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FERN BIODIVERSITY AT NAGAON DISTRICT OF ASSAM

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Abstract: Nagaon is the most populous district of Assam and one of the largest in area. It is known as the rice bowl of Assam. Nagaon district spreads in 3993 sq. km having 28,26,006 populations, Kaziranga National Park and Lowkhowa Wildlife Sanctuary. Many ferns from tropical rain forests are epiphytes, which mean they only grow on other plant species. Pteridophytes, the seedless vascular plants, had a very flourishing past in dominating the vegetation on the earth about 280-230 million years ago. Although they are now largely replaced by the seed bearing vascular plants in the extant flora today. In view of variable climatic and altitudinal variations the Indian sub-continent represents Himalayas, Gangetic plains and Thar Desert as biodiversity centers. All the *pteridophytes* have economic importance. The *pteridophytes* grow in different habitats like moist or dry rocks and boulders, on tree trunks, as hydrophytes in lakes, ponds, etc., on forest floors and edges, along perennial streams and deep ravines, grasslands, tea and coffee estates, inside dark area, etc. The industrial sector growing day by day mainly cements plants in Nagaon District. Tree ferns need special attention for conservation.

Keywords: Biodiversity; Indicator; Nagaon; Nutrition; Pteridophyte.

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INTRODUCTION

Biodiversity refers to the variety of life forms at all levels of organization, from gene through species to higher taxonomic forms and also includes the variety of ecosystems and habitats as well the processes occurring therein. Biodiversity is fundamental to the fulfillment of human needs; a biodiversity rich region offers wide options and opportunities for sustaining human welfare including adoption to changes. India is one of the 17 Mega bio-diverse countries in the world and accounts for 7-8% of the recorded species. The climatic condition and wide variety in physical features witnessed in Assam have resulted in a diversity of ecological habitats such as forests, grasslands, wetlands, which harbor and sustain wide ranging floral and faunal species placing. The climatic conditions cause prevalence of not and

highly humid weather in this part of country and coupled with heterogenic physiography make possible luxuriant growth of a number of plant communities imparting Assam a distinct identity phyto-geographically, many a species are endemic to this region and it is also the center of origin for commercially important plants including Banana, Citrus, Mango, Zizyphus, and Tea. The array of floristic richness has prompted many a scholars to describe Assam as the Biological Gateway of North East. The eminent Plant Taxonomist and Plant Geographer Armen L. Takhtajan observed, Cradle of flowering plants lies in between Assam and Fiji. In the Revised Survey of Forest Types in India, Champion and Seth categorized as many as fifty one different forest types/ sub types for this region. But, the species diversity is so spectacular that it becomes often difficult to clearly identify

separate rich to existing plant formations. However, broadly speaking the forest in Assam can be described into following types/sub types.

- i. Tropical Wet Evergreen Forests.
- ii. Tropical Semi Evergreen Forests.
- iii. Tropical Moist Deciduous Forests.
- iv. Sub-tropical Broadleaf Hill Forests.
- v. Sub-tropical Pine Forests.
- vi. Littoral and Swamp Forests.
- vii. Grassland and Savannas.

Tropical Wet Evergreen Forests are found in the districts of Golaghat, Jorhat, Sibsagar, Tinsukia, Dibrugarh and in a narrow stretch in Lakhimpur and Dhemaji districts along foot hills. These forests also occur in the southern part of the State at lower elevations in Borail Range, and in Loharbund, Sonai, Longai and Dholia Reserve Forests in Cachar and Karimganj Districts. Nagaon district is bounded by Sonitpur district and the Brahmaputra River in the north, West Karbi Anglong and North Cachar Hills in the south, East Karbi Anglong and Golaghat district in the east. The major rivers are The Brahmaputra, Kalong, Sonai, Nanoi, Jamuna, Kopili and Barpani. There are several beels, marshy lands and swamps are there, these are in reality old abandoned channels of Kalong and Kopili rivers of Nagaon district. These are Marikalong, Potakalong/Haribhanga, Jongalbalahu, Samoguri beel, Urigadang and Nawbhanga. These beels are major unused resources of the district. There are nearly more than two hundred numerous marshy land exist here which should be used for development of the area. The soil is mainly clayey loam mixed with silt. The soil is acidic and pH varies from 4.36-6.86. The average annual rainfall remains around 2000 mm and about 70% occurs during June-September. The relative humidity varies between 65-95% and is lowest during the month of March. The present paper deals with the floristic diversity of the study site. The present study reveals the presence of 373 species of Angiosperms. The dicotyledonous plants belong to 74 families, 178 genera and 267 species, and the monocotyledonous to 18 families, 80 genera and 106 species. In addition to this 16 species of ferns were

identified these belong to 12 families and 15 genera. Poaceae is the largest family in the sanctuary followed by Euphorbiaceae and Papilionaceae as the 2nd and 3rd largest families respectively.

Biodiversity is the characteristics of nature and is the basis for ecological stability. Biodiversity refers to the variety and variability among living organization, the ecological complexes in which they occur, and the ways in which they interact with each other and their environment. At present, biodiversity is a result of a series of turnovers in the rate of evolution and extinction since the geological past. In an ideal world, all biodiversity conservation needs should be addressed without jeopardizing human aspirations for social and economic development. Thus, conservation is becoming the crisis discipline. Deciding what, where and for whom to conserve is an essential first step in managing the crisis. India has a rich and varied heritage of biodiversity, encompassing a wide spectrum of habitats from tropical rain forests to alpine vegetation to coastal wetlands. India figured with two hotspots; the Western Ghats and the Eastern Himalayas; out of 25 biodiversity hotspots identified by Myers (2000). In addition, India has 26 recognized endemic centers that are home to nearly one third of all the flowering plants identified and described till now. *Pteridophytes* are vascular plants and have leaves (known as fronds), roots and sometimes true stems, and tree ferns have full trunks. Examples include ferns, horsetails and club-mosses. Fronds in the largest species of ferns can reach some six meters in length. Many ferns from tropical rain forests are epiphytes, which mean they only grow on other plant species; their water comes from the damp air or from rainfall running down branches and tree trunks. There are also some purely aquatic ferns such as water fern or water velvet (*Salvinia molesta*) and mosquito ferns (*Azollaspecies*). *Pteridophytes* do not have seeds or flowers either instead they also reproduce via spores. The pteridophytes which dominated the earth during carboniferous are survived today by about 12,000 species comprising 305 genera. Amongst of which most numerous are the homosporous ferns

comprised of approximately 11,500 species, whereas rest 500 as fern-allies known globally. In India the Pteridophytes have been found to grow in almost all climatic zones under different habitats and represented by approximately

1200 species falling under 191 genera. In addition to species composition the Pteridophytes are very diverse in their habitat as well as occupancy (Page, 1997).

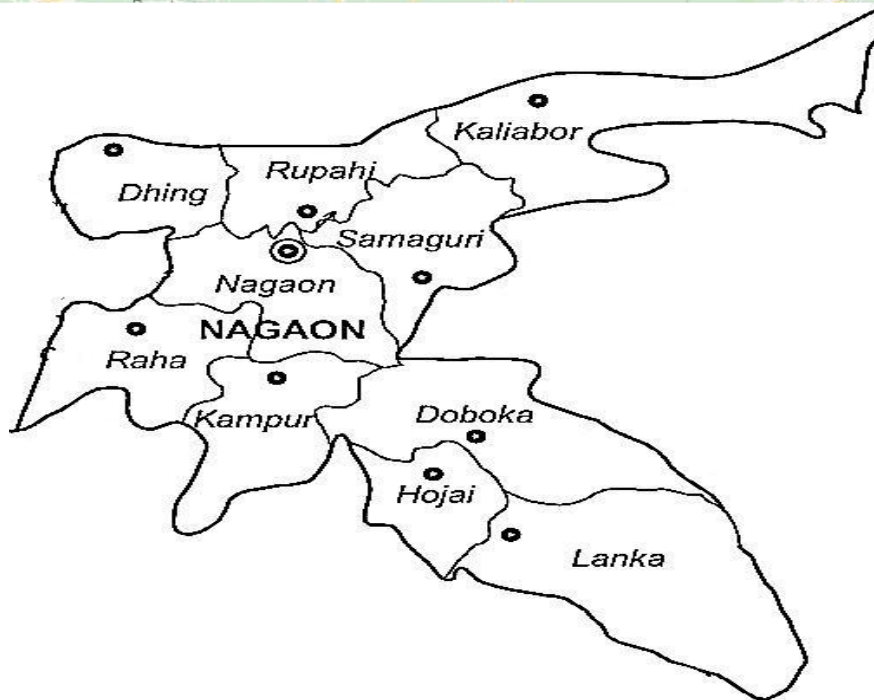


Figure 1. Map showing Nagaon District in Assam

EXPERIMENTAL

The baseline study, for the evaluation of the floral and faunal biodiversity of the terrestrial environment of the study area in Nagaon District has been conducted during 2013-2014.

This study was a part of Environmental Impact Assessment for Cement Units at Nagaon (Assam).

The primary objective of survey was to describe the floral and faunal communities

within the study area. The sampling plots for floral inventory were selected randomly in the suitable habitats within the study area. Emphasis has been placed on presence of endemic species, threatened species if any present in the study area. Desktop literature review was conducted to identify the representative spectrum of threatened species and floral communities listed by BSI (Kumar and Srivastava 2012; Kumar, 2013;2014); Kumar and Aggarwal 2013a;b; Kumar et al., 2013).

RESULTS AND DISCUSSION

The study area, Nagaon district, is agricultural land. The few villages in the study area are engaged in Paddy and Tea cultivation. Villages are scattered in between the large patches of agriculture lands especially for paddy due to heavy rainfall for six month. The tea garden was dominated over the study area. The tree cover in the study area is scanty restricted only in the habituated areas of the village and few along the boundary of the agricultural fields and road sides. It was observed that most of the villages in the study area was with large village beel (water bodies) used in rain water harvesting. One village was distributed in parts of two or three (tripartite) due to development of Tea Estate. The study area is also characterized by many water logged regions occupied by hydrophytes. Majority of the area covered in the present investigation was suitable of paddy crop and other part is developed for tea gardens. Almost entire south-east are occupied by forest, while north-west occupied by the large patch of scrub land with sparse population of *Areca catechu*, *Cocos nucifera*, *Bombax ceiba* and *Ficus religiosa*. The fern species were found near the water bodies.

Flora

Shrubs are the dominant perennials of this area, represented mainly-

- i. *Prosopis juliflora*,
- ii. *Lowsonia intermis*,
- iii. *Dichorostachys cinera*,
- iv. *Mimosa hamata*,
- v. *Calotropis procera*,
- vi. *Calotropis gigantea*,

- vii. *Maytenus emarginata*,
- viii. *Lantana camara*,
- ix. *Zizyphus nummularia*,
- x. *Cassia auriculata*,
- xi. *Ipomoea fistulosa*,
- xii. *Euphorbia nivulia*
- xiii. *Capparis decidua*.

The low lying area along the fringes of agriculture lands were dominated by thick ground cover of herbaceous species-

- i. *Hygrophila auriculata*,
- ii. *Echinops echinatus*,
- iii. *Tridax procumbens*,
- iv. *Xanthium strumarium*,
- v. *Cressa cretica*,
- vi. *Cyperus sps*
- vii. *Abutilon indicum*,
- viii. *Cortalaria meicaginea*,
- ix. *Indigofera oblongifolia*,
- x. *Tephrosia purpurea*,
- xi. *Tephrosia tinctoria*
- xii. *Phragmites karaka*,
- xiii. *Triumfetta pentandra*
- xiv. *Typha angustata*.

Aquatic Plant Diversity

The aquatic plants species belongs to diverse habits and have distinctive characteristics. More than 9 aquatic species have been identified and they can be described into following broad categories.

- ❖ Free floating hydrophytes: *Eichhornia crassipes*, *Lemna mino*.
- ❖ Suspended submersed hydrophytes: *Ceratophyllum demersum*, *Utricularia gibba*.
- ❖ Anchored submerged hydrophytes: *Hydrilla verticillata*, *Potamogeton crispus*, *P. pectinatus*.
- ❖ Anchored hydrophytes with floating shoots: *Ludwigia aquarium*, *Ipomea aquatica*.
- ❖ Emergent amphibious hydrophytes: *Sagittaria latifolia*.

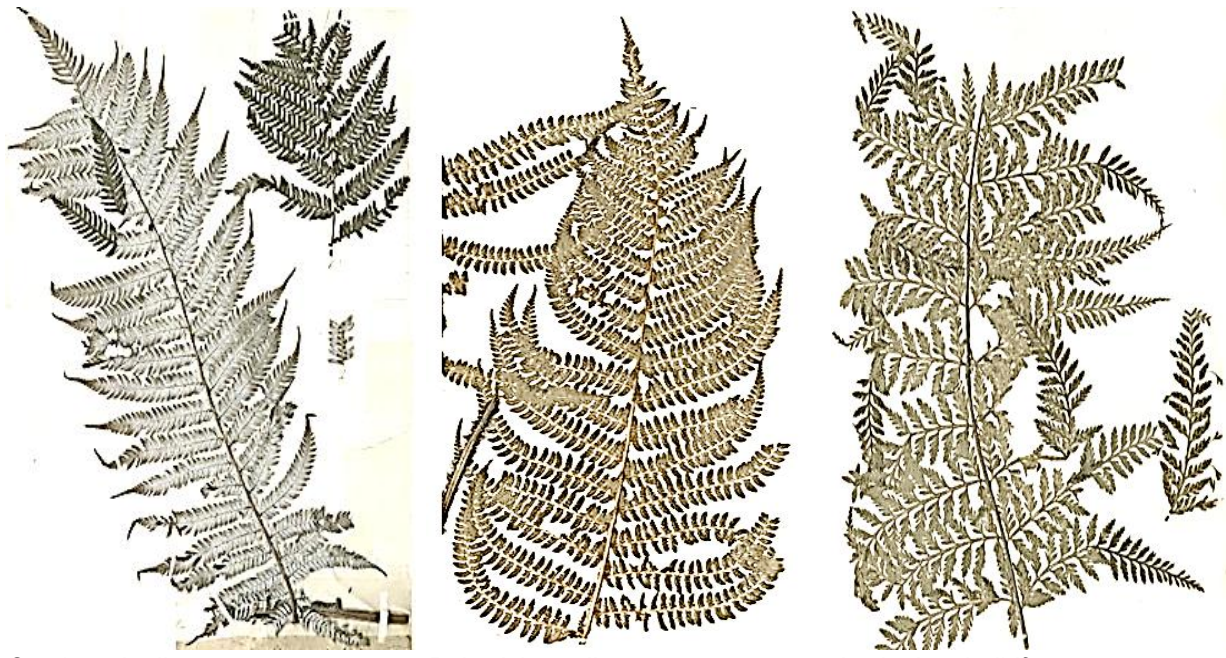
The IUCN Red List is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all

species and all regions of the world. With its strong scientific base, the IUCN Red List is recognized as the most authoritative guide to the status of biological diversity. Out of 17000 species of higher plants known to occur in India, nearly 614 higher plant species were evaluated by IUCN. Among them 247 species are under threatened category (IUCN, 2008). Among the enumerated flora in the study area, none of them were assigned any threat category by Red data book of Indian Plants (Jain and Sastry, 1984; Nayar and Sastry, 1987; 1988; 1990; Oldfield *et al.*, 1998; Kholia and Bhakuni, 2009) and Red list of threatened Vascular plants (IUCN, 2010). De Candolle (1855), Swiss botanist, first used the concept of Endemic, which is defined as an area of a taxonomic unit, especially a species which has

a restricted distribution or habitat, isolated from its surrounding region through geographical, ecological or temporal barriers. Out of 17000 species of known flowering plants of India nearly 5000 species are said to be endemic. Nearly 58 genera and 1932 taxa are found to be endemic to peninsular India (Nayar, 1980; Ahmedullah and Nayar, 1986; 1987; Jain 1992; Nayar, 1996; Vijaya Shankar *et al.*, 2005; Nautiyal *et al.*, 2009a; b; Shendage *et al.*, 2010). Tree community (Species-area) curves based on phytosociology fitted to the data may show unnatural shapes, with levelling-off or even decrease in sampling sizes higher than average. This distortion can be explained by the subjective, preferential method of field sampling used in phytosociology.



Figure 2. Images showing Mixed Flora: top left to right Water hyacinth and Lantana; down left to right silver fern and Bamboo



Cyathea dealbata

Polystichum discretum

Asplenium bulbiferum

Figure 3. Specimen of Ferns Spotted

CONCLUSION

The Nagaon district has a good diversity of Ferns. The industrial sector growing day by day especially cements plants in Nagaon District. The dust emission and air pollutants (PM, SO_x, NO_x) from Cements industries have adverse impact on ferns. The ferns are the indicator of vascular plant composition in rain forests. Ferns in general provide an ecological service as bio-indicators for habitat health because of their sensitivity and preference for temperature, humidity, soil type, moisture, pH, light levels, etc. Ferns thrive in a variety of habitats that flowering plants would often fail to dwell in such as tree limbs and rock crevices. Tree ferns need special attention for conservation.

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