposited at ASSAM and/or from live plants.