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Research Article

CLIMBING PLANTS DIVERSITY IN THE FLORA OF NAMDHAPA RESERVE FOREST, ARUNACHAL PRADESH, INDIA

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ABSTRACT
The present paper focuses on the phytosociological survey of climbers and liana in Namdhapa reserve forest and enlists the plant species with their habitat and their climbing mechanisms. The survey in this restricted forest encountered 29 herbaceous climbers and 22 woody climbers, covering 28 families. In dicotyledons, there are 23 families containing 33 genera and 42 species. In monocotyledons, there are 2 families containing 4 genera and 6 species. Menispermaceae and Dioscoreaceae, among dicot and monocot are found to be dominant family respectively. It also provides a data base on Namdhapa forest plant species which can be utilized in the context of species conservation and future inventories.

Keywords: *Diversity, Climbing Plants, Namdhapa Forest, Arunachal Pradesh*

INTRODUCTION
Climbing plants are more diverse and abundant being commonly associated with tropical forests than in temperate forests (Givnish and Vermeiji, 1976; Grubb, 1977; Putz, 1984; Gentry, 1991; Richards, 1996). In India the tropical forests occupy 84% of the total forest cover (637293 km2), which is 19.39% of the total geographic area. The tropical wet evergreen forest extends up to 15010 km2, thus covers 10% of the tropical forest cover of the country (IIRS, 2002). Such forests face serious threats because of widespread landuse changes, leading to hamper species survival (Menon *et al*., 2001). This emphasizes the need to conserve biodiversity rich sites by bringing more area under conservation network, at the same time update our knowledge on species distribution, floristic composition, ecosystem diversity and plant structure protected areas (Rodgers *et al*., 2000).
To protect biodiversity rich areas of the country, a protected area network (PAN) programme initiated by bringing large number of habitats and ecosystems under PAN in the Himalaya as well as other parts of India (Kothari *et al*., 1989; Rodgers *et al*., 2000).
The northeast India is a global hotspot of biodiversity because of its geographical position, climatic conditions and altitudinal variations (Myers *et al*., 2000). The region has 49 protected areas (11 national parks and 38 wildlife sanctuaries) covering a land area of 13936.80 km2, which comprises 5.46% of the total area of the northeast (Rodgers *et al*., 2000). Namdapha National Park, Arunachal Pradesh comprised the largest area among all (14.24% of total PAN of the northeast) with extremely diverse vegetation and habitat types (Chauhan *et al*., 1996; Ghosh, 1987; Deb and Sundriyal, 2008).
Although there are a few studies on biodiversity characterization of selected vegetation types in the northeast India (Rao *et al*., 1997; Khan *et al*., 1986, 1987; Barik *et al*., 1996). However such information is highly limiting for protected areas, which otherwise has significant implications for forest management and biodiversity conservation of the region (Proctor *et al*., 1998; Nath *et al*., 2005). In almost all the works on the flora of different countries, the climbers are nearly neglected. Climbers are the most under collected of any major plant group (Gentry, 1991). Although, interest in climbing plants inventory has recently gained currency (DeWalt *et al*., 2000; Muthuramkumar and Parthasarathy, 2001; Perez- Salicrup *et al*., 2001; Parren, 2003; Reddy and Parthasarathy, 2003; Kouame *et al*., 2004; Mascaro *et al*., 2004; Parthasarathy *et al*., 2004; Rice *et al*., 2004; Phillips *et al*., 2005; DeWalt *et al*., 2006; Prasad *et al*. 2009; Ghosh and Mukherjee, 2006; Ghosh, 2013a, b, Ghosh, 2014, a, b, c, d; Ghosh and Pandey, 2014). No comprehensive work is available for climbers in the study area. Therefore, the specific objectives of the present study was to determine the diversity and distribution of climbing plants in Namdapha forest,

Arunachal Pradesh as a way of contributing to the understanding of the general floristic composition, abundance and diversity.

MATERIALS AND METHODS

Methodology and Study Area

Namdapa National Park (27°23'30''- 27°39'40'' N to 96°15'2'' - 96°58'33'' E longitude) located in the Changlang district of Arunachal Pradesh state, northeast India (Deb and Sundriyal, 2008). It comprised an area of 1985.25 km2 with 177.43 km2 in buffer zone and 1807.82 km2
in the core zone (Figure 1). The park shares southern and eastern boundaries with Myanmar, and the northern boundary with the Kamlang wildlife sanctuary of Lohit district of the state. The park area falls under the Eastern Himalaya (2D) biogeographic province, which covers the Paleartic and the Indo-Malayan (Oriental) realms (Rodgers *et al*., 2000). It is wedged between the Dapha Bum range of Mishmee Hills, an outspur at the tail end of North Eastern Himalaya, and the Patkai range with an elevational variance of 200 to 4571 m above sea level. General topography of the park is rugged with steep hills and narrow valleys intersected by several streams. Geologically the park is of recent origin and owes its formation to the upheaval of the Himalaya in Pleiocene period of the tertiary age (Chauhan *et al*., 1996). The area exhibits tropical climate, it receives an annual rainfall of 2500 to 3000 mm, and the temperature and relative humidity remains high throughout the season (Deb and Sundriyal, 2008).

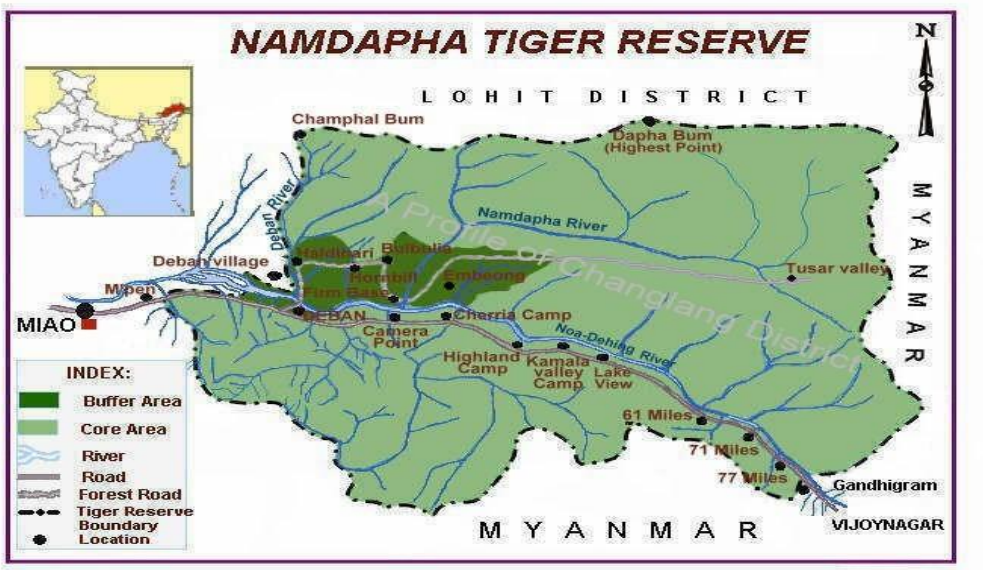

Figure 1: Study area

Quantitative inventory of climbers was carried out between January 2001 and September 2004. For collection and preservation of plant specimens and to document the information, the author followed the guidelines as mentioned by Jain (1965), Jain and Rao (1977) and Pal and Jain (1999) with some minor modifications wherever necessary. Climbers were identified with the help of published flora (Hooker, 1872-1885; Gamble and Fisher, 1921-1935; Mathew, 1991). Climbing mechanisms were also studied for each species and classified them based on observations in the field and reliable references (Putz, 1984). The voucher specimens were processed into mounted herbarium sheets following the conventional methodology (Jain and Rao, 1977) and deposited at CUH herbarium.

RESULTS AND DISCUSSION

A total of 536 species of climbers and lianas were identified from the different area of protected forests of Namdhapa. They are represented by 48 species of angiosperms, 3 ferns (Pteridophytes). The 23 families

of the dicotyledons have 42 species under 33 genera, while 2 families of the monocotyledons have 6 species under 4 genera. Total number of genera is 3 in the pteridophytes under 3 families.

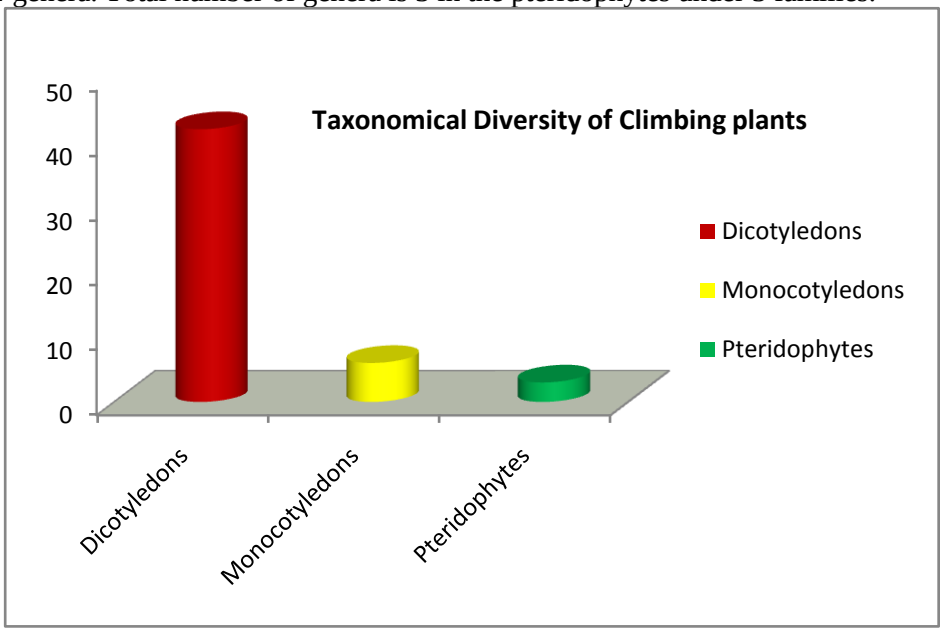

Figure 2: Taxonomical Diversity of Climbing plants in Namdhapa Reserve Forest

Species wise, major families are: Menispermaceae (5), Moraceae (5), Oleaceae (4), Piperaceae (4), Dioscoreaceae (3), Vitaceae (3), Anonaceae (2), Araceae (2), Asclepidaceae (2) and Celastraceae (2). Families represented by single member each are: Arecaceae, Asteraceae, Caesalpiniaceae, Combretaceae, Cucurbitaceae, Dilleniaceae, Dennsteadiaceae, Fabaceae, Lygodiaceae, Malphighiaceae, Mimosaceae, Myrsinaceae, Papilionaceae, Passifloraceae, Rhamnaceae, Rutaceae, Selaginellaceae, Sterculiaceae and Thunbergiaceaee (Table: 1).

Genera with 2 species or more are: *Ficus* (5), *Piper* (4), *Dioscorea* (3), *Caryatia* (2), *Jasminum* (2). The total number of herbaceous climbers is 29 (56.86%) and that of woody lianas is 22 (43.13%) respectively (Figure 3).

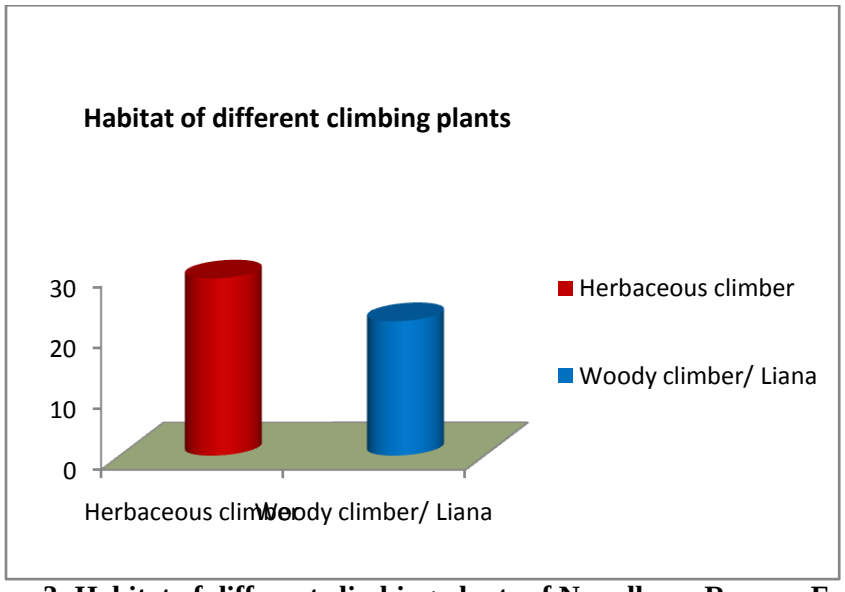

Figure 3: Habitat of different climbing plants of Namdhapa Reserve Forest

Table: 1. Enumeration of different climbing plants of Namdhapa Reserve Forest.

Sl. No.	Species	Family	Habitat	Climbing mode	Nature of Climbing organ	Voucher No.
1	*Acacia torta* Craib.	Mimosaceae	L	Hook climber	Hooke thorns on the stem.	85
2	*Artabotrys caudatus* Wall.	Anonaceae	L	Hook climber	Inflorescence axis.	12
3	*Aspidocarya uvifera* Hk.f.&Th.	Menispermaceae	C	Twiner	Branches	5
4	*Bauhinia anguina* Roxb.	Caselpiniaceae	L	Twiner	Distal leaflets	49
5	*Buetheria aspera* Colebr.	Sterculiaceae	L	Twiner	Branch	3
6	*Butea parviflora* Roxb.	Fabaceae	L	Twiner	Branches	14
7	*Calamus leptospadix* Griff.	Arecaceae	L	Twiner	Stem	22
8	*Cayratia pedata* (Lamk.) Juss.ex.Gagnep.	Vitaceae	C	Tendril climber	Apical part of the main axis.	7
9	*Cayratia trifolia* (L.) Domin.	Vitaceae	C	Tendril climber	Modified axillary branch	79
10	*Celastrus stylosa* Wall.	Celastracae	L	Branch climber	Leader axis or branch	48
11	*Cissampelos pareira* L.	Menispermaceae	C	Twiner	stem	14
12	*Cocculus macrocarpus* W.& A.	Menispermaceae	L	Twiner	Branch	4
13	*Combretum pilosum* Roxb.	Combretaceae	L	Twiner	Stem	28
14	*Cryptolepis buchanani* Roem.	Asclepiadaceae	C	Twiner	stem	17
15	*Derris cuneifolia* Benth.	Papilionaceae	L	Twiner	Coiled stem	56
16	*Dioscoria glabra* Roxb.	Dioscoriaceae	C	Twiner	Stem	35
17	*Dioscoria hamiltonii* Hook.f.	Dioscoriaceae	C	Twiner	Stem	97
18	*Dioscoria spinosa* Roxb. ex Wall.	Dioscoriaceae	C	Twiner	Stem	77
19	*Embelia robusta* Roxb.	Myrsinaceae	L	Branch climber	Branches	81
20	*Erythropalum scandens* Bl.	Oleaceae	C	Tendril climber	Leader axis	1
21	*Euonymus cinereus* Lawson	Celastracae	C	Branch climber	Leader axis or branch	95
22	*Ficus crininervia* Miq.	Moraceae	C	Root climber	Root	65
23	*Ficus foveolata* Wall.	Moraceae	C	Root climber	Root	92
24	*Ficus heterophylla* L.	Moreaceae	C	Root climber	Root	27
25	*Ficus ramentacea* Roxb.	Moraceae	C	Root climber	Root	94
26	*Ficus rostrata* Lamk.	Moraceae	C	Root	Root	30

				climber		
27	*Hiptage acuminata* Wall.	Malphighiaceae	L	Twiner	Stem	60
28	*Hoya globulosa* Hook.f.	Asclepiadaceae	C	Twiner	Branch	13
29	*Jasminium glandulosum* Wall.	Oleaceae	L	Twiner	Branches	15
30	*Jasminum flexile* Vahl.	Oleaceae	L	Twiner	Stem	9
31	*Melodorum polyanthum* Hk.f.& Th.	Anonaceae	L	Branch climber	Branched coiled & hooked	59
32	*Mikania micrantha* Kunth.	Asteraceae	C	Twiner	Stem	22
33	*Myxopyrum smilacifolium* Bl.	Oleaceae	L	Twiner	Stem	91
34	*Passiflora nepalensis* Wall.	Passifloraceae	C	Tendril climber	Modified axillary bud	50
35	*Piper nigrum* L.	Piperaceae	C	Root climber	Root	89
36	*Piper peepuloides* Roxb.	Piperaceae	C	Root climber	Root	19
37	*Piper petiolatum* Hook.f.	Piperaceae	C	Root climber	Root	67
38	*Piper thomsonii* Hook.f.	Piperaceae	C	Root climber	Root	63
39	*Pyrrosia numulariaefolia* (S.W.) Ching.	Dennsteadtiaceae	C	Root climber	Root	74
40	*Raphidophora hookeri* Schott.	Araceae	L	Root climber	Root	24
41	*Scindapsus officinalis* Schott.	Araceae	C	Root climber	Root	21
42	*Selaginella helferi* Warb	Selaginellaceae	C	Root climber	Root	71
43	*Stephania glandulifera* Miers.	Menispermaceae	C	Twiner	Branch	2
44	*Tetracera sarmentosa* (L.) Vahl..	Dilleniaceae	L	Twiner	Rough stem & leader axis	37
45	*Tetrastigma serrulatum (*Roxb.*)* Planch	Vitaceae	C	Tendril climber	Apical part	33
46	*Thunburgia coccinia* Wall.	Thunbergiaceae	C	Twiner	Stem	45
47	*Tinomiscium micranthum* Diels	Menispemaceae	L	Twiner	Stem	17A
48	*Trichosanthes truncate* C.B.Clarke	Cucurbitaceae	C	Tendril climber	Stem	2A
49	*Uncaria sessilifructus* Roxb.	Rubiaceae	L	Hook climber(Paired hooks)	Axillary brachlets	88
50	*Zanthoxylum hamiltonianum* Wall.	Rutaceae	L	Prickly twiner	Prickles on stem	28A
51	*Zizyphus funiculosa* Ham.	Rhamnaceae	L	Prickly climber	Prickles on stem	106

The number of herbaceous climbers in the dicotyledons is 23 (45.09%) and in the monocotyledons it is 6 (11.76%) only. Amongst the dicotyledons 19 (37.25%) species are lianas and 23 (45.09%) species is herbaceous climbers. Pteridophytes have 3 climbers.

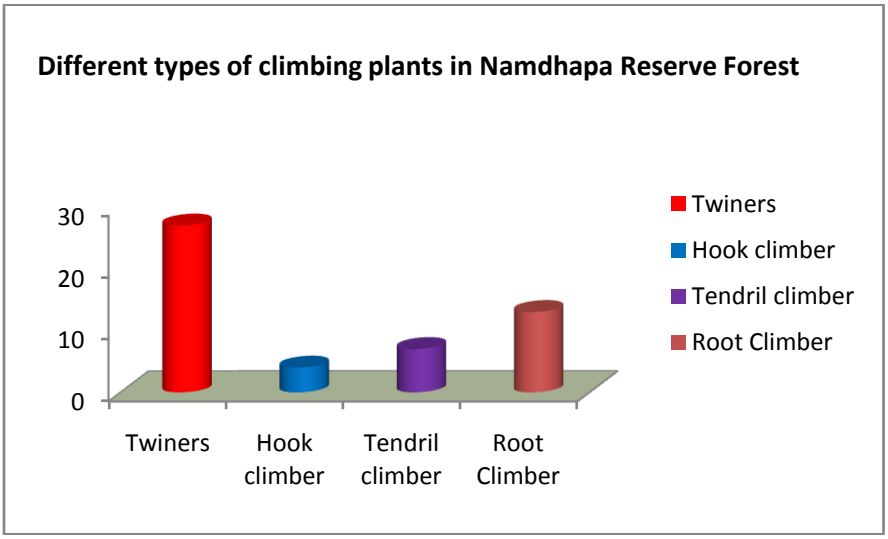

Figure 4: Different types of climbing plants in Namdhapa Reserve Forest

Taken together, there are 26 (52 %) twiners, within which 21 stem twiner, 3 branch twiner, 2 prickly twiners; 4 (8%) hook climbers; 7 (14%) tendril climbers and 13 (26%) root climbers (Figure 4).

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