Angiosperm diversity of Borail Wildlife Sanctuary, Assam, India: Report - II

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Abstract

The present investigation deals with the composition of angiospermic plants in the Borail Wildlife Sanctuary, Assam. A total of 190 angiospermic species under 152 genera and 61 families were recorded from the sanctuary during the survey period. Angiosperm included 35 herbs, 30 shrubs, 59 trees, 27 climber, 7 lianas, 1 palm, 8 small grasses, 13 sedges, 2 bamboos, 3 canes, 4 epiphytic and 1 parasitic species.

Key words: Angiosperm diversity, Borail Wildlife Sanctuary

INTRODUCTION

Forests provide us with shelter, livelihoods, water, food and fuel security. All these activities directly or indirectly involve forests. Some are easy to figure out - fruits, paper and wood from trees, and so on. Others are less obvious, such as by-products that goes into everyday items like medicines, cosmetics and detergents. Forest provides ecosystem services that are critical to human welfare. They are serving as a buffer in natural disasters like flood and rainfalls, Absorbing harmful greenhouse gasses that produce climate change. Forest providing habitat both for water and land based species. Wildlife sanctuaries are helping to protect animals and safeguard their lives. Wildlife Sanctuaries help to protect animals from illegal activities, and serve as places where endangered animals breed and are therefore protected. It is a good place for animals where they can be protected (WWF 2018). Plants play an important role in wildlife sanctuary by providing shelter and food to the animals. Plants form the basic producer tier in any complex forested ecosystem.

The North-east Indian state Assam is lying in between 24°44' N to 27°45' N latitude and 89°41' and 96°02' E longitudes and has an geographical area of 78,433 sq km. 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 harbour and sustain wide ranging floral and faunal species. The state is surrounded by hills and mountains on the north, east and the south side. The state has the Brahmaputra valley in the northern part bordering to Arunachal Pradesh and the Barak valley in the southern part bordering to Mizoram, Tripura and Meghalaya. The state is enriched with 3832 (dicotyledons 2752 and monocotyledon 1080) species of angiosperms comprising of 1370 (dicotyledons 1012 and monocotyledon 368) genera distributed in 229 (dicotyledons 189 and monocotyledon 40) families (Chowdhury 2005).

The Barail Wildlife Sanctuary (BWS) is located between latitude 24°58' - 25°50' N and longitude 92°50' - 92°52' E. The sanctuary is situated in the northern part of Cachar district of Assam and lies along the foothills of the North Cachar and Barail hills (PLATE I). The total area covered by this wildlife sanctuary is 326.24 sq km. Barail Wildlife Sanctuary is a combination Barail Reserve Forest and North Cachar Reserve Forest, which were together upgraded to Barail Wildlife Sanctuary in June 2004. The climate is humid tropical to sub-tropical; annual rainfall varies from 200 to 600 cm and the average humidity is 72 – 90 %. Temperatures range minimum 8° C and maximum temperatures 38° C. Rivers like Jatinga, Daloo (Photo -14), Kayong, Gumra, and Boleswar has formed the riverine forest of BWS. The sanctuary is characterized by undulating hills having altitudinal range of less than 30 m to more than 1867 m. As per classification of Champion and Seth (1968), the sanctuary has 2 broad groups of forests, tropical wet evergreen (Photo -15) and tropical semi-evergreen forests. Tree, shrub and liana species (Photo - 13) forming a thick vegetation of the sanctuary. Forest floor is enriched by many herbaceous species. The main secondary landscape elements are cultivated flatland, extensive bamboo brakes, tree plantations (Teak and Sal), secondary and disturbed forest (betel-vine plantation), and village gardens including Areca nut plantations (Barbhuiya & Singh 2012; Hussain 2015; Bora & Bhattacharyya 2017; Bora *et al.* 2017).

Several publications came out on assessment of plant diversity in protected areas of Assam. Some of them are Begum *et al.* (2011) on sketch of the flora of Nameri National Park; Sarkar & Devi (2015) on Assessment of plant diversity in Hollongapar Gibbon Wildlife Sanctuary; Jain & Hajra (1975) on the plant diversity of Manas Wildlife Sanctuary; Dutta *et al.* (1974) on forest flora of North Cachar Hills and Borail Range; Buragohain & Swargiari (2016) on Diversity and conservation of *Ficus* L. (Moraceae) in Chakrashila Wildlife Sanctuary; Baruah & Baruah (2000) on hydrophytes of Kaziranga National Park; Baruah & Baruah (2007) on vegetation characteristics of grassland of Kaziranga National Park ; Baruah *et al.* (2003) on biodiversity status in Manas Biosphere reserve; Bharali & Borua (2003) on diversity of orchid flora of Dibru-Saikhowa National Park and Biosphere Reserve; Gogoi *et al.* (2009) on orchid flora of Joypur Reserve Forest of Dibrugarh district; Gogoi *et al.* (2010) on orchid flora of Dibru-Saikhowa National Park and Biosphere Reserve; Gogoi (2005) on the genus *Dendrobium* in Dibru-Saikhowa National park and Biosphere Reserve; Dey *et al.* (2007) on Orchid diversity in Manas National Park, Assam; Bujarbarua & Sarma (2006) on the diversity of Poaceae in Gibbon Wildlife Sanctuary, Assam; Konwar *et al.* (2009) on the abundance of food plant species and food habits of *Rhinoceros unicornis* L. in Pobitora Wildlife Sanctuary; Talukdar & Deori (2017) on Floristic Diversity of Laokhowa Wildlife Sanctuary; Nath (2012) on Aquatic macrophytes of Laokhowa Wildlife Sanctuary; Deori & Talukdar (2015) Floristic Diversity of Barnadi Wildlife Sanctuary; Kar *et al.* (2015) on vascular plant diversity in Amchang Wildlife Sanctuary; and Hajra & Jain (1996) on plants of Kaziranga and Manas.

As far as plant diversity study of the Borail Wildlife Sanctuary is concerned, only few report on angiosperm plants (Dutta *et al.* 1974) is available. Bora & Bhattacharyya (2017) worked on the trees and lianas of Borail Wildlife Sanctuary; Bora *et al.* (2017) studied the Grasses and bamboos of Barail Wildlife Sanctuary are available. Kar *et al.* (2018) carried out some studies on angiosperm flora of the sanctuary and recorded 281 angiosperm species out of which 224 species were dicots and 57 species were monocots. Considering the possibilities to add more species in the angiosperm category from this sanctuary, thus this work was taken up to provide information on the occurrence of more species of angiosperms in BWS. Therefore, the present investigations were carried out with the objective of record previously unrecorded angiospermic plants of the Borail wildlife Sanctuary.

MATERIALS AND METHODS

Surveys of the angiosperm plants of Borail Wildlife Sanctuary (Figure 1) were conducted from November 2018 to May 2019 covering both wild and cultivated species within the sanctuary. Surveys were conducted from fifteen sites of the sanctuary *viz.*, Malidor, Kalaincherra, Durganagar, Lakhicherra, Gumra, Madhura, Indranagar, Khasia Punji, Hmar Punji, Kapocherra, Balacherra, Marwa cherra, Durbin tilla, Damcherra, Bandarkhal and dense forest areas. External mor-phological characteristics including hairs, stipules and floral parts, of collected specimens was observed using Foldscope microscope. Characteristics of each species were observed and noted. The collected specimens were processed into mounted herbarium specimen following standard herbarium techniques (Jain & Rao 1977). Identification of the specimens was done by comparing the field descriptions and observations with the descriptions available in authentic literature (Kanjilal *et al.* 1934 – 1940; Chowdhury 2005) and confirmed by matching at ASSAM Herbarium. Herbarium specimens were deposited at the TERI herbarium for future reference. The International Plant Name Index (IPNI 2012), The Plant List (2013) and Tropicos (2017) were consulted for current nomenclature and family delimitation of all recorded taxa. The Angiosperm Phylogeny Group III Classification (APG III 2009) was followed for the classification of families. The families were arranged in alphabetical order.

Figure 1. Location map of Borail Wildlife Sanctuary (not in scale)

RESULTS AND DISCUSSION

Study recorded total 190 species under 154 genera from 63 families (Table 1) were recorded from the study area. Angiosperm comprises of 63 families (dicot 48 and monocot 15), 154 genera (dicot 110 and monocot 44) and 190 species (dicot 135 and monocot 55). Out of the total recorded 190 angiosperm species the composition were 35 herbs, 30 shrubs, 59 trees, 27 climbers, 7 liana, 1 palm, 8 small grasses, 13 sedges, 2 bamboo, 3 canes, 4 epiphytic and 1 parasitic species (Figure 2).

Among the dicotyledons, Leguminosae is the most dominant family in the study area in respect to number of species with 23 species, followed by Malvaceae, Meliaceae and Rubiaceae each with 8 species, and Menispermaceae (5 species) etc. In Monocots Cyperaceae is the dominant family with 13 species followed by Poaceae with 10 species, Araceae with 8 species, Orchidaceae with 5 species, and Commelinaceae with 4 species. Among the dicotyledons

Table 1. Angiosperm plant of Borail Wildlife Sanctuary

[**Abbreviations used:** **Habit:** H = Herb; S = Shrub; Cl = Climber; L = Lianas; T = Tree ; PA = Palm; G = Grass; SE = Sedge; B = Bamboo; EP = Epiphytic ; P = Parasitic ; CA = Cane. **Habitat:** RS = Road sides; SS = Stream side; HS = Hill slopes; RB = River bank; F = Forest; GL = Grassland]

Sl No	Name of the plants	Habit	Habitat	Distribution
DICOTYLEDONS				
	Anacardiaceae			
1	<i>Mangifera sylvatica</i> Roxb.	T	F	Rare
	Annonaceae			
2	<i>Cananga odorata</i> (Lam.) Hook.f. & Thomson	T	F	Rare
	Apocynaceae			
3	<i>Holarrhena pubescens</i> Wall. ex G.Don	T	F	Common
4	<i>Hoya acuminata</i> (Wight) Benth. ex Hook.f. [Photo 22]	Cl	F	Common
	Balsaminaceae			
5	<i>Impatiens trilobata</i> Colebr.	H	SS	Rare
	Begoniaceae			
6	<i>Begonia thomsonii</i> A.DC. [Photo : 24]	H	SS	Rare
	Burseraceae			
7	<i>Bursera serrata</i> Wall. ex Colebr.	T	F	Rare
8	<i>Canarium bengalense</i> Roxb.	T	F	Rare
9	<i>Garuga floribunda</i> Decne.	T	F	Common
10	<i>Garuga pinnata</i> Roxb.	T	F	Rare
	Cannabaceae			
11	<i>Holoptelea integrifolia</i> Planch.	T	F	Rare
12	<i>Trema orientalis</i> (L.) Blume	T	F	Rare
13	<i>Trema tomentosa</i> (Roxb.) H.Hara	T	F	Rare
	Calophyllaceae			
14	<i>Mesua ferrea</i> L.	T	F	Rare
	Clusiaceae			
15	<i>Garcinia xanthochymus</i> Hook.f. ex T.Anderson	T	F	Very rare
16	<i>Kayea floribunda</i> Wall.	T	F	Very rare
	Compositae/ Asteraceae			
17	<i>Acmella paniculata</i> (Wall. ex DC.) R.K. Jansen	H	RS	Common
18	<i>Blumea balsamifera</i> (L.) DC.	H	HS	Rare
19	<i>Galinsoga parviflora</i> Cav.	H	RS	Common
	Convolvulaceae			
20	<i>Ipomoea quamoclit</i> L.	Cl	RS	Common
21	<i>Merremia vitifolia</i> (Burm.f.) Hallier.f.	Cl	RS	Common

Sl No	Name of the plants	Habit	Habitat	Distribution
22	<i>Poranopsis paniculata</i> (Roxb.) Roberty	Cl	RS	Common
	Cornaceae			
23	<i>Alangium chinense</i> (Lour.) Harms	T	F	Rare
	Cucurbitaceae			
24	<i>Diplocyclos palmatus</i> (L.) C. Jeffrey	Cl	F	Rare
25	<i>Indofevillea khasiana</i> Chattarjee	Cl	F	Rare
26	<i>Mukia maderaspatana</i> (L.) M. Roem.	Cl	HS	Rare
27	<i>Solena amplexicaulis</i> (Lam.) Gandhi	Cl	F	Rare
	Dilleniaceae			
28	<i>Dillenia indica</i> L.	T	F	Common
29	<i>Dillenia pentagyna</i> Roxb.	T	F	Very rare
	Dipterocarpaceae			
30	<i>Dipterocarpus retusus</i> Blume	T	F	Rare
	Elaeocarpaceae			
31	<i>Sloanea tomentosa</i> (Benth.) Rehder & E.H.Wilson	T	F	Very rare
	Fagaceae			
32	<i>Lithocarpus elegans</i> (Blume) Hatus ex Soepadmo	T	F	Very rare
	Icacinaceae			
33	<i>Natsiatum herpeticum</i> Buch.-Ham. ex Arn. [Photo 23]	Cl	F	Common
34	<i>Nothapodytes nimmoniana</i> (J. Graham) Mabb.	S	F	Very rare
	Juglandaceae			
35	<i>Engelhardtia spicata</i> Lechen ex Blume	T	F	Rare
	Lamiaceae/ Labiatae			
36	<i>Gomphostemma parviflorum</i> Wall. ex Benth. [Photo 21]	S	F	Very Rare
37	<i>Pogostemon benghalensis</i> (Burm.f.) Kuntze	S	RS	Rare
38	<i>Premna mollissima</i> Roth	T	F	Common
39	<i>Premna longifolia</i> Roxb.	T	F	Common
	Lauraceae			
40	<i>Cinnamomum tamala</i> (Buch.-Ham.) T. Nees & Eberm.	T	F	Common
41	<i>Cinnamomum verum</i> J.Presl.	T	F	Very Rare
42	<i>Litsea monopetala</i> (Roxb.) Pers [Photo 11]	T	F	Very Rare
43	<i>Litsea nitida</i> (Roxb.) Hook.f.	T	F	Common
	Leguminosae/ Fabaceae			
44	<i>Acacia caesia</i> (L.) Willd. [Photo 3]	L	F	Common
45	<i>Acacia myriophylla</i> Graham	T	F	Common

PLATE - I: 1. *Peliosanthes teeta*; 2. *Liparis elliptica*; 3 *Acacia caesia* ; 4. *Cymbidium aloifolium*; 5. *Catunaregum spinosa* ; 6. *Ixora rangonensis* ; 7. *Dracaena angustifolia*; 8. *Ardisia paniculata* ; 9. *Morinda angustifolia* ; 10. *Pterospermum acerifolium* ; 11. *Litsea monopetala*; 12. *Dendrobium lituiflorum*

SI No	Name of the plants	Habit	Habitat	Distribution
46	<i>Acrocarpus fraxinifolius</i> Arn.	T	F	Rare
47	<i>Bauhinia racemosa</i> Lam.	S	F	Rare
48	<i>Chamaecrista mimosoides</i> (L.) Greene	S	RS	Rare
49	<i>Caesalpinia cucullata</i> Roxb.	L	F	Rare
50	<i>Caesalpinia tortuosa</i> Roxb.	Cl	F	Rare
51	<i>Crotalaria pallida</i> Aiton	S	RS	Common
52	<i>Crotalaria juncea</i> L.	S	RS	Rare
53	<i>Derris elliptica</i> (Wall.) Benth.	S	SS	Rare
54	<i>Dalbergia pinnata</i> Lour. Prain	S	RB	Rare
55	<i>Derris scandens</i> (Roxb.) Benth.	Cl	RB	Rare
56	<i>Caesalpinia bonduc</i> (L) Roxb.	L	RS	Very rare
57	<i>Moullava spicta</i> (Dalzell) Nicolson	L	F	Rare
58	<i>Mucuna bracteata</i> DC.	Cl	RS	Rare
59	<i>Ohwia caudate</i> (Thunb.) H.Ohashi	S	F	Rare
60	<i>Peltophorum pterocarpum</i> (DC.) <u>K.Heyne</u>	T	F	Common
61	<i>Saraca asoca</i> (Roxb) .Willd.	T	F	Very rare
62	<i>Senna hirsuta</i> (L.) Irwin & Barneby	S	RS	Common
63	<i>Senna siamea</i> (Lam.) H.S. Irwin et Barneby	T	F	Common
64	<i>Senegalia pennata</i> (L.) Maslin	L	F	Common
65	<i>Tamarindus indica</i> L.	T	F	Common
66	<i>Tephrosia candida</i> (Roxb.) DC.	S	RS	Rare
67	<i>Uraria picta</i> (Jacq.) DC.	H	F	Very Rare
	Loranthaceae			
68	<i>Tolypanthus involucratus</i> Blume	P	F	Very common
	Magnoliaceae			
69	<i>Magnolia hodgsonii</i> (Hook.f. & Thomson) H. Keng	T	F	Very Rare
70	<i>Magnolia pterocarpa</i> Roxb.	T	F	Very Rare
71	<i>Magnolia champaca</i> (L.) Baill.ex Pierre	T	F	Rare
	Malvaceae			
72	<i>Abelmoschus manihot</i> (L.) Medik.	S	RS	Rare
73	<i>Byttneria aspera</i> Collebr.ex Wall.	L	F	Rare
74	<i>Corchorus aestuans</i> L.	H	GL	Common
75	<i>Grewia abutilifolia</i> Vent. ex Juss.	S	RS	Common
76	<i>Grewia eriocarpa</i> Juss.	S	RS	Common
77	<i>Grewia serrulata</i> DC.	S	RS	Common
78	<i>Hibiscus aculeatus</i> Walter	H	RS	Rare
79	<i>Pterospermum acerifolium</i> (L.) Willd. [Photo 10]	T	F	Common
80	<i>Pterospermum javanicum</i> Jungh	T	F	Rare
81	<i>Sida spinosa</i> L.	H	RS	Rare

Sl No	Name of the plants	Habit	Habitat	Distribution
82	<i>Sterculia guttata</i> Roxb.	T	F	Common
83	<i>Triumfetta annua</i> L.	H	RS	Very common
	Meliaceae			
84	<i>Aglaia cucullata</i> (Roxb.) Pellegr	T	F	Rare
85	<i>Aglaia edulis</i> (Roxb.) Wall.	T	F	Rare
86	<i>Aglaia perviridis</i> Hiern.	T	F	Common
87	<i>Aglaia spectabilis</i> (Miq.) S.S. Jain & S.Bennet	T	F	Rare
88	<i>Chisocheton cumingianus</i> (C.DC.) Harms	T	F	Rare
89	<i>Dysoxylum cauliflorum</i> Hiern	T	F	Rare
90	<i>Dysoxylum grande</i> Hiern	T	F	Common
91	<i>Dysoxylum excelsum</i> Blume	T	F	Common
	Menispermaceae			
92	<i>Anamirta cocculus</i> (L.) Wight & Arn.	Cl	F	Common
93	<i>Cocculus orbiculatus</i> (L.) DC.	Cl	F	Common
94	<i>Haematocarpus validus</i> (Miers) Bakh.f. ex Forman	Cl	HS	Rare
95	<i>Hypserpa nitida</i> Miers. ex Benth.	Cl	HS	Rare
96	<i>Parabaena sagittata</i> Miers.	Cl	F	Rare
97	<i>Pericampylus glaucus</i> (Lam.) Merr.	Cl	F	Rare
98	<i>Tinomisium petiolare</i> Hook.f. & Thomson	L	HS	Rare
	Moraceae			
99	<i>Ficus tinctoria</i> G. Forst. [Photo 20]	T	RS	Rare
	Myrtaceae			
100	<i>Syzygium fruticosum</i> DC.	T	F	Common
	Oxalidaceae			
101	<i>Biophytum sensitivum</i> (L.) DC.	H	RS	Rare
102	<i>Oxalis debilis</i> Kunth	H	RS	Rare
	Passifloraceae			
103	<i>Passiflora foetida</i> L.	Cl	RS	Very rare
	Phyllanthaceae			
104	<i>Bischofia javanica</i> Blume [Photo 16]	T	RS	Very rare
105	<i>Bridelia retusa</i> (L.) A. Juss	T	F	Rare
	Piperaceae			
106	<i>Piper berembunse</i> A.Chaveerach & R Sudmoon [Photo 17]	Cl	F	Very rare
	Primulaceae			
107	<i>Ardisia paniculata</i> (Roxb.) [Photo 8]	S	F	Very rare
	Rhamnaceae			
108	<i>Gouania leptostachya</i> DC.	Cl	F	Very rare
	Rhizophoraceae			
109	<i>Carallia brachiata</i> (Lour.) Merr.	T	F	Common

Sl No	Name of the plants	Habit	Habitat	Distribution
	Rubiaceae			
110	<i>Catunaregam spinosa</i> (Thunb.) Triveng. [Photo : 5]	S	F	Rare
111	<i>Coffea benghalensis</i> B. Heyne ex Schult.	H	F	Common
112	<i>Ceriscoides campanulata</i> (Roxb.) Triveng.	S	F	Rare
113	<i>Dentella repens</i> var. <i>serpyllifolia</i> (Wall. ex Craib) Verdc.	H	RS	Common
114	<i>Ixora rangonensis</i> Bremek [Photo 6]	S	F	Very rare
115	<i>Meyna laxiflora</i> Robyns	S	RS	Common
116	<i>Morinda angustifolia</i> Roxb. [Photo 9]	S	F	Very rare
117	<i>Spermacoce alata</i> Aubl.	H	GL	Very common
	Rutaceae			
118	<i>Clausena heptaphylla</i> (Roxb.) Wight & Arn.	S	F	Rare
119	<i>Murraya koenigii</i> (L.) Spreng.	S	F	Very common
120	<i>Murraya paniculata</i> (L.) Jack	S	F	Rare
121	<i>Toddalia asiatica</i> (L.) Lam.	Cl	F	Very rare
122	<i>Zanthoxylum nitidum</i> (Roxb.) DC.	Cl	F	Rare
	Salicaceae			
123	<i>Casearia glomerata</i> Roxb.	T	F	Rare
124	<i>Xylosma longifolia</i> Clos	T	F	Rare
	Sabiaceae			
125	<i>Meliosma pinnata</i> (Roxb.) Maxim.	T	SS	Rare
126	<i>Meliosma simplicifolia</i> (Roxb.) Walp.	T	F	Rare
	Simaroubaceae			
127	<i>Ailanthus altissima</i> (Mill.) Swingle	T	F	Very rare
128	<i>Ailanthus excelsa</i> Roxb.	T	F	Very rare
129	<i>Ailanthus integrifolia</i> Lam.	T	F	Very rare
	Solanaceae			
130	<i>Cestrum nocturnum</i> L.	S	RS	Very common
	Tetramelaceae			
131	<i>Tetrameles nudiflora</i> R.Br.	T	F	Rare
	Urticaceae			
132	<i>Boehmeria glomerulifera</i> Miq.	S	SS	Common
133	<i>Pilea scripta</i> (Buch.- Ham. ex D.Don) Wedd.	S	SS	Common
	Vitaceae			
134	<i>Cissus repanda</i> (Wight & Arn.) Vahl	Cl	HS	Very common
135	<i>Tetrastigma planicaule</i> (Hook.f.) Gagnep.	Cl	HS	Common
	MONOCOTYLEDONS			
	Amaryllidaceae			
136	<i>Crinum lorifolium</i> Roxb. ex Ker Gawl	H	RS	Rare

SI No	Name of the plants	Habit	Habitat	Distribution
	Araceae	H		
137	<i>Amorphophallus bulbifer</i> (Roxb.) Blume	H	RS	Common
138	<i>Amorphophallus paeoniifolius</i> (Dennst.) Nicolson	H	HS	Rare
139	<i>Colocasia esculenta</i> (L.) Schott	H	RS	Very common
140	<i>Lasia spinosa</i> (L.) Thwaites	H	SS	Rare
141	<i>Monstera deliciosa</i> Liebm. [Photo : 18]	EP	F	Rare
142	<i>Philodendron perplexum</i> G.S Bunting	H	F	Rare
143	<i>Syngonium auritum</i> (L.) Schott	H	F	Rare
144	<i>Typhonium trilobatum</i> (L.) Schott	H	HS	Rare
	Arecaceae/ Palmae			
145	<i>Areca catechu</i> L.	PA	HS	Common
146	<i>Calamus erectus</i> Roxb.	CA	SS	Rare
147	<i>Calamus flagellum</i> Griff. ex Mart.	CA	RB	Rare
148	<i>Calamus tenuis</i> Roxb.	CA	RB	Common
	Asparagaceae			
149	<i>Dracaena angustifoli</i> (Medik.) Roxb. [Photo 7]	S	F	Rare
150	<i>Peliosanthes teta</i> Andrews [Photo 1]	H	F	Very rare
	Colchicaceae			
151	<i>Gloriosa superba</i> L.	H	HS	Very rare
	Commelinaceae			
152	<i>Commelina benghalensis</i> L.	H	RS	Common
153	<i>Commelina diffusa</i> Burm.f.	H	RS	Common
154	<i>Cyanotis cristata</i> (L.) D.Don	H	RS	Common
155	<i>Murdannia nudiflora</i> (L.) Brenan	H	SS	Common
	Cyperaceae			
156	<i>Bulbostylis barbata</i> (Rottb.) C.B. Clarke	SE	GL	Common
157	<i>Carex indica</i> L.	SE	GL	Common
158	<i>Cyperus compressus</i> L.	SE	GL	Common
159	<i>Cyperus digitatus</i> Roxb.	SE	GL	Common
160	<i>Cyperus imbricatus</i> Retz.	SE	GL	Common
161	<i>Cyperus iria</i> L.	SE	GL	Common
162	<i>Cyperus dubius</i> Rottb.	SE	GL	Common
163	<i>Eleocharis dulcis</i> (Burm.f.) Trin. ex Hensch.	SE	GL	Common
164	<i>Eleocharis spiralis</i> (Rottb.) Roem. & Schult.	SE	RS	Common
165	<i>Fimbristylis dichotoma</i> subsp. <i>podocarpa</i> (Nees) T.Koyama	SE	RS	Common
166	<i>Bolboschoenus maritimus</i> (L.) Palla.	SE	GL	Common
167	<i>Isolepis setacea</i> (L.) R.Br.	SE	GL	Common
168	<i>Scleria rugosa</i> R. Br.	SE	GL	Common

PLATE – II. 13. Lianas in BWS; 14. Riverine forest of BWS; 15 . Evergreen forest of BWS; 16. *Bischofia javanica* ; 17. *Piper berembunse* ; 18. *Monstera deliciosa*; 19. *Musa sanguinea*; 20. *Ficus tinctoria*; 21. *Gomphostemma parviflorum*; 22. *Hoya acuminata*; 23. *Natsiatum herpenticum* ; 24. *Begonia thomsonii*

Sl No	Name of the plants	Habit	Habitat	Distribution
	Dioscoreaceae			
169	<i>Dioscorea hispida</i> Dennst.	Cl	F	Common
	Marantaceae			
170	<i>Clinogynae dichotoma</i> (Roxb.) Salisb.	S	RB	Common
	Musaceae			
171	<i>Musa sanguinea</i> Hook.f. [Photo 19]	H	F	Common
	Orchidaceae			
172	<i>Aerides multiflora</i> Roxb.	EP	F	Common
173	<i>Aerides odorata</i> Lour.	EP	F	Common
174	<i>Cymbidium aloifolium</i> (L.) Sw. [Photo 4]	EP	F	Common
175	<i>Dendrobium lituiflorum</i> Lindl. [Photo 12]	EP	F	Rare
176	<i>Liparis elliptica</i> Wight. [Photo 2]	H	GL	Very rare
	Pandanaceae			
177	<i>Pandanus foetidus</i> Roxb.	H	F	Rare
	Poaceae/ Gramineae			
178	<i>Bambusa vulgaris</i> Schrad.	B	F	Common
179	<i>Chrysopogon aciculatus</i> (Retz.) Trin.	G	F	Common
180	<i>Dendrocalamus hamiltonii</i> Nees & Arn. ex Munro	B	F	Rare
181	<i>Digitaria ciliaris</i> (Retz.) Koeler	G	RS	Common
182	<i>Eragrostis atrovirens</i> (Desf.) Trin. ex Steud.	G	GL	Common
183	<i>Panicum brevifolium</i> L.	G	GL	Common
184	<i>Saccharum spontaneum</i> L.	G	GL	Common
185	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	G	GL	Common
186	<i>Microstegium fasciculatum</i> (L.) Henrard	G	GL	Common
187	<i>Themeda villosa</i> (Lam.) A. Camus	G	RS	Common
	Smilacaceae			
188	<i>Smilax glabra</i> Roxb.	Cl	F	Common
	Zingiberaceae			
189	<i>Alpinia roxburghii</i> Sweet	H	HS	Rare
190	<i>Curcuma aromatica</i> Salisb.	H	F	Rare

Aglaia is the dominant genera represented with 4 species followed by *Derris*, *Grewia*, *Ailanthus* and *Dysoxylum* each with 3 species, *Garuga* and *Dillenia* each with 2 species. Among the monocotyledons *Cyperus* is the most dominant genus represented by 5 species followed by *Calamus* with 3 species and *Aerides*, *Commelina* and *Amorphophallus* with 2 species each.

With regard to the habitat preference of these 188 plant species, 106 species are from inside the forest, 37 species from the road-sides, nine species from the stream margins, five from river banks, 12 from hill slopes and 19 species from the grassland areas.

It is interesting to note that *Liparis elliptica* with only four plants in one population were recorded from the whole study area. Among herbs, *Peliosanthes teeta*, among shrubs *Gomphostemma parviflorum*, *Ardisia paniculata*, *Ixora rangonensis*, *Morinda*

Figure 2. Plant habit in Borail Wildlife Sanctuary (BWS)

angustifolia, *Dracaena angustifolia*; among climbers *Piper berembunse*, *Todalia asiatica* and among trees *Bischofia javanica*, *Litsea monopetala*, *Saraca asoca*, *Mangifera sylvatica* and *Dillenia pentagyna* were very rare and were located in restricted pockets.

was observed that, there is severe anthropogenic pressure on the sanctuary and that is now in an alarming cause for the decline of the reserve's species diversity. Major problem of the sanctuary is deforestation due to construction works of East-West Corridor which is passing through East block of the sanctuary. I have missed out to relocate some species from the same sites which were observed during my previous study as these species were vanished from particular site due to road widening activities. Expansion of Areca nut plantation, Tea plantation, Teak plantation and cultivation of black pepper and vegetables in fringe areas are also threat for the sanctuary. Extraction of important species particularly *Homalomena aromatica*, Bamboos, Dalchini, Amla etc. from the forest areas is a matter of concern. Concerned department and local civil society should take care on these issues to protect the valuable plant resources and wildlife of the sanctuary.

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