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## STUDY OF THE VEGETATION AND FLORA OF RAJIV GANDHI WILDLIFE SANCTUARY, ASSAM

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### Introduction

Rajiv Gandhi Wildlife Sanctuary renamed from well known Orang Wildlife Sanctuary of Darrang district of Assam a well protected sanctuary from ravaging activities since 1st November 1972, when it came under Wildlife Regulation Act (1972) for protection and conservation. It is one of the finest sanctuaries of Assam, blessed by nature's bounty of natural resources, a repository of the World famous one horned Rhino (*Rhinoceros unicornis*), Tiger (*Panthera tigris*), Leopard (*P. pardus*), Asiatic elephant (*Elephas maximus*), Wildboar (*Sus scrofa-cristata*), Swamp deer (*Cervus duvaucelii duvaucelii*) and reptiles. This sanctuary is also an abode of a number of birds including Pelicans (*Pelecanus philippensis philippensis*) and Bengal Floricans (*Eupodotis bengalensis*) and a habitat of migratory birds. The vegetation and its floristic elements provide flood, fodder, shelter and camouflage of wild animals.

But it seems, it has not been given due attention by early plant collectors, although the State had the distinction of exploration work by a number of distinguished explorers since 1820. Only the casual references of plants have been made by Kanjilal *et al.* (1934-1940) and Bor (1940), Hooker (1872-

1897) and in 1970's by Rao and Verma. The reorganisation of B.S.I. with establishment of Regional headquarters at Shillong in 1956, made valuable collection upto the period of 31st May, 1966 and published (Rao-Verma, 1972-1982) their account in series with or without a reference of representation of the plant of the sanctuary. However, certain aspect of the work of this type has been presented by Jain and Hajra (1975) and later Hajra (1978). Sporadic contribution have also been made by Jain and Hajra (1975) on certain floristic elements of protected habitat in Assam as also by Kataki and Bourah (1989). This has necessitated the study of the Rajiv Gandhi Wildlife Sanctuary, Darrang, Assam.

### Physiography

The Sanctuary is situated 130 km away from Guwahati a flood plain of the mighty River Brahmaputra on its North Bank and its tributary Dhansiri which flow by the South-western part of the Sanctuary. Only the River Pachnoi - a tributary of Brahmaputra traversed with its branches through the heart of the Sanctuary. The Sanctuary covers an area of nearly 80 km<sup>2</sup> and lies between 26°30'N - 26° 40'N and 92°15'E-92°30'E and falls well within Darrang District with but a small area of Sonitpur district towards eastern fringe.

1994]

Study of the vegetation and flora of...

941

On the basis of soil character it may be possible to demarcate the Sanctuary into three different regions. The southern part of the Sanctuary nearly covering 60% of the area is low lying inundated annually by flood water of River Brahmaputra is of recent origin with sandy alluvial soil with a number of depressions, large or small, retained water even after receding flood water and formed Beels and marshy swamps - an ideal habitat for Rhinos. Some what older alluvial soil is found on the central part forming highland in between the two banks of the rivers Dhansiri and Pachnoi where most of the animals are found to take shelter during the flood extending from June to October. Whereas the Northern part is of older origin composed mostly of alluvial soil with as many as 26 man-made ponds of different geometrical shapes of early historical origin, the banks of which are covered with black porous soil enriched with humus. The altitudes ranges between 30 m to 80 m ASL.

### Climate

A sub-humid tropical area enjoys typical monsoon climate with average rainfall being 2500 mm with heavy precipitation during the months of June-September. The maximum and minimum temperatures are with annual average 41°C and 7°C respectively. The relative humidity has been found to be 50%-60% in southern part and central parts whereas it is nearly 90% in northern parts and more particularly in Old Orang Region.

### Observations

Since August, 1991, several collection trips have been undertaken and yielded as many as 669 field numbers to the present and revealed interesting findings not only its vegetation and composition of floristic elements but also food habit of Rhinos and

Wild-boars as well. The plant species that have so far been identified, representing 95 families comprising 322 genera and 450 species of Angiosperms; 10 families with 12 species of Ferns and Fern-allies and a single Gymnosperm. The family Poaceae with 45 species is found to be the largest (Table 1) in an area of c 80 km<sup>2</sup> where as Kataki and Bourah (1989) reported only 53 species from Manas Biosphere Reserve having core area of c 391 km<sup>2</sup>. Besides Grasses, a number ground orchids have been collected and discovered 2 new records of species from North-East viz., *Pecteilis triflora* and a peculiar pungent smelling *Habenaria graveolens*. Based on representation of number of species found in a family, the largest 11 families are shown in Table 1.

Table 1

Family	Number of Genera	Number of species
Poaceae	37	45
Papilionaceae	20	36
Asteraceae	28	33
Cyperaceae	6	26
Euphorbiaceae	13	17
Scrophulariaceae	10	14
Verbenaceae	10	12
Acanthaceae	8	12
Polygonaceae	2	12
Lamiaceae	10	10
Orchidaceae	8	10

The area broadly encompasses the vegetation of a Deciduous type in Natural forested land and mixed Deciduous type in man-made forest. the Natural forests comprise of the common tree species viz. *Sterculia villosa*, *Melia azadirachta*, *Toona ciliata*, *Diospyros binectariferum*, *Kydia calycina*, *Litsea monopetala*, *Albizia procera*, *A. lebbek*, *Callicarpa arborea*, *Biscofia*

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*javanica*, *Trema orientalis*, *Ficus nerifolia* var. *nemoralis* and in some places with a pure stand of *Semicarpus anacardium*, *Bridelia retusa*, *Oroxylum indicum* and *Mallotus philippensis* etc.; shrubby species along the edges of the forest and are commonly met with species like *Clerodendrum serratum*, *Abroma angusta*, *Micromelum minuta*, *Strebus asper*, *Litsea salicifolia*, *Leea asiatica*, *Indigofera hamiltonii*, *Sesbania aculeata*, *Solanum torvum*, *Lantana camera* var. *aculeata*, *Phyllanthus reticulatus* etc. whereas the ground cover in and around the forests are with the species of herbaceous in nature with both annual and perennial. The species are *Ageratum conyzoides*, *Bidens pilosa*, *Pouzolzia zeylanica*, *Polygala glomerata*, *P. chinese* var. *linifolium*, *Scoparia dulcis*, *Grewia assamica*, *Cassia tora*, *C. sophera*, *Youngia japonica*, *Rauvolfia serpentina* and in abundance of Fern *Cyclosorus parasiticus* is found to be quite common growing along with bulbous, rhizomatous herbs covering the forest floor, most common are *Curcuma zedoaria*, *C. montana*, *Costus speciosus*, *Alpinia nigra*, *Curculigo orchioides*, *Zingiber zerumbet* and *Hedychium* spp. The common ground orchids spp. occurring in the Sanctuary are *Geodorum densiflorum*, *Eulophia* spp., *Habenaria stenopetala* and *Nervilia juliana* etc. Along with these the parasitic species like *Helixanthera ligustrina* (Partial stem parasites on *Litsea monopetala*) and *Aeginetia* spp. (Total parasites on grass roots) are more common in the Sanctuary.

Bordering natural forested land and man-made forest and on highland consisting of Savannah Ecosystem with the association of *Imperata cylindrica*, *I. cylindrica* var. *koenigii*, *Erianthus ravennae*, *Arundinella nepalensis*, *A. decempedalis* interspersed with *Alpinia nigra*, *Hedychium* spp., gregarious growth of *Leea asiatica* and scarcely distributed tree species of *Acacia catechu*,

*Bombax ceiba*, *Anthocephalus chinensis* and *Zizyphus mauritiana* whereas low-lying area annually inundated by River Brahmaputra and its tributaries Dhansiri and over flowing of River Pachnoi, there is pure Grassland with association of *Themeda villosa*, *Arundo donax*, *Phragmatis karka*, *Erianthus ravennae*, *Apluda mutica* etc. attaining 3-5 m in height serving as hiding place and camouflage to wild animals. Along the edges of Grassland in marshy depression and perennial water reservoir, Beels where in abundance of low grasses and sedges. Among the grasses, the common palatable ones for herbivores are *Setaria pumila*, *Saccolpis interrupta*, *S. indica*, *Vetiveria zizanioides*, *Desmostachya bipinnata*, *Brachiaria ramosa*, *Agrotis zenkiri*, *Apocapsis paleacea*, *Hemarthria compressa*, *H. protensa* etc. Sedges are *Cyperus haspan*, *C. hyalinus*, *C. compressus*, *Scirpus juncoides*, *S. grossus*, *Carex phacota* etc. Along with these grasses and sedges, one will find plenty of *Polygonum* species viz. *Polygonum strigosum*, *P. flexuosum*, *P. orientale*, etc. Others which still retained water are with *Nelumbo nucifera* where Rhinos love of wallow.

At the riparian belt species of *Themeda*-*Erianthus-Imperata* association mixed sparsely with *Tamarix dioica*, *Crotalaria pellida* and a few tree species of *Acacia catechu*, *Zizyphus mauritiana* etc. and char areas of mainly *Imperata cylindrica*, *I. cylindrica* var. *koenigii* with *Arundo donax* just started settling and *Typha angustifolia* in small patches are found along the edges.

The prominent tree species in the man-made forest are with species like viz., *Michelia champaca*, *Dalbergia sissoo*, *Lagerstroemia reginae*, *Chukrasia tabularis*, *Gmelina arborea*, *Terminalia bellirica*, *T. arjuna*, *Phoebe gacapensis*, *Mangifera indica*, *Delonix regia*, *Dillenia indica* etc.

In the oldest area, for example "Azar Bagan" based on *Lagerstroemia reginae*, locally called 'Azar' sheltering epiphytic species like viz., *Papilionanthe teres*, *Dendrobium aphylleum* along with Fern species of *Microsorium punctatum* and *Drynaria quercifolia*; "Set simul" with *Bombax ceiba*. The investigation reveals magnificent Forest-Ecosystem with a variety of plant resources. Besides timber yielding plant, there are a number of medicinal plants growing luxuriantly in the forested land. Mention may be made of *Rauvolfia serpentina*, *Curcuma zedoaria*, *Costus speciosus*, *Holarrhena antidysenterica* etc. are found to be in abundance, whereas *Semicarpus anacardium* forming a pure stand, the fruits of which are utilized in preparation of indelible ink. On the other hand, along with grasses interesting finding of *Equisetum diffusum* and *E. ramosissimum* var. *debile* as these fern allies are very much palatable to *Rhinoceros unicornis* whereas Wildboar's love to devour bulbs, rhizomes and even bulbs of ground orchids viz. *Geodorum densiflorum* and species of *Eulophia*, *Habenaria* only when plants are fully matured enriched with storage products in their underground organs. A few patches of *Cynodon dactylon* a palatable grass for deer in savannah grassland and also patches of *Ipocapsis paleacea* and *Hemarthria conoressa*, *H. protensa* in wetland as well as in marshy depression observed to be more favorite ones for *Rhinoceros unicornis* as well. The study on the vegetation and its correlation of Flora and fauna have great importance in the study of the environment and its management.

As a result of cutting of grasses and trees found in the Sanctuary mainly for shelter for the winter year for better growth and development of herbivores. Studies made during the field visits have been worthwhile

and accordingly certain measures have been forwarded.

1. As the Sanctuary is located in a flood prone area nearly 50% or so, the Southern part remained under water at least from July to September annually. As such wild animals have to take shelter on Highland in the central part of the Sanctuary. At the time, the fodder grasses attain a height of 3-5 m that serves only the purpose of hiding but could not be utilized as fodder. The Herbivores love only sprouting tender leaves and for that they have to move out in search of food.

2. Lack of sufficient food and fodder during winter months as there is cessation of growth of fodder grasses coupled with annual burning resulted in the migration of Rhinos, Deers and Elephants to nearby settlements causing great harm to local inhabitants where they have to spend sleepless nights for protection of their crops.

Measures should be adopted so as to control the migration of Herbivores for search of food and fodder. That may be possible only when cutting and clipping of grasses are to be done at regular intervals just above the ground level retaining the first node and when they are found already more than a meter in height during the period from May to September and that too particularly in central part of the Sanctuary comprising 30% of high land. That may save 2-3 years of cutting on normal rate of 1.5 m. for grazing or 1.5 m. for cutting and clipping. The cutting and clipping should be done in a systematic manner so as to maintain the growth of grasses and its palatability to the animals.

3. Through burning is used, it promotes the growth of grasses but it destroys totally the herbaceous plants leaving only the bulbous, rhizomatous which penetrate deep

underground. Controiled burning after 2 or 3 years of some places of highland may be tried along with clipping and cutting at places where the soil retains moisture even in winter months.

A few patches of *Cynodon dactylon* - a palatable grass for Deers and found in Savannah Grassland - and absence of fruit trees like *Phyllanthus emblica*, *Spondias pinnata* and *Elaeocarpus floribunda* etc. may cause migration towards the crop land of local inhabitants residing at the out-skirts of the Sanctuary. Cultivation of these plants is suggested.

Moreover, abundance of *Leea crispata* with its gregarious growth may take up sufficient nutrients from the soil which result in deterioration of growth of grasses. Eradication of some, if not all, is suggested alongwith eradication of a semi-parasitic plant *Helixanthera ligustrina* which is a specific parasite only on *Litsea monopetala* (*L. polyantha*) a primitive indigenous plant of Assam found in and around Silburi Forest Range causing great damage to host and totally destroying it, is suggested.

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#### SUMMARY

Rajiv Gandhi Wildlife Sanctuary, renamed from well know Orang Wildlife Sanctuary, situated well within Darrang District with but a small area towards eastern fringes in Sonitpur district of Assam, lies between  $26^{\circ}30' - 26^{\circ}40'$  N and  $92^{\circ}15' - 92^{\circ}30'$  E covers an area of nearly 80 km<sup>2</sup>. A flood plain of River Brahmaputra and its tributary Dhangiri presents a sub-humid tropical area encompassing magnificent man-made forest of indigenous plant species (not less than 50 species) of Assam; natural forested land of deciduous species; savannak; extensive pure grasslands and luxuriant wetlands. An excellent habitat for endangered *Rhinoceros unicornis* and other wild animals. Based on several field trips conducted since August 1991, the authors collected as many as 668 in field numbers to the present, revealed interesting findings not only its vegetation and composition of floristic elements including 45 species of grasses, 26 species of sedges and number of ground orchids with 2 new records of species from North Eastern Region viz., *Pecteilis triflora* and a peculiar pungent smelling *Habenaria graveolens* but also on the food habit of particularly *Rhinoceros unicornis* and *Sus scrofa-cristata* as well. Besides grasses, most palatable amongst others for khios are *Equisetum diffusum* and *E. remosissimum* sub-sp. *debole* of Fern allies whereas Wildboar even love to devour matured bulbs of ground orchids like species of *Gordonia densiflorum*, *Euphorbia* and *Habenaria* etc. A variety of plant resources and its impact on growth and development of wildlife has also been highlighted in the paper.

राजीव गांधी वन्यप्राणी अभ्यारण्य, असम की वनस्पतियों और पेड़-पौधों का अध्ययन सुरेन्द्र शोहन नाथ व एस० चौधरी

सारांश

प्रसिद्ध ओरेज वन्यप्राणी अभ्यारण्य का नाम बदला हुआ राजीव गांधी वन्यप्राणी अभ्यारण्य, असम, जो असम के शोनितपुर जिले के पूर्वी तरफ की झालार के छोटे से क्षेत्र को छोड़कर लगभग सारे का सारा दारंग जिले में स्थित है,  $26^{\circ}30' - 26^{\circ}40'$  उत्तर अक्षेंश और  $92^{\circ}15' - 92^{\circ}30'$  पूर्व देशान्तर के बीच पड़ता है, 80 वर्ग किलोमीटर क्षेत्र में फैल हुआ है। ब्रह्मपुत्र और उसकी सहायक धनशी नदी की पूरे जल से वन मैदान उपआँधी उष्ण क्षेत्र है जिसमें असम की देशी पादप जातियों (50 से अन्यून जातियों) के शानदार मानव-निर्मित वन, पर्णापाती जातियों के प्राकृतिक वन क्षेत्र, घास प्रदेश, विस्तृत घास क्षेत्र और भरे-पूरे जंगी क्षेत्र फैले हुए हैं। विलुप्त खतरे में पड़े एकश्चंगी गैंडे (राहनोसेरस युनिकार्निस) और अन्य वन्य प्राणियों के लिए यह अत्युत्तम प्राकृतिक वास है। अगस्त 1991 के बाद इस क्षेत्र में की गई कई यात्राओं के आधार पर अबतक 669 जिली अधिक संख्या में एकत्र किए गए पर्यावरणों से न केवल वनस्पतियों और पादप मात्रिकीय अंशों के बारे में रोचक वार्तों का पता लगा है, जिनमें 45 घासों की जातिया 26 वर्गीकों (सेज) की और कई प्रकार के पीनशिक सम्प्रसिद्धि हैं जिनमें से दो जातियों का अधोत् पेकटेलिस द्राइफ्लोरा और एक तीसरी गंध वाला हैं बोनेरिया थ्रेवियोलेंस उत्तर पूर्वी क्षेत्र से भिली जातियों के नवोल्लेख हैं, बल्कि विशेषकर के राहनोसेरस युनिकार्निस और सुस स्कोरोफो-क्रिस्टेटा की भोजन आदतों पर भी नई जनकारी मिली है। घासों के अलावा गैंडों के अन्य खाद्यों के साथ सबसे अधिक सुखादु भोजन पर्णागों के साथ पाई जाने वाली इविचसेटम डिफ्युनम और ३० रेमोस्टीसीम उपजाति डेविले हैं जबकि जंगली सुअर गिगोडोरम डेंसिफ्लोरम, युलोफिया और हैवेनेरिया आदि जैसे भूमि पीनशिकों के प्रौढ़ आकर्त्त्व तक को भी खा डालना पसन्द करते हैं। पादप संसाधनों की नानारूपता तथा वन्यप्राणियों की वृद्धि और विकास पर इनके प्रभाव को भी इस अभिपत्र में प्रकाशित किया गया है।

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