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## **Floral Biodiversity in Buffer Zone of Dampa Tiger Reserve and Impact of Developmental activities**

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### **Abstract**

Mizoram, A north eastern hilly state a part of Indo-burma biodiversity hot spot is a very rich and unique bio-geographic area. Dampa Tiger Reserve is located in the western part of Mizoram, in the Mamit district. A plant biodiversity survey was conducted in the buffer zone of Dampa Tiger Reserve to assess the present status and possible impact of proposed developmental activities on floristic diversity. The buffer zone area of Dampa tiger reserve spreads from W. phaileng to marapara region of Mizoram covering about an area of 488Km<sup>2</sup>. To achieve the desired sampling intensity about 30 quadrats of 400m<sup>2</sup> size were laid out for assessing floral biodiversity along the west of Marapara to W. Phaileng road as per the buffer zone map provided by forest department. A total of 203 species of plant species belonging to 160 genera and 73 families were documented from the study site. Out of this 96 tree species, 86 species of herbs, shrubs and climbers and 21 species of Bamboo, orchids and ferns were documented. As per Shannon-wiener index of diversity, the values H' = 3.457 and 5.373 was found for the tree species and others plants (herbs, shrubs, climbers) respectively. Since the area is fragmented already due to plantations of oil palm, orange dominated orchards and about 4 village settlements. Further, developmental activities like proposed power supply lines may affect

the diversity of native and threatened species of flora present in the area. Henceforth, there is an urgent need for proper alternative conservation measures.

**Keywords:** Tiger Reserve, Biodiversity, Flora, Quadrat, Shannon-weiner index, Threatened species

### Introduction

North east India represents a distinct bio geographic zone very rich in bio-resources, ethnic cultures and folk traditions is a part of both Easter Himalaya as well as Indo-Burma biodiversity hotspots (Dutta and Dutta, 2005). The region comprising eight sister states namely Assam, Manipur, Sikkim, Arunachal Pradesh, Meghalaya, Nagaland and Manipur and can be physiographically categorized into eastern Himalaya, Northeast hills and the Brahmaputra and Barak valley plains (Rodgers and Panwar, 1998).

It is the richest reservoir of plant biodiversity in India supporting about 50% of India's biodiversity (Mao and Hynniewta, 2000). The region exhibits the richest diversity in orchids, Yams, Rhododendrons, Zingibers, Bamboos, canes and wild relatives of cultivated plants (Mao *et al.*, 2009). About 50% of total 17500 flowering plants hail from the region, 40% of them are endemic. Wild relatives of 132 economically important species like citrus, banana, rice, pulses are originated in this region (Hore, 1998). NBGR regional station at Shillong has so far collected over 10000 accessions of wild relatives of crop plants from this region. The region represents high endemic diversity consisting about 33% of India's recorded flora along with Western Ghats, Himalayas and the Andaman and Nicobar Islands (Tandon and Kumaria, 2009). Forests of North eastern region of India are under high anthropogenic pressure as the region is relatively economically backward. People are mostly forest dwellers and almost entirely depend on forests for their basic needs (Tripathi *et al.*, 2016; Grogan *et al.*, 2012).

Mizoram is a hilly state of North East India sharing its boundaries with Myanmar in the East and South, Bangladesh and Tripura in the west and Assam and Manipur in the north. The state shares the International boundary of 404km with Myanmar and 318 kms with Bangladesh. Interstate boundaries are of 123km, 66km and 95 km with Assam, Tripura and Manipur respectively. Geographical Area is about 21,087 sq. km. State capital is Aizawl with 8 districts namely Aizawl, Saiha, Lunglei, Lawngtlai, Kolasib, Champhai, Serchhip and Mamit District. ([http://mizenvis.nic.in/Database/Forest\\_894.aspx](http://mizenvis.nic.in/Database/Forest_894.aspx)).

Mizoram has the recorded forest area of about 19117 Km<sup>2</sup> which is about 90.68% of its geographical area out of which reserved forests constitute 47.31%, protected forests 21.34% and un-classed forests 31.35%. The state has only 134 Km<sup>2</sup> areas under dense forests, 6086 Km<sup>2</sup> area under moderately dense forests and 12897 Km<sup>2</sup> areas under open forests. The state has a climate ranging from moist tropical to moist subtropical (FSI, 2015). Champion and Seth gave 3 forest types initially for Mizoram. However, based on past studies as well as from the field observations, Singh *et al.* (2002) described the forest types of the State based mainly on altitude, rainfall and dominant species composition namely, Tropical Wet Evergreen Forest, Montane sub-tropical Forest, Temperate Forests, Bamboo Forests, Quercus Forests, Jhumland.

Dampa Tiger Reserve (DTR) is located in the western part of Mizoram, in the Mamit district. Surrounded by Chittangong hill tracts of Bangladesh to the west, Tripura state, Mamit and kawrthah forest divisions to the North and Mamit forest divisions to the south and East. the area lies in the Lushai Hills, a series of parallel mountain ranges allied to Arakan Yoma Arc. DTR lies between 92° 16'08" to 92° 27'41" E and 23°18'27" to 23°43'50" N. The tropic of cancer passes through Dampa Tiger Reserve near the Range office at Phuldungsei. Dampa Tiger Reserve was declared in the year 1994 vide Govt. of Mizoram gazette notification No. B-11011/14/90-FST, the 7<sup>th</sup> December 1994, after its approval from the Government of India. The total area of DTR is 988 km<sup>2</sup> out of which 500 km<sup>2</sup> areas is Core Zone / Critical Tiger Habitat and 488Km<sup>2</sup> areas is Buffer Zone Area (Suchitra Devi H *et al* 2011).

Based on Champion Seth Classification, vegetation of Dampa can be categorized into Tropical Evergreen and Semi Evergreen Forests: 1Bc3 and 2Bc2, Tropical Moist Deciduous Forests: 3C/C3b and 3C2S1, Sub - Montane type: 2B1b. Terrain of buffer area is highly undulating and rugged in nature consisting of alternating ridges and valleys with a tendency to taper at both ends. The area is characterized by Tropical humid climate with distinct cold (Nov-Feb), hot (March-June) and rainy (May-September) seasons. The diurnal variation of temperature is high. Relative humidity averages to 60-95%. Strong wind with thunderstorms is common in pre-monsoon period.

The buffer area was declared in 2011. There have been few conspicuous changes in habitat since inception. An increase in monoculture oil palm plantations and rubber plantations is notable in the buffer landscape in the recent years. Oil palm plantations have been promoted the buffer

zone by private companies namely Godreg Agrovet Oil Palm Ltd., in Mamit district along with the agriculture and horticulture departments of State Government. These plantations are being established mostly in the erstwhile bamboo and secondary forest areas (regenerating jhum forests and fallows), recently rested jhum fields, and few valley rice field areas. Although some plantations were established as early as 2007, it is only in the recent years that the pace of conversion of these habitats into monoculture cash crop plantations has increased. A study was conducted in the buffer zone of DTR to assess the floristic diversity and possible threat on the biodiversity due to fragmentation by some settlements and associated developmental activities.

### **Material and Methods**

#### **Study Area**

Study area for the present study is along the West Phaileng-Marapara road in the buffer zone of Dampa tiger reserve. Forest area is mostly evergreen, dense in patches especially towards W. Pulpui and moderately dense and open in rest of the areas. Considering the forest type and canopy density a sampling intensity of 1% is chosen as per which sample size comes to 13200 m<sup>2</sup>. 30 quadrats of 20 m x 30 m were laid each at a distance of 1.5 km along the transition of buffer and core area considering the villages, farm lands (orange, oil palm, and zinger), jhum lands and watershed project areas coming in between. Coordinates of all the quadrats, village starting and end points, farm lands, jhum lands etc along with altitude were noted down. In each quadrat, all the tree species above 10cm girth were noted down along with girth at breast height and height, No. of species in each quadrat, no. of individuals of each species were recorded. In each quadrat 5m by 5m regeneration plots were laid to count the no. of herb species, climbers, ferns, orchids, seedlings *etc.* Checklist of flora was prepared including common and botanical name of the species by referring Flora of Mizoram and Mizoram Plants by Sawmliana M. (2013). Family name, habit (tree, shrub, herb, climber, fern, grass etc) of the species, Rare Endangered and Threatened (RET) status as per the IUCN red data book and any other special remark was noted. Acquired information was used to calculate Importance Value Index (IVI), Shannon–Wiener index and Simpson index.

### **Result and Discussion**

Vegetation zone/ habitat can be broadly identified in relation to various plant assemblages, canopy density and other features of various

areas of proposed project site in Dampa buffer zone. Very Dense Forest with good ground cover: found in most parts of W. Pulpui area, small parts of Phungdungsui and Kawnmawi areas. Moderate Dense Forest with good ground cover found in small parts of W. Pulpui , Pungdungsui and Lallen, Saithai and Kawnmawi areas. Open Forest with good ground cover found in most parts of Lallen, Saithai and parts of Kawnmawi areas. Open Forest with weeds found in small parts of Phungdungsui, Saithai and many parts of Lallen, Kawnmawi areas. A checklist of flora encountered is given in the below tables. (Table 1,2 and 3)

Table 1. Checklist of tree species

SI No	Name of the Species	Common Name	Family	IUCN Status
1.	<i>Alangium chinense</i>	Arsarimnam	Alangiaceae	Not assessed
2.	<i>Albizia chinensis</i>	Vang	Mimosaceae	Not assessed
3.	<i>Albizzia procera</i>	Kangtek	Mimosaceae	Not assessed
4.	<i>Alphonsea lutea</i>	Zawngbalhla	Annonaceae	Not assessed
5.	<i>Alstonia scholaris</i>	Thuamriat	Apocynaceae	Lower risk
6.	<i>Anthocephalus chinensis</i>	Banphar	Rubiaceae	Not assessed
7.	<i>Artocarpus chama</i>	Tatkawng	Moraceae	Not assessed
8.	<i>Artocarpus heterophyllus</i>	Lamkhuang	Moraceae	Not assessed
9.	<i>Artocarpus lakoocha</i>	Theitat	Moraceae	Not assessed
10.	<i>Baccaurea ramiflora</i>	Pangkai	Euphorbiaceae	Not assessed
11.	<i>Balacata baccata</i>	Thing-vawk-pui	Euphorbiaceae	Not assessed
12.	<i>Bauhinia variegata</i>	Vaube	Ceasalpinaceae	Least concern
13.	<i>Beilschmedia roxburghiana</i>	Khuang hlang	Lauraceae	Not assessed
14.	<i>Betula cylindrostachya</i>	Hriang- zau	Betulaceae	Not assessed
15.	<i>Bischofia javanica</i>	Khuangthli	Phyllanthaceae	Not assessed
16.	<i>Boehmeria rugulosa</i>	Len-lang	Urticaceae	Not assessed
17.	<i>Bombax ceiba</i>	Phunchawng	Bombacaceae	Not assessed
18.	<i>Bombax insigne</i>	Pang	Bombacaceae	
19.	<i>Bridelia retusa</i>	Thing-phak-tel	Euphorbiaceae	Not assessed
20.	<i>Calicarpa arborea</i>	Hnahkiah	Verbenaceae	Not assessed
21.	<i>Caryota urens</i>	Tum	Arecaceae	Not assessed

22.	<i>Cassia fistula</i>	Ngaingaw	Caesalpiniaceae	Not assessed
23.	<i>Cassia javanica</i>	Mak-pa-zang-kang	Caesalpiniaceae	Not assessed
24.	<i>Celtis timorensis</i>	Thinghmarcha	Ulmaceae	
25.	<i>Choerospondias axillaris</i>	thei-khuang-chawn	Anacardiaceae	Not assessed
26.	<i>Cinnamomun obtusifolium</i>	Thakthibngsuak	Lauraceae	Not assessed
27.	<i>Cinnamomun verum</i>	Thakthing	Lauraceae	Not assessed
28.	<i>Colona floribunda</i>	Hnah-thap	Tiliaceae	Not assessed
29.	<i>Cordia fragrantissima</i>	Mukpui	Boraginaceae	Not assessed
30.	<i>Dalbergia obtusifolia</i>	Bianghrei	Fabaceae	Not assessed
31.	<i>Dendrocnide sinuate</i>	Thak-pui	Urticaceae	Not assessed
32.	<i>Derris robusta</i>	Thingkha	Papilionaceae	Not assessed
33.	<i>Dipterocarpus retuses</i>	Lawngthing	Dipterocarpaceae	Vulnerable
34.	<i>Duabanga gradiflora</i>	Zuang	Sonneratiaceae	Not assessed
35.	<i>Dysoxylum binectariforum</i>	Sa ha tah	Meliaceae	Endangered
36.	<i>Elaeocarpus serratus</i>	Vantha	Elaeocarpaceae	Not assessed
37.	<i>Erythrina variegata</i>	Fartuah	Fabaceae	Least concern
38.	<i>Eurya cerasifolia</i>	Sihneh	Theaceae	Not assessed
39.	<i>Eurya japonica</i>	Sihneh	Theaceae	Not assessed
40.	<i>Ficus auriculata</i>	Theibal	Moraceae	Not assessed
41.	<i>Ficus elastica</i>	Thialret	Moraceae	Not assessed
42.	<i>Ficus hirta</i>	Sazutheipui	Moraceae	
43.	<i>Ficus hispida</i>	Paihemaian	Moraceae	Not assessed
44.	<i>Ficus racemosa</i>	Chhohe	Moraceae	Not assessed
45.	<i>Ficus semicordata</i>	Theipui	Moraceae	
46.	<i>Gmelina arborea</i>	Thlanvawng	Verbenaceae	Not assessed
47.	<i>Gmelina oblongifolia</i>	Vawngthla	Verbenaceae	Not assessed
48.	<i>Grewia laevigata</i>	Varitabelkang	Tiliaceae	Not assessed
49.	<i>Heteropanax fragrans</i>	Changkhen	Araliaceae	Not assessed
50.	<i>Ligustrum robustum</i>	Chawmzil	Oleaceae	Not assessed

51.	<i>Lithocarpus pachyphyllus</i>	Thil	Fagaceae	Not assessed
52.	<i>Litsea cubeba</i>	Sernam	Lauraceae	Not assessed
53.	<i>Macaranga indica</i>	Hnahkhar	Euphorbiaceae	Not assessed
54.	<i>Macaranga peltata</i>	Kharduap	Euphorbiaceae	Not assessed
55.	<i>Macaranga pustulata</i>	Hnahkharpa	Euphorbiaceae	Not assessed
56.	<i>Mallotus paniculatus</i>	Khar-pa	Euphorbiaceae	Not assessed
57.	<i>Mangifera indica</i>	Theihai	Anacardiaceae	Not assessed
58.	<i>Manihot esculenta</i>	Pangbal	Euphorbiaceae	Not assessed
59.	<i>Mesua ferrae</i>	Herhse	Guttiferae	Not assessed
60.	<i>Michelia champaca</i>	Ngiau	Magnoliaceae	Not assessed
61.	<i>Neolitsea umbrosa</i>	Thakthing-suak	Lauraceae	Not assessed
62.	<i>Neonauclea purpurea</i>	Lungkhup	Rubiaceae	Not assessed
63.	<i>Olea dioica</i>	Sevuak	Oleaceae	Not assessed
64.	<i>Oroxylum indicum</i>	Archangkawm	Bignoniaceae	Not assessed
65.	<i>Parkia timoriana</i>	Zawngtah	Mimosaceae	Not assessed
66.	<i>Protium serratum</i>	Bil	Burseraceae	Not assessed
67.	<i>Rhus semialata</i>	Khawm hma	Anacardiaceae	Not assessed
68.	<i>Sapium baccatum</i>	Thing vak pui	Euphorbiaceae	Not assessed
69.	<i>Sapium eugeniaefolium</i>	Thingvawkpui-kungmam	Euphorbiaceae	Not assessed
70.	<i>Schima wallichii</i>	Khiang	Theaceae	Not assessed
71.	<i>Securinega virosa</i>	Sai siak	Phyllanthaceae	Not assessed
72.	<i>Spondias pinata</i>	Tawitaw	Moraceae	Not assessed
73.	<i>Sterculia alata</i>	Thing van dawt	Sterculiaceae	Not assessed
74.	<i>Sterculia urens</i>	Pang khau	Sterculiaceae	Not assessed
75.	<i>Sterculia villosa</i>	Khaupui	Sterculiaceae	Not assessed
76.	<i>Stereospermum chelonoides</i>	Zihngthal	Bignoniaceae	Not assessed
77.	<i>Syzygium clariflorum</i>	Pichilimim	Myrtaceae	Not assessed
78.	<i>Syzygium cumini</i>	Lenhmu	Myrtaceae	Not assessed
79.	<i>Tectona grandis</i>	Tlawr	Verbenaceae	Not assessed

80.	<i>Terminalia myriocarpa</i>	Char	Combretaceae	Not assessed
81.	<i>Tetrameles nudiflora</i>	Thingdawl	Datiscaceae	Lower risk
82.	<i>Toona ciliata</i>	Teipui	Meliaceae	Lower risk
83.	<i>Trema orientalis</i>	Belpuar	Cannabaceae	Not assessed
84.	<i>Wendlandia budleoides</i>	Batling	Rubiaceae	Not assessed
85.	<i>Areca catechu</i>	Kuhva-kung	Arecaceae	Not assessed
86.	<i>Apourosa octandra</i>	Chhawn tual	Euphorbiaceae	Not assessed
87.	<i>Persea villosa</i>	Bul bawn	Lauraceae	Not assessed
88.	<i>Dyospyros stricta</i>	Thing sam kir	Ebenaceae	Not assessed
89.	<i>Knema linifolia</i>	Thingthi	Myristicaceae	Not assessed
90.	<i>Acrocarpus fraxinifolius</i>	Ngan bawm	Caesalpiniaceae	Not assessed
91.	<i>Phoebe hainesiana</i>	Bul-eng	Lauraceae	Not assessed
92.	<i>Saraca asoca</i>	Mual hawih	Caesalpiniaceae	Not assessed
93.	<i>Vitex peduncularis</i>	Thing khawi lu	Verbenaceae	Not assessed
94.	<i>Chukrasia velutina</i>	Zawng tei	Meliaceae	Not assessed
95.	<i>Emblica officinalis</i>	Sun hlu	Euphorbiaceae	Not assessed
96.	<i>Castanopsis tribuloides</i>	Then mim	Fagaceae	Not assessed

Table 2. Checklist of herbs, shrubs &amp; climbers

Sl. No.	Name of the Species	Common Name	Family	IUCN Status	Remarks
1.	<i>Abelmoschus manihot</i>	Ui chu hlo	Malvaceae	Not assessed	Herb
2.	<i>Acacia gageana</i>	Khang hu	Mimosaceae	Not assessed	Climber
3.	<i>Acacia pruinascens</i>	Khang Pawl	Mimosaceae	Not assessed	Climber
4.	<i>Achyranthus aspera</i>	Bu chhawl	Amaranthaceae	Not assessed	Herb
5.	<i>Achyranthus bidentata</i>	Vangvat hlo	Amaranthaceae	Not assessed	Herb
6.	<i>Acmella paniculata</i>	An sa te	Asteraceae	Not assessed	Herb
7.	<i>Acmella uliginosa</i>	An sa te	Asteraceae	Not assessed	Herb
8.	<i>Adenia trilobata</i>	Cho ak a um suak	Passifloraceae	Not assessed	Shrub
9.	<i>Aeschynomene indica</i>	Hlo nuar suak	Fabaceae	Not assessed	Herb
10.	<i>Ageratum conyzoides</i>	Vaihlen-hlo	Asteraceae	Not assessed	Herb

11.	<i>Alternanthera philoxeroides</i>	Ngha-te-ril	Amaranthaceae	Not assessed	Herb
12.	<i>Alternanthera sessilis</i>	An-ngha-ril	Amaranthaceae	Not assessed	Herb
13.	<i>Amaranthus viridis</i>	Len-hling-hling-nei-lo	Amaranthaceae	Not assessed	Herb
14.	<i>Ammomum maximum</i>	Ai-du	Zingiberaceae	Not assessed	Herb
15.	<i>Anisochilus pallidus</i>	Phunglengser	Lamiaceae	Not assessed	Herb
16.	<i>Argyreia splendens</i>	Phel-phek	Convolvulaceae	Not assessed	Climber
17.	<i>Arisaema album</i>	Mitthi-vai-mim	Araceae	Not assessed	Herb
18.	<i>Bauhinia scandens</i>	Zawng-alei-lawn	Caesalpiniaceae	Not assessed	Climber
19.	<i>Borassus flabellifer</i>	Sial-lu	Arecaceae	Not assessed	Palm
20.	<i>Bridelia Montana</i>	Phaktel	Euphorbiaceae	Not assessed	Shrub/small tree
21.	<i>Bridelia stipularis</i>	Hrui-phak-tel	Euphorbiaceae	Not assessed	Shrub
22.	<i>Bridelia tomentosa</i>	Se-be-hliang	Euphorbiaceae	Not assessed	Shrub
23.	<i>Byttneria pilosa</i>	Sa-zuk-nghawng-hlap	Sterculiaceae	Not assessed	Climber
24.	<i>Centella asiatica</i>	Lam-bak	Apiaceae	Not assessed	Herb
25.	<i>Cheilocostus speciosus</i>	Sum-bul	Zingiberaceae	Not assessed	Herb
26.	<i>Chromolaena odorata</i>	Tlang-sam	Asteraceae	Not assessed	Shrub
27.	<i>Cissampelos pareira</i>	Hnah-bial-hrui	Menispermaceae	Not assessed	Climber
28.	<i>Cissus japonica</i>	Sa-nghar-hmai	Vitaceae	Not assessed	Climber
29.	<i>Cissus repens</i>	Hrui-pawl	Vitaceae	Not assessed	Climber
30.	<i>Clausena excavate</i>	Arpa-sen-til	Rutaceae	Not assessed	Shrub
31.	<i>Clerodendron infortunatum</i>	Phui-hnam-chhia	Verbenaceae	Not assessed	Shrub
32.	<i>Codariocalyx gyroides</i>	Hmei-thai-sa-rawh-t	Fabaceae	Not assessed	Shrub
33.	<i>Colebrookiana oppositifolia</i>	Kawih-thuang-suak	Lamiaceae	Not assessed	Shrub
34.	<i>Colocassia affinis</i>	Lep-lawp	Araceae	Not assessed	Herb

35.	<i>Colquhounia coccinea</i>	Zumzuk	Lamiaceae	Not assessed	Shrub
36.	<i>Combretum indicum</i>	—	Combretaceae	Not assessed	Climber
37.	<i>Connarus paniculatus</i>	Hmeh-keh-rep	Connaraceae	Not assessed	Climber
38.	<i>Crassocephalum crepidioides</i>	Buar-thau	Asteraceae	Not assessed	Herb
39.	<i>Crotalaria micans</i>	di-ral	Fabaceae	Not assessed	Shrub
40.	<i>Cryptolepis dubia</i>	Thei-kel-ki-suak	Asclepiadaceae	Not assessed	Climber
41.	<i>Cyanotis cristata</i>	Vawm-kur	Commelinaceae	Not assessed	Herb
42.	<i>Dalbergia pinnata</i>	Saizawl	Fabaceae	Not assessed	Shrub
43.	<i>Debregeasia longifolia</i>	Leh-ngo	Urticaceae	Not assessed	Shrub
44.	<i>Dendrolobium triangulare</i>	Se-be-hliang	Fabaceae	Not assessed	Shrub
45.	<i>Dendrophthoe falcate</i>	Thikthli-ek-bawm-chi-khat	Loranthaceae	Not assessed	Bushy parasite
46.	<i>Dioscorea alata</i>	Ba-chhim	Dioscoreiaceae	Not assessed	Climber
47.	<i>Dioscorea hispida</i>	Li-liam	Dioscoreiaceae	Not assessed	Climber
48.	<i>Dioscorea pentaphylla</i>	Vawk-pui-ba-hra	Dioscoreiaceae	Not assessed	Climber
49.	<i>Dioscorea glabra</i>	Hra-kai	Dioscoreiaceae	Not assessed	Climber
50.	<i>Gallinsoga parviflora</i>	Sazu-pui-chaw	Asteraceae	Not assessed	Herb
51.	<i>Jasmenium elongatum</i>	Hlo-kha	Oleaceae	Not assessed	Climber
52.	<i>Jasmenium laurifolium</i>	Kangfimhrui	Oleaceae	Not assessed	Climber
53.	<i>Jasmenium multiflorum</i>	Hlo-kha	Oleaceae	Not assessed	Climber
54.	<i>Jasmenium nervosum</i>	Hrui-kha	Oleaceae	Not assessed	Climber
55.	<i>Jasmenium scandens</i>	Hrui-dam-dawi	Oleaceae	Not assessed	Shrub
56.	<i>Entada purseatha</i>	Khawihrui	Fabaceae	Not assessed	Climber
57.	<i>Leea compactiflora</i>	Kum-tin-tuai	Leeaceae	Not assessed	Shrub
58.	<i>Lepionurus sylvestris</i>	Anpangthuam	Olacaceae	Not assessed	Shrub
59.	<i>Maesa indica</i>	Arngeng	Myrsinaceae	Not assessed	Shrub
60.	<i>Melastoma malabathricum</i>	Bui-lu-kham	Melastomaceae	Not assessed	Shrub
61.	<i>Merremia umbellata</i>	Thian-pa	Convolvulaceae	Not assessed	Climber

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62.	<i>Mussanda macrophylla</i>	Va-kep	Rubiaceae		Shrub
63.	<i>Nervilia arangoana</i>	Hnah-khat	Orchidaceae	Not assessed	Climber
64.	<i>Osbeckia stellata</i>	Bui-lu-kham-pa	Melastomaceae	Not assessed	Shrub
65.	<i>Oxyspora paniculata</i>	Kham-par	Melastomaceae	Not assessed	Shrub
66.	<i>Pavetta indica</i>	Thai-nu-rual	Rubiaceae	Not assessed	Shrub
67.	<i>Pericampylus glaucus</i>	Khau-chhim	Menispermaceae	Not assessed	Climber
68.	<i>Polygonum chinense</i>	Diktawn	Polygalaceae	Not assessed	Herb
69.	<i>Pothos chinensis</i>	Liking-chang-dam	Araceae	Not assessed	Climber
70.	<i>Pothos scandens</i>	Laiking-tai-rua	Araceae	Not assessed	Climber
71.	<i>Premna coriacea</i>	Kuam	Verbenaceae	Not assessed	Climber
72.	<i>Rhododendron johnstonianum</i>	Chhawkhlei-par-var	Ericaceae	Endangered	Shrub
73.	<i>Rubia cordifolia</i>	Saphit	Rubiaceae	Not assessed	Climber
74.	<i>Rubus alceifolius</i>	Siali-nu-chhu	Rosaceae	Not assessed	Shrub
75.	<i>Sarcochlamys pulcherrima</i>	Leh-ngo	Urticaceae	Not assessed	Shrub
76.	<i>Sida acuta</i>	Khing-khih	Malvaceae	Not assessed	Shrub
77.	<i>Smilax glabra</i>	Tluang-ngil	Smilacaceae	Not assessed	Climber
78.	<i>Smilax ovalifolia</i>	Kai-ha-pui	Smilacaceae	Not assessed	Climber
79.	<i>Stachyphrynium placentarium</i>	Hnah-thial-pa	Marantaceae	Not assessed	Herb
80.	<i>Tadehagi triquetrum</i>	Ui-fawm-a-ring	Fabaceae	Not assessed	Herb
81.	<i>Thysanolaena maxima</i>	Hmunphiah	Poaceae	Not assessed	Grass
82.	<i>Triumfetta rhomboidea</i>	Se-hnap-suak	Tiliaceae	Not assessed	Shrub
83.	<i>Urena lobata</i>	Se-hnap	Malvaceae	Not assessed	Shrub
84.	<i>Ipomoea hederifolia</i>	Ni-pui-par	Convolvulaceae	Not assessed	Herb
85.	<i>Saccharum arundinaceum</i>	Rai-Ruang	Poaceae	Not assessed	Grass
86.	<i>Daemonorops jenkinsiana</i>	Rai-chhawk	Arecaceae	Not assessed	Palm

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Table 3. Checklist of bamboo, orchids and ferns

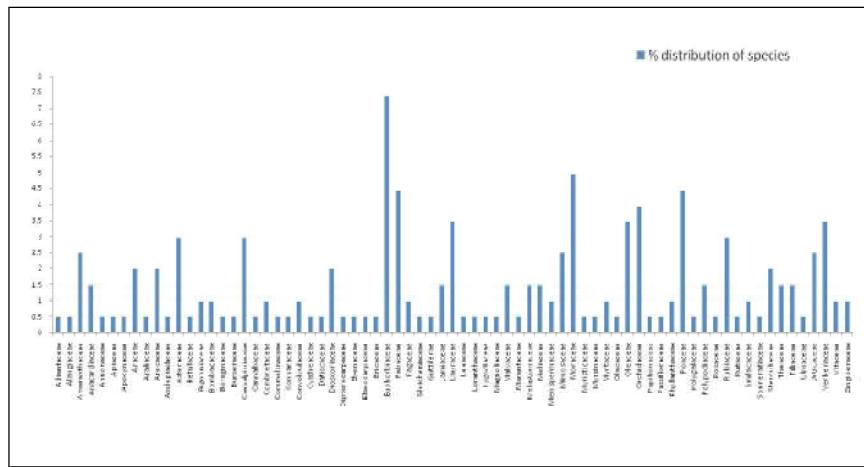
Sl. No.	Name of the Species	Common Name	Family	IUCN Status	Remarks
1.	<i>Adiantum philippense</i>	Lungpui-sam	Adiantaceae	Not assessed	Fern
2.	<i>Aerides rosea</i>	Nauban	Orchidaceae	Not assessed	Orchid
3.	<i>Aglaomorpha coronans</i>	Tuai-bur	Polypodiaceae	Not assessed	Fern
4.	<i>Bambusa tulda</i>	Rawthing	Poaceae	Not assessed	Bamboo
5.	<i>Bulbophyllum lobbi</i>	Hnankhat	Orchidaceae	Not assessed	Orchid
6.	<i>Cyathea chinensis</i>	Kawk-pui	Cyatheaceae	Not assessed	Tree fern
7.	<i>Dendrobium chrysanthum</i>	Danghang	Orchidaceae	Not assessed	Orchid
8.	<i>Dendrobium falconeri</i>	Lenpatkung-bawl	Orchidaceae	Not assessed	Orchid
9.	<i>Dendrobium formosum</i>	Nauban parvar	Orchidaceae	Not assessed	Orchid
10.	<i>Dendrobium nobile</i>	Nauban	Orchidaceae	Not assessed	Orchid
11.	<i>Dendrobium wattii</i>	Nauban parvar	Orchidaceae	Not assessed	Orchid
12.	<i>Dendrocalamus longispathus</i>	Rawnal	Poaceae	Not assessed	Bamboo
13.	<i>Dendrocalamus dampaensis</i>	Dampa mau	Poaceae	Not assessed	Bamboo
14.	<i>Dendrocalamus hamiltonii</i>	Phulrua	Poaceae	Not assessed	Bamboo
15.	<i>Dicranopteris linearis</i>	Ar-thla-dawn	Gleicheniaceae	Not assessed	Fern
16.	<i>Dinochloa compactiflora</i>	Sairil	Poaceae	Not assessed	Bamboo
17.	<i>Drynaria quercifolia</i>	Tui bur suak	Polypodiaceae	Not assessed	Fern
18.	<i>Dryopteris sp.</i>	Katchatpui	Polypodiaceae	Not assessed	Fern
19.	<i>Lygodium flexuosum</i>	Dawnzempui	Lygodiaceae	Not assessed	Fern
20.	<i>Melocanna baccifera</i>	Mautak	Poaceae	Not assessed	Bamboo
21.	<i>Schizostachyum dullosa</i>	Rawthla	Poaceae	Not assessed	Bamboo

A total of 203 species of plants belonging to 160 genera and 73 families were documented from the study site. Out of this 96 tree species,

86 species of herbs, shrubs and climbers and 21 species of Bamboo, orchids and ferns were documented. However, checklist includes list of plants adjacent to the quadrats also. For calculation of diversity indices and IVI only those species occurring within 30 sample plots are considered.

As per Shannon-wiener index of diversity, the values  $H' = 3.457$  and  $5.373$  was found for the tree species and others plants (herbs, shrubs, climbers) respectively. The Values of Shannon-wiener index normally range from 0 to 5, usually ranging from 1.5 to 3.5. An ecosystem with  $H'$  value greater than 2 has been regarded as medium to high diverse in terms of species (Barbour *et al.* 1999). Therefore the current study area can regarded as medium to highly diverse forest.

As per Simpson index of dominance, the values  $D = 0.036$  and  $0.0481$  was found for the tree species and others plants (herbs, shrubs, climbers) respectively. Simpson index values range from  $0-1$ . The Simpson index of diversity is given as  $1-D$  which again indicates higher diversity values in the study area. Importance Value Index (IVI) for tree species *Macaranga peltata* (22.373) was found to be the most important species followed by *Trema orientalis* (19.45), *Duabanga grandiflora* (19.41), *Tectona grandis* (16.57), and *Derris robusta* (12.46) and so on. The least IVI value was observed for *Cinnamomum obtiosifolium* (0.52). Euphorbiaceae family was found to be most prominent followed by Moraceae, Poaceae, Fabaceae, Verbinaceae and Lauraceae. (Shown in Graph 1)



Graph 1: Family wise distribution of species (%)

As per the observations made on potential threats to biodiversity in the present study in the buffer zone area of the Tiger Reserve stretching from W. Phaileng to Marapara it is evident that anthropogenic pressure is high in this area. Four villages with human settlements are located in the buffer zone area of Dampa tiger reserve namely Phungdungse, Saithai, Lallen and Kawnmawi. There are plantations of Oil palm, Orange coming up at about 8 locations, jhumlands and mixed farms at about 10 locations. Apart from these there are proposed watershed project areas under IWDP, and a proposed old age home area in this region which are acting as break to the natural forest areas. It has been observed that weeds like *Mikania micrantha* and *Cromolena odorata* are extensively covering the site at the periphery of these human settled areas. Moreover, a proposed power supply line is going to pass through these areas potentially causing further disturbance. Species like *Dipterocarpus* and *Dysoxylum* present in the area are highly vulnerable species when the natural habitat is disturbed. Wherever bamboo patches are observed, it appears that bamboos have resulted from jhumming system of cultivation as discussed before by Deb and Dutta, 1987.

### **Conclusion**

Over the years, the increase in biotic pressure, mainly practice of jhum cultivation, diverse land uses in forested landscape have adversely affected the floristic composition of the natural forest. Buffer zone of DTR has rich diversity of primates which are dependent on arboreal flora for food. These wild fruit and leaf fodder yielding trees species are specifically distributed in some pockets which if disturbed will disappear in due course of time. Alternatively there is a need to prevent scattered distribution of human settlements and the monoculture of commercial plantation species and consolidate these activities in a particular stretch and leave the rest of the forest area unaffected so as to retain the vast assemblage of floristic diversity and the habitat.

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