AMBIENT APPRAISAL

Checklist for Phytodiversity of East Karbi Anglong Wildlife Sanctuary, Assam, Northeast India: Part I

Puranjoy Mipun^{1*}, Dipankar Borah², Nazir Ahmad Bhat¹, Yogendra Kumar¹

¹Centre for Advanced Studies in Botany, North Eastern Hill University, Shillong, Meghalaya, 793022, India

²Department of Botany, Rajiv Gandhi University, Rono Hills, Doimukh, Arunachal Pradesh, 791112, India

Key words: Angiosperms, Floral Diversity, Threatened species

Study area: Karbi Anglong, Assam

Coordinate: 24°33' N to 26°35' N; and 92°10' E to 93°50' E

Abstract

This work presents a checklist of plant species in East Karbi Anglong Wildlife Sanctuary (EKAWLS), Assam, India. Inventorization was carried out from 2015-2018, and a total of 252 plant species are recorded belonging to 203 genera and 87 families. Fabaceae (25 species) is the most dominant family, and *Clerodendrum* (4 species) is the most species-rich genera. The enumerated taxa are presented with their vernacular names, habit form, and voucher numbers. Threat status of each taxon according to IUCN Red List categories is also provided. Anthropogenic activities and other natural calamities are causing serious threats particularly to the threatened species of the sanctuary. Population survey of all the threatened species was done based on the number of seedling, sapling, and adult from the study site.

Introduction:

Karbi Anglong district, the largest district of Assam is home to five Wildlife Sanctuaries viz., Nambor, East Karbi Anglong, North Karbi Anglong, Garampani, and Marat Longri Wildlife Sanctuary. East Karbi Anglong Wildlife sanctuary (EKAWLS) is situated in the eastern part of Karbi Anglong district and serves as an essential component of the Karbi Anglong-Kaziranga landscape, recognized as one of the rich floral and faunal diversity region within the Indo-Burma biodiversity hotspot (WWF, 2002). During recent decades due to several anthropogenic activities viz., over-exploitation, habitat destruction, and fragmentation of forest areas have substantially altered the natural landscapes affecting the distribution of species populations and habitats (Hansen *et al.*, 2013), which simultaneously hinder the sufficient propagation of the plant in its natural condition (Borthakur *et al.*, 2018).

Moreover, the indigenous flora of a region today is mostly confined to the native forests found in the protected areas such as National Parks, Biosphere Reserves, Wildlife Sanctuaries, etc. Protected areas along with conserving the biodiversity, it also serve as indispensable to forest dwellers for subsistence and livelihoods (Phangchopi *et al.*, 2017). Even these protected areas are under tremendous anthropogenic pressure, and several floristic elements face the threat of extinction. So, knowing the phyto-diversity of protected areas with its threatened species status could serve as a baseline for future conservation. In spite of numerous steps taken for cataloging the biodiversity

present in the protected areas, studies in Northeast, India is still lacking (Bora & Bhattacharyya, 2017). Moreover, considering the increased threats from large-scale deforestation and degradation of the natural habitat during the recent decades (Ronghang *et al.*, 2012), it is urgent to have floristic studies of these sanctuaries before the floristic elements are lost forever. Unfortunately, till date, no floristic studies have been published from any of the sanctuaries as mentioned above, apart from some relatable works by Sankar & Chowdhury (2000) reporting 431 plant species having different ethnobotanical categories and Gogoi & Yonzon (2013) on orchids of the district. Several workers have undertaken publications in aspect to small localities within the district focusing on the ethnobotany (Kar & Borthakur, 2008; Teron & Borthakur, 2009, 2012, 2013; Teronpi *et al.*, 2015; Phongchopi *et al.*, 2014). The present study is focused on providing a checklist of the Phytodiversity of East Karbi Anglong Wildlife Sanctuary and to survey the population status of the collected threatened species.

Methodology:

Study area: The present study was carried out in East Karbi Anglong Wildlife Sanctuary (EKAWLS) of Karbi Anglong district of Assam, which is one of the primary forests of the state covering an area of 221.81 km². It is in the elevation ranges from 80-600m a.s.l. The Topography is varied with undulating hills, wide valleys, steep gorges, rivers and rivulets, annual and perennial streams. The wildlife

*Corresponding Author: mipunpuranjoy@gmail.com

sanctuary holds different forest types ranging from moist semi-evergreen, moist mixed deciduous to miscellaneous type with scattered pure or mixed patches of bamboos. The soil is well-drained, sandy loamy to clayey loamy, and the climate is warm and humid with an annual rainfall of 1800 mm. The average temperature is around 24° C.

Field survey and data collection: extensive field studies were conducted from 2015-2018 covering almost all seasons, focusing mostly on the flowering and fruiting phases. The surveys were done after seeking permission from the Principal Chief Conservator of Forests, Karbi Anglong Division (O.O. No. 43/Memo No. Addl. PCCF/KA/Wildlife/2015-16/886-89, dated Diphu, 15 September 2015). The materials were processed according to the methodology followed by Jain & Rao (1977), and depositions were made into NEHU herbaria. The species identifications were carried out by consulting specimens housed at regional herbaria (NEHU, ASSAM, ARUN), with images of type specimens available in online databases and specialized bibliography and specialists. The International Plant Name Index (2019) and The Plant List (2019) (<http://www.ipni.org>) were consulted for current nomenclature of the taxa. The resulting floristic list is consistent with Angiosperm Phylogeny Group IV (2016) system of classification and arranged in alphabetical order in both the family and generic level. The IUCN Red List (2019) (<http://www.iucnredlist.org>) was used to categorize species into different Red List categories. Population and regeneration studies of the threatened plants were done based on the density of seedling, sapling, and adult individuals within the study site following the methodology Mir *et al.*, (2017 a,b)."

Results and Discussion:

A total of 252 species belonging to 203 genera and 87 families was collected (Table-1). The lifeform of the collected taxa was highest for herbs (37%) followed by trees (34%), shrubs (28%) and climbers (1%). Among the representing families, Fabaceae was the most dominant with a total of 25 species under it, followed by Poaceae (14), Malvaceae (10), Zingiberaceae, Rubiaceae, Orchidaceae and Lamiaceae with 9 species each, Phyllanthaceae (8), Araceae (7), Moraceae, Cyperaceae Compositae, Apocynaceae and Acanthaceae with 6 species each,

Rutaceae, Lythraceae, Euphorbiaceae and Araliaceae with 4 species each, Vitaceae, Solanaceae, Magnoliaceae, Balsaminaceae, Arecaceae, Apiaceae, Annonaceae and Amaranthaceae with 3 species each, Anacardiaceae, Calophyllaceae, Combretaceae, Commelinaceae, Convolvulaceae, Fagaceae, Gesneriaceae, Linderniaceae, Meliaceae, Menispermaceae, Musaceae, Actinidiaceae, Myrtaceae, Olacaceae, Oxalidaceae, Piperaceae, Polygonaceae, Sapindaceae, Simaroubaceae, Theaceae and Urticaceae with 2 species each and rest 40 families with 1 species each. *Clerodendrum* was the most species-rich genera with four species followed by *Phlogacanthus*, *Impatiens*, *Cyperus*, *Dalbergia*, *Senna*, *Magnolia*, *Ficus*, *Phyllanthus* and *Bambusa* (3 species each), 29 Genera with two species each and rest 164 genera with one species each.

The diversity of the Wildlife sanctuary is scattered due to the sporadic occurrence of bamboo patches over large areas. *Bauhinia variegata* L., *Senna siamea* (Lam.) Irwin & Barneby, *Erythrina stricta* Roxb., *Litsea monopetala* (Roxb.) Pers. among the trees, *Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult, *Dracaena angustifolia* (Medik.) Roxb., *Chloranthus elatior* Link among the shrubs and *Impatiens balsamina* L., *Drymaria cordata* (L.) Willd. ex Schult., *Bidens pilosa* L. among the herbs were most commonly found and distributed throughout all the parts of the wildlife sanctuary. *Geodorum densiflorum* (Lam.) Schltr., *Geophila repens* (L.) Johnst., *Habenaria dentata* (Sw.) Schltr., *Brucea mollis* Wall. ex Kurz, *Hydnocarpus kurzii* (King) Warb., *Caryota urens* L. were locally rare within the forest with a very low number of occurrences. Most of the plants have been traditionally utilized by the communities living in the periphery such as *Abrus precatorius* L., *Abroma augusta* (L.) L. f., *Stemona tuberosa* Lour. are used for medicine, *Chisocheton cumingianus* (C.DC.) Harms, *Magnolia hodgsonii* (Hook & Thomson) Keng, *Magnolia insignis* Wall., *Engelhardia spicata* Lesch. ex Blume for timber, *Clinopodium umbrosum* (M. Bieb.) Kuntze, *Boesenbergia longiflora* (Wall.) Kuntze, *Zanthoxylum rhetsa* (Roxb.) DC. as food items. Though the forest is mostly degraded in its outer parts, the core area is rich in terms of plant life with high endemism. Some endemic taxa of Northeast India present within the boundaries of the sanctuary are *Larsenianthus careyanus* (Benth.) Kress & Mood, *Larsenianthus assamensis* Dey,

Figure-1: Landscapes of East Karbi Anglong wildlife sanctuary: a. Waterlogged area during floods. b. Peripheral zone of the sanctuary. c. River flowing through the sanctuary. d. Freshly cleared forestland for Jhum cultivation

Table 1: Family-wise, list of plants with their habit, accession number (Ac. No.) and threat status (TS)

Scientific name	Habit	Ac. No.	TS
Acanthaceae			
<i>Lepidagathis incurva</i> Buch.-Ham. ex D. Don	S	NEHU-12308	NE
<i>Phlogacanthus curviflorus</i> (Wall.) Nees	S	NEHU-12346	NE
<i>Phlogacanthus parviflorus</i> T. Anderson	S	NEHU-12323	NE
<i>Phlogacanthus thyrsoiflorus</i> Nees	S	NEHU-12278	NE
<i>Strobilanthes cusia</i> (Nees) Kuntze	S	NEHU-12194	NE
<i>Thunbergia grandiflora</i> Roxb.	S	NEHU-12205	NE
Achariaceae			
<i>Hydnocarpus kurzii</i> (King) Warb.	T	NEHU-12291	DD
Actinidiaceae			
<i>Saurauia armata</i> Kurz	T	NEHU-12269	NE
<i>Saurauia punduana</i> Wall.	T	NEHU-12001	CE
Amaranthaceae			
<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	H	NEHU-12241	NE
<i>Alternanthera sessilis</i> (L.) R. Br. ex DC.	H	NEHU-12193	NE
<i>Amaranthus spinosus</i> L.	H	NEHU-12192	NE
Anacardiaceae			
<i>Rhus chinensis</i> Mill.	T	NEHU-12293	NE
<i>Rhus succedanea</i> L.	T	NEHU-12328	NE
Annonaceae			
<i>Annona reticulata</i> L.	T	NEHU-12191	NE
<i>Annona squamosa</i> L.	T	NEHU-12190	NE
<i>Goniothalamus sesquipedalis</i> (Wall.) H. & T	S	NEHU-12337	NE
Apiaceae			
<i>Centella asiatica</i> (L.) Urb.	H	NEHU-12189	NE
<i>Eryngium foetidum</i> L.	H	NEHU-12326	NE
<i>Oenanthe javanica</i> (Blume) DC.	H	NEHU-12290	LC
Apocynaceae			
<i>Alstonia scholaris</i> (L.) R. Br.	T	NEHU-12329	NE
<i>Holarrhena pubescens</i> Wall. ex G. Don	T	NEHU-12214	NE
<i>Hoya parasitica</i> Wall. ex Wight	S	NEHU-12249	NE
<i>Ichnocarpus frutescens</i> (L.) W. T. Aiton	S	NEHU-12270	NE
<i>Tauba montana divaricata</i> (L.) R. Br. ex Roem. & Schult	S	NEHU-12283	NE
<i>Wrightia coccinea</i> (Roxb. ex Hornem.) Sims	T	NEHU-12312	NE
Araceae			
<i>Aglaonema hookerianum</i> Schott	H	NEHU-12279	NE
<i>Alocasia macrorrhizos</i> (L.) G. Don	H	NEHU-12188	NE
<i>Amorphophallus bulbifer</i> (Roxb.) Blume	H	NEHU-12187	NE
<i>Homalomena aromatica</i> (Spreng.) Schott	H	NEHU-12334	NE
<i>Pistia stratiotes</i> L.	H	NEHU-12232	NE
<i>Rhaphidophora calophylla</i> Schott	H	NEHU-12186	NE
<i>Sauromatum meghalayense</i> Roy et al.	H	NEHU-12185	NE
Araliaceae			
<i>Aralia armata</i> (Wall. ex G. Don) Seem.	T	NEHU-12149	NE
<i>Brassaiopsis hainla</i> (Buch.-Ham.) Seem.	T	NEHU-12155	NE
<i>Hydrocotyle sibthorpioides</i> Lam.	H	NEHU-12151	LC
<i>Trevesia palmata</i> (Roxb. ex Lindl.) Vis.	S	NEHU-12162	NE
Arecaceae			
<i>Calamus tenuis</i> Roxb.	S	NEHU-12161	LC
<i>Calamus erectus</i> Roxb.	S	NEHU-12184	NE
<i>Caryota urens</i> L.	T	NEHU-12292	LC
Aristolochiaceae			
<i>Aristolochia indica</i> L.	C	NEHU-12247	NE
Asparagaceae			
<i>Dracaena angustifolia</i> (Medik.) Roxb.	S	NEHU-12281	NE
Balsaminaceae			
<i>Impatiens arguta</i> Hook.f. & Thomson	H	NEHU-12303	NE
<i>Impatiens balsamina</i> L.	H	NEHU-12217	NE
<i>Impatiens laevigata</i> var. <i>laevigata</i> Hook.f.	H	NEHU-12362	NE
Begoniaceae			
<i>Begonia roxburghii</i> A. DC.	H	NEHU-12255	NE
Bignoniaceae			
<i>Oroxylum indicum</i> (L.) Kurz	T	NEHU-12182	NE
Bixaceae			
<i>Bixa orellana</i> L.	T	NEHU-12349	NE
Boraginaceae			
<i>Ehretia acuminata</i> R. Br.	T	NEHU-12181	NE
Calophyllaceae			
<i>Mesua ferrea</i> L.	T	NEHU-12331	NE
<i>Trema orientalis</i> (L.) Blume	T	NEHU-12180	NE
Capparaceae			
<i>Capparis pachyphylla</i> M. Jacobs	S	NEHU-12361	E
Caryophyllaceae			
<i>Drymaria cordata</i> (L.) Willd. ex Schult.	H	NEHU-12179	NE
Celastraceae			
<i>Microtropis discolor</i> (Wall.) Arn.	T	NEHU-12272	NE
Chloranthaceae			
<i>Chloranthus elatior</i> Link	S	NEHU-12348	NE
Clusiaceae			
<i>Garcinia pedunculata</i> Roxb. ex Buch.-Ham.	T	NEHU-12178	NE
Combretaceae			
<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	T	NEHU-12177	NE
<i>Terminalia bellirica</i> (Gaertn.) Roxb.	T	NEHU-12294	NE
Commelinaceae			
<i>Commelina benghalensis</i> L.	H	NEHU-12296	NE
<i>Cyanotis axillaris</i> (L.) D. Don ex Sweet	H	NEHU-12176	NE
Compositae			
<i>Ageratina adenophora</i> (Spreng.) King & Rob	H	NEHU-12242	NE
<i>Ageratum conyzoides</i> (L.) L.	H	NEHU-12243	NE
<i>Bidens pilosa</i> L.	H	NEHU-12208	NE
<i>Blumea fistulosa</i> (Roxb.) Kurz	H	NEHU-12307	NE
<i>Blumea hieracifolia</i> Hayata	H	NEHU-12304	NE
<i>Conyza japonica</i> (Thunb.) Less. ex Less.	H	NEHU-12309	NE
Convolvulaceae			
<i>Ipomoea hederifolia</i> L.	S	NEHU-12267	NE
<i>Merremia umbellata</i> (L.) Hallier	H	NEHU-12195	NE
Costaceae			
<i>Cheilocostus speciosus</i> (Koenig) Specht	H	NEHU-12175	NE
Cucurbitaceae			
<i>Hodgsonia macrocarpa</i> (Blume) Cogn.	C	NEHU-12332	NE
Cyperaceae			
<i>Cyperus aster</i> (Clarke ex Cherm.) Kük.	H	NEHU-12225	NE
<i>Cyperus diffusus</i> Vahl	H	NEHU-12229	LC
<i>Cyperus rotundus</i> L.	H	NEHU-12230	NE
<i>Fimbristylis aestivalis</i> Vahl	H	NEHU-12238	NE
<i>Fimbristylis bisumbellata</i> (Forssk.) Bubani	H	NEHU-12237	LC
<i>Lipocarpa chinensis</i> (Osbeck) J. Kern	H	NEHU-12224	LC
Dilleniaceae			
<i>Dillenia indica</i> L.	T	NEHU-12221	NE
Dioscoreaceae			
<i>Dioscorea alata</i> L.	S	NEHU-12174	NE
Elaeocarpaceae			
<i>Elaeocarpus lanceifolius</i> Roxb.	T	NEHU-12260	NE
Euphorbiaceae			
<i>Acalypha indica</i> L.	H	NEHU-12211	NE
<i>Croton caudatus</i> Geiseler	T	NEHU-12360	NE
<i>Jatropha gossypifolia</i> L.	S	NEHU-12196	NE
<i>Mallotus philippensis</i> (Lam.) Müll. Arg.	T	NEHU-12273	NE
Fabaceae			
<i>Abrus precatorius</i> L.	S	NEHU-12313	NE
<i>Acacia pennata</i> (L.) Willd.	T	NEHU-12148	NE
<i>Adenanthera pavonina</i> L.	T	NEHU-12330	NE
<i>Bauhinia racemosa</i> Lam.	T	NEHU-12315	NE
<i>Bauhinia variegata</i> L.	T	NEHU-12147	LC
<i>Caesalpinia bonduc</i> (L.) Roxb.	S	NEHU-12336	NE
<i>Callicarpa arborea</i> Roxb.	T	NEHU-12207	NE
<i>Cassia fistula</i> L.	T	NEHU-12146	LC
<i>Codariocalyx gyroides</i> (Link) Hassk.	S	NEHU-12320	NE
<i>Dalbergia rimosa</i> Roxb.	T	NEHU-12321	LC
<i>Dalbergia sissoo</i> Roxb. ex DC.	T	NEHU-12295	NE
<i>Dalbergia stipulacea</i> Roxb.	T	NEHU-12285	NE
<i>Desmodium elegans</i> DC.	S	NEHU-12145	LC
<i>Entada rheedii</i> Spreng.	C	NEHU-12333	NE
<i>Erythrina stricta</i> Roxb.	T	NEHU-12144	NE
<i>Gymnocladus assamica</i> P. C. Kanjilal	T	NEHU-12253	CE

<i>Indigofera tinctoria</i> L.	S	NEHU-12143	NE	<i>Stephania glandulifera</i> Miers	H	NEHU-12265	NE
<i>Parkia timoriana</i> (DC.) Merr.	T	NEHU-12142	NE	Menyanthaceae			
<i>Pueraria montana</i> (Lour.) Merr.	S	NEHU-12345	NE	<i>Nymphoides indica</i> (L.) Kuntze	H	NEHU-12231	LC
<i>Senna alexandrina</i> Mill.	S	NEHU-12141	NE	Moraceae			
<i>Senna siamea</i> (Lam.) H.S. Irwin & Barneby	T	NEHU-12140	NE	<i>Artocarpus chama</i> Buch.-Ham.	T	NEHU-12126	NE
<i>Senna alata</i> (L.) Roxb.	S	NEHU-12316	NE	<i>Artocarpus heterophyllus</i> Lam.	T	NEHU-12123	NE
<i>Tadehagi triquetrum</i> (L.) H.Ohashi	S	NEHU-12297	NE	<i>Ficus benghalensis</i> L.	T	NEHU-12122	NE
<i>Tephrosia candida</i> (Roxb.) DC.	S	NEHU-12252	NE	<i>Ficus hispida</i> L.f.	T	NEHU-12121	NE
<i>Tephrosia purpurea</i> (L.) Pers.	S	NEHU-12289	NE	<i>Ficus racemosa</i> L.	T	NEHU-12120	NE
Fagaceae				<i>Streblus asper</i> Lour.	T	NEHU-12223	NE
<i>Castanopsis indica</i> (Roxb. ex Lindl.) A.DC.	T	NEHU-12259	NE	Musaceae			
<i>Castanopsis tribuloides</i> (Sm.) A.DC.	T	NEHU-12305	NE	<i>Musa balbisiana</i> Colla.	H	NEHU-12119	NE
Gesneriaceae				<i>Musa acuminata</i> Colla.	H	NEHU-12118	NE
<i>Aeschynanthus parviflorus</i> (D.Don) Spreng.	S	NEHU-12250	NE	Myrtaceae			
<i>Rhynchosyche ellipticum</i> (Wall. ex Dietr.) A. DC.	S	NEHU-12353	NE	<i>Syzygium formosum</i> (Wall.) Masam.	T	NEHU-12282	NE
Hypoxidaceae				<i>Syzygium cumini</i> (L.) Skeels	T	NEHU-12124	NE
<i>Molineria capitulata</i> (Lour.) Herb.	H	NEHU-12266	NE	Nyctaginaceae			
Juglandaceae				<i>Boerhavia repens</i> L.	H	NEHU-12203	NE
<i>Engelhardia spicata</i> Lesch. ex Blume	T	NEHU-12210	LC	Oleaceae			
Lamiaceae				<i>Erythralium scandens</i> Blume	S	NEHU-12125	NE
<i>Clerodendrum cordatum</i> D.Don	S	NEHU-12218	NE	<i>Olex acuminata</i> Wall. ex Benth.	S	NEHU-12117	NE
<i>Clerodendrum glandulosum</i> Lindl.	S	NEHU-12299	NE	Oleaceae			
<i>Clerodendrum infortunatum</i> L.	S	NEHU-12139	NE	<i>Nyctanthes arbor-tristis</i> L.	T	NEHU-12115	NE
<i>Clerodendrum paniculatum</i> L.	S	NEHU-12206	NE	Onagraceae			
<i>Clinopodium umbrosum</i> (M.Bieb.) Kuntze	H	NEHU-12138	NE	<i>Oenothera rosea</i> L'Hér. ex Aiton	H	NEHU-12240	NE
<i>Gomphostemma parviflorum</i> Wall. ex Benth.	S	NEHU-12261	NE	Orchidaceae			
<i>Leucas aspera</i> (Willd.) Link	H	NEHU-12137	NE	<i>Acampe praemorsa</i> (Roxb.) Blatt. & McCann	H	NEHU-12116	NE
<i>Ocimum gratissimum</i> L.	S	NEHU-12136	NE	<i>Cleisostoma subulatum</i> Blume	H	NEHU-12268	NE
<i>Pseudocaryopteris foetida</i> (Don) Cantino	S	NEHU-12135	NE	<i>Dendrobium lituiflorum</i> Lindl.	H	NEHU-12114	NE
Lauraceae				<i>Dendrobium nobile</i> Lindl.	H	NEHU-12310	NE
<i>Litsea monopetala</i> (Roxb.) Pers.	T	NEHU-12319	NE	<i>Denia ophrydis</i> (J.König) Seidenf.	H	NEHU-12324	NE
Lecythidaceae				<i>Geodorum densiflorum</i> (Lam.) Schltr.	H	NEHU-12306	NE
<i>Careya arborea</i> Roxb.	T	NEHU-12366	NE	<i>Habenaria dentata</i> (Sw.) Schltr.	H	NEHU-12276	NE
Lentibulariaceae				<i>Hetaeria affinis</i> (Griff.) Seidenf. & Ormerod	H	NEHU-12227	NE
<i>Utricularia gibba</i> L.	H	NEHU-12235	LC	<i>Vanilla borneensis</i> Rolfe	H	NEHU-12264	NE
Linderniaceae				Oxalidaceae			
<i>Lindernia crustacea</i> (L.) F.Muell.	H	NEHU-12344	LC	<i>Averrhoa carambola</i> L.	T	NEHU-12113	NE
<i>Lindernia ruellioides</i> (Colsm.) Pennell	H	NEHU-12351	LC	<i>Oxalis corniculata</i> L.	H	NEHU-12112	NE
Lythraceae				Passifloraceae			
<i>Duabanga grandiflora</i> (DC.) Walp.	T	NEHU-12200	NE	<i>Passiflora foetida</i> L.	H	NEHU-12317	NE
<i>Lagerstroemia parviflora</i> Roxb.	T	NEHU-12322	NE	Pedaliaceae			
<i>Lagerstroemia speciosa</i> (L.) Pers.	T	NEHU-12220	NE	<i>Sesamum indicum</i> L.	S	NEHU-12111	NE
<i>Rotala rotundifolia</i> (Buch.-Ham. ex Roxb.) Koehne	S	NEHU-12343	NE	Phyllanthaceae			
Magnoliaceae				<i>Actephila excelsa</i> (Dalzell) Müll. Arg.	S	NEHU-12359	NE
<i>Magnolia hodgsonii</i> (Hook.f. & Thomson) Keng	T	NEHU-12133	LC	<i>Baccaurea ramiflora</i> Lour.	T	NEHU-12315	NE
<i>Magnolia insignis</i> Wall.	T	NEHU-12356	LC	<i>Bridelia retusa</i> (L.) A. Juss.	T	NEHU-12209	NE
<i>Magnolia pterocarpa</i> Roxb.	T	NEHU-12357	DD	<i>Bridelia tomentosa</i> Blume	T	NEHU-12110	NE
Malpighiaceae				<i>Phyllanthus glaucus</i> Wall. ex Müll.Arg.	T	NEHU-12335	NE
<i>Hiptage benghalensis</i> (L.) Kurz	S	NEHU-12363	NE	<i>Phyllanthus acidus</i> (L.) Skeels	T	NEHU-12109	NE
Malvaceae				<i>Phyllanthus emblica</i> L.	T	NEHU-12108	NE
<i>Abroma augusta</i> (L.) L.f.	S	NEHU-12288	NE	<i>Sauropus androgynus</i> (L.) Merr.	T	NEHU-12107	NE
<i>Abutilon indicum</i> (L.) Sweet	S	NEHU-12298	NE	Piperaceae			
<i>Bombax ceiba</i> L.	T	NEHU-12132	NE	<i>Piper nigrum</i> L.	H	NEHU-12106	NE
<i>Grewia serrulata</i> DC.	T	NEHU-12302	NE	<i>Piper thomsonii</i> (C. DC.) Hook. f.	H	NEHU-12105	NE
<i>Hibiscus cannabinus</i> L.	S	NEHU-12131	NE	Plantaginaceae			
<i>Hibiscus sabdariffa</i> L.	S	NEHU-12130	NE	<i>Plantago major</i> L.	H	NEHU-12338	NE
<i>Sida rhombifolia</i> L.	S	NEHU-12202	NE	Poaceae			
<i>Sida acuta</i> Burm.f.	S	NEHU-12129	NE	<i>Arthraxon lancifolius</i> (Trin.) Hochst.	H	NEHU-12246	NE
<i>Sterculia villosa</i> Roxb.	T	NEHU-12128	NE	<i>Bambusa affinis</i> Munro	S	NEHU-12364	NE
<i>Sterculiaha miltonii</i> (Kuntze) Adelb.	T	NEHU-12311	NE	<i>Bambusa pallida</i> Munro	S	NEHU-12104	NE
Marantaceae				<i>Bambusa tulda</i> Roxb.	S	NEHU-12222	NE
<i>Phrynium pubinerve</i> Blume	H	NEHU-12127	NE	<i>Chrysopogon aciculatus</i> (Retz.) Trin.	H	NEHU-12341	NE
Melastomataceae				<i>Chrysopogon gryllus</i> (L.) Trin.	H	NEHU-12239	NE
<i>Melastoma malabathricum</i> L.	S	NEHU-12201	NE	<i>Coix lacryma-jobi</i> L.	H	NEHU-12339	NE
Meliaceae				<i>Dendrocalamus hamiltonii</i> Nees&Arn. ex Munro	S	NEHU-12103	NE
<i>Azadirachta indica</i> A. Juss.	T	NEHU-12204	NE	<i>Dendrocalamus strictus</i> (Roxb.) Nees	S	NEHU-12102	NE
<i>Chisocheton cumingianus</i> (C.DC.) Harms	T	NEHU-12258	NE	<i>Eleusine indica</i> (L.) Gaertn.	H	NEHU-12342	NE
Menispermaceae				<i>Eragrostis gangetica</i> (Roxb.) Steud.	H	NEHU-12236	NE
<i>Cissampelos pareira</i> L.	H	NEHU-12365	NE	<i>Ischaemum barbatum</i> Retz	H	NEHU-12244	NE

AMBIENT APPRAISAL

<i>Paspalum conjugatum</i> P.J.Bergius	H	NEHU-12245	LC
<i>Phalaris arundinacea</i> L.	H	NEHU-12340	LC
Polygonaceae			
<i>Persicaria glabra</i> (Willd.) M.Gómez	H	NEHU-12226	NE
<i>Polygonum microcephalum</i> D. Don	H	NEHU-12101	NE
Pontederiaceae			
<i>Eichhornia crassipes</i> (Mart.) Solms	H	NEHU-12234	NE
Potamogetonaceae			
<i>Potamogeton alpinus</i> Balb.	H	NEHU-12228	LC
Primulaceae			
<i>Ardisia paniculata</i> Roxb.	S	NEHU-12271	NE
Rhamnaceae			
<i>Ziziphus xylopyrus</i> (Retz.) Willd.	T	NEHU-12100	NE
Rubiaceae			
<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	T	NEHU-12286	NE
<i>Chassalia curviflora</i> (Wall.) Thwaites	S	NEHU-12099	NE
<i>Geophila repens</i> (L.) I. M. Johnst.	H	NEHU-12098	NE
<i>Ixora polyantha</i> Wight	S	NEHU-12263	NE
<i>Mussaenda roxburghii</i> Hook. f.	S	NEHU-12199	NE
<i>Ophiorrhiza mungos</i> L.	H	NEHU-12354	NE
<i>Paederia foetida</i> L.	S	NEHU-12317	NE
<i>Psychotria calocarpa</i> Kurz	S	NEHU-12274	NE
<i>Psychotria montana</i> Blume	H	NEHU-12277	NE
Rutaceae			
<i>Citrus assamensis</i> Dutta & Bhattacharya	T	NEHU-12023	NE
<i>Micromelum pubescens</i> Blume	S	NEHU-12219	NE
<i>Murraya koenigii</i> (L.) Spreng.	T	NEHU-12097	NE
<i>Zanthoxylum rhetsa</i> (Roxb.) DC.	T	NEHU-12077	NE
Sapindaceae			
<i>Aesculus assamica</i> Griff.	T	NEHU-12325	NE
<i>Lepisanthes senegalensis</i> (Poir.) Leenh.	T	NEHU-12287	NE
Saururaceae			
<i>Houttuynia cordata</i> Thunb.	H	NEHU-12257	NE
Simaroubaceae			
<i>Brucea mollis</i> Wall. ex Kurz	T	NEHU-12215	T
<i>Picrasma javanica</i> Blume	T	NEHU-12352	NE
Smilacaceae			
<i>Smilax ovalifolia</i> Roxb. ex D. Don	S	NEHU-12350	NE
Solanaceae			
<i>Physalis peruviana</i> L.	H	NEHU-12065	NE
<i>Physalis angulata</i> L.	H	NEHU-12280	NE
<i>Solanum spirale</i> Roxb.	S	NEHU-12318	NE
Stemonaceae			
<i>Stemona tuberosa</i> Lour.	H	NEHU-12066	NE
Theaceae			
<i>Camellia caudata</i> Wall.	T	NEHU-12248	LC
<i>Schima wallichii</i> Choisy	T	NEHU-12314	NE
Urticaceae			
<i>Oreocnide integrifolia</i> (Gaudich.) Miq.	T	NEHU-12056	NE
<i>Sarcochlamys pulcherrima</i> Gaudich.	S	NEHU-12212	NE
Verbenaceae			
<i>Lippia alba</i> (Mill.) Br. ex Britton & Wilson	S	NEHU-12059	NE
Vitaceae			
<i>Leea asiatica</i> (L.) Ridsdale	S	NEHU-12256	NE
<i>Cayratia pedata</i> (Wall.) Gagnep.	S	NEHU-12049	V
<i>Leea indica</i> (Burm. f.) Merr.	S	NEHU-12367	NE
Zingiberaceae			
<i>Alpinia nigra</i> (Gaertn.) Burt	H	NEHU-12048	NE
<i>Boesenbergia longiflora</i> (Wall.) Kuntze	H	NEHU-12262	NE
<i>Curcuma aromatica</i> Salisb.	H	NEHU-12300	NE
<i>Globba multiflora</i> Wall. ex Baker	H	NEHU-12254	NE
<i>Hedychium coronarium</i> J. Koenig	H	NEHU-12301	NE
<i>Larsenianthus assamensis</i> Dey, Mood & Choudhury	H	NEHU-12047	NE
<i>Larsenianthus careyanus</i> (Benth.) Kress & Mood	H	NEHU-12251	NE
<i>Zingiber chrysanthum</i> Roscoe	H	NEHU-12197	NE
<i>Zingiber rubens</i> Roxb.	H	NEHU-12046	NE

(Abbreviations: H = Herb, S = Shrub, T = Tree, C = Climber; IUCN status: E=Endangered, CE= Critically Endangered, V = Vulnerable, DD = Data Deficient, LC = Least Concern and NE = Not Evaluated)

Table 2: Population of Threatened taxa within EKWLS

Species and Vegetation type (Champion & Seth, 1968)				
Mature	Saplings	Seedling	Total	Threat status (Reference)
<i>Brucea mollis</i> in: Moist semi-evergreen forests				
27	12	10	49	E (Borthakur <i>et al.</i> , 2018)
<i>Capparis pachyphylla</i> in: Moist mixed deciduous forests				
5	0	0	5	E (IUCN)
<i>Cayratia pedata</i> in: Moist semi-evergreen forests				
7	0	0	7	V (IUCN)
<i>Gymnocladus assamicus</i> in: Moist mixed deciduous forests				
9	4	0	13	CE (IUCN)
<i>Hydnocarpus kurzii</i> in: Moist semi-evergreen forests				
21	10	15	46	T (Majumdar <i>et al.</i> , 2019)
<i>Saurauia punduana</i> in: Moist semi-evergreen forests				
7	2	0	9	CE (IUCN)
<i>Vanilla borneensis</i> in: Moist semi-evergreen forests				
2	1	0	3	T (Deka <i>et al.</i> , 2017)

Figure-2: a) *Hetaeria affinis* b) *Geophila repens* c) *Hoya parasitica* d) *Gymnocladus assamicus* e) *Schima wallichii* f) *Trema orientalis* g) *Sauromatum megalayense* h) *Vanilla borneensis* i) *Boesenbergia longiflora* j) *Wrightia coccinea* k) *Habenaria dentata* l) *Magnolia pterocarpa*

Mood & Choudhury, *Globba multiflora* Wall. ex Baker and *Citrus assamensis* Dutta & Bhattacharya. The work also states a new distributional record of *Sauromatum megalayense* to the state of Assam was first reported from the state of Meghalaya (Talukdar *et al.*, 2014) (Fig.-1,2).

Threat categories: of all the species, 4 species were in threatened categories according to IUCN 2019, which

includes 2 Critically Endangered (*Gymnocladus assamicus*, *Saurauia punduana*), one Endangered (*Capparis pachyphylla*), 1 Vulnerable (*Cayratia pedata*) and 3 species were listed as regionally threatened by different literatures (*Brucea mollis*, *Hydnocarpus kurzii*, *Vanilla borneensis*) and the other species are categorized as Data Deficient, Least Concern or are within Not Evaluated categories.

Population and regeneration status of the threatened species: Of the threatened species population of *Brucea mollis* was highest with 27 adults Individuals, followed by *Hydnocarpus kurzii* (21), *Gymnocladus assamicus* (9), *Cayratia pedata* (7), *Saurauia punduana* (7), *Capparis pachyphylla* (5) and *Vanilla borneensis* (2). Among them *Brucea mollis* and *Hydnocarpus kurzii* has shown a high regeneration, whereas *Capparis pachyphylla*, *Cayratia pedata* and *Vanilla borneensis* with meager regeneration rates, based on number of seedling and sapling present in the study site (Table-2).

Conclusion:

EKAWLS is covered on almost all the sides by human habitation, and due to a clearing of lands for Jhum practice, collection of firewood and non-timber forest products, has put the present vegetation under severe threat. Therefore there is an urgent need for effective conservation strategies to safeguard the existing resources. Moreover, the population of those threatened species needs to protect strictly and monitored within its natural habitat. Illegal timber extraction, shifting cultivation, forest fires, and illicit agricultural expansion, need to be check-in and around the population of this species. Moreover, there are no known reports on the diversity of plants within the region, hence this report will serve as a baseline for future considerations.

Acknowledgments:

The first author is thankful to the University Grant Commission (UGC), New Delhi for the financial support through National Fellowship for Higher Education of ST students. We also extend our sincere thanks to the PCCF, Karbi Anglong Division & Forest Department of Assam for granting permission to carry out this study. Authors are also grateful to the Head, Centre for Advanced Studies in Botany, NEHU Shillong for providing necessary facilities and Botanical Survey of India (Eastern Circle, Shillong) for consultation the library and herbaria.

References:

- Bora, A. & Bhattacharyya, D. (2017): Phytodiversity of Barail Wildlife Sanctuary, Assam, India: field-based observations—I. Trees and lianas. *Check List*, 13(6):1037–1053.
- Borthakur, S.K., Baruah, P.S., Deka, K., Das, P., Sarma, B., Adhikari, D. & Tanti, B. (2018): Habitat distribution modelling for improving conservation status of *Brucea mollis* Wall. ex Kurz.—an endangered potential medicinal plant of Northeast India. *J. Nat. Conserv.*, 42:104–110.
- Deka, K., Baruah, P.S., Sarma, B., Borthakur, S.K. & Tanti, B. (2017): Preventing extinction and improving conservation status of *Vanilla borneensis* Rolfe—A rare, endemic and threatened orchid of Assam, India. *J. Nat. Conserv.*, 37:39–46.
- Gogoi, K. & Yonzon, R. (2013): Orchids of the Karbi Anglong District of Assam, India. *MOISL*, 14(4):1–20.
- Hansen, M.C., Potapov, P.V., Moore, R., Hancher, M., Turubanova, S.A., Tyukavina, A.L., Justice, C.O. & Townshend, J.R.G. (2013): High-resolution global maps of 21st-century forest cover change. *Science*, 342(6160):850–853.
- Jain, S.K. & Rao, R.R. (1977): **Handbook of Field and Herbarium Methods**. Pub. by: Today and Tomorrow's Printers and Publishers, New Delhi, India. P. 157.
- Kar, A. & Borthakur, S.K. (2008): Wild Vegetation of Karbi Anglong District, Assam. *Nat. Prod. Radiance*, 7(5):448–460.
- Majumdar, K., Adhikari, D., Datta, B.K. & Barik, S.K. (2019): Identifying corridors for landscape connectivity using species distribution modeling of *Hydnocarpus kurzii* (King) Warb., a threatened species of the Indo-Burma Biodiversity Hotspot. *Landsc. Ecol. Eng.*, 15(1):13–23.
- Mir, A.H., & Upadhaya, K. (2017): Effect of traditional management practices on woody species composition and structure in montane subtropical forests of Meghalaya, Northeast India. *J. Mountain Sci.*, 14(8):1500–1512.
- Mir, A.H., Upadhaya, K., Odyuo, N. & Tiwari, B.K. (2017a): Rediscovery of *Magnolia rabaniana* (Magnoliaceae): A threatened tree species of Meghalaya, northeast India. *J. Asia Pac. Biodiv.*, 10(1):127–131.
- Mir, A.H., Upadhaya, K. & Roy, D.K. (2017b): Rediscovery, distribution and conservation implications of *Cleyera grandiflora* Wall. ex Choisy (Pentaphylacaceae): an endangered and endemic tree species of Meghalaya, Northeast India. *Nat. Acad. Sci. Lett.*, 40(3):205–209.
- Phongchopi, U., Tamuli, A.K. & Teron, R. (2014): Inventory of wild food plants in Marat Longri Wildlife Sanctuary in Assam, India. *Pleione*, 8(2):331–343.
- Phongchopi, U., Teron, R. & Tamuli, A.K. (2017): Conservation Crisis in Marat Longri Wildlife Sanctuary, Assam, India. *Ambient Sci.*, 04(1):67–73.
- Ronghang, R., Teron, R., Tamuli, A.K. & Rajkhowa, C.R. (2012): Tribal societies and deforestation in Karbi Anglong District of Assam (India). *Ecscan*, 1:231–236.
- Sankar, S. & Chowdhury, S. (2000): Survey of diversity of living economic flora and their conservation and development in the Karbi Anglong District of Assam. *Envis Bull.*, 8:1–4.
- Talukdar, A.D., Roy, D.K., Sinha, B.K. & Choudhury, M.D. (2014): *Sauromatum meghalayense* (Araceae; Tribe: Araceae), a new species from Meghalaya, India. *NeBIO*, 5(3):1–3.
- Teron, R. & Borthakur, S.K. (2009): Traditional knowledge relating to use of flora and fauna as indicators in predicting annual seasons among Karbi tribe of Assam. *Indian J. Trad. Know.*, 8(4):518–524.
- Teron, R. & Borthakur, S.K. (2012): Traditional knowledge of herbal dyes and cultural Significance of colors among the Karbis Ethnic Tribe in Northeast India. *Ethnobot. Res. Appl.*, 10:593–604.
- Teron, R. & Borthakur, S.K. (2013): Folklore claims of some medicinal plants as antidote against poisons among the Karbis of Assam. *Pleione*, 7(2):346–356.
- Teronpi, N., Terongpi, R., Tamuli, A.K. & Teron, R. (2015): Ethnobotanical investigations on antidotes in Singhason hills, Karbi Anglong district. *Int. J. Res. Ayur. Phar.*, 6(1):150–156.