

**STUDIES OF THE ANGIOSPERMIC FLORA OF
ALPINE EAST SIKKIM WITH SPECIAL REFERENCE
TO PANGOLAKHA WILD LIFE SANCTUARY**

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*Dedicated to all those,
who forfeit their little but valuable life for saving Plants.*



The silent-freezing winter in the conifer forest
of Pangolakha Wildlife Sanctuary (Christmas 2008)

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"The most wonderful mystery of life may well be the means, by which it created so much diversity from so little physical matter" – Wilson.

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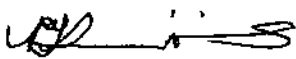
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Chapter-1

Introduction

Sikkim, a former British Protectorate, became a part of India, as the 22nd state of the Indian Union on 16th May 1975. It is the realm of the snow-clad peaks of the Himalayas, including the world's third highest peak Mt. Kanchenjunga (8585 m). The geographical advances of the state covers 27°4' 46" to 28° 7' 48" N and 88° 58" to 88° 55' 25" E and altitudinal ranges of 270 to 8585 m. It is located north of the Darjeeling-hills of West Bengal, and shares international border with Nepal in the west, China in the North and North east and Bhutan in the east and extending approximately 114 km from north to south and 64 km from east to west. An extensive precipitous mountain walls, which looks like the "Pearl in the Craggy Oyster" commonly built up of crystalline rocks that separate Sikkim from Tibetan highlands. With the total geographical area of 7096 sq km, the entire part of it is interlaced with jungle clad ridges and deep ravines created through major mountain peaks and the river valleys and extremely dense forests (Champion & Seth 1968). Sometimes, Sikkim is also referred as the "Abode of snow" (Rishley 1889).

Geomorphologically, it belongs to the upper parts of Teesta basin and the landscape of the state owes to the drainage network of Teesta and Rangit rivers. As usual, the structural slope of the land is from north to south; hence all the major glaciers of *Rellichu*, *Rathongchu*, *Talungchu*, *Langbachu* etc are originating from a common accumulation area in north-west parts of the this Himalayan state.

Lepchas (an indigenous tribe), Sikkimese Bhutia tribe and Sikkimese Nepali inhabit this tiny Himalayan state and few others mainly associated with industries, factories and other business related activities. Each ethnic tribal group has their own distinct language and literature, though the *Lingua franca* of state in the present day is Nepali language (Pahari). Hence, Sikkim is endowed with a great diversity of cultural traditions and practices. There are altogether 11 languages, which have been recognized as official language by the state government.

Eastern Himalaya, including Sikkim, Darjeeling and Arunachal Pradesh is considered as a distinct phytogeographical region (Clarke 1898; Hooker 1907; Chatterjee 1940). Eastern

Himalaya directly confronts the moisture, monsoon winds, blowing in land across the Bay of Bengal. That leads to a high degree of precipitation that has no equal in the planets. Habitats with almost absolute aridity to maximum of humidity favors the migration of plants widely from different bordering countries; notably China and Malaysia in the east and north; Europe, Siberia and Tibet in north and Africa, and other oriental countries in the west.

Hooker (1904) commented, "The flora of British India is more varied than that of any other country of equal area in the Eastern hemisphere, if not in the globe"

As such, having being an integral part of the Eastern Himalaya and due to its immensely rich flora and fauna, this tiny Himalayan state of India has been recognized as a "hotspot" of biodiversity. Sikkim shares only 0.2% of the geographical area of the country but harbors more than 26 % of the flowering plants of the country; hence identified to be an important phytogeographical reserve of the country.

This tiny state of Sikkim supports luxuriant tropical temperate and alpine vegetation in its most pristine and virgin form. Its unique geographical position varied topography, high annual precipitation, maximum demographic pressure makes the area one of the richest botanical treasure house of the country (Singh & Chauhan 1998). Nearly 46% of the total geographical area of the state is covered by forest (FSI 2001).

Most importantly, orchid resources and its distribution is exceptionally distinct and deserves appreciations, as out of around 1200 species of the country, it alone contributes for not less than 550 species (Lucksom 2007). Out of 82 species of *Rhododendron* recorded from the country, this tiny Himalayan state alone represents not less than 36 species. Apart from that, Sikkim is also endowed with substantial account of both floral and faunal diversity.

Therefore, due to its sheer location and complex inter-relationship and species composition, this Himalayan state attracts a large number of researchers from different parts of the world. It arouses largely of interest among scientists and researchers. (Rai *et al* 1998). A cursory glance at the location of Sikkim in the map of India reveals the extraordinary strategies important of the state and despite represent, a fraction of global land surface has been a paradise for natural scientists. It is because the land endowed with exceedingly rich biological wealth as evidenced by the presence of 16 conifers, 23 bamboos, 362 ferns and fern allies, 8 tree ferns, 16 Primulas, 11 oaks, over 424 medicinal plants, 150 mammals, 552 birds, 48 fishes and 690 species of butterflies. There are also 28 mountain peaks, 21 glaciers, 227 high altitude lakes and wetlands and over 104 rivers and streams located within the boundary of this tiny state.

Reasons of such immensely rich biodiversity present in such a small area may be various, but also presumed to be due to diversity of habitats / microclimates and nearness to the Bay of Bengal, which is the ultimate source of moisture (water), a vital ingredient for supporting spectrum of life forms in this land.

1.1. ALPINE AND SUB-ALPINE ZONE IN EAST SIKKIM

Sikkim being a hilly state, it comprises of nearly 60 % of its landscape substantially falls under the alpine and sub-alpine zone. The altitudinal range of the sub-alpine to alpine region including alpine region of east Sikkim ranges from 2134 m to 4572 m above mean sea level. The landscape of the region being hill terrain, rocks, covered with scrubs to thick forest, which ultimately turns out to be practically unfavorable for human settlement. Apart from that, having being these areas remained under snow covers for minimum of four to five months is comparatively cold throughout the year and tend to have not less than 300 cm average annual accumulation that gives out the major glaciers like Talung and Zemu.

The vegetation of the alpine region of East Sikkim is completely unusual. The *Abies*, *Salix*, and *Rhododendron* scrubs are the most dominating type of vegetation supported by several minute spiny short herbs. Devoid of the predictable extremely climate, it still supports a large numbers of animals including birds, mammals, fishes etc. Perhaps it is also not wrong to say that it appears to be home of some of the endemic animal species of Sikkim particularly of *Sikkim Stag*, *Blue sheep* etc. Some notable places that fall under the region are Chhangu, Kupup, Kyongnosla, Nathula, Memen tsho, Nathang, Padam Chen etc. As such, Chhangu, Men-men tsho, Bidang tsho, Lampohkri etc. are major lakes and contribute substantially in terms of wildlife, tourism etc. Most importantly, two important wildlife sanctuary of Sikkim namely Kyonglasha Wildlife sanctuary (31 sq km) and Pangolakha Wildlife Sanctuary (128 sq km) are located in this region. Some of the important nurseries of alpine medicinal plants are developing there by the Forest Department, Government of Sikkim for *ex-situ* conservation of rare and endangered medicinal and other valuable plant species. Notable species under the conservation process includes *Aconitum ferox*, *Berginia ciliata*, *Neopicrorhiza scrophulariifolia*, *Nardostachys jatamansi*, *Podophyllum hexandrum*, *Panax pseudo-ginseng* etc.

As elsewhere, floristic component representing here is entirely diverse from the one that appear in temperate and tropical regions. It uphold a majority of highly valuable economical plants including medicinal and aromatic, dye yielding, timber yielding etc.

Different species of *Rhododendrons*, known for their medicinal and aesthetic values, are the major floristic components of this region. Interestingly, rare orchids under the genus *Orchis*, *Spirentes*, *Habenaria* etc are also nicely represented in the vegetation.

The alpine region of East Sikkim including the places like Nathula, Jalepla, Baba Mandir, Mem-Men tshu, Chhangu lake are already identified as important tourist hubs. Apart from that, the reopening of the trade centre at Sherathang near Nathula further enriches the important of the area.

Alpine and sub-alpine regions of East Sikkim cover an important strategic international boarder with China and kingdom of Bhutan. As such, the major areas of this region are occupied for the national army and for their camps etc. However, a negligible number of the highlanders including Sherpas, Bhutias, Tibetans and others in the form of laborers, supplier etc. partially inhabit the area.

1.2. VEGETATION STRUCTURE IN SIKKIM

Hooker in 1954, while documenting the rich and diverse floristic wealth of Sikkim and categorized the vegetation into three major types: Tropical, Temperate and Alpine. Several authors followed this classification of vegetation (Gammie 1894; Ali 1962; Mani 1974; Hajra & Verma 1996; Singh & Chauhan 1998; Sudhakar *et al* 1998; Islam & Rahmani 2004). Broadly, Sikkim can be divided into six botanical zones based on elevation and characteristics of vegetation (Haribal 1992; Hajra & Verma 1996). Distinct transition of vegetation occurs at about 900 m altitude. These zones are (i) Tropical semi-deciduous forests (<900 m); (ii) Tropical moist and broad-leaved forests (900 - 1800m); (iii) Temperate broad-leaved forests (1800 - 2800 m); (iv) Temperate coniferous and broad-leaved forests (2800 - 3800 m); (v) Sub-alpine vegetation (3800-4500 m) and (vi) Alpine zone (>4500 m).

The Sikkim Himalayas temperate forests that grow at elevations where moisture tends to condense and remain in the air during the warm, moist growing season are among the most species-rich temperate forests in the world. They are dominated by evergreen broadleaf trees (e.g. *Quercus*, Lauraceae) in the lower reaches, from about 2,000 - 2,500 m, and mixed conifers (e.g. *Tsuga*, *Taxus*) and winter-deciduous broadleaf species (e.g. *Acer*, *Betula*, *Magnolia*) in the upper reaches, from 2,500-3,000 m. The drier, south-facing slopes support extensive stands of arboreal *Rhododendron* species that may co-occur with oak (*Quercus semecarpifolia*) or other ericaceous species such as *Lyonia ovalifolia*. These temperate forests support a rich epiphytic community, consisting of a variety of dicots, orchids, ferns, and mosses. Bamboo (*Arundinaria* spp.) is also dominant in the forests of these ecoregion.

Further upslope, sub-alpine conifer forests begin from about 3,000 m and extending to 4,000 m. *Tsuga*, *Picea* or *Larix* mostly dominate these forests between 3,000 to 3,500 m and by *Abies* above 3,500 m. *Juniperus* is widespread along the timberline, and may form dwarf *krummoltz* formations above 4,700 m. The dry slopes and inner valleys support *Pinus* and *Cupressus* on basic limestone soils.

Above the tree-line the vegetation is moist alpine scrub community of dense juniper and *Rhododendron* shrubberies that extend to about 4,500 m. Plant richness in these alpine shrubs and meadows is very high, especially on the shady north-facing slopes those are protected from extreme winter cold by an insulating layer of snow. South-facing slopes tend to be dominating by *Kobresia* sedge and forbs with scattered shrubby species of *Berberis*, *Rosa*, *Lonicera*, and *Cotoneaster* to about 4,500 m. From 4,500 to 4,700 m the vegetation consists of alpine meadows with a diverse assemblage of alpine herbs and smaller-stature woody shrubs, such as a variety of dwarf rhododendrons, and numerous alpine herbs like species of *Potentilla*, *Ranunculus*, and the alpine *Saussurea*.

Periglacial and subnival communities occur in the high alpine areas above 4,700 meters, where the short growing season, high winds, and unstable soils allow only specialized plants to survive. Some of these include *Androsace*, *Arenaria*, *Saxifraga*, *Meconopsis* and *Primula*. The latter two have their global centers of diversity in the Eastern Himalaya. At about 5,500 to 6,000 meters, the nival zone, or permanent ice and bare rock, begins. Even here, at the highest elevations on Earth, microclimates may support small cushion-forming vascular plants, such as *Arenaria*.

A notable feature of the protected areas systems of Bhutan, Nepal, and northeastern India is that many of these are located adjacent to each other across the national borders, and provide opportunities for transboundary conservation. The Kanchenjunga National Park in Sikkim and Kanchenjunga Conservation Area in eastern Nepal and Manas National Park in Bhutan and Manas Tiger Reserve in Assam are two such complexes.

1.3. CONSERVATION OF BIODIVERSITY

The mountains of the Himalayas including the Eastern Himalaya are geologically young (Xu 1993). By many measures of biodiversity, the Eastern Himalayan region stands out as globally important. It has been included in the 34-biodiversity hotspots on Earth (Myers *et al.* 2000; IUCN 2010), includes several Global 200 ecoregions (Olson & Dinerstein 1998), two Endemic Bird Areas (Satterfield *et al.* 1998), and several centers for plant diversity (IUCN

1995). Previously, this region was included under the Indo-Burma Hotspot but now it is located within the territory of Himalaya Hotspot (**PLATES - I**).

Extending from central Nepal to Northeast India and with the total area of about 2,060,000 km², Eastern Himalaya is identified as a vast biodiversity hotspot next to the Mediterranean Basin, which is marginally bigger at 2,363,000 km² (Mittermier *et al.* 1999).

Because of multiple biogeographic origins, considerable climatic variability associated with the topography along with out reach of the mountains, also complex and steep topography with a large-scale climatic variability ultimately contribute the Eastern Himalaya an extremely rich in biological diversity (Singh & Chowdhery 2002; Rai 2006).

Sikkim Himalaya, which lies at the convergence of the Central and Eastern is also a part of Eastern Himalaya (Ali 1962; Mani 1974; Islam & Rahmani 2004; Nandi *et al.* 2006). With the total area of 7096 km² and having being only with only 0.2% of the geographical area of the country, Sikkim harbors around one third of the flowering plants of India. This is because it supports luxuriant tropical, temperate and alpine vegetation in its most pristine and virgin form and also due to its unique geographical position varied topography, high annual precipitation, maximum demographic pressure make the area one of the richest botanical treasure houses of the country (Singh & Chauhan 1998). Since the inception of its centre, the Botanical Survey of India is carrying out the exploration and mapping of floristic diversity in Sikkim Himalayan region.

Mehra & Bir (1964) have reported as many as 362 species of ferns and ferns allies from Sikkim. As such, the Sikkim is also noted for its rich repository of angiospermic flora (Hara 1965; Rao 1994). The much diversified epiphyte flora of Sikkim forms a rich specialized canopy based vegetation structure in semi- evergreen forest trees (Champion & Seth 1968).

The total forest covers being estimated is as ca 42.8 % (3124 sq km) of the total geographical area of which 2260 sq km are under protected and reserved area (Srivastava 1993, 1996).

The enormous resource of numerous Non-Timber Forest Produces (NTFPs), those are of biological origin other than wood, are also been noted from Sikkim. Their role in the sustenance of rural economy and daily livelihood are distinctly visible. The major components of NTFPs of Sikkim are medicinal, fiber, food, vegetable, agricultural implements, construction of houses, making rope, handicrafts, household articles etc. Accumulated through the generations, the use of NTFPs is an integral part of the traditional and cultural practice in this small but beautiful Himalayan state.

Himalaya Conservation Hotspot area



PLATE I: Himalaya Conservation Hotspot area

Source: IUCN 2010, <http://WWW.biodiversityhotspots.org/xp/hotspots/hotspotScience/pages/>

Sikkim upholds more than 424 species of medicinally important plants (Gurung 2003). Majority of species are being used as medicinal also narrated in Ayurveda are endowed with rare and endangered species of high altitude medicinal plants. It also upholds an immense value in social, cultural and spiritual life of the people of Sikkim Himalayas.

It is being realized that the biodiversity throughout the world is being gradually affected by the direct and indirect intervention of human being. In addition, natural calamities as drought, floods, landslide, soil erosions etc are also responsible to some extent for the loss of the biodiversity. Hence, it is felt that unless immediate and effective measures are not taken, we may tend to loose some of our important living resource before knowing their potential economic use.

The practice of biodiversity conservation is practiced for a long period in India. Long back in 3rd Century, it was Emperor Ashoka, who first enforced the conservation measures by establishing hospital and protected places for animals and birds.

Through a Royal Decree, the sanctuaries for wildlife conservation were later established in India over two thousand years ago. In the northeastern region of India including Sikkim, many tribal groups especially Lepchas have traditionally recognized protected sacred groves, which have been effective refuges for biodiversity for millennia (Gadgil 1985).

Therefore, realizing the facts of gradual depletion of biodiversity from the fragile ecozone and having being identified the extension of Protected Areas Network (PAN) have been, the cornerstones of biodiversity conservation. The Government of Sikkim has taken initiative to conserve those potential species of flora and fauna through declaration of six Wildlife Sanctuaries, one National Park and one Biosphere reserve (Tables 1.1 & 1.2).

Table 1.1: Lists of Biosphere Reserve & National Park in Sikkim

Sl.No	Name of the National park	Area (sq km)	District	Year of Estd.
1.	Kanchandzonga Biosphere Reserve	2566	N / W.	-
2.	Kanchandzonga National Park	1784	N / E	1977

Table 1.2: Lists of Wildlife sanctuaries of Sikkim

Sl. No.	Names of the sanctuary	Area (sq km)	District	Year of Estd.
1.	Kyongnosla Alpine Sanctuary	31	East	1982
2.	Fambong Lho Wildlife Sanctuary	51.76	East	1984
3.	Maenam Wildlife Sanctuary.	3534	South	1987
4.	Singba Rhododendron Sanctuary	43	North	1992
5.	Barsey Rhododendron sanctuary	104	West	1996
6.	Pangolakha Wildlife sanctuary	128	East	2001

Chapter-11

Study area

2.1 THE LOCATION AND SIZE OF THE STUDY AREA

Pangolakha Wildlife Sanctuary is the largest wildlife sanctuary in Sikkim (Lepcha 2006; Lepcha *et al* 2007, 2009). It is situated at the southeastern part of the Sikkim and falls under the Himalayan biogeographic IBA Site Code no IN-SK-09. With the total area of 128 sq km (12,800 Hectares), the sanctuary belongs to the bio-geographical zone 2C (Central Himalayas) as recognized by Rodgers and Panwar (1988). It is located between 27° 08' 03" N latitude near *Phusrey* in southern tip to 27° 21' 59" N latitude in northern tip near *Jelepla* and extended from 88° 55' 23" E latitude near *Batangla* to 88° 41' 28" E latitude at *Simane Khola*. The lowest point of the sanctuary falls at the 27° 11' 35" N latitude and 88° 43' 43" E longitude at *Chukha river* in between *Rigu* and *Sangha* rivers at the elevation of 1200 m. And, the highest elevation points falls on 27° 21' 01" N latitude and 88° 53' 16" E longitude at *Pinbriono* near *Dongchula* at the elevation of 4570 m. The sanctuary covers various climatic zones ranges right from the sub-tropical to alpine zone. The map of the location, vegetation type, landuse, elevation and drainage system of the PWS is mentioned at plate II,III &IV.

Based on information and relevant statistics collected from the area, the optimum size of the protected area was standardized considering the richness of the bio-diversity, availability and distribution of flora and fauna. The entire region is crossing along the international border between Sikkim, China, and Bhutan harboring the virgin forests and alpine pastures. The forest in the sanctuary is commencing from *Phadamchen*, *Zuluk*, *Lamateng*, *Barapathing*, *Men Men itso*, *Assam Lingzey*, *Bhusuk* and *Lagyap* formed the natural trail of many carnivores and ungulates, which is further connected with Pangolakha and Rachel Reserve Forest and the adjoining regions of Bhutan and West Bengal. Many of the species reported are either en-route into Sikkim via Bhutan or West Bengal on migration. The natural boundaries of sanctuary however do not proportionately follow the actual alignment; however, western alignment follows the *Rongli-Nathang-Jalepla* road. Further, a

large number of Army bunkers and settlement as well as civilian settlements fell along the road. The sanctuary also includes areas like *Pangolakha* Reserve Forest, *Rigu* south and north, *Rachela*, *Zuluk*, *Nathang*, *Lampokhari* and part of *Jalepla*.

2.2. LEGISLATION

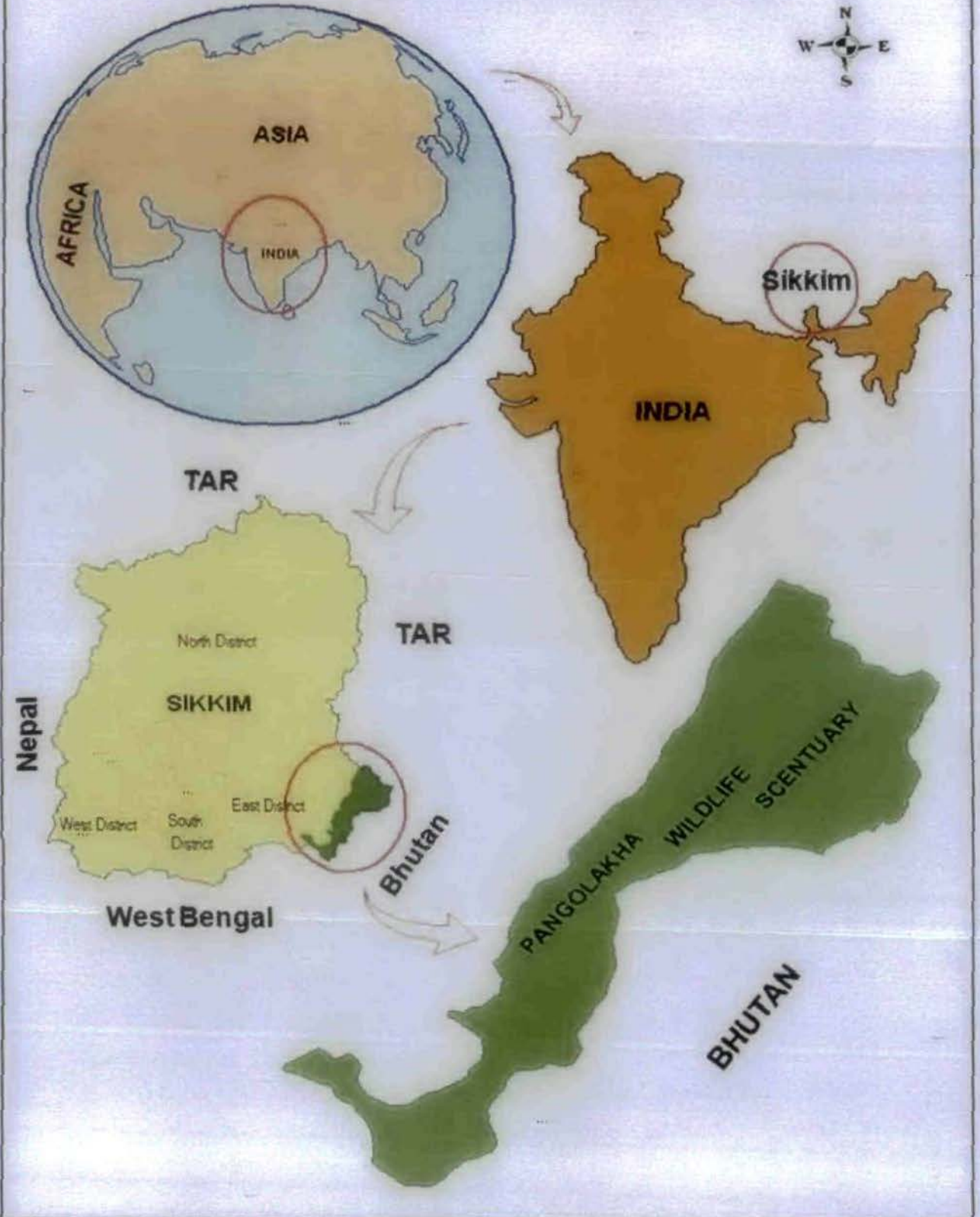
The Government of Sikkim declared Pangolakha Wildlife Sanctuary with its total area of about 128 sq km as Wildlife Sanctuary in the year 2002 through the notification no. 10 / 09 / WLC / 02 / 127, dated 05.09.2002 (Annexure- I). The reason behind the declaration of this sanctuary is for the protection of the both rare and endangered species of flora and fauna, apart from that area being extremely rich in biodiversity, inaccessible, virgin vegetations, wide range of topography, edaphic, altitudinal biotic composition and of complex species composition.

2.3. BOUNDARY AND DEMARCATION OF THE SANCTUARY

The Northern boundary of the sanctuary actually starts from the *Zuluk* and runs through the places like *Gnathang*, *Tukla*, *Neola*, *Kupup*, *Jalepla* etc. As such, the southern boundary of the sanctuary starts from the point where *Dichu* meets the internal boundary with Bhutan up to *Rachila* and further it runs along the state boundary with *Neora Valley National Park*, *West Bengal*. The eastern boundary starts from *Jalepla*, runs along with the international boundary with *China*, *TAR*, meets the *Tri-junctions*, and further runs the international boundary with *Bhutan* up to where to where the *Dichu* meets the *Indo-Bhutan* boundary. The western boundary starts from the points where the Reserve line of *Chandey* Reserve Forest meets with the boundary with *West Bengal* state and runs along the reserve line of *Chandey* Reserve Forest, *Bichkharka* Reserve Forest, *Pangolakha* Reserve Forest, *Singhaney Bans* Reserve Forest, *Tungsey* Reserve Forest and above north and south *Regu*, *Premlakha*, *Padamchen*. This area is now partially inhabited by the *Border Security Force* as well as the *Indian army* and the rest of the areas are mostly occupied by the *Sherpas*, few *Bhutias*, and others who helps the army in the form of the laborers, contractors, suppliers etc. Some of the important forests pockets under the sanctuary are *Panikharka* Reserve Forest (*Rachila*), *Chandaney* Reserve Forest (*Thami dara*), *Singhaney bhans* (Reserve Forest), *Maj kharka*, *Kheohyaklo* Reserve Forest (*Zuluk*), *Salami* Reserve Forest (*Nathang*), *Lungthung* Reserve Forest (outlet of *Dichu* & *Dokala*), *Pangola* Reserve Forest (*Tukula interior*) and *Lampokhri*

LOCATION MAP

PANGOLAKHA WILDLIFE SANCTUARY



(Rhododendrons and Juniperus forest). The lists of some important places of sanctuary and significant value are mentioned in Annexure-II.

Apart from that, the sanctuary is situated in extremely difficult terrains. Devoid of road communication to nearby areas, the accessibility inside the sanctuary is extremely difficult and tough. However, recently some facilities are being extended by the Department of Forests and by the Department of Tourism, Government of Sikkim (Annexure- III). Other facilities like tent, and necessary kits cum field equipments for trekking must have to be arranged by the visitors, while entering particularly in the far interior forests other than Panglakha, Rachela, Phusrey and Hathichereay. The lakes mostly located nearby the forest barracks are actually the main source of drinking water over here. Apart from that, there are few villages primarily inhabited by the local people including Lepcha, Bhutias, Sherpas, Limbos, Rais, Manger, Chettris and others. Some villages situated at the vicinity of the sanctuary has been involved in Eco-Development Committee to conserve the sanctuary (Annexure-III) and their representative assembly constituency are mentioned in Annexure-III.

2.3. SIGNIFICANCE OF THE STUDY AREA

The Pangolakha Wildlife Sanctuary (PWS) is located within the IUCN recognized Himalaya Hotspot (IUCN 2010) and has been identified as one of the richest storehouse of the biological resources. It is a compact terrain of 128 sq km and with recorded altitudinal range varying from 1200m near Simaney Kholā to 4579 m at Pinbriongo near Donchulla. The entire Pangolakha range is one very difficult terrain guarded by steep mountain, dense forest etc. Due to such natural limitations, the natural habitats of flora and fauna of this sanctuary remained undisturbed for past many centuries and that has resulted into the formation of a significant plethora of diversity in regards to both the floral and faunal species. The sanctuary has its own distinct identity in regards to the existence of variety in orchids, ferns, bamboos, rhododendrons etc. The PWS covers a wide range of subtropical to alpine types of vegetation producing innumerable variation in habitat structure allowing much wider diversity of flora & fauna to settle within its periphery. In addition, the sanctuary also acts as a home for the many lower groups of plants. The sanctuary is also identified as one of the important repository of various economic plant wealth, especially the high valued medicinal plants and several other plants indispensable floral species directly or indirectly associated with the humanity. The present study has clearly indicates that the sanctuary is also a reservoir of high value Non-

Timber Forest Produces (NTFP) including bamboos, dyes and high altitude medicinal plants. Apart from that, the intensive knowledge on the flora of Pangolakha ridge and its adjacent regions would certainly improve our understanding about the flora *vis-à-vis* biodiversity of Sikkim (Singh & Chauhan 1998).

The landscape of the sanctuary is uniquely varied. The major portion of the sanctuary is occupied by the valleys, hills, rocks, meadows, barren alpine flat lands, and finally ends up with the huge mountain peaks in the northern direction. Existence of such varied landscape certainly contributes its own significant.

Most importantly, the glory of the sanctuary is further enriched by the presence of two important tri-junctions of Sikkim. The Rachela tri-junction (3100 m) amsl is situated at the southeastern part of the sanctuary and it is point where the borderline of Sikkim, West Bengal and the kingdom of Bhutan meets. Whereas, the other important tri-junction is known as *Batangla*, where the border line among Sikkim (India), Kingdom of Bhutan and Tibet Autonomous Region (TAR) meets. Both these points are of the extremely important in regards to their picturesque scenic beauties. It attracts numerous travelers for trekking, hiking, and birds watching almost throughout the year. Amazingly, one can view near about one-third part of Sikkim from these two points. Significantly, the sanctuary also acts as birthplace of some important rivers of east Sikkim like Rongli, Dichhu, and Ratey chu.

2.4. HISTORICAL SIGNIFICANCE OF THE STUDY AREA

The alpine region of the east Sikkim including Pangolakha range has occupied an important position in the history of Sikkim. It was during the sovereignty of British India the promotion of commercial intercourse with Tibet was undertaken through alpine region of east Sikkim. The places like Nathula, Jalepla, Gnathang, Lingtu, Kupup including Chumby valley (presently under the TAR) was under the administration of Sikkim's Chogyal (King) and believed to have belonged to Sikkim until about 2 hundred years ago. These places are noted for having the only national trade route of India to central Tibet, would therefore be of commercial as well as strategic importance, and remained an important pass way to Lhasa. The entire region was known for its splendid climate and scenic beauty and with the signs of material well-being, comforts, and believes to be a small commercial hub for people of Sikkim and Tibet. Tibet during those time are known for having very rich gold fields in the world, due to which the British India government often intended to capture the region including that part of Jalepla, to established their centre and could draw the railway line till Tsangpo river to

extent their goods (Waddell 1899). Britishers realized that the Sikkim, particularly east Sikkim, being indispensable point for their scientific mission to Lhasa. Therefore, a special permission was obtained to visit Lhasa from Chinese emperor. Britishers felt that the Tibetan occupation of east Sikkim could also invite friction and inconvenience for their negotiatory representative to Peking, China (Rishley 1928).

It was during the reign of Chogyal Thothup Namgyal, a British mission under the headship of Colman Macaulay visited Tibet in 1886 for the promotion of trade through a route between British-India and Tibet passing across the alpine region of east Sikkim. However, the mission was later withdrawn before completion due to the Tibet's interference. Consequently, a group of Tibetan force attacked and occupied the strip of Sikkim's territory south of Jelep till the Lingtu. Britishers in another site could not tolerate for being the Chogyal of Sikkim to be pro-Tibetan and do encourages trans-boarder infiltrations. Therefore, with *Hobson's choice* British-India government commenced military operations in march 1888 against Tibetan army to retaliate back the Tibetan attack at Gnathang on 22nd May 1888, which is presently, situated at the western edge of the Pangolakha Wildlife Sanctuary. The then most proficient Derbyshire regiment, the 32nd Pioneers Sikh regiment, Gorkha regiment and six mountain guns of nearly 2000 men retaliated against the Tibetan army and driven out of Lingtu on 20 March 1888. Consequently, the Tibetans were completely thrown out of Sikkim's territory after six month and the battle came to an end on 24th September 1888. However, quite a lot of British and Tibetan soldiers died in the battle. Sementary of several British soldiers are still subsisting near Gnathang government school. Later a fort was built by Britishers and was presumed to be the highest military point in the world, ever held by Europeans. The Indian army, Tibetans, Sherpas and few other communities presently engage the Gnathang. It is a landmark in the history of Sikkim, that the first Political Officer, Sir James Claude White appointed by the British India government to maintain the administration in the region consequently after the battle.

After nearly a hundred years back in 1962, Chinese army once again attacked the Sikkim through Nathula pass (4389 m), located at the northwestern boundary of the Sanctuary and is one of significant strategic pass to China. Since then, Nathula pass had been remained for the subject of concern for both India and China. It is one of such international (border) frontiers in the world located at a tremendous height where, the troops of two hostile nations confront and coexist within an extremely short distance. Hence, it is one of an acutely sensitive spot in the scheme of both Indian and Chinese defense.

Most recently, the government of Sikkim under the patronage of the Government of India has reinitiated the international trade route between India and China. Sherathang near the Nathula pass has already enlisted in the Guinness book of world record for its host to the world highest ATM. Significantly, with the inaugural of community information Centre at Sherathang on 21 April 2006 has also enlisted its name in Limca Book of Records for its highest permanent cyber cave at an altitude of 4145 m.

2.5. TOPOGRAPHY / MOUNTAIN PASS

The Pangolakha Wildlife Sanctuary is covering several terrain types, based on ground surface morphology characterized by smooth and broken surface. It is of alpine terrain with isolated, boulders or gregarious formation or rocks which and is generally treated as smooth surface. This type of terrain is prevailing at the base of mountain ranges and in saddles with altitude ranging c.242 m – c.4242 m. This type of terrain extended over 25 – 30% in the area.

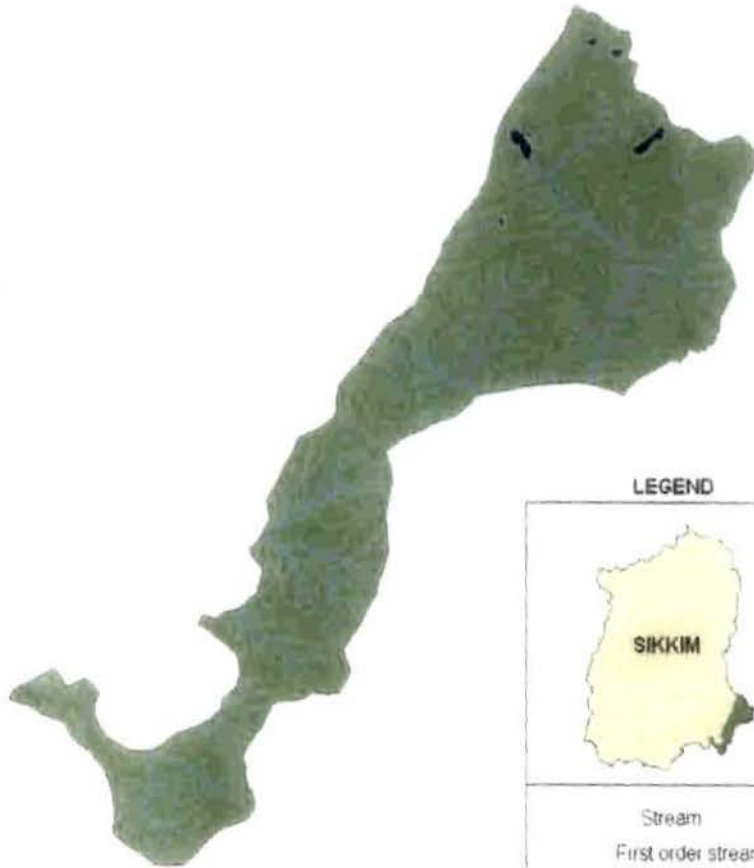
The other type of terrain varies from distinct undulating broken surface including stream sites and deep gullies located along the ridge between West Bengal and Sikkim. It also included large rocks on the ground. This type of configurations was considered as broken terrain, which covered 30 – 40 % of total land.

The steep rocky outcrops with prominent narrow ledges and continuous rock formation with distinct array of boulder land caves were categorized as very broken terrain. These types of terrain are distributed above the villages with elevation ranging between c.131 m – 227 m and c.2727 m – 4394 m respectively.

One of the significant attractions of the region is of its accountability of widespread and imperative passes to other countries. The major passes of Sikkim located in the alpine East Sikkim are Chola range, Nathula, Jalepla and Batangla. Out of which Nathula and Jalepla lead to Chumby valley in Tibet and Batangla lead to Bhutan. During the reign of the Chogyal dynasty the Chola pass was commonly used to access to Tibet. Nathula pass, located 2 km ahead of the Sherathang, is only pass where Chinese and Indian army troops face each other at breathing distance. Until 1962 both Nathula and Jalepla passes has been a part of the trade route between India and Tibet. The Young Husband regiment extensively used Jalepla pass situated near Kupup (Bathang Cho) in 1903 to attack Tibet, for which the pass is known as Young-Husband track

DRAINAGE MAP

PANGOLAKHA WILDLIFE SANCTUARY

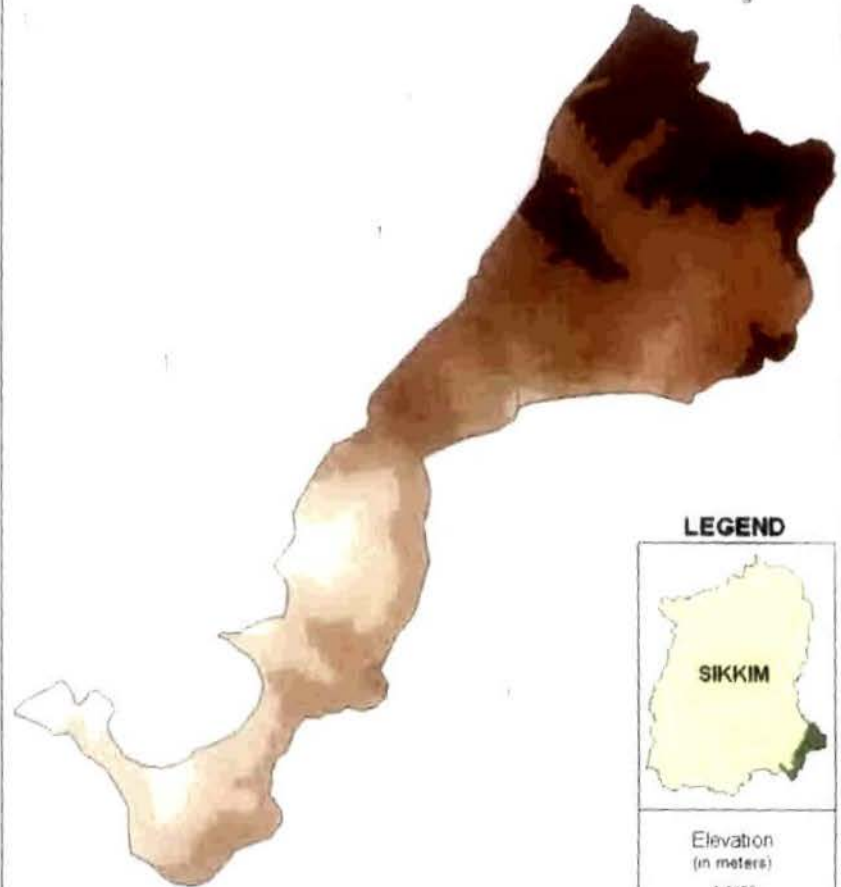


LEGEND



ELEVATION MAP

PANGOLAKHA WILDLIFE SANCTUARY



LEGEND



2.6. GLACIERS

Himalayan glaciers have been in a state of general retreat since 1850 and recent publications confirm that, for many, the rate of retreat is accelerating. Jangpang & Vohra (1962), Srikanta & Pandit (1972), Vohra (1981), Oberoi *et al.* (2001) and many others have made significant studies on the glacier snout fluctuation of the Himalayan glaciers. However, a dramatic increase in the rate seems to have occurred in last three decades (Kaab *et al.*, 2002).

Altogether, 84 Glaciers has been recorded in Tista basins, (Anonymous 2001a). Due to Climatic variation, the number of Glacier field is increasing, but the total area of the Glaciated region will be decreasing continuously. Obviously, this will have a profound impact on snow accumulation and ablation rate in the Himalayas, as snow and glaciers are sensitive to global climate change. In response to climate change, the glaciers in the major mountainous regions of the World as Himalayas, Alps, Rockies and Andes are retreating Casassa *et al* (2002). Glaciers in Caucasus Mountain have retreated from 700 to 3000 m in the last 100 years i.e. the average maximum rate of retreat is 30 m per annum (Mikhaleenko 1997). Investigations in the Baspa basin in India have shown an overall 19 % deglaciation from 1962 to 2001 (Kulkarni & Alex 2003). Investigations carried out in the Himalayas suggests that almost all glaciers are retreating with an annual rate varying from 16 to 35 m (Dobhal *et al* 2004; Oberoi *et al.* 2001). When these ice fields are broken down then those results in the formation of moraine dammed lakes.

About 40 % landmass of the Sanctuary falls under the alpine region and remain under the snow cover from the moth of December to April but there are few other instances for having covered the land with snow for almost entire year. The piles of these permanent snows are also the source of the river waters flowing through the sanctuary.

2.7. LAKES AND SPRINGS

The lakes are the important water bodies and are the major sources of drinking water for all the living being exist under an ecosystem. As such, Sikkim also endowed with more than 150 lakes located at different altitudinal ranges, which are traditionally recognized to be sacred and holy (Roy & Thapa 1996). Alpine East Sikkim including Pangolakha range holds more than 25 lakes, which ultimately serves as source of water for the wild animals inside the sanctuary (Table 2.5). Most of these high altitude lakes are often being snow fed and remain snow covered during winter. However, some lakes tend to remain snow covered almost round the year. The dimensions of these lakes vary from few meters to around hundred meters in length, but most of these lakes appear to be shallow and deep as well. These are permanent water

bodies and seem to have formed through the continuous process of so-called “glaciations”. Although all these lakes have their own specific names, some are devoid of, especially those, which are situated in isolated, or at much interior of the sanctuary. The lakes are pronounced as *Chhoka* or *Tso* or *Chona* in Bhutia; *Chho* or *Dah* by Lepchas; and *Pokhri* or *Jeel* in Nepali.

Some of the fascinating lakes of the alpine East Sikkim are Chhangu, Bidang tsho, Men-men tsho etc. Their popularity for aesthetic and scenic beauty is known worldwide. The congenial climate, rich biodiversity, blooming flowers, panoramic view of mountains and valleys, pristine lakes and forests contribute the growth of tourism in the state. It is now estimated that approximately 4 lakhs of tourists has visited this area in the year 2007. The simulation based on the trend of tourists visited in past are expected to be jump up from 7.6 – 10.4 lakhs of tourist would visits Sikkim during the year 2017 (Joshi & Dhyani 2009). Therefore, having being an important contributor for the tourism sector in Sikkim, these resourceful lakes will certainly play a crucial role for such steady rise in the inflow of tourists that may have direct or indirect impact on the economic growth of the state as well.

Table 2.5. Lists of important natural lakes of East Sikkim including PWS.
[AES: Alpine East Sikkim. PWS : Pangolakha Wildlife Sanctuary.]

Natural lakes of East Sikkim	Location	Importance in nature
<i>Changu lake</i>	AES	<i>Tourism, religious & alpine flowers</i>
<i>Men-miot Tso</i>	AES	<i>Tourism, religious and Fishery.</i>
<i>Jelepla Tso</i>	AES	<i>Wild life & habitat of waterfowl.</i>
<i>Sherathang tso</i>	AES	<i>Domestic use & migratory birds</i>
<i>Bithang Tso</i>	PWS	<i>Tourism & migratory birds.</i>
<i>Chhukhya Tso</i>	PWS	<i>rich vegetational diversity</i>
<i>Chuu Tso</i>	PWS	<i>Wildlife habitat</i>
<i>Lampokhari</i>	PWS	<i>migratory birds & wildlife</i>
<i>Kafing dah, (Singhaneys bans)</i>	PWS	<i>Wildlife & migratory birds.</i>
<i>Chhokhy Tso</i>	PWS	<i>Rich vegetational diversity</i>
<i>Doka tso</i>	PWS	<i>wildlife habitat</i>
<i>Jor Pokhri</i>	PWS	<i>wildlife & avifauna</i>
<i>Uor Pokhri</i>	PWS	<i>Wild life</i>
<i>Pangla tso</i>	PWS	<i>high diversity of vegetations</i>
<i>No Name</i>	PWS	<i>water source for wildlife</i>
<i>Bhewsa tso</i>	PWS	<i>Wildlife & rich habitation.</i>
<i>Syabiyuka Tso</i>	PWS	<i>Wildlife habitat</i>
<i>Thosa tso</i>	PWS	<i>Wildlife & Avifauna</i>
<i>Anonymous lake</i>	PWS	<i>Wildlife habitat</i>
<i>Anonymous lake</i>	PWS	<i>Wildlife habitat</i>
<i>Anonymous lake</i>	PWS	<i>Wildlife & avifauna</i>
<i>Rongli Pokhri(Lungthung)</i>	PWS	<i>Wild life</i>
<i>Mul kharka Pokhri</i>	PWS	<i>Wild life & birds,</i>
<i>Tongey pokhri(Premlekha)</i>	PWS	<i>Wild life</i>
<i>Gnathang tso</i>	PWS	<i>Wildlife</i>

2.9. FAUNAL RESOURCE OF THE STUDY AREA

Sikkim Himalayas upholds a significant plethora for faunal bio-diversity. Having being remained isolated and undisturbed for past many centuries, the forests of the Pangolakha Wildlife Sanctuary also turns out to be one of the reservoir for the numerous faunal species including mammals, birds, butterflies, beetles, snakes etc. which eventually contribute an additional significant enchantment of life of the sanctuary (Anonymous 2000). The reason being is its extremely varied topographical exposition. The report also reveals about the availability of ungulates, carnivores and birds from the pockets of *Singanebase*, *Thamdara*, *Jalepla*, *Sher peak*, *Rachela*, and *Pangolakha*.

According to Lachungpa *et al.* (2003), the three important biomes for the faunal species have been identified within the sanctuary. This biome includes Biome 5, Biom-7, and Biome 8. Remarkably, the Biome-5 with an altitude ranges above 3600 m amsl contributes the existence of 48 species, that of 11 are recorded from study area. In contrast, the Biome-7, situated in between the altitudinal range of 1800 m to 3600 m amsl, contributes 112 species, again 14 species are reported within the study area. However, only two faunal species have been reported from the Biome-8 so far.

The sanctuary also supports a large number of species, which have been enlisted for highly vulnerable and volatile mammalian species. The Indian Bison, Takin, Serow, Goral, Barking Deer, Himalyan Langur, Red Panda, Leopard Cat, Large Indian Civet etc. and Pheasant, Tragopan and flock of partridges as well as large numbers of birdlike including migratory ducks were reported from the area (Lachungpa *et al.* 2003). The list of faunal resource of PWS is mentioned at Annexure-IV.

Interestingly, the study area is also recorded for one of the noted establishment for the migratory route of tiger, through the Neora Valley, which is situated in the southeast direction of the sanctuary. The record reveals that the tigers use this belt of forest for more than hundred years ago. The existence of Red deer in eastern Sikkim through the display of trophies and hunting record identified as a sub-species of *Cervus elephus*, either *C.E. wallichi* or the probable synonym *C.E Affinis*. However, so little has been known about it, probably extinct (Dolan & Killmar 1988) considered it "almost as a mythical animal" (Schaller 1996, 1998). The occasional anthropogenic interference in the forests of Chumby region (TAR) might have been drives those rare species of Deer back into Bhutan through the Pangolakha forest. Red Panda, Musk deer and Bharal (blue sheep) are among the highly endangered animals very rarely sighted during the last decade (Lama 2001).

2. MAR 2012



However, the practice of poaching inside the sanctuary has been a common phenomenon prior to the declaration of the sanctuary, though legal and illegal poaching of endangered animal species for meat, hides, fur and other medicinal applications is resulting in depletion of their population (Lama 2001).

Sikkim Himalaya including Pangolakha Wildlife Sanctuary sustains enormous water resources in the form of rivers, streams and lakes. The total estimated length of rivers of the state is about 900 km and area of ponds and lakes are 0.1 and 3.2 thousand hectares, respectively. All this water bodies are known to have been home for the various species of fishes. Tamang in 1993 recorded about 48 species of fishes from Sikkim. However, only 37 species were recorded in 2001 (MoEF 2002). It is note worthy to mention that most abundantly available members of Cyprinidae family was *Scizothorax* spp with maximum length of this species recorded at 60.0 cm (Talwar & Jhingran 1991).

It was indicated by several studies that both anthropogenic as well as natural factors influence the fish population in the rivers. Overexploitation and faulty fishing techniques might be the major factors affecting the fish germplasm. The availability frequency of different kinds of fish decreased as indicated by 82.94 % of fishers. It was also confirmed by the reports of Tamang (1993).

Sikkim also occupies an important position in Eastern Himalaya Endemic Bird fauna (Islam & Rahmani 2004). Of the 1295 species of birds reported from Indian Subcontinent (Inskipp *et al.* 1996) of which Sikkim harbors 572 species (Acharya and Vijayan 2007). These species represents 45 % of the total birds within 0.21 % of the geographical area of India. Out of the 22 restricted range species of this Endemic Bird Area, 19 (including genus *Sphenocichla*) are confined to this region (Stattersfield *et al* 1998; Rasmussen & Anderton, 2005; Jathar & Rahmani 2006). Of these 19 endemics, ten are reported to occur in Sikkim, whereas, *Arborophila mandellii* and *Brachypteryx hyperythra* are two such species which falls under threatened and near threatened category of IUCN. Of the 78 globally threatened bird species of the Indian Subcontinent, 16 threatened (two critically endangered, one endangered and 13 vulnerable) and four near threatened species live in Sikkim (www.iucn.org/). Of these 20 species, three are endemic to the Eastern Himalaya.

The bird fauna of Eastern Himalaya, especially land birds, is enriched compared to the rest of the Indian subcontinent of similar or even larger area (Ali 1962; Daniels 1992; Ali & Ripley 2001, Price *et al.* 2003). The diversity of vegetation, with abrupt variation in elevation and climatic conditions, created diverse habitats, forming of continuous larger tract of evergreen vegetation ultimately formed a meeting point of various zoogeographical realms

favours the immense richness in birds diversity (Inskipp *et al.* 1996).

The study area is also found to be rich in avifaunal, where major mountain passes of Sikkim such as *Donkyala*, *Nathula*, *Jeplela*, *Rachela* are situated. These passes are identified to be the routes for migratory water birds. Numerous wetlands and associated water bodies eg. *Bedang Tso Lake*, *Lampokhri* and numerous other anonymous lakes existing inside the sanctuary are observed to be regularly visited by Himalayan Monal (*Lophophorus impejanus*), locally called as *Feydong*. (Lachungpa *et al.* 2003). *Bidang tsho* (3880 m) is one of the important amongst other alpine lakes of east Sikkim. Noted by Mr Blandford for its natural glacier lake (Waddell 1899) is source of drinking water for numerous animals and other avifaunal species.

According to C. Lachungpa, name *Bedang Tso* might have been semantized through it. Lachungpa *et al.* (2003) also reported the mass migration of birds of prey such as Red Kites and unidentified eagles including Brahminy Shelduck from the area. It is also note worthy to mention that some globally threatened bird species like Eurasian Woodcock and Wood Snipe are also reported to live here. (Anonymous 2001). According to the Lachungpa *et al.* (2003) Hill Pigeons including Himalayan Monal, Gold-naped Black Finch, Fish-Eagle Large Cormorant, and Bar-headed Geese, Greater Spotted Eagle, *Red-breasted Hill-Partridge*, *Wood Snipe*, *Rufous-necked Hornbill*, *Slender-billed Babbler*- *Black-breasted Parrotbill* and *Hodgson's Prinia* are also some of the common bird species noted from the forest patch of the *Pangolakha* range. The *Tibetan Eared Pheasant*, which is considered as a threatened species, were also reported from *Bedang Tso* and *Jalepla* in the year 2003. The Common hill partridges of Sikkim are also being sighted in forest of *Pangolakha*.

Significantly, the habitat fragmentation through anthropogenic pressure on bird species is a increasing concern of Eastern Himalaya including Sikkim and is the major reason for decline of many rare and threatened bird species particularly in Sikkim (Chettri 2000; Chettri *et al* 2001; Acharya & Vijayan 2007).

2.10. VEGETATIONAL STRUCTURE OF STUDY AREA

In the present study, the vegetative structure of the *Pangolakha Wildlife Sanctuary* is demarcated in between elevation of 1800 m to 4600 m amsl and above. The altitudinal ranges are predominantly distinguished by their rich floristic compositions. The vegetation however is conspicuously under the domain of angiosperms followed by ferns and its allies and gymnosperms. (*Abies webbiana*, *Tsuga dumosa*, *Taxus bacca* and of domesticated *Pinus longifolia* and *Cryptomeria japonica*).

The alpine meadows remain covered with perpetual snow for 5 – 6 months (December to April) of the year. Such areas are with comparatively lesser floristic richness and its composition. However, the flora as a whole represent with characteristically interesting and distinctive of its usefulness occurrence in species wise.

Hence, for the present study, the vegetation has been classified into a number of groups with the incorporation of some negligible studies made by the Department of Forests, Government of Sikkim (Anonymous 2000), which is mainly based on its dominant species composition distributed along the altitudinal elevations.

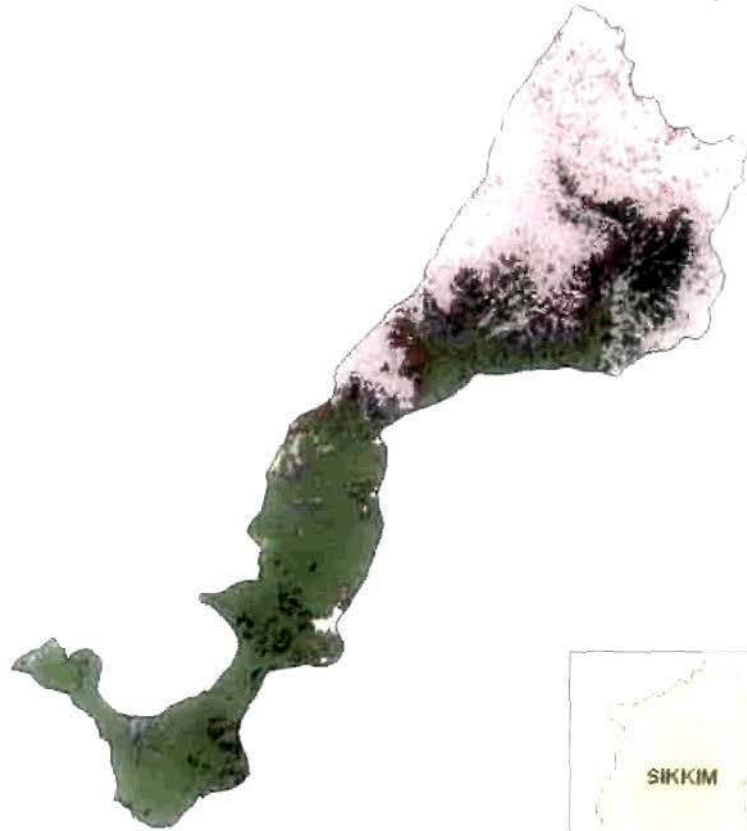
1. Temperate broad-leaved (1800 – 2400 m)
2. Temperate cold forest (2400 – 2800 m)
3. Temperate conifer forest or sub-alpine forest (2800 – 3400 m)
4. Alpine vegetation/ Alpine scrubs (3400 m and above)

2.10.1 Temperate Broadleaved Forest (1800 – 2400 m)

The temperate broad-leaved forests extended up to the elevation of 2400 m amsl. The vegetation in this range is hold together in considerable compact association of numerous average height trees of its significance. Evergreen and deciduous trees occupy comparatively lesser proportion of the vegetation. The important points or areas located inside the sanctuary such as *Subaney dara*, *Prem Lakha*, *Tal Kharkha*, *Mul Kharkha*, *South regu*, *North regu*, *Singhaney Bans*, *Chuktum*, *Kingsa*, *Buddha (Takney)*, adjoining part of *Neora* valley etc. The vegetations of this type are composed of dominating laurels etc, simultaneously formed a thick canopy with other species to form the mixed type vegetation. There is however, an indication of rare fungi, lichens and other saprophytes as well as epiphytes associated with afore mentioned tree vegetation.

The chief characteristic of this type of vegetation is of its enormous variation of habits i.e. herbs, shrubs, climbers, twiners, creepers and prostrate elements are common and are distinctly prevalent. The forests in this range are of marked distinction of being compact composition of numerous species of trees like: *Schema wallichii*, *Chukrasia tabularis*, *Betula cylindrostachys*, *Alnus nepalensis*, *Acer campbellii*, *Quercus lamellosa*, *Q. pachyphylla*, *Q. lineata*, *Magnolia campbellii*, *Michelia doltsopa*, *Michelia cathcartii*, *Betula alnoides*, *Prunus napaulensis*, *P. cerasoides*, *Castanopsis hystrix*, *C. tribuloids*, *Machilus edulis*, *Symplocos glomerata*, *S. theaeifolia*, *Eurya japonica*, *Evodia fraxinifolia*, *Taxus baccata*, *Rhododendron arboreum*, *Toona ciliata* etc. The vegetation is further enriched by many species of shrubs, viz. *Aucuba himalaica*, *Maesa chisia*, *Neillia thirsifloris*, *Gaultheria griffithiana*, *Elsholtzia*

VEGETATION TYPE PANGOLAKHA WILDLIFE SANCTUARY



LEGEND

oak forest	alpine meadow	subalpine thicket
alpine scrub	middle hill forest	alpine thicket
conifer forest	alder forest	forest scrub
stunted conifer forest	snow and ice	forest blank
agriculture	forest thicket	rocky barren
agriculture scrub	temperate thicket	sand

LANDUSE MAP PANGOLAKHA WILDLIFE SANCTUARY



Landuse

Scrub
Forest blank
Cropland in Forest
Dense Forest
Lake
Land without scrub

fruticosa, *Ilex crenata*, *Rubus lineatus*, *Leycesteria formosa*, *L. stipulata*, *Viburnum erubescence* and of various species of bamboos. All the species put together to constitute a magnificent thick layer of dense shrubby canopy. Apart from this, there is predominant composition of herbaceous species like *Potentilla polyphylla*, *P. sundaica*, *Prunella vulgaris*, *Didymocarpus aromaticus*, *Chirita macrophylla*, *Begonia sikkimensis*, *Campanula pallida*, *Fragaria nubicola*, *Impatiens bracteata*, *Voila biflora*, *Cynoglossum glochidiatum*, *Hemidesmus indicus*, etc.

2.10.2. Temperate Cold Forest (2400 – 2800 m)

The dense forests of tall trees gradually replaced by grassy slopes and scattered trees in this zone. The prominent floristic components under the temperate cold forests are of *Acer*, *Quercus* and *Rhododendron*. Remarkably, the vegetations of the forest type is further distinguished by commendable occurrence of herbs, shrubs, and the sporadic appearance of numerous strangling climbers. The major components of broad-leaved tree species include *Acer campbellii*, *Betula utilis*, *Engelhardtia spicata*, *Exbucklandia populnea*, *Ilex dipyrrena*, *Quercus lineata*, *Q. lanata*, *Q. lamellosa*, *Lithocarpus pachyphylla*, *L. elegans* etc. As such, the oak forests are the characteristic feature of this vegetation zone.

The notable shrubs observed under this vegetation are *Aconogonum molle*, *Agapetes saligna*, *Dichroa febrifuga*, *Gaultheria fragrantissima*, *Helwingia himalaica*, *Daphne bholua*, *Holboellia latifolia*, *Rubus lineatus*, *Rubus paniculatus*, *R. macilentus*, *Vaccinium retusum*, *Arundinaria malling*, *Dendrocalamus hamiltonii*, *Smilax glaucophylla*, *Vaccinium retusum*, *Lyonia ovalifolia*, *Piptanthus nepalensis*, *Principia utilis*, *Rhododendron grande*, *R. falconeri*, *Viburnum erubescens*, *Zanthoxylum oxyphyllum* etc.

The herbaceous plants being the chief component and are most dominant in the vegetation viz. *Anemone vitifolia*, *Arisaema jacquemontii*, *Ajuga lobata*, *Aster tricephalus*, *Cardamine impatiens*, *Fragaria vesca*, *Clintonia alpinea*, *Hemiphragma heterophyllum*, *Primula denticulata*, *Gallium mollugo*, *Valeriana wallichii*, *Aristolochia griffithii*, *Gnaphalium affine*, *Fimbristylis dichotoma*, *Potentilla fulgens*, *Elsholtzia strobilifera*, *Fragaria nubicola*, *Voila pilosa*, *Hydrocotyle himalaica*, *Poa annua*, *Streptolirion volubile*, *Carex spp.* etc. It is rather, notable to observe that species like *Alnus nepalensis* and *Thysanotaena latifolia* extensively inhabit to the areas comprising of degraded and sliding landmass.

2.10.3. Temperate Conifer Forest or Sub-alpine Forest (2800 – 3400 m)

The sub-alpine vegetations of Pangolakha Wildlife Sanctuary that ranges from 2800 – 3400 m is characteristically distinct with the presence of a mixed forest comprising of *Rhododendrons*

and *conifers*. The major indicators that distinguish sub alpine forest from that of cold temperate forest are by the presence of numerous tree species like *Acer caudatum*, *A. campbellii*, *A. sikkimensis*, *Quercus lineata*, *Q. pachyphylla*, *Magnolia campbellii*, *Tsuga dumosa*, *Larix griffithiana*, *Picea spinulsa*, *Abies densa*, *Euonymus frigidus*, *Enkianthus deflexus* etc. However, the *Rhododendron* forests gradually dominate as the elevation increases. In between the trees like *Larix griffithiana*, *Abies densa*, *Picea spinulosa*, and *Tsuga dumosa* appeared uniformly inside *Arundinaria* spp, and mixed silver fir trees. Significantly, the forest now symbolized with strong under growth of *Berberis wallichiana*, *Enkianthus deflexus*, *Euonymus frigidus*, followed by some species of *Lonicera*, *Rubus*, *Ribes*, *Gaultheria* etc. The most predominant shrubs in these forests are the species of *Rhododendron* e.g. *R. barbatum*, *R. edgeworthii*, *R. grande*, *R. arboreum*, *R. falconeri*, *R. dalhousie*, *R. griffithianum*, *R. glaucophyllum*, *R. niveum*, *R. vaccinoides*, *R. campylocarpum*, *R. thomsonii*, *R. lepidotum* and *R. campanulatum* etc. Some rare and interesting herbs found here are the *Panax pseudoginseng*, *Swertia chirayita*, *Valeriana wallichiana*, *Gallium mollugo*, *Fragaria rubiginosa* and *Podophyllum hexandrum*. Most interestingly, it has been observed that the formation of *Rhododendron arboreum* in Rachel ridge has attained its optimum with extremely high density and huge girth, which is *hitherto* rarely occurred in other parts of the state.

2.10.4. Alpine Vegetation / Scrub (3400 m and above)

George A. Gammie (1893) during his visit in Sikkim in the year 1892, classified the alpine region of East Sikkim into two parts, Sub-alpine and Alpine regions, According to him the altitude ranging upto 3100 m as a sub-alpine or temperate region and above that is termed as alpine zone.

However, in the present study the alpine vegetation or an alpine scrub is marked to be ranges from 3400 m and above. Some of the noted areas covered under this vegetation type are Jalepla, Bhim Base, Lampokhari, Nathang, Kupup, Panglakha, Rachel etc. At lower altitudes, the vegetations under this category are transformed into shrubby habit. The scrubs formed of *Rhododendron*, *Berberis*, *Euonymus*, *Gaultheria*, *Vaccinium*, *Salix* etc. are the major elements, while *Rhododendron anthopogon* and *R. setosum* form the dense tussocks near the sub-alpine mountaintops. The most dominating herbaceous species distributed under such vegetation are *Aconitum ferox*, *Anaphalis contorta*, *Cassiope fastigiata*, *Meconopsis paniculatus*, *Primula capitata*, *P. sikkimensis*, *Sedum multicaule*, and species of *Arenaria*, *Epilobium*, *Potentilla*, *Polygonatum*, *Rhodiola* etc. The vegetation is further enriched by the

presents of species having tremendous medicinal value viz. *Aconitum heterophyllum*, *Podophyllum hexandrum*, *Panax pseudoginseng*, *Neopicrorhiza scrophulariifolia* etc.

With the rise of elevation, the vegetations further transform into typical alpine moorland type, where the growth of trees are completely arrested. Rather, the stunted bushy growth of *Rhododendron anthopogon*, *R. lepidotum*, *Salix caliculata*, *S. lindleyana*, *Myricaria germanica*, *Cotoneaster microphylla*, *Rosa sericea*, *Lonicera tomentella* and *Rhododendron nivale* are more regular and uninterrupted. The existence of *Rhododendron nivale* in this condition, is interestingly being observed in the altitude of 4600 m amsl, which is *hitherto* not seen in other part of the Sikkim. Most importantly, the plants like *Polygonatum campanulatum*, *Nardostachys jatamansi*, *Rheum australe* were once common at Kupup, Nathang, Baba mandir area are now rarely met with. The vegetation is further enriched by the mosaic growth of *Rhododendron anthopogon*, *R. campanulatum*, *R. thomsonii*, *R. setosum*, and species of *Ranunculus*, *Primula*, *Aconitum*, *Voila*, *Fragaria*, *Meconopsis*, *Potentilla*, *Arisaema*, etc.

The flowering plants prevail here are comparatively distinct and the majority of the herbs and shrubs represented themselves with more bright colors which is presumed to be adaptation to attract the insects for pollination; with the exception of *Delphinium*, Lamiaceae, Asteraceae and primroses which are remarkably devoid of odor. The species of alpine shrubs are also signifying with their procumbent habits e.g. *Rhododendron nivale*, *Diplarche multiflora* etc. The tree limit of alpine vegetation is though appeared variable but mostly held between 3000 m to 4000 m. Species of *Carex*, *Kobresia*, *Festuca*, *Stipa*, *Poa* etc occupies the grassy areas and in the higher cliffs such vegetation is composed of different species of *Draba*, *Lonicera*, *Meconopsis*, *Saussurea*, *Saxifraga*, *Leontopodium* and *Tanacetum* etc.

Chapter-III

The vast area of the study area is covered by dense forests, comprising of elements of bushy growth to the tall trees. The higher elevations regions of the sanctuary are mostly covered by vast stretches of mountain ranges those separate the world's highest plateau, Tibet Autonomous Region (TAR) from Sikkim state of India. The vicinity of these mountain ranges receives heavy snowfall during winter, though the areas remain under snow covered almost round the year. As such, the climatic condition of the region experiences extremely cold and freezing.

The middle or lower region of the sanctuary encompasses extremely dense forests. The forests of study area is also intricately surrounded by the extremely dense forest of Neora Valley, Toorsa Strict Nature Reserve (in Bhutan) and the part of abandon forest of TAR region, where the human habitation are invisible.

Therefore, considering those facts and because of the direct exposure of moisture from Bay of Bengal resulted with heavy rainfall and due to which the temperature of the region remains low for most of the time.

There is no weather station available nearby the study area. Therefore, it is almost impossible to get climatic data particularly for this region. There is one Automatic Weather Station at Tadong, Gangtok and that is the nearest meteorology station wherefrom data can be available. But, the weather condition at Gangtok and in PWS area are much different and the climatic data available from the Tadong centre can not be used properly to understand or to interpret the climatic condition in PWS.

3.1 TEMPERATURE

The temperature of Sikkim varies from place to place depending upon the altitude, exposure and vicinity to the snow-capped peaks. In the hilly regions, the temperature (day and night) remains higher during rainy season than in the summer and spring.

The maximum air temperature recorded for last five years (2002 – 2006) in Tadong (1372 m) near Gangtok was recorded at 23° C during the year 2003 and 2005 and minimum air temperature recorded was 5.5° C in the year 2005 (Table 3.1).

Table 3.1: Mean maximum and minimum temperature (in °C) of Tadong, Sikkim for January – December (2002 to 2006).

Months	Years & Temperature in °C									
	2002		2003		2004		2005		2006	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
January	12.9	05.5	13.1	05.8	12.8	05.5	11.7	05.4	13.7	06.7
February	15.8	08.2	13.5	06.4	14.7	07.1	14.7	07.9	16.9	10.3
March	18	10.1	15.9	09.1	20.2	12.1	18.1	10.2	18.8	10.5
April	19.6	12.3	20.3	13.0	18.7	12.7	20.7	12.5	20.1	12.5
May	21.5	14.4	21.3	12.1	20.9	15.3	20.2	14.0	21.5	15.5
June	21.7	17.0	21.7	14.4	21.4	16.9	22.0	17.0	21.2	17.2
July	21.4	17.2	21.8	17.0	21.0	16.8	21.5	17.7	21.9	18.3
August	22.1	13.3	23.0	18.0	22.3	17.8	22.0	17.8	22.7	17.6
September	21.6	16.2	21.3	17.1	20.8	16.7	23	17.4	21.0	16.6
October	20.8	13.3	21.0	14.0	19.9	12.5	19.6	14.1	20.7	13.6
November	18.3	10.5	16.1	10.0	16.9	09.4	16.3	09.6	15.8	10.1
December	13.8	07.4	14.7	07.0	14.3	07.3	15.1	07.3	14.2	07.9
Average	19.38	12.12	18.64	11.99	18.66	12.51	18.74	12.58	19.04	13.07

Source: The monthly weather data from Automatic Weather Station located at Tadong, East Sikkim, (Department of Meteorology, Government of India, Sikkim Unit)

3.2. PRECIPITATIONS

Sikkim is the stupendous stairway leading from western border of Tibetan plateau, and in south to the Darjeeling district of West Bengal hence, experiences with most humid condition because of its close proximity to the Bay of Bengal and of its direct exposure to the effects of moisture laden South-Western monsoon.

The climate of Sikkim has its own peculiarities. Sometime it experience of an overlapping of seasons, as months of March to May is a period of pre-monsoon and predominant by thunderstorms and overcasts, of course cannot be for prolonged. In addition, the heavy rainfalls are mostly observed during the mid of June to July.

The climate remains fairly cold and humid with heavy rainfall especially during the months from June to September, followed by intermittent showers throughout the year. The higher elevation or an upper ridge receives snowfall in between the months of November to February. However, the rate of precipitation in Chholamo cold desert zone and adjoining area is comparatively less than other area. The general trend of temperature decreases with the increase altitude throughout the state. Fog occurs during May to September and sometimes in any season. Pre-monsoon or the spring prevails during April to May with light spell of early

shower and seams into monsoon (South / West) normally from the month of May and continued to late September and sometime till the middle of October

Table 3.2. Monthly mean Rainfall (in mm) of Tadong near Gangtok during 2002 – 2006.

Months	Years & Rainfall in mm					
	2002	2003	2004	2005	2006	Average
January	050.9	045.5	022.8	028.2	002.3	29.48
February	002.6	173.2	066.6	062.2	024.7	65.86
March	244.5	134.5	139.0	141.3	070.3	145.92
April	343.9	58.6	496.7	387.1	232.4	303.74
May	409.7	620.5	631.0	583.0	549.0	558.64
June	867.3	656.1	502.3	727.1	493.9	649.18
July	663.0	588.2	623.1	836.0	546.2	651.30
August	654.5	456.0	469.7	604.5	631.1	563.16
September	302.1	401.7	320.1	430.2	449.1	380.64
October	123.6	224.4	161.7	132.2	073.4	143.06
November	008.3	018.9	028.1	025.3	028.6	21.78
December	019.0	066.9	001.0	001.0	014.9	20.56
TOTAL	3689.4	3483.5	7982.8	3958.1	3115.9	3534.85
Average	307.45	290.29	665.23	329.84	259.66	294.57

Source: The monthly weather data from Automatic Weather Station located at Tadong, East Sikkim, (Department of Meteorology, Government of India, Vajra, Sikkim Unit)

3.3. RELATIVE HUMIDITY

The atmosphere in Sikkim Himalayan region maintains a comparatively high Relative Humidity (RH). The sky atmosphere normally remains humid for little longer and the north facing slopes usually experiences cold almost round the year. The RH normally recorded for ranges between 72 – 97 % during rainy season. It decreases gradually towards the lower elevations. The humidity range remained in between 74 – 84 % during the drier months of March – April.

The maximum average relative humidity recorded in the month of July (96 %) and minimum average RH recorded in the month of December (78.80 %).

Table 3.2. Monthly mean Relative Humidity (%) at 08.30 hrs IST of Tadong, Sikkim during 2002 – 2006.

Humidity	Years & RH in %					
	2002	2003	2004	2005	2006	Monthly Average
January	076	079	089	083	083	82.00
February	072	088	080	083	083	81.20
March	081	084	083	083	067	79.60

April	085	084	086	077	074	81.20
May	085	084	089	093	089	88.00
June	089	095	093	093	096	93.20
July	096	096	096	096	096	96.00
August	095	096	096	096	096	95.80
September	087	096	096	092	097	93.60
October	088	093	087	089	090	89.40
November	080	090	080	084	087	84.2
December	085	078	079	075	077	78.8
Average	84.92	88.58	87.83	87.00	86.25	86.91

Source: Automatic Weather Station located at Tadong, east Sikkim, (Department of Meteorology, Government of India, Vajra, Sikkim Unit).

3.4. SUNSHINE / BRIGHTNESS

The sky remains heavily overcast and cloudy, particularly during the monsoon. During which the very dense form of fog and mist covers extensively over most of the area, almost everyday during the months of July and August. However, in the higher elevations, clouds and associated drizzle is common during the months June to September. While in winter, especially in the morning most of the area commonly remains filled with lifted fogs. However, the rest of the seasons are moderately clouded. The autumn and spring mostly brings sunny days on clear sky.

Table 13. Monthly Mean Sunshine (in hrs/day) during 2002 – 2006.

YEARS	Years & Precipitation in mm					Monthly average
	2002	2003	2004	2005	2006	
January	4.0	4.3	4.0	3.2	5.2	4.14
February	4.4	4.2	4.7	4.0	3.5	4.16
March	4.0	3.6	4.0	3.7	6.9	4.44
April	3.5	4.5	2.6	1.3	7.0	3.78
May	3.7	4.6	3.1	2.9	3.0	3.46
June	1.0	1.7	1.6	1.9	1.3	7.5
July	0.7	1.7	0.7	1.2	1.0	1.2
August	1.6	2.9	1.7	1.9	3.6	2.34
September	2.3	1.1	1.1	2.7	3.0	2.04
October	5.3	5.1	5.1	6.8	7.7	6.00
November	5.6	3.4	5.3	4.4	3.3	4.4
December	1.5	4.5	3.4	5.7	3.4	3.7
Average	3.13	3.47	3.11	3.31	3.53	3.31

Source: Monthly Automatic Weather Station located at Tadong, East Sikkim, (Department of meteorology, Government of India, Vajra, Sikkim Unit)

Chapter-IV

The Present Work

4.1. PREVIOUS FLORISTIC WORKS

The rich botanical diversity of Eastern Himalaya, including Sikkim, has attracted a large number of researchers and plant collectors from different parts of the world since the visit of D. Don in 1825. Virtually after two decades, the famous naturalist Griffith also explored the area in 1847. The famous botanist sir J.D. Hooker made his visit sometime during 1848 - 49. He is one of such botanist who explored the entire region and made a historic collection of approximately 2500 specimen of plants .His expedition and the account published by him include *Flora of British India* is still one of the most comprehensive descriptions of botanical splendors of the region. Significantly, his *The Flora of British India* (Hooker 1872 - '97) *The Himalayan Journals* (Hooker 1854), *Flora of India* (Hooker & Thomas 1855) with T. Thomas, *Rhododendrons of Sikkim Himalayas* (Hooker 1849 - '51) and a *Sketch of the Flora of British India* (Hooker 1907) are now acknowledged as most authentic floristic records of Eastern Himalaya. However, the floristic account of Pangolakha range and the report of plant specimens collected from this rich floristic pockets is not been mentioned in this monumental works.

Several other successive botanical explorers after Hooker like C. B. Clarke (1876, 1885), George Watt (1881), King & Pantling (1898) G.A. Gammie (1894a, 1894b), J. A. Gammie (1894), C.C. Lacaite (1913) and many other botanists did not explore the Pangolakha range. Although Smith & Cave (1911) and W.W. Smith (1911, 1913) has visited the few regions of alpine zone of East and North Sikkim but there is no records of specimens collected from the Pangolakha range. Although the Pangolakha range remain unknown to them even after the visit of several of other plant collector in the eastern Himalaya.

Significantly, botanists from various part the world has latter made significant contributions to the flora of Sikkim and Darjeeling Himalaya. This include J.S. Gamble (1878, 1895) A.M Cowan & J. M. Cowan (1929), S.K. Mukherjee (1940), H. Ohashi (1975), A.J.C. Grierson & D.G. Long (1979, 1987). In the past K.P. Biswas (1967), R. S. Rao (1963),

Sharma & Ghosh (1970) had made successful visits to Sikkim but they were almost silent over the floristic richness of Pangolakha range. On top of that, so far no comprehensive flora of Sikkim is available except a BSI's publication "Flora of Sikkim" (vol-1) for the classification of monocot only.

Many other eminent botanists has visited Sikkim even after the 1975 merger to India some persons from outside Sikkim like Das & Chanda (1987), Krishna & Singh (1987), Shrivastava (1992 – 1996), Hajra & Verma (1996) and very lately in 1994 and 2000 by H.J. Noltie in many hilly terrains of Sikkim beside the Pangolakha Range.

W.W. Smith (1913) visited the adjoining areas of Pangolakha ranges and few pockets of Sub alpine zone of East Sikkim. He has made a survey with his teammates at places like Changu Lake, Nathang, Padamchen, Jelepka etc. however it is being clearly visible that he has certainly missed to reach the interior terrains of the Pangolakha range. A team from Forests Department, Govt of Sikkim and WWF, Sikkim Circle has made a baseline survey of sanctuary in the year 1999 and collected some of 100 common plant species of the sanctuary (Anonymous 2000). However, it is nowhere mentioned about collection of those specimens from far interior of the sanctuary.

4.2 IMPORTANCE OF THE PRESENT WORK

Sikkim Himalaya is an important part of eastern Himalaya that is recognized as on 22nd Biodiversity Hotspot in the entire world by IUCN. The entire Landscape of Sikkim is hilly and terrain having significant rich botanical diversity, occupied an important platform for huge number of tourists, researchers and also for plant scientist (taxonomist) . Representing all the major groups of plant kingdom, it is estimated to represent a higher percentage of floras in country. The immigration of plants from wide different bordering countries, notably Chinese, and Malayan on the east and south of Oriental, European, and African on the west and of Tibetan and Siberian on the North is an important phenomenon of the flora diversity (Hooker 1906)

The region is also significantly bestowed with the considerable numbers of endemic plant species, some of those may be *Hitherto* not reported from other parts of the world (Maity & Chauhan 2002). PWS along with Kanchenjunga National Park, Dombyong valley Tankarla, Sakyong valley, Tolung, Zemu and Lhonak valley (North district), Karki, Hilley Reserve Forest (west district) Tendong, Melli, Kitam, Mainam Wildlife Sanctuary (South) are among such distinct areas in account of plant diversities. After identifying, the

significant richness in its floral and faunal diversity the entire area has been declared as Pangolakha Wildlife Sanctuary in the year 2000.

The present study area (sanctuary) falls in the alpine and sub-alpine regions of East Sikkim, which is not only the home for some rare and interesting faunas of alpine Himalayas, but also got the huge tract of unexplained vegetation. 75 % of area under sanctuary being remains under snow covers for at least 4 - 5 months annually i.e. from December - April, resulting very harsh climatic conditions followed by very low temperature almost through out the year. Consequently, it is not less than a Herculean task to undertake floristic studies; however, the work is extremely essential in order to supervise the government while framing the work plan to conserve the biodiversity of the state of Sikkim as a whole. Apart from that, *the intensive flora studies of the Pangolakha ridge and its counter parts would certainly increase the knowledge about the flora of Sikkim (Singh & Chauhan 1998).*

There is absolutely, no records of floristic studies previously been carry out here. Therefore, the flora of this range particularly being hilly terrain of irregular landscape the interior regions were either to remained virgin in floristic point of view. The present study is associated with the floristic work, through field visits, survey by making extensive explorations and recording of the floristic components of the Pangolakha range. During the study , the latest updated nomenclature of plant species , brief taxonomic descriptions, vernacular names, flowering and fruiting seasons, distributions, their ecological status and the ethno-botanical knowledge of local people residing at adjoining places of sanctuary have significantly dealt for the future use.

Besides, the listing of all important plants and preparation of check list flora of Pangolakha Wildlife Sanctuary perceived through this work shall remained as an indispensable source of information for students, researchers, scientists and policy makers in *near future for the meaningful utilization and management of biodiversity.*

The famous place of east Sikkim like Nathula, Kupup, Changu, Nathang, Baba Mandir and Men-Menchu has been recently identified as an important tourist destination of the state. Therefore, the State Government under the guidance of Central Government for last four to five years has initiated a significant emphasis on the extension of ecotourism activities in the area projected above. The reopening of trade route between China and India through Nathula in June 2006 long after 1962 shall fetch opportunities to the local people by generating alternative income by adopting the tools of ecotourism.

However, the state government most also perceive the annual depletion of floristic components due to mismanagement of biodiversity through making comparative assessment with the results of the present study. Innumerable medicinal plants of the projected area have already been under serious constrain followed by the vanishing of many rare and endemic components.

Pangolakha range has contributed a significant value to the local people who is residing in its periphery. For many centuries, they have been closely associated for the foods, shelters and for alternative medicines. The documentation of the ethno botanical information from the tribal people of the periphery shall be important resources in near future. With the completion of the studies, the outcome is preparation of Flora of Pangolakha Wildlife Sanctuary, which shall be important reference while assessing natural resources. These ultimately enable identification thereby conserving the economically potential plants species. This high value plants of the Pangolakha range are comprises of aromatic, ornamental, wild edibles, timbers. Spices, herbal plants etc. The flora of sanctuary may be an essential tools for naturalists , plant taxonomist, ecologist, foresters for conservation activities, sustainable exploitation, environmental strategies planning and over all planning of numerous basic developmental activities.

However, the studies also ultimately enable to identify the status of our endemic, endanger, and critically endangered floral elements of the projected region. Most importantly, the herbarium sheet of specific species achieved during the explorations may definitely be useful for students, foresters, ecologists, botanist and other researchers for reference.

PLATE V



PLATE VI



LEGEND OF PHOTOS

Plate V

1. Dense canopy of forest of Pangolakha range
2. The undisturbed forest of PWS
3. Alpine meadows near Bhimbase
4. A perpetual view of Mt. Kanchenjunga and other mountain peaks from Panglakha.
5. A view of *Abies* forest near Nathang
6. An en-route to Rachela trijunction
7. View of a pristine Rachela lake, a permanent source of water for numerous wild animals.
8. A view of Changu lake surrounded by sub-alpine plants

Plate VI

9. A morning view of Pangolakha ridge from Pakyong, East Sikkim.
10. A continued vegetation patterns from Panglakha ridge to Neora valley
11. A compact growth of ground vegetation
12. A spreading patches of *Juncus* and other grasses.
13. A view of Ronchu water stream near Kyongnosla
14. Rhododendron scrubs near Zuluk.
15. Dominating growth of *Yushania sp* near Rachela.
16. En-route to Rachela from Phusrey

Chapter-V

CHAPTER V

Materials and Methods

5.1. THE FIELD WORKS

The entire virgin area of Pangolakha ridge was surveyed during the years 2001 to 2007 with the assistant of Forests, Environment & Wildlife Department, Government of Sikkim. Based on the available negligible literature, records, publications on the status of flora and fauna, it has been assumed that the Pangolakha ridge is certainly been not visited by any individual or group for floristic studies point of view, except by a team comprising of forest department, Government of Sikkim and World Wide Fund (WWF) Sikkim circle in 1999 - 2000 (a unpublished report Forest. Dept. Govt of Sikkim.(Anonymous 2000). Prior to the onset of survey, the base map created by forest department in the same year was extensively studied and recorded the altitudes and the distance in kilometers between the places in the first phase. After the drawing and enlargement in the derived scales the trekking routes campsites were fixed in different blocks of the areas from the altitude 1981m to 4724 m. After the thorough consultation with forest department local people and tourist guides (mountain trekkers) and army, personals including police the routes to reach dense ridges in deep forests in all the parts of the sanctuary were identified and chosen at different sub-ridges of Pangolakha.

The Sanctuary being located at the boarder areas to China and Bhutan, the frequent survey over few of far interior of pockets Dokala, Dongchula, and towards Batangla was imposed restricted by the army personnel. However, the sanctuary with the areas of virtually huge and inaccessible, several ideal places were identified as base camps. These are Kupup, Padamchen, Pangolakha, Rachel, Hathi cherey, Phusrey dara, from where many sub-camps were further identified wherever necessary. However, availability of some basic necessities like water, proper shelter, enforced us to shift the campsites other than identified spot.

The field surveys was initiated with the optimum plans and information of the ridge including methods of collecting plant samples in the field and the hiring of survey equipments including tents and trekking equipments from Namgyal's tours and travels, Tibet road, Gangtok . Forest personnel from department of forest were officially deputed in all survey that has been made between 2001 and 2007 for field guide, for every single survey minimum of

three to four porters was employed to carry the luggage including tent and trekking equipments. After the first preliminary studies conducted in year 2002, the entire pockets of Pangolakha ridges were explored simultaneously in every seasonal interval until 2007 and recorded the distributions and habitat status of different taxa. During the survey, the samples of the plant materials were collected initially in the bulk, which contained all types of specimens and are recorded properly in the field notebooks.

The major portion of the Pangolakha Wildlife Sanctuary is occupied by the part of alpine and sub-alpine vegetations; the areas remained under the snow cover for minimum of four to five months in winter and the climatic conditions of the ridges is extremely harsh. . Therefore, survey team must acclimatize with the climatic condition of different altitudes of the ridges before undertaking minimum 20 days field trips.

In order to provide security and to maintain back-up support for the needs of other teams for field activities three numbers of control room was temporarily being installed at Padamchen range forest check post and Rongli range forest check post and Kupup range forest out post. The communication between scientific team and the control room was maintained through mobile phones and walky-talky provided by forest department. However, the ridges of Pangolakha sustain extremely reliable network for mobile phone after the year 2003, which enabled the team to communicate with the head quarter, Gangtok, as and when required.

Pangolakha ridges are one of the most difficult terrain and practically inaccessible to its interior without the help of the local guides. Therefore, the progress of every activities of the field is proportional to their numbers. Significantly, the minimum time taken to visit in between two-control rooms was not less than eight to nine hours walking on foot every day. Since, the sanctuary is the repository of many furious wild animals like tigers, leopards, bears, Takins and Wild boars, however the alternative security system was provided by the department of forest, wherever it was practically necessary. Most recently constructed trekker's hut / Barrack at Rachel and Pangolakha by tourism department of Sikkim was used optimally for the studies. However, in several other places the camping was done away at the several natural caves or abandoned wreck cowsheds (*Goth*). The forest check post at Kyongnosla, Kupup and Lingtam are few other places where the staff of both forest and police department had provided a commendable support and extended needful help.

5.2.PROCESSING OF SPECIMENS

The methodology as suggested by Jain & Rao (1977) was followed in general for this work with minor modifications wherever it was essential. Generally, specimens were collected in triplicate preferably in their flowering as well as in fruiting stages, but rarely in vegetative stage. With the complete recording of field-characters in field notebooks, the specimens were temporarily preserved in polythene bags, with the mouth being kept tied perfectly; not letting the access or exit of air. The specimens collected in the field were further processed with trimming of infected parts and selection of better and young parts, cleaned and placed in blotting papers. Drops of formalin were added in different parts of specimens to check the decomposition and fragmentation. Blotters with specimens were then put into a light herbarium press and tied tightly with rope. In order to absorb all the moistures from the specimens, the blotting papers used in the herbarium press were changed regularly along with the repositioned of each specimen continuously for at least three to seven days at the campsite.

However, the specimens after bringing back to the laboratory were transferred to a heavy plant press, kept in a hot-chamber, changed blotters in regular interval until dried properly. All the specimens were then properly poisoned with 6 % solution of $HgCl_2$ in rectified spirit (ethanol).

Further, the specimens were mounted on standard herbarium sheets (41.5 x 28 cm) using glue and stitched with threads. There after the herbarium labels (15.5 x 10 cm) with important information recorded in the field were fixed on the right hand bottom side of each individual sheet.

These labels contained the following important information (a) Area under exploration, (b) Family of the plant, (c) Name of the plant, (d) Field number, (e) Date of collection, (f) Vernacular names, (e) Habit and habitat, (f) Place of Collection or distributions, (g) Altitudes (h) Flower color, (j) Use, (k) Name of collector and determinator; etc.

The specimens were then stored temporarily in steel cabinets in the laboratory for further study.

To record the exact period of flowering and fruiting different areas were visited frequently in different seasons. Since majority of alpine plants are annual and short living, they deserved to visit between the month of April to July for flowering and August to November to study the fruiting stage.

5.3.IDENTIFICATION, AMASSMENT AND DEPOSITION OF SPECIMENS

The specimens were identified in the Taxonomy & Environmental Biology Laboratory of the Department of Botany, North Bengal University and in the herbarium section of the Sikkim

Hill Circle of the Botanical Survey of India, at Gangtok. For this wide range of literature (floras, monographs, revisions, etc) were consulted including Hooker (1849 – 1851, 1872 – 1897), Hara (1966, 1971), Hara *et al* (1978, 1979, 1982), Ohashi (1975), Grierson & Long (1983, 1984, 1987, 1991, 1999, 2001), Karthikeyan *et al* (1989), Hajra & Verma (1996), Noltie (1994, 2000) and Pearce & Cribb (2002). After identification in the laboratory the specimens were then matched at different herbaria including that of Sikkim Forest Department, Deorali, Gangtok, BSHC, NBU and CAL.

After completion of the work, three sets of the specimens will be deposited in (i) NBU-Herbarium; (ii) Sikkim Forest Department Herbarium and (iii) BSHC.

The detail morphological studies of each specimen were undertaken at both the Environmental Biology laboratory of department of Botany, university of North Bengal and at herbarium section of the Sikkim Hill Circle of the Botanical Survey of India. Specimens were described mostly using common technical terminology. The description of the specimens was supported with the proper measurements and with the recognition of some special characters; those differentiate between the specimens studied.

5.4 METHODS OF ENUMERATION

The basis of framing up of present flora of Pangolakha Wildlife Sanctuary is the classification presented by Arthur Cronquist (1988). However, with the availability of recent literature including *Flora of Bhutan* (Long & Grierson 1983, 1984, 1987, 1991, 1999, 2001) and *Flora of Sikkim* (Hajra & Verma 1996) facilitated the work. Dahlgren *et al* (1985) Cronquist (1981), Dahlgren (1980) and Hutchinson (1973) has been chiefly followed for the delimitation of families of the flowering plants of the PWS flora. As far as possible up-to-date nomenclature of plants has been used in terms of the provisions of ICBN. However, genera within a family and the species (and infraspecific categories) within a genus were arranged alphabetically. Proper artificial dichotomous Keys were provided for the identification of genera, species and infraspecific categories. The legitimate correct name of the species is printed in italic-bold and that is followed by basionym and selected synonym(s), if any, in italics only. The local and vernacular names recorded for different species of plant from the field through interaction with the people of local community residing in periphery of sanctuary have been clearly mentioned in the profile of each species. The local names of the species are in the Lepcha and Nepali languages.

The present status of the species in its natural habitat, data of collection and the local and general distribution for each taxa have also been clearly indicated.

Chapter-VI

Enumeration

The plant with the most legitimate name as per the latest nomenclature code, through proper taxonomic treatments of species, collected from the Pangolakha Wildlife Sanctuary has been arranged in compliance with the classification presented by Arthur Cronquist (1988). Further, for more convenient the presentation of each species their enumeration the genera and species under the families are arranged in alphabetical order.

The following sequence of enumeration is taken into consideration while enumerating each identified plant.

(a) Legitimate correct name, (b) Basionym, (c) Synonyms if any (selected ones only), (d) Homonym if any, (e) Protologue and other important publication references, (f) Vernacular name, (g) Description, (h) Flowering and fruiting periods, (i) Specimen cited, (j) Status (k) Local distribution, (l) General distribution, (m) Important note if any on some special features or of the traditional values of the taxon.

Most importantly, in the present study, an attempt has been made to include all the available taxonomic reference on the taxon. Mentioned below is the list of important books, selected scientific journals, papers, newsletters and periodicals that has been referred during the citation of the same.

6.1 Chronicles of literature used in the reference

Names of the important books referred.

Bengal Pl.	: Bengal Plants
En. Fl. Pl. Nepal	: An Enumeration of the Flowering Plants of Nepal
Fasc. Fl. India	: Fascicles, Flora of India
Ferns. S. India	: Ferns of south India
Fl. Brit. India	: Flora of British India
Fl. Bhutan	: Flora of Bhutan
Fl. E. Him.	: Flora of Eastern Himalaya

Fl. India	: Flora of India
Fl Indica	: Flora Indica
Fl. Sikkim	: Flora of Skim (Monocot).
Fl. West Bengal.	: Flora of West Bengal
Han. Ferns. Brt. Ind	: Handbook of the Ferns of British India, Ceylon and the Malay Peninsula (with supplement)
Lab. India	: Labiatae of India
Prodr. Fl. Nepal	: Prodr. florae Nepalensis
Pl. As. Rar.	: Plantae Asiaticae Rariores
Pl. Wilson	: Plantae Wilsonianae
Rhod. Sikkim Him.	: Rhododendron of Sikkim Himalayas
Tent. Fl. Nap	: Tentamen Florae Nepalensis Illustratae
Tr. N. Bengal	: The Trees of Northern Bengal
FOC	: Flora of China
Fl. Meg	: Forest flora by Meghalaya by K. Haridarsan and R. R. Rao.
FC. Asm	: Flora of Assam by U. N. Kanjilal and A. Das.
Orch. Sik. Him.	: The orchids of Sikkim Himalayas
WI	: The wealth of India.
Trs. Sik. Hil	: Tress of Sikkim hills by L.K. Rai.
HFD.	: Herbaceous flora of Dehradun.
S. Fl. Sikkim Him.	: Spring Flora of Sikkim Himalayas
Hi. Cob. Li.	: Himalayan Cobra-lilies (<i>Arisaema</i>) their botany and culture
Fl. Jow.	: Flora of Jowai
Fl. W. Pakistan.	: Flora of west Pakistan
Nam. Change. Flr. Pl.	: Name changes in flowering plants by S. S. R. Bennett.

Names of the journal referred

Bull.As.Soc.Beng.	: Bulletin of Asiatic Society of Bengal
Bull.Bot.Sur.Ind..	: Bulletin of Botanical Survey of India
Jour.Arn.Arb.	: Journal of Arnold Arboretum
Jour.Beng.Nat.Hist.Soc.	: Journal of Bengal Natural History Society
Jour.Bomb.Nat.Hist.Soc.	: Journal of Bombay Natural History Society
Jour.Econ.Tax.Bot.	: Journal of Economic and Taxonomic Botany
Jour.Hill Res.	: Journal of Hill Research

Jour.Him.Res.Dev.	: Journal of Himalayan Research and Development
Jour.Jap.Bot	: Journal of Japanese Botany
Jour. R.A.S. Beng. Sci	: Journal of Royal Asiatic Society of Bengal
Jour.Trop.Med.Pl.	: Journal of Tropical Medicinal Plants
Jour.Res.Ind.Med	: Journal of Research in Indian Medicine
Kew.Bull.	: Kew Bulletin
Nat.Acad.Sci.Letter.	: National Academy of Science Letter
Notes R.B.G.Edinb.	: Notes from the Royal Botanical Garden, Edinburgh
Rec.Bot.Sur.Ind.	: Records of Botanical Survey of India
Jour. Ind. For.	: Indian forester, Dehradun.
Jour. Ind. Forestry.	: Indian Journal of Forestry , Dehradun.
Jour. Plione	: Plieoine
Panda	: Biannual publication of forest dept. Govt of Sikkim.

6.2 Abbreviation used in Enumeration.

<i>agg.</i>	: aggregated species
<i>auct.</i>	: of various authors (<i>auctorum</i>)
<i>C.</i>	: about (<i>Circa</i>)
<i>Cf.</i>	: compare (<i>Confer</i>)
<i>f.</i>	: form (<i>forma</i>)
<i>nom.illeg.</i>	: Illegitimate name (<i>Nomen illegitimum</i>)
<i>nom.nud.</i>	: <i>Nomen nudum</i>
<i>p.p.</i>	: In Part (<i>pro parte</i>)
<i>Sensu.</i>	: In the sense of author indicated and not as originally intended
<i>ssp.</i>	: Sub-species
<i>Var.</i>	: Variety
<i>Var. nov.</i>	: New variety

Other abbreviations common used in enumeration

Acad.	: Academy	Ill.	: Illustration
Bull.	: Bulletin	Journ.	: Journal
Cat.	: Catalogue	n.	: Number
Contr.	: Contribution	Rep.	: Report
Faun.	: Fauna	Repert.	: Repertorium

Fl. : Flora
Ic. : Icones

S. : Society
Contr. : Contribution

Authorities of botanical names.

A.DC : Alphonse de Candolle
Anders : T.Anderson
Bung : Bunge
Benth. : Bentham
Baill : Baillon
Berh : Berhandi
Burm.f : Burman (*filius*)
CL. : Clarke
DC. : Augustine de Candolle
Decne. : Decaisne
Dumort. : Dumortier
Falcc. : Falconer
Fisch. : Fischer
Hutch. : Hutchinson
Haussk : Hausskal
Hk. : Hooker
Jeff. : Jeffery
Jacq. : Jacquin
kitam. : Kitamura
Kunz : Kuntze
L.f. : C.Linnaeus (*filius*)
Lour. : Loureiro
Mart. : Martius
Mill. : Miller
Muell. : Mueller
Meisn : Meisner
Planch. : Planchom
Rehd. : Rehder
Retz. : Retzius
Shult. : Roemer-Shultes
Ser. : Seringe
Steud. : Stewdal
R.Br. : R. Brown
Sieb& Zucc.: Siebold & Zuccarini
Thunb. : Thunberg
Vent. : Venttenat
Wettst. : Wettstein
Wt. : Wight

Aans. : Adanson
Amt. : Arnott
Brow. : Browne
Bl. : Blume
Benn. : S.S.R. Benett
Buch-Ham. : Buchanan-Hamilton
Cogn. : Cogniaux
Cham. : Chamisso
Denns : Denstedt
Edgew. : Edgeworth
Forssk : Forsskal
Griff. : Griffith
Griseb.: Grisenbach
Hand-Mzt : Handel-Mazzetti
Humb. : Humboldt
Hook.f : J.D.Hooker (*filius*)
Juss. : Jussiew
Ker-Gawl.:Ker-Gawler
Koid. : Koidzumi
L. : C. Linnaeus
Lamk. : Lamarck
Maxim : Maximowicz
Merr. : Merrill
Mich. : Michaux
Miq. : Miquel
Pax. : Paxton
Reich. : Reichenbach
Roem : Roemer
Salisb. : Salisbury
Schr. : Schrader
Spreng.: Sprengel
Sieb. : Siebold
Roxb. : Roxburgh
Thoms.: Thomas Thomson
T.Anders.: Thomas Anderson
Wall. : Wallich
Willd. : Willdenow
Zucc. : Zuccarina

Local (Common) names.

Lep. : Lepcha Hind : Hindi Eng. : English
Nep : Nepali Sans : Sanskrit Beng : Bengali

Description:

Diam.	: Diameter
Fig.	: Figure
Fem.	: Female
Pl.	: Photoplate
Exiccata	: Exiccatus

Distributions:

C.	: Central
E.	: Eastern
S.	: Southern
W	: Western
N.	: North
NE.	: North-eastern

The measurement of the specimens during the study was made through metric unit system (m, cm & mm) for e.g. the dimensions of leaves are given as 6 x 4 the first figure indicating the length and the second breadth, the only one measurement indicates the length or height for e.g. fruit 2cm. . Measurements usually inside the brackets refers the specimens outside the average range e.g. trees 25 – 30m (-60m) indicates the normal range of height as 25- 30 m but sometime exceptionally up to 60m.

6.3. DETERMINATION OF ECOLOGICAL STATUS OF PLANTS IN THE WILD HABITATS

Status of plants in the wild is actually being determined through the eye estimation and through the consultation of Red Data lists of IUCN (1998, 2000) and Botanical Survey of India.

ENUMERATION OF THE FLORA OF PANGOLAKHA WILDLIFE SANCTUARY

6.4. PTERIDOPHYTES

While working on the study of angiospermic flora, many species of ferns and its allies were also collected and recorded from temperate to subalpine region. This includes 39 genera under 68 species belonging to 20 Pteridophytic families. The ferns and its allies constitute a significant component of the sanctuary's flora. They tend to possess equal important in regards to both animal and human beings. Significantly, some ferns are known to have considerable economic values and have good demand in local markets. The population of the ferns inside the sanctuary is extremely rich and diverse as well. The distribution pattern of ferns seems uniform from the lower temperate belt to the alpine region of the sanctuary. The enumeration of some of the prominent species of fern & ferns allies of the PWS is mentioned below.

ASPIDIACEAE S.F. Gray

Ctenitis C. Chr.

Ctenitis apiciflora (Wall. Ex Mett.) Ching in Bull. Fan. Mem. Inst. Biol., 8, 284, 1938; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.134. 2008.

Basionym: *Aspidium apiciflorum* Wall. (lists n. 345, 1828 ex Mett., Farngett. Phleg. Et Aspid., 54, n. 128, 1858.

Exsiccatus : Dhorok 2300 m, **SR Lepcha & AP.Das**, 04035, dated 07.08.2003.

Driopteris Adanson

Driopteris chrysocoma (Christ) C. Chr., Index Fill.,257.1905; Mehra& Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.132.2008.

Basionym: *Aspidium fructuosum* Christ in Bull. Herb.Boiss., 6, 966, 1898.

Exsiccatus : Dhorok 2300 m, **SR Lepcha & AP.Das**, 04099, dated 15.11.2004.

Driopteris sikkimensis (Bedd.) O. Ktze., Rev. Gen. Pl.,2, 813, 1891; Mehra& Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.133.2008.

Basionym: *Polystichum sikkimensis* Bedd., Ferns brit. India,t.127, 1866.

Exsiccatus : Phusrey, 2380 m, **SR Lepcha & AP.Das**, 04038, dated 07.08.2003.

Driopteris serrate-dentata(Bedd.) Hayata, Ic. Pl. Formos., 4, 179, 1914; Ching in Bull.Fan Mem. Inst Biol., 8, 433, 1938; Mehra& Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.131.2008.

Basionym: *Lastrea filix-mas* var. *serrate - dentate* Bedd., Handb. Ferns Brit. India, Suppl., 55, 1899.

Exsiccatus : Rachel below, 2750m, **SR Lepcha & AP.Das**, 04039, dated 08.08.2003.

*Driopteris barbiger*a (Moore) O.Ktze., Rev. Gen. Pl. 2, 812, 1891; Ching in Bull. Fam Mem. Inst. Biol., 8, 431, 1938; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.132.2008.

Basionym : *Nephrodium barbigerum* Hook., Spec. Fil., 4, 113, 1891; Clarke in Trans. Linn. Soc. London II Bot., 1, 522, 1880.

Exsiccata : Dhorok 2300 m, **SR Lepcha & AP.Das**, 04036, dated 07.08.2003.

Driopteris panda (Clarke) Christ in bull Geogr. Bot. mem., 20, 176, 1909; C.Chr., Index Fil. Suppl. III, 94, 1934; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.130. 2008.

Basionym: *Nephrodium filix-mas* var. *panda* Clarke in trans. Linn. Soc. London, II, Bot., 1, 519, Pl. 68, Fig. 1, 1880.

Exsiccatus : Hangey, 1900 m, **SR Lepcha & AP.Das**, 04041, dated 07.08.2003.

Driopteris palaceae (Don) Hand – Mazz., Verh. Zool. -Bot. Ges. Wien., 58:100. 1908 (*non-palaceae* (Swartz) Christensen, 1911; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.131. 2008.

Basionym: *Aspidium palaeceum* Don, Prodr. Fl. Nepal., 4.1825 (non Sw., 1806)

Exsiccatus: Subaney – Singhaney, 2700 m, **SR Lepcha & AP.Das**, 04042, dated 10.08.2003.

Driopteris splendens (Hook.) O.Ktze., Rev. Gen. Pl. ,2 : 813. 1891; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.133. 2008.

Basionym: *Nephrodium splendens* Hook., spec. Fil., 4: 126. 1862.

Exsiccatus: Durpiney- Neora boundry,2400 m, **SR Lepcha & AP.Das**, 04043, dated 07.08.2003.

Elaphoglossum Schott

Elaphoglossum petiolatum (Sw. Urban, symb. Ant., 4.61, 1903; C. Chr., Index Fil., 313, 1906; ; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.130. 2008.

Basionym : *Acrostichum petiolatum* Swartz, Prod., 128, 1788.

Exsiccatus : Beusa, 2200 m, **SR Lepcha & AP.Das**, 05000, dated 07.10.2004.

Polystichum Roth.

Polystichum nepalense (Spr.) C. Chr., Index Fil., 84, 1905 (585, 1906) Ching, Ie. Fil. Sinicarum 5, Pl. 243, 1958; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.126..2008.

Basionym: *Aspidium nepalense* Spreng, Syst., 4, 97, 1827.

Exsiccatus : Hangey, 2200 m, **SR Lepcha & AP.Das**, 04045, dated 08.08.2003.

Polystichum prescottianum (Wall.) Moore, Index Fil., 101, 1858; Bedd., Handb. Ferns Brit. India 210, t. 105, 1883; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.127.2008.

Basionym: *Aspidium prescottianum* Wall., List n. 363, 1828 (*nomen nudum*); Clarke in Trans. Linn. Soc. London, II, Bot., 1, 510, 1880.

Exsiccatus : Panglakhha 2800 m, **SR Lepcha & AP.Das**, 05002, dated 10.10.2003.

Polystichum aculeatum (L.) Schott, Gen. Fil., ad.t. 9, 1834; Bedd., Handb. Ferns Brit. India, 207, 1883. Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.127.2008.

Basionym: *Polypodium aculeatum* Linn., Spec. Plant., 2, 1090, 1753.

Exsiccatus : Rachela below, 2600 m, **SR Lepcha & AP.Das**, 04044, dated 08.08.2003.

Polystichum thomson (Hook.fil.) edd., ferns Brit. India, t. 126, 1866; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.127. 2008.

Basionym : *Aspidium thomsonii* Hook., Fil. In Hook., 2nd Cent., t. Pl. 25, 1880 (*pro-parte*) ; Clarke in trans. Linn. London, II, Bot., 1, 508, 1880.

Exsiccatus : Singhaney, 2600 m, **SR Lepcha & AP. Das**, 05010, dated 11.10.2005.

Polystichum obliquum (Don) Moore, Index Fil., 87. 1858; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.126. 2008.

Basionym; *Aspidium obliquum* Don, Prodr. Fl. Nepal., 3. 1825.

Exsiccatus : Dhorok 2200 m, **SR Lepcha & AP.Das**, 04046, dated 08.08.2003.

ASPLINIACEAE S.F. Gray

Asplenium Linnaeus

Asplenium ensiforme Wall., List n. 200, 1828 (*nom.- nud.*); Hook. & grev., Ic. Fil., t. 71, 1829; Bedd., ferns South. India, t. 125, 1863 and Handb, ferns Brit. India 141, t. 71, 1883; Clarke in Trans. Linn. Soc. London, II, Bot., 1, 476, 1880; ; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.156. 2008.

Exsiccatus: Phusrey, 2000 m, **SR Lepcha & AP. Das**, 04000, dated 07.08.2003.

Asplenium tenuifolium Don, Prodr. Fl. Nepal., 8, 1825; Clarke in trans. Linn. Soc. London II, Bot., 1, 485, 1880; Bedd., Handb. Fern brit. India, 159, t. 78, 1883; hope in Journ. Bombay at. Hist. Soc. 13, 667.1901; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.158. 2008.

Exsiccatus: Rachela, 2500 m, **SR Lepcha & AP. Das**, 04050, dated 07.08.2003.

Asplenium lacinatedum Don, Prodr. Fl. Nepal., 8. 1825; Clarke in trans. Linn. Soc. London,II, Bot., 1, 481, 1880; (*pro-parte*); Bedd., Handb. Ferns Brit. India, 154, 1883 (*pro- parte*); Wu et al. , Polypod. Yaoshan, 184, 1932; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.157. 2008.

Exsiccatus: Beusa,1800 m, **SR Lepcha & AP. Das**, 05007, dated 10.10.2004.

Asplenium planicaule Wallich in Met., Aspl., n. 158, 1828; Bedd., ferns South India t. 139, 1863; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.156. 2008.

Basionym: *Asplinum laciniatum* var. *planicaule* Clarke in Trans. Linn. Soc. London, II, Bot. , 1:482. 1880.

Exsiccatus: Talkharka, 1800 m, **SR Lepcha & AP.Das**, 06035, dated 09.09.2006.

ATHYRIACEAE Alston.

Athyrium Roth

Athyrium rupicola (Hope) C. Chr. Index Fil., 145. 1905; Alston & Bonner in Candolles, 15: 213. 1956; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.137. 2008.

Basionym: *Asplenium rupicola* Hope in Journ. Bombay nat. Hist. Soc. 12, 531-32, Pl. 5, 1899.

Exsiccatus: Dhorok 2300 m, **SR Lepcha & AP. Das**, 04055, dated 07.08.2003.

Note: Species of high altitude above Karponang.

Athyrium mehrae Bir in nova Hedwigia, 4, 166, 1962; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.140. 2008.

Exsiccatus:

Athyrium nigripis (Bl.) Moore, Index Fil. Xlix, 1857, 98, 1858; sledge in bull. Brit. Mus (nat. hist.) 2: 285. 1962; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.141. 2008.

Basionym: *Aspidium nigripes* Bl., Enum. Fil. Jav., 2: 162. 1828.

Exsiccatus: Hangay, 1900 m, **SR Lepcha & AP.Das**, 05010, dated 10.10.2004.

Exsiccata : Karponang – Kyonglasha 3200, **SR Lepcha & AP.Das**, 06010, dated 07.09.2006

Athyrium duthie (Bedd.) bedd., ferns Brit. India , suppl. 34, 1892; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.141. 2008.

Basionym: *Asplenium duthie* Bedd., in Journ. Bot., 27. 72. 1889.

*Exsiccatu*s : Dhorok 2300 m, **SR Lepcha & AP.Das**, 04059, dated 25.08.2003.

Diplazium Swartz

Diplazium polypodioides Blume, Enum. Pl. Jav., 194, 1828; Bedd., Handb. Ferns Brit. India, 184, t. 89.1883 (excl. var.) ; Bir in Bull. Bot Surv. India , 4, 5. 1862; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.147. 2008.

*Exsiccatu*s : Hangey, 1900 m, **SR Lepcha & AP. Das**, 05013,dated 13.13. 2004.

CYATHEACEAE Reichnb.

Alsophila A. Brown

Alsophila glabra (Bl.) Hook. Spec. Fil., 1: 51. 1844; Clarke in trans. Linn. Soc. London, II, Bot., 1: 433.1880; Bedd., Handb. Ferns Brit. India 14. 1883; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.123. 2008.

Basionym: *Gymnosphaera glabra* Bl., Enum.Pl. Jav. 242. 1828.

*Exsiccatu*s: Phusrey, 2200 m, **SR Lepcha & AP.Das**, 04066, dated 07.08.2003.

Cyathea Smith.

Cyathea spinulosa Wallich ex Hook., Spec. fil., 1: 25, t. 12C, 1844; Bedd., Handb. Ferns Brit. India 6, t. 3. 1883; Clarke in trans. Linn. Soc. London II, Bot., 1: 429.1880; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.124. 2008.

*Exsiccatu*s : Talkharka, 1700 m, **SR Lepcha & AP.Das**, 04070, dated 05..08.2003.

DAVALLIACEAE Reichnb.

Araiostegia Copel

Araiostegia pulchra (Don) Copel. In Phil. Journ. Sci. , 34: 241.1927; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.119. 2008.

Basionym : *Davallia pulchra* Don, Prodr. Pl. Nepal., II, 1825; Clarke in Trans. Linn. Soc. London, II, Bot .1: 443. 1880.

*Exsiccatu*s: Rachel, 2600 m, **SR Lepcha & AP.Das**, 005015, dated 14.10. 2003.

Athyrium multidentata (Bedd.) Copel in Phil. Jour, Soc. 34: 241. 1927; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.120. 2008.

Basionym: *Leucostegia multidentata* Bedd., Ferns Brit. India, suppl., 2. 1876 and Handb. Ferns Brit. India 50. 1883.

*Exsiccatu*s : Dhorok 235000 m, **SR Lepcha & AP.Das**, 04068,dated 10.08.2003.

DENNSTAEDTIACEAE Ching.

Dennstaedtia Bernh.

Dennstaedtia appendiculata (Wall.) J. smith, Hist. fil., 265, 1875; Bedd., Handb. Ferns brit. India (with suppl.) 26. 1892; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.116. 2008.

Basionym : *Dicksonia appendiculata* Wall., List n. 65. 1825; Clarke in Trans. Linn. Soc. London, II, Bot., 1: 436. 1880.

Exsiccatus : Panglakha below, 2700m, **SR Lepcha & AP.Das**, 05020, dated 16.10.2004.

Dennstaedtia scabra (Wall.) Moore, Index Fil., 1861; Bedd., Handb. Ferns brit. India 24, t. 12. 1883; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.116. 2008.

Basionym: *Dicksonia scabra* Wall., List n. 2173. 1829; Clarke in Trans. Linn. Soc. London II, Bot., 1: 436.1880.

Exsiccatus : Karponang – Kyongnosla, 2300 m, **SR Lepcha & AP.Das**, 06012, dated 10.09.2006.

GLEICHENIACEAE Gaudich.

Dicranopteris Bernh.

Dicranopteris linearis (Burm.) Underwood in bull. Torey Bot. Cl. , 34: 250.1907; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.122. 2008.

Basionym : *Polypodium lineare* Burm., Fl. India 235, t. e. 2. 1768.

Exsiccatus : PWS, upto 2600 m, **SR Lepcha & AP. Das**, 05025, dated 25. 10. 2004.

Gleichenia Smith

Gleichenia glauca (Thbg.) Hook., Spec. fil., 1, 4, t. 3B, 1844; Clarke in trans. Linn. Soc. London II, Bot., 1, 428, 1880; Bedd., Handb. Ferns brit. India (with Suppl.), 2. 1892; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.122. 2008.

Basionym : *Polypodium galucum* Thbg. In Houtt., nat. Hist., 14, 177, 1783.

Exsiccatus: Dhorok 2300 m, **SR Lepcha & AP.Das**, 04070, dated 07.08.2003.

GRAMMITACEAE Presl.

Ctenopteris Blume

Ctenopteris subfalcata (Bl.) Kunze in Bot. Ziet., 6: 120.1948; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.176. 2008.

Basionym: *Polypodium subfalcatum* Bl. Enum. Pl. Jav., 2: 130. 1828; Clarke in Trans. Linn. Soc. London II, Bot., 1: 549.1880.

Exsiccatus: Hangay, 2000 m, **SR Lepcha & AP.Das**, 04072, dated 07.08.2003.

Ctenopteris trichomanoides J. Smith. Hist. Fil., 184. 1875; ; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.177. 2008.

Polypodium trichomanoides Sw. , Prodr. 131. 1788; Clarke in Trans. Linn. Soc. London , II. Bot., 1: 549.1880.

Exsiccatus: Dhorok 2400 m, **SR Lepcha & AP.Das**, 04095, dated 25.08.2003.

HYMENOPHYLLACEAE Gaudich.

Mecodium Presl.

Mecodium exsertum (Wall. Ex. Hook.) Copel. In Phill. Journ. Sci. 67: 23.1938; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.115. 2008.

Basionym: Hymenophyllum exertum Wall., List n. 170, 1828 (*nom. – nud.*); Hook., Spec. Fil., 1: 109, Pl. 38A, 1844; Clarke in trans. Linn. Soc. London II, Bot., 1: 436. 1880.
Exsiccatus: PWS, upto 2700 m, **SR Lepcha & AP.Das**, 05027, dated 12. 10.2004.

Mecodium polyanthus (Sw.) Copel. In Phill. Journ. Sci., 67: 19.1938; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.115. 2008.

Basionym: Trichomanes polyanthus Sw., Prod. Fil. India Occ., 137. 1788.

Exsiccatus: Rachel, 2400 m, **SR Lepcha & AP.Das**, 04077, dated 10.08.2003.

LINDSAEACEAE Presl.

Lindsaya Dryander

Lindsaya cultrata (Willd.) Swartz, Synopsis Fil., 119. 1806; Bedd., Handb. Ferns brit. India (with suppl.) , 72, t. 36, 1892; Clarke in Trans. Linn. Soc. Lond., II, Bot., 1; 450. 1886; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.118. 2008.

Basionym: Adiantum cultratum Willd., Phytogra., 14,t. 10,f.2, 1794.

Exsiccatus: Rigu forests, 1800m, **SR Lepcha & AP.Das**, 04078, dated 13. 08.2003.

Note : Grows compactly on moist rocks or stony walls.

Sphenomeris Maxon

Sphenomeris chinensis (L.) Maxon in Wash, Acad. Sci. Journ. 3: 144. 11913; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.119. 2008.

Basionym: Trichomanes chinensis Linn., Spec. plant., 2: 1099. 1880.

Exsiccatus: Beusa, 1900 m, **SR Lepcha & AP.Das**, 04079, dated 07.08.2003.

LYCPODIACEAE Reichenb.

Lycopodium Linnaeus

Lycopodium selago Linn., Spec. Plant., 1753; Chaudary in trans. Nat. inst. Sci., India, 1: 190.1937; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.101. 2008.

Exsiccatus: Nathang, 3600 m, **SR Lepcha & AP.Das**, 06020, dated 23. 09. 2006..

Lycopodium sikkimensis Herter ; Chaudary in trans. Nat. Inst. Sci., India 1: 192. 1937; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.101. 2008.

Exsiccatus: Jalepla – Kupup, 4000 m, **SR Lepcha & AP.Das**, 06021, dated 23.09.2006.

Lycopodium serratum Thunberg, Fl. japan, 341, t.38. 1784; Clarke in Trans. Linn. Soc. London, Bot., II, Bot., 1: 591. 1880; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.101. 2008.

Exsiccatus: Dhorok 2300 m, **SR Lepcha & AP.Das**, 04080, dated 19.08.2003.

Lycopodium phlegmaria Linn., Spec. Plant., 2, 1564. 1753; Clarke in trans. Linn. Soc. London II, Bot., 1: 592. 1880; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.102. 2008.

Exsiccatus: Subanay dara, 1800 m, **SR Lepcha & AP.Das**, 05030, dated 27. 10.2004.

Note : A rare epiphytic (Subaney dara)

OLEANDRACEAE Ching & Pich-serm.

Nephrolepis Schott

Nephrolepis cordifolia (L.) Tent. Pterid., 79, 1836; Bedd., Handb. Ferns Brit. India, 282, t. 144. 1883; Clarke in Trans, Linn. Soc. London, II, Bot., 1: 540.1880; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.121. 2008.

Basionym: *Polypodium cordifolium* Linn., Spec. plant., 2: 1089.1753.

Exsiccatus: Mulkharka upto 1800m, **SR Lepcha & AP.Das**, 04082, dated 25.08.2003.

Oleandra Cavanilles

Oleandra wallichii (Hook.) presl, Tent. Pterid., 78, 1836; Bedd., Handb. Ferns Brit. India, 287, t. 147. 1883; Clarke in Trans. Linn. Soc. London II, Bot., 1. 542.1880; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.121. 2008.

Basionym: *Aspidium wallichianum* Hook., Exotic Fl., 1, t, 5. 1823.

Exsiccatus: Dhorok 2300 m, **SR Lepcha & AP.Das**, 04083, dated 25.08.2003.

Oleandra neriformis Cav. In Ann. Hist. nat., 1, 115. 1799; Bedd., Hanb, Ferns Brit. India, 285, t. 146. 1883; Clarke in trans. Linn. Soc. London ii, Bot., 1. 541.1880; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.121. 2008.

Exsiccatus: **Phusrey**, 2200 m, **SR Lepcha & AP.Das**, 04084, dated 25.08.2003.

POLYPODIACEAE S.F. Gray(s.str.)

Arthromeris J. Smith

Arthromeris himalayensis (Hook.) Ching in Contrib. Inst. Bot. nat. Acad. Peiping, 2: 99.1933; Alston & Bonner in Candollea 15: 207.1956; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.173. 2008.

Basionym: *Polypodium himalayensis* Hoo., Spec.Fil., 5: 91.1863.

Exsiccatus: Panglakha, 2400 – 3000 m, **SR Lepcha & AP.Das**, 05055, dated 27.09.2004.

Arthromeris wallichiana (Spr.) Ching in Contrib. Inst. Bot. nat. Acad. Peiping, 2: 92.1933; Alston & bonner in candollea, 15: 207. 1827; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.173. 2008.

Basionym: *Polydpodium wallichianum* Spr., Syst., 4: 53. 1872.

Exsiccatus: Rachel, 2400 m. **SR Lepcha & AP.Das**, 04085, dated 25.08.2003.

Phymatodes Presler

Phymatodes griffithiana (Hook.) Ching in Contrib. Inst. Nat. Acad. Peiping, 2, 71. 1933; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.170. 2008.

Exsiccatus: Dhorok 2300 m, **SR Lepcha & AP.Das**, 04088, dated 27.08.2003.

Phymatodes hastata (Thunb.) Ching in Sinensis, 3: 344. 1933; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.170. 2008.

Basionym: *Polypodium hastatum* Thunb., Fl. Japan, 335, 1784; Clarke in trans. Linn. Soc. London, II, Bot., 1, 562. 1880.

Exsiccatus: Premlakha, 1900 m, **SR Lepcha & AP.Das**, 05056, dated 28.098.2004.

Phymatodes malacodon (Hook.) Ching in Contrib. in Ist. Bot. nat. Acad. Peiping, 2.83.1933; Alston & Bonner in candollea , 15,207.1956; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.172. 2008.
Basionym: *Polypodium malacodon* Hook., Spec. Fil., 5.87.1863; Clarke in Trans. Linn. Soc. London., II, Bot.1, 564.1880.

Exsiccatus : Nathula – Kupup upto 4300 m. **SR Lepcha & AP.Das, 06063**, dated 28.10.2006.

Phymatodes stracheyi hing in contrib.. Inst. Bot. nat. Acad. Peiping, 2: 83.1933; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.172. 2008.

Exsiccatus: Dhorok 2360 m, **SR Lepcha & AP.Das, 04087**, dated 25.08.2003.

Note : A new record for India (Mehra & Bir , 2001),

Polypodium Linnaeus

Polypodium argutum Wallich , List n. 308,1828 (nom.nud) ; Hook., Spec.Fil., 5, 32, 1863; Clarke in Trans. Linn. Soc. London ii, Bot., 1, 551. 1880; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.167. 2008.

Exsiccatus: Kupto 2700 m. Dhorok 2300 m, **SR Lepcha & AP.Das, 04083**, dated 25.08.2003.

Polypodium microrhizoma Clarke ex Bak. In Hook. & Bak., Syn. Fil., Ed. 2, 511, 1874; Clarke in trans. Linn. Soc. London, II, Bot. 1,551. 1880; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.167. 2008.

Exsiccatus: kyongosla 2800 m, **SR Lepcha & AP.Das, 06040**, dated 29.10.2006.

Polypodium lucida (Roxb.) Ching in Controb. Inst. Bot. nat. Acad. Peiping, 261;1933 ; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.173. 2008.

Basionym : *Polypodium lucidum* Roxb. In cal. Journ. Nat. Hist., 4. 486.1844.

Exsiccatus: Talkharka, 1700 m. **SR Lepcha & AP.Das, 04089**, dated 25.08.2003.

Pyrrosia Mirbel

Pyrrosia mollis (Kze.) ching in Bull. Chinese Bot. soc., 1, 53. 1935; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.163. 2008.

Basionym: *Niphobolus mollis* Kunze, Bot. Zeit., 121. 1848.

Exsiccata: Rachel, 2600 m, **SR Lepcha & AP.Das, 05080**, dated 27.10.2006.

Pyrrosia stigmosa (Sw.) Ching in Bull. Chinese Bot. Soc. 1, 67. 1935; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.165. 2008.

Basionym: *Olypodium stigosum* Sw., Schrad. Journ., 1800, 21. 1801; Clarke in trans. Linn. Soc. London. II. Bot., 1, 553. 1801 (p.p.)

Exsiccatus: Phusrey- Dhorok 2300 m, **SR Lepcha & AP.Das, 04090**, dated 25.08.2003.

PTERIDACEAE (S.F. Gray) Gaudich.

Pteris Linnaeus

Pteris erecta Linn.. Mant., 130, 1767; Clarke in Trans. Linn. Soc. London II, Bot., 1, 462. 1880; Bedd. Handb., Ferns. Brit. India (with Suppl.) 106, 1892; Alston & Bonner in candollea, 15. 2002. 1956; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.113. 2008.

Exsiccatus: Rachel 2600 m, **SR Lepcha & AP.Das, 05083**, dated 27.10. 2004.

Pteris wallichiana Ag., Rec. Spec. Gen. Pterid., 69. 1839, type from Himalayas; Alston & Bonner in *candollea*, 15: 203. 1956; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.115. 2008.
Exsiccatus: Dhorok 2300 m, **SR Lepcha & AP.Das**, 04092, dated 25.08.2003.

SELAGINELLACEAE Mett.

Selaginella Spring

Selaginella monosperma Spring in Mem. Acad. Roy. Sci. , Belgique, 24.135.1850; Alston in Proc. Nat. Inst. Sci., India 2: 228. 1945; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.101. 2008.
Exsiccatus: Panglakh, 2600 m, **SR Lepcha & AP.Das**, 05084, dated 25.08.2003.

Selaginella chrysorrhizos Spr. In Mem. Acad. Roy. Sci. Blegique 24, 189.1850; Alston in Proc. Nat. Inst. Sci. india 11:226.1945; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.101. 2008.
Exsiccatus: Dhorok 2300 m, **SR Lepcha & AP.Das**, 04098, dated 25.08.2003.

THYLYPTERIDACEAE

Thylypteris Schmidel

Thylypteris elwesii (Bak.) Ching in Bull. Fan. Mem. Inst. Boil., 6: 308.1936; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.150. 2008.

Basionym : *Nephrodium elwesii* Baker in Hoover & Baker, syn. Fil., 497, 1874; Clarke in Trans. Linn. Soc. London II, Bot., 1: 516.1880.

Exsiccatus: Singhaney -Dhorok 2200 m, **SR Lepcha & AP.Das**, 04093, dated 25.08.2003.

Thylypteris uliginosa (Kunze) Ching in bull. Fan. Mem. Inst. Biol. , 6: 342.1936; Holtt., Fl. Malaya. II, 241. 1954; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.152. 2008.

Basionym : *Aspidium uliginosum* Kunze in Linnaea, 20: 6. 1847.

Exsiccatus : Rachel, 2500 m, **SR Lepcha & AP.Das**, 05088, dated 27.10.2004..

Note : Collected from the base of tree trunk (upto 3900 m)

VITTARIACEAE Presl.

Vittaria J. Smith

Vittaria elongata Swartz, Syn. Fil., 109, 302, 1806; Clarke in trans. Linn. Soc. London II, Bot., 1, 573. 1880; Bedd., Handb. Ferns Brit. India (with Supl.) 404, t238, 1892; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.106. 2008.

Exsiccatus : On way to Singhaney, 2300 m, **SR Lepcha & AP.Das**, 05090, dated 29.10.2004..

Vittaria flexuosa Fee, 3 me. Mem., 16. 1851 – 52; Clarke in trans. Linn. Soc. London , II, Bot. 1: 574. 1880; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.107. 2008.

Exsiccatus Dhorok 2300 m, **SR Lepcha & AP.Das**, 04096, dated 25.08.2003.

Vittaria himalayensis Ching in Sinensia 1; 190. 1931; Alston & Boner in Candollea 15: 199. 1956; Bir in rs. Bull. Punjab Univ. (N.S.) 13: 20. 1962b. Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.106. 2008.

*Exsiccatu*s: Phusrey - Dorok 2300 m, *SR Lepcha & AP.Das*, 04097, dated 25.08.2003.

WOODSIACEAE Ching.

Daicalpe Blume

Daicalpe aspidiodes Bl., Enum. Pl. Jav., 241, 1828; Bedd., Handb. Ferns Brit. India 18, 1883; Clarke in trans. Linn. Soc. London, II, Bot., 1, 434, 1880; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.125. 2008.

*Exsiccatu*s : Karponang – Kyongnosla, 2700 m, *SR Lepcha & AP.Das*, 06038, dated 20.09.2006.

Paranema D. Don

Paranema cyatheoides D. Don, Prodr. Fl. Nepal, 12, 1825; Clarke in Trans. Linn. Soc. London II, Bot., 1, 435, 1880; Bed., Handb. Ferns Brit. India, 22,t. 11, 1883; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.125. 2008.

*Exsiccatu*s Dhorok – Rachel, 2500 m, *SR Lepcha & AP.Das*, 04099.dated 29.08.2003.

Woodsia R. Brown

Woodsia elongata Hook., Spec. Fil., 1, 62,t. 21C, 1844; Clarke in Trans. Linn. London, II., Bot., 1, 435, 1880; Bedd., Handb. Ferns Brit. India 22, t. 11, 1883; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.125. 2008.

*Exsiccatu*s: Chhangu – Sherabthang, 3200 m, *SR Lepcha & AP.Das*, 05087, dated 29.10. 2004.

Note : Extremely common

Woodsia lanosa hook., Syn. Fil., 47, 1866; Clarke in Trans. Linn. Soc. London, 1, 435, 1880; Bedd., Handb. Ferns Brit. India, 22,1883; Mehra & Bir, Pteridophyt. Fl. Darjeeling & Sikkim Him.125. 2008.

*Exsiccatu*s : Nathula – Kupup, 4200m, *SR Lepcha & AP.Das*, 06058, dated 29. 10.2006.

6.5. GYMNOSPERMS

The forest of alpine East Sikkim including PWS also do possess some conifer species. *Taxus baccata* and *Tsuga dumosa* are the most prominent species of the sanctuary in altitude ranging between 2300 – 3500 m altitude. The aril of *Taxus baccata* are used medicinally (Biswas & Chopra 1956). Also, the arils are crushed and eaten as expectorant, carminative and tonic (Rai *et al* 1998). However, the leaves are poisonous to cattle.

Significantly, the *Cryptomeria japonica* and *Pinus longifolia* are two exotic species and often put into extensive plantation near by road sides and also inside the forests area in large scale in the altitude ranging between 2400 - 3600m. These plantations support very little undergrowth (Das & Lahiri 1997). Leaves and twigs of *Cryptomeria japonica* are used as incense during the Buddhist religious ceremonies in the monasteries, *chorten* in the morning and also in evening prayers It is locally called *dhup* or sang. Other than this, the species are of equally important for the people residing in the vicinity of the sanctuary. The enumerations of the some prominent

CUPRESSACEAE Bartl.

Cupressus corneyana Hort. ex (Knight & Perry, Syn. Conif. 19. 1850, *nom.nud.*) Carriere, Traite, Gen. Conif. 128. Jun.1855; Hara *et al*, Enum. Fl. Pl. Nepal 1: 27. 1978; Grierson & Long, Fl. Bhutan 1(1): 52. 1983. *Cupressus cashmeriana* Royle ex Carriere, Traite Gen. Conif.ed.2: 161.1867. *Cupressus funebris* auct. non. Endl. K. Koch, Dendr. 2(2): 160.1873; Hook.f., in Fl. Brit. Ind.5: 646. 1888.

English Name: :Weeping-cypress.

Evergreen tree up to 30m, stem bark fissured, branches pendulous. Leaves scale like on branchlets, ovate, smaller than those of main shoots. Male cone oblong, pale brown. Female cone globose when young, 0.3-0.5cm across; stalks 0.5-0.6cm; scales 0.5-0.8cm across on their outer face, flat with a blunt plug at center.

Flower & Fruit : July – November

Exsiccatus : Padamchen, 2000m. **SR Lepcha & AP. Das 3550**, dated 27.10.2008.

Status : Plantation

Local Distribution : Gangtok, Karponang, 1800 – 2500 m.

General Distribution : E.HIMALAYA, INDIA, NEPAL, BHUTAN, S.TIBET. **Endemic to Bhutan.**

Uses : Cultivated as noted sacred tree in other places.

Juniperus recurva Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. 55. 1825; Hook.f., Fl. Brit. India 5: 647. 1888; Hara, Fl. E. Him. 2: 13. 1971; Hara *et al*, Enum. Fl. Pl. Nepal 1: 28. 1978; Grierson & Long, Fl. Bhutan 1(1): 54. 1983. *J. exelsa* auct. non. Bieb: Brandis, For. Fl. Ind. 538. t. 68. 1874. *J. macropoda* auct. non. Boiss., Hook.f. in Fl. Brit. India 5: 647.1888.

Local name: *Bhairung-pati* (Nep.) *Chukboo*, *Song- Yang* (Lep.) .

Shrubs spreading or prostrate stem. Bark flaky brown; shoots long or recurved. Leaves in whorls of 3, appressed, 0.10 - 0.2cm broad, 0.3 - 0.6cm long and scarcely overlapping on shoot apex. Male cones

oblong, 0.4 - 0.3 x 1.8 - 2.5 cm of 8 - 12 ovate scales. Female cones globose, ovoid at maturity, black with tips of 3 scales at apex.

- Flower & Fruit* : May - October
Exsiccatus : KAS, 3600m, **SR Lepcha & AP. Das** 3552, dated 27. 10. 2008.
Status : Threatened due to excessive collection.
Local Distribution : Dongkyala, KAS, not below 3600 m.
Geneneral Distribution : HIMALAYA (KASHMIR-BHUTAN), ASSAM, MYANMAR, W.CHINA.
Note : Dried twigs are being used as incense, during Buddhist ceremonies.

Thuja orientalis L., Sp. Pl. 1002. 1753; Sahni, Gymn. Ind. 110. t. 26. f. 2. 1990; Grierson & Long, Fl. Bhutan 1(1): 54. 1983. *Biota orientalis* (L.) Endl. syn. conif. 47. 2847. *Platycladus stricta* Spach., Hist. Veg. Phan 11: 335. 1842.

Local name: Chapte-dhupi (Nep.)

Tree upto 13 m tall. Stem forming roughly conical crown, brown, fissured horizontally; bark dull red brown. Leaves evergreen, decussate, lamina 0.3 - 0.4 cm long, broadly ovate, triangular scale like, bluntly pointed. Female cone 2 x 1 cm, blue-glaucous to gray, flask shaped; scales upto 8, decussate, oblong-elliptic, basally attached, thinly woody with a down curved hooked tip, each bearing 1 - 2 ovules. Seeds wingless.

- Flower & Fruit* : Most of the year.
Exsiccatus : Padamchen, 1900m, **SR Lepcha & AP. Das** 3555, dated 28.10.2008.
Status : Planted for its beautiful foliage and crown.
Local Distribution : Padamchen, 100 - 2400 m.
General Distribution : A native of CHINA and JAPAN.

TAXACEAE S.F. Gray

Taxus baccata L., Sp. Pl. 1040. 1753; Hook.f., Fl. Brit. Ind. 5: 648. 1888; Hara *et al*, En. Fl. Pl. Nepal 1: 28.1978; Grierson & Long, Fl. Bhutan 1(1): 56.1983. Subsp *wallichiana* (Zucc.) Pilger in Engler, Pfl.reich IV-5, Ht.18: 112. 1903; Satake in Hara, Fl. E. Him.40. 1966; Op.at.2: 11. 1971. *Taxua nucifera* auct.non.L.Wall; Tent.Fl. Nepal:57,t.44.1826. *Taxus wallichiana* Zucc. In Abh,Bayar Akad.Wiss.3:803,1:5.1843; Kitamura in Kihara in Fauna.Fl.Nepal Himal 81.1955.

Local name: Cheongboo (Lep.) Dhyengre-salla (Nep.)

Tree up to 12m. Leaves linear flattened, 1- 2.5 x 0.13 - 0.20 cm, spiny tipped, curved, dark green above, paler beneath. Male cones ovoid, 0.7 - 0.9 cm across. Female cones ovoid, 0.2 - 0.6 cm. Fruits red, fleshy, often concealing the single seed.

- Flower & Fruit* : April - October
Exsiccatus : Nathang towards Chukya Cho, 3600 m, **SR Lepcha & AP. Das** 3556, dated 28.10. 2008.
Status : Less common
Local Distribution : Nathang towards Chukya Chu, upto 3700 m.
Geneneral Distribution : HIMALAYAS, INDIA, NEPAL, BHUTAN, N.MYANMAR, INDO-CHINA, W. CHINA, MALAYSIA.

TAXODIACEAE Warming

Cryptomeria japonica (L.f.) D. Don in Trans. Linn. Soc.18: 167, t. 13. f. 1. 1841; Wilson, Conif & Tax. Jap. 66. 1916; Journ. Arn. Arb.7: 59. 1926; Hara, Fl. E. Him. 41. 1966; Hara *et al*, Enum. Fl. Pl. Nepal 1: 27. 1978; Grierson & Long, Fl. Bhutan 1(1): 51. 1983. *Cupressus japonica* L.f., Suppl. Pl. 421. 1781.

Local name: Chunden (Lep.) Dhupi (Nep.)

Evergreen tree to 30 m. Stem brown, peeling off in long strips. Branches spreading, forming a narrow conical crown towards apex. Leaves in wardly curved, 0.6 - 1 cm, 4-angular, acuminate, shortly decurrent at base, arranged spirally on twigs. Male cones oblong, 0.3 - 0.5 x 0.2 - 0.3 cm, pale brown. Female cone 1.2 - 1.6 cm, scales divided apically into 3-6 teeth, bracts exserted, mostly adnate to scale but free at triangular apex.

Flower & Fruit : February – May.

Exsiccatus : Kyongnosla , 2700 m, **SR Lepcha & AP. Das 3560**, dated 03.11.2008

Status : Planted by the department of Forest

Local Distribution. : Karponang, Kyongnosla, 1000 – 2200 m.

General Distribution : E.HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR, MALAYSIA, JAPAN, CHINA.

PINACEAE Lindley

Abies Miller

Abies densa Grieff Notol.4: 19; Grierson & Long, Fl. Bhutan 1(1): 50. 1883. *Abies spectabilis* (D.Don.) Mirb.in Mem.Mus.Hist.Nat.Paris.13:70.1825;. *Pinus spectabilis* D.Don.in Lambert.Descr.Gen.Pinus.2:3, t.1824.*Pinus webbiana* Wall ex D.Don.Prodr.Fl.Nepal.55.1825. *Abies webbiana* Lindl in Penny.Cycl.1:30.1833.nom.illegit; Hook.f. Fl.Brit.Ind.5:654,1888..

Local name: Tungshing kung (Lep.) Gobre-salla (Nep.)

Tree evergreen up to 30m tall. Branches wide spreading. Leaves linear, flattened, spirally arranged, 2.5 – 5 x 0.4 - 0.6cm, green above, whitish beneath, apex rounded and notched. Malecones c3 x 0.6cm. Female cones ovoid at first, cylindrical on maturity, 6.5 -13 x 2.5 - 9cm; ovuliferous scales c3cm broad. Seeds ovoid, bearing a spatulate wing.

Flower & Fruit : April – July

Exsiccatus : Chhukya cho area, 3550 m, **SR Lepcha & AP. Das 3561**, dated 03.11.2008

Status : Frequent

Local Distribution : Chhukya chu, 2200 – 3600 m.

Geneneral Distribution : AFGANISTHAN, HIMALAYAS; INDIA, NEPAL BHUTAN, TIBET.

Note : The species is a potential wood for making valuable furniture.

6.6. ANGIOSPERMS

The angiospermic flora presented here following the classification of Arthur Cronquist (1988). A schematic arrangement of the recorded families in the Flora of Pangolakha Wildlife Sanctuary has been presented below following this system of classification.

Class: Magnoliopsida

Subclass: Magnoliidae

Order: *Magnoliales*

Magnoliaceae

Order: *Laurales*

Lauraceae

Order: *Piperales*

Piperaceae

Order: *Aristolochiales*

Aristolochiaceae

Order: *Illiciales*

Schisandraceae

Order: *Ranunculales*

Ranunculaceae

Berberidaceae

Podophyllaceae

Lardizabalaceae

Menispermaceae

Order: *Papaverales*

Papaveraceae

Fumariaceae

Subclass: Hamamelidae

Order: *Daphniphyllales*

Daphniphyllaceae

Order: *Urticales*

Moraceae

Urticaceae

Order: *Juglandales*

Juglandaceae

Order: *Fagales*

Fagaceae

Betulaceae

Subclass: Caryophyllidae

Order: *Caryophyllales*

Phytolaccaceae

Chenopodiaceae

Amaranthaceae

Caryophyllaceae

Order: *Polygonales*

Polygonaceae

Subclass: Dilleniidae

Order: *Theales*

Theaceae

Hypericaceae

Order: *Malvales*

Elaeocarpaceae

Malvaceae

Order: *Nepenthales*

Droseraceae

Order: *Violales*

Flacourtiaceae

Stachyuraceae

Violaceae

Cucurbitaceae

Begoniaceae

Order: *Salicales*

Salicaceae

Order: *Capparales*

Brassicaceae

Order: *Ericales*

Ericaceae

Vacciniaceae

Monotropaceae

Order: *Ebenales*

Symplocaceae

Order: *Primulales*

Myrsinaceae

Primulaceae

Subclass: Rosidae

Order: *Rosales*

Hydrangeaceae

Grossulariaceae

Crassulaceae

Saxifragaceae

Parnassiaceae

Rosaceae

Order: *Fabales*

Mimosaceae

Fabaceae

Caesalpiniaceae

Order: *Proteales*

Elaeagnaceae

Order: *Myrtales*
 Sonneratiaceae
 Onagraceae
 Melastomataceae

Order: *Cornales*
 Nyssaceae
 Cornaceae

Order: *Santalales*
 Santalaceae
 Loranthaceae

Order: *Celastrales*
 Celastraceae
 Aquifoliaceae

Order: *Euphorbiales*
 Buxaceae
 Euphorbiaceae

Order: *Rhamnales*
 Rhamnaceae
 Leeaceae
 Vitaceae

Order: *Linales*
 Linaceae

Order: *Sapindales*
 Staphyleaceae
 Aceraceae
 Burseraceae
 Anacardiaceae
 Rutaceae

Order: *Geraniales*
 Oxalidaceae
 Geraniaceae
 Balsaminaceae

Order: *Apiales*
 Araliaceae
 Apiaceae

Subclass: Asteridae

Order: *Gentianales*
 Gentianaceae
 Asclepiadaceae

Order : *Solanales*
 Solanaceae
 Convolvulaceae
 Cuscutaceae

Order: *Lamiales*
 Boraginaceae
 Lamiaceae

Order: *Plantaginales*
 Plantaginaceae

Order: *Scrophulariales*
 Buddlejaceae

Oleaceae
 Scrophulariaceae
 Gesneriaceae
 Acanthaceae
 Lentibulariaceae

Order: *Campanulales*
 Campanulaceae
 Lobeliaceae

Order: *Rubiales*
 Rubiaceae

Order : *Dipsacales*
 Sambucaceae
 Caprifoliaceae
 Valerianaceae
 Dipsacaceae
 Morinaceae

Order: *Asterales*
 Asteraceae

Class: Liliopsida

Subclass: Arecidae

Order: *Arales*
 Araceae

Subclass: Commelinidae

Order: *Commelinales*
 Commelinaceae

Order : *Juncales*
 Juncaceae

Order : *Cyperales*
 Cyperaceae
 Poaceae

Subclass: Zingiberidae

Order: *Zingiberales*
 Zingiberaceae
 Musaceae

Subclass: Liliidae

Order: *Liliales*
 Convallariaceae
 Hypoxidaceae
 Uvulariaceae
 Liliaceae
 Uva
 Melanthiaceae
 Trilliaceae
 Iridaceae
 Smilacaceae
 Dioscoreaceae

Order : *Orchidales*
 Orchidaceae

6.6.1. ENUMERATION OF ANGIOSPERMIC FLORA

Class: Magnoliopsida Subclass: Magnoliidae Order: Magnoliales

MAGNOLIACEAE A.L. Jussieu

Key to the Genus:

1. Flowers terminal, carpels densely crowded on receptacle *Magnolia*
+ Flower axillary, carpels forming a loose spike *Michelia*

Magnolia Linnaeus

Key to the species:

1. Tree upto 10m tall, lateral nerves upto 8 pairs *M. globosa*
+ Tree upto 45 m tall, lateral nerves upto 14 pairs *M. campbellii*

Magnolia campbellii Hook.f.& Thoms., Fl. India 1: 77. 1855; in Hook.f., Fl. Brit. India 1: 41. 1872; Hara & Ohashi in Fl. E. Him.95. 1966; 2: 36. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 24. 1972; Grierson in Grierson & Long, Fl. Bhutan 1(2): 234. 1984; Sharma *et al.*, Fl. India 4: 166. 1997

Local Name: Ghoge champ (N).

Trees perennial upto 45m tall. **Lamina** 22 – 33 x 8 – 12 cm, elliptic-oblong subovovate to ovate base, cordate or rounded, apex acute or acuminate, glaucous pubescent or silky beneath; lateral nerves 11 - 14 pair petioles ca. 4.2cm long. pilose stipules. **Flowers** appears before leaves, solitary terminal erect bract spathaceous ovate to obovate, caducous perianth part 12 - 16 obovate, outer yellow inner one white with purple or pink at base, **stamens** numerous, purplish, free; **anthers** connectives produce into an appendage; **carpels** sessile, numerous, purplish, ovoid; fruiting carpels compresses laterally; **seeds** ovoid.

Flower : February *Fruit:* August
Exsiccatus : Singaney, *SR Lepcha & AP Das* 250, dated 16.05.2003.
Status : Threatened
Local distribution : Singaney, 2250-2700m
General distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, MYANMAR, YUNNAN.

Note : 1. The timber is immensely durable and has a great demand for planking, doors, window frames, furniture.
2. The species is also of ornamental importance.

Magnolia globosa Hook.f. & Thoms, Fl. India 1: 77. 1855; in Hook.f., Fl. Brit. India 1: 41. 1872; Hara & Ohashi in Fl. E. Him. 95. 1966; Grierson in Grierson & Long, Fl. Bhutan 1(2): 234. 1984; Sharma *et al.*, Fl. India 4: 167. 1997

Trees small; young branches tomentose. **Leaves** glabrous, ovate elliptic, base rounded or obtuse acute and mucronate, subcoracious glaucous and brownish tomentose at nerve beneath, lateral nerve 8 pair petioles long flower buds globose, appearing with leaves. **Flowers** pendulous cream to white colored odor. **Perianth** parts ca 9, broadly ovate, **stamens** numerous crimson coloured; anthers oblong, truncate at apex ca 0.8cm long. **Carpels** free, 12-20, elliptic ovoid; fruiting carpels ellipsoid, compressed angular, rounded at base, ca 23 mm long beaked at apex, dorsally dehiscent; **seeds** 2 rounded at base.

Flower : May. *Fruit*: August.
Exsiccatus : Dohrok, **SR Lepcha & AP. Das** 31156, dated 03.10.2004.
Status : Threatened
Local Distribution : On way to Rachela, in between 2800 – 3400 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, TIBIT, MYAMAR, YUNNAN.

Note : 1. The timber is used in house building.
 2. The species is also cultivated for an ornamental.

Michelia Linnaeus

Key to the species:

1. Tree upto 30m tall, buds lanceolate, perianth 12 part *M. doltsopa*
 + Tree upto 15 m tall, buds oblong, perianth 9 part *M. cathcartii*

Michelia doltsopa Buch.-Ham. ex D. Don, Cyst Nat 1: 448. 1817; Hara & Ohashi in Fl. E. Him. 96 1996.; 2: 37. 1971; Hara *et al.* Enum Fl. Pl. Nepal, 2: 25. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 235. 1984; Sharma *et al.*, Fl. India 4: 177. 1997. *Magnolia excelsa* Wall., Tent. Fl. Nepal, s, t. 2. 1824. *Sampacca excelsa* (Wall.) Kuntze, Rav, Gen, Pl. 1: 6. 1891. *Michelia excelsa* (Wall.) Blume, Fl. Jav .9. 1824.

Local Name: Rani champ (Nep.)

Trees perennial upto 30m tall deciduous. **Leaves** elliptic to ovate lanceolate, cuneate to slightly rounded at base acute to acuminate at apex glabrous shiny glaucous and minutely pubescent beneath, lateral nerves usually 7 - 10, pairs arched; petioles upto 3 cm long, glabrous stipules oftenly oblong-acuminate, silky outside stipular sears 3.5mm long. **Flowers** axillary rarely spuriously terminal, fairly scented, white, buds lanceolate, apiculate, **bracts** 2, oblong ovate **perianth** parts 12, spatulate to obovate, while outer ones larger, gradually, narrower, towards center; **stamen** 45 - 80, yellowish, filaments short, connective produced into short appendage; receptacles elongate; carpels stipulate, minutely tomentose, **ovules** 2 - 4 in carpel, fruiting carpel shortly beaked; seeds 1 - 2, red, compressed.

Flower : July - August *Fruit*: September - October
Exsiccatus : Dohrok - Phusrey, **SR Lepcha & AP. Das** 30247, dated 06.10.2004. NNP& PWS border, **SR Lepcha & AP. Das** 31175, dated 03.10.2004.
Status : Rare & Threatened
Local Distribution : Dhorok, Singhaney, ; 2100 - 2500 m.
General Distribution : INDIA, NEPAL, BHUTAN, TIBET, MYAMAR, YUNNAN.
Note : The timber is remarkably durable for making furniture..

Michelia cathcartii Hook.f., Thoms., Fl. India 79.1855 & in Fl. Brit. India 1:42.1872; Sharma *et al.* Fl. India 4: 177. 1997. *Alcimandra cathcartii* Hook.f. & Thoms. in Fl. India 79.1855 & in Hook.f., Fl. Brit. India 1: 42.1872; Grierson in Grierson & Long, Fl. Bhutan 1(2): 237.1984.

Local Name: Gok (Lep.), Tite Champ (Nep.)

Trees ever green upto 15m tall, **branches** tomentose when young. **Lamina** 8 – 12 x 2.5 – 6 cm, elliptics to lanceolate, cuneate, acute to acuminate apex subcoriaceous, base rounded or cuneate. **Flowers** creamy white – usually reddish when dried, terminal fragrant, buds oblong, pedicel stout ca-2.5cm long, perianth 9 parts. **Stamens** ca 40 or more. **Filaments** short. **Gynoecium** stipitate. **Carpels** sessile.

Flower & Fruit : March – August
Exsiccatus : Dohrok **SR Lepcha & AP. Das** 30268, dated 07.10.2004.
Status : Rare & Threatened
Local Distribution : Phusrey
General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, VIETNAM.
Note : Timber is used in house construction.

Order: Laurales

LAURACEAE A.L. Jussieu

Key to the Genera:

1. Shoots with conspicuous terminal vegetative buds 2
- + Shoots without conspicuous terminal vegetative buds 3
2. Flower unisexual 4
- + Fruit bisexual 3
3. Leaves pinnately veined 5
- + Leaves strongly 3-veined *Neocinnamomum*
4. Umbels sessile 7
- + Umbels pedunculate *Actinodaphne*
5. Perianth cup shaped or tubular 6
- + Perianth ovate *Cinnamomum*
6. Perianth cup shaped *Phoebe*
- + Perianth tubular *Litsea*
7. Leaves pinnately veined *Litsea*
- + Leaves 3-veined from above base *Neolitsea*

Litsea Lamarck (*nom. cons.*)

Key to the species:

1. Leaves lanceolate, elliptic lanceolate in outline; Fruit sub-globose 2
- + Leaves obovate in outline; fruit ellipsoid *L. elongata*
2. Shrubs or small tree strongly aromatic; lateral nerves 8 - 13 pairs *L. cubeba*
- + Trees non -aromatic; lateral nerves 10 - 17 pairs *L. sericea*

Litsea elongata (Nees) Hook.f., Fl. Brit. India 5: 165. 1885; Hara in Fl. E. Him 2: 101. 1966; 2: 39. 1971; 3:42. 1975; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 185. 1982; Long in Grierson & Long, Fl. Bhutan 1(2): 275. 1984. *Daphnidium elongatum* Nees in Wallich, Pl. Asiat. Rar. 2: 63. 1831. *Local Name: Thulo Pahenlay* (Nep.).

Trees robust upto 18 m tall. Branch-lets often tomentose, brownish. **Leaves**; petioles to 1.5cm long; obovate, **lamina** 6.5 - 15 x 3 - 7.5 cm, acute or obtuse, base cuneate, tomentose, pinnately veined, lateral nerves upto 13 pairs, distinct in lower surface; peduncles to 2.3 cm long. **Umbels** solitary with silky pubescent; pedicels to 0.8 cm long. **Perianth** segments oblong; **filaments** 0.45 cm, slightly villous. **Fruits** to 1.5 cm, ellipsoid.

Flower : September - November *Fruit*: June - April.
Exsiccatus : Rachela below 2240m, **SR Lepcha & AP. Das 32908**, dated 27.10. 2004

Status : Common.

Local Distribution : Middle Rachela, 1800 - 2600 m.

General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, W. & S. CHINA.

Note : The species is a good fodder for cattle.

Litsea cubeba (Lour.) Persoon, Pl. 2(1): 4. 1806; Hara *et al.* Fl. E. Him. 1: 101. 1966; 2: 38. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 3: 185. 1982; Long in Grierson & Long, Fl. Bhutan 1(2): 274. 1984. *Laurus cubeba* Lour., Fl. Cochinch. 1: 252. 1790. *L. citrata* Bl., Bijdr. 565. 1825; Hook.f. in Fl. Brit. India 5: 155. 1885.

Local Name: Siltimbur (Nep.).

Shrubs or a small trees aromatic upto 5m tall. **Stem** usually glabrous, blackened when dry. **Lower leaves** opposite, upper alternate; petioles to 0.13 cm, slender; **lamina** lanceolate, entire-half lanceolate, entire-half contortate 5.5 - 13 x 1.8 - 2.5 cm, acuminate, cuneate, upper surface green above, lower surface glaucous, glabrous both sides, nerves distinct, lateral veins obliquely ascending, 10 - 17 pairs. **Inflorescence** usually umbels in clusters of 3 - 4, 4 - 10 flowered, in short peduncled; pedicels white, pubescent. **Flowers** hairy; **perianth** toothed, tube slightly reduced at base. **Fruits** subglobose.

Flower : December - February *Fruit*: March - May .

Exsiccatus : Below Rachela 2400 m, **SR Lepcha & AP. Das 31179**, dated 3.10. 2004.

Status : Less Common.

Local Distribution : Middle Rachela. 2200 - 2550 m.

General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR, JAVA, TONKIN, W. & C. CHINA.

Note : The fruit is edible and also medicinal.

Litsea sericea (Nees) Hook.f, Fl. Brit. India 5: 156. 1885; Hara in Fl. E. Him. 1: 102. 1966; 2: 39. 1971; 3: 42. 1975; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 186. 1982; Long in Grierson & Long, Fl. Bhutan 1(2): 273. 1984. *Tetranthera sericea* Nees in Wallich, Pl. Asiat. Rar. 2: 67. 1831; Prodr. 15 (1): 181. 1864. *Litsea oreophila* Hook. f., Fl. Brit. India 5: 156. 1885.

Local Name: Lekh Timbur (Nep.).

Trees with stout branches. Juvenile shoots often hairy, silky. **Leaf-buds** slightly punctuate; petioles to 2.4 cm long; **lamina** elliptic-lanceolate, 5 - 9.8 x 1.6 - 4.2 cm, acute to acuminate, base acute, silky tomentose; lateral nerves 8 - 13 pairs, slightly impressed in upper surface,

distinct prominent in lower surface; peduncles brownish, hairy.; bracts glabrous. **Flowers** in umbels; perianth segments rounded, basally hairy within; **stamens** 12; filaments hairy; **ovary** ovoid; style short. **Fruits** sub-globose with persistent small flat perianth tube; Fruit pedicel with both stout and longer.

Flower & Fruit : March – April *Fruit:* September - October
Exsiccatus : Jorepokhri 2650 m, **SR Lepcha & AP. Das** 32909, dated 27.10. 2004.
Status : Common
Local distribution : Jore pokhri 2100 – 3200 m.
General distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.

Actinodaphne Nees

Actinodaphne longipes Kosterm. in Reinwardtia 9: 98. 1974; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 182. 1982; Long in Grierson & Long, Fl. Bhutan 1(2) : 281. 1984. *A. reticulata* Meisn. var. *glabra* Meisn. in DC. Prodr. 15: 1. 212. 1864; Hook.f. in Fl. Brit. India 5: 147. 1885; Hara in Fl. E. Him. 1: 99. 1966.

Local Name: Lali Kawlo (Nep.).

Trees with juvenile branches often tomentose. **Leaves** usually in whorl; petiole to 1.2 cm, glabrous, pubescent; lamina 6 – 27 x 1 – 4 cm, narrowly elliptic-lanceolate, entire, acuminate, cuneate, coriaceous, glabrous, upper surface dark green, lower slightly pale, distinct reticulate nerves on both sides, lateral nerves 13 - 24 pairs. **Flowers** unisexual, clustered, light yellow; **perianth** segments 6, sub-equal, tube short; **stamens** 6, introrse; filaments glabrous; **anthers** 4-loculate. **Fruits** broadly ellipsoid; Fruit pedicels to 3 cm.

Flower : November *Fruit:* March – May
Exsiccatus : Singhaney 2350 m, **SR Lepcha & AP. Das** 32912, dated 27.10.2004.
Status : Common
Local Distribution : Rigu, Hangey, 1800 – 2500 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN.
Note : Endemic to Eastern Himalaya.

Cinnamomum Schaeffer *

Cinnamomum impressinervium Meisn. in DC., Prodr. 15(1): 21. 1864; Hara in Enum. Fl. Pl. Nepal 3: 183. 1982; Long in Grierson & Long, Fl. Bhutan 1(2): 258. 1984.

Local Name: Khorsanay (Nep.).

Trees stout. **Branches** spreading, slender; juvenile buds silky. **Leaves** opposite; petiole to 1.3 cm, slender; **lamina** elliptic-lanceolate, 5 - 13 x 1.5 – 4 cm, curved downwards, entire, long acuminate, base slightly acute, lower surface pale, both surfaces glabrous, -3 nerved, nerves prominent in upper surface. **Panicles** with few flowered, oftenly pubescent. **Flowers** greenish-yellow; **Fruit perianth** cupular, segments 0.3 cm. **Fruits** obovoid to globose.

Flower : June - July *Fruit:* October - December.
Exsiccatus : Rachila below, 2450 m, **SR Lepcha & AP. Das** 32913, dated 27.10. 2004.
Status : Common.
Local Distribution : Rachela Durpinay, 2100 – 2600 m.

General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.

Neocinnamomum Liou

Neocinnamomum caudatum (Wall. ex Nees) Merr. in Contrib. Arn. Arb. 8: 64. 1934; Hara et al., Enum. Fl. Pl. Nepal 3: 186. 1982; Long in Grierson & Long, Fl. Bhutan 1(2): 260. 1984. *Cinnamomum caudatum* Wallich ex Nees in Wallich, Pl. Asiat. Rar. 2:76. 1831; Hook.f., in Fl. Brit. India 5:134. 1886.

Local Name: Khorsanay (Nep.).

Shrubs with slender, spreading branching. Stem brownish-red, glabrous. **Petioles** to 15 cm, slender; lower leaves alternate, sub-opposite towards apex; **lamina** 8.8 - 13 x 3.3 - 5.7 cm, narrowly elliptic, entire, half contorted, obtusely caudate-acuminate, base acute, 3-nerved, nerves distinct and slightly elevated in lower surface. **Inflorescence** with reduced cymes, axillary, with few flowered. **Flowers** bisexual; **perianth** usually 6 -lobed, funnel-shaped; stamens 9 (6 introrse + 3 extrorse); **anthers** 4-celled. **Fruits** globose.

Flower & Fruit : July - January

Exsiccatus : Sokpa pokhri 1900 m, *SR Lepcha & AP. Das 32911*, dated 29.10.2004

Status : Frequent.

Local Distribution : Beusa, Bekchung, Subaney 1700 - 2300 m.

General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA

Neolitsea (Bentham) Merrill

Neolitsea cuipala (D. Don) Kosterm. in Bull. Bot. Surv. India 10: 287. 1968; Morniyama in Hara in Fl. E. Him.3: 42.1972; Chater in Enum. Fl. Pl. Nepal 3: 186. 1982; Long in Grierson & Long, Fl. Bhutan 1(2): 278. 1984. *Tetranthera cuipala* D. Don, Prodr. 65. 1825. *Litsea lanuginosa* (Wallich ex Nees) Nees, Syst. Laurin. 634. 1836; Hook.f. in Fl. Brit. India 5: 178. 1886. *L. cuipala* (D. Don) Nees, Syst. Laurin. 638. 1836; Journ. Bomb. Nat. Hist. Soc. 63: 329. 1966.

Trees small, deciduous. Stem slightly with whitish hairs. **Leaves** alternate or sometimes crowded in terminal whorls; petiole 0.4-1.3 cm; **lamina** oblanceolate, 3.3 - 13 x 0.5 - 3.8 cm, entire, long acuminate, base attenuate, coriaceous, glabrous both surfaces, 3-nerved. **Umbels** sessile, to 3 cm across, globose and clustered, 4-flowered. **Perianth** segments yellow. **Fruits** with persistent small perianth cup, ellipsoid, **Fruits** pedicels to 0.6 cm.

Flower : February - March *Fruit*: March - October

Exsiccatus : Neora patak 2700 m, *SR Lepcha & AP. Das 32910*, dated 29.10.2004.

Status : Less Common.

Local Distribution : Chitray, Thami dara 2000 - 2700 m.

General Distribution : HIMALAYA; INDIA, (Kashmir to BHUTAN)

Note : Endemic to Eastern Himalaya.

Persea Miller

Key to the species:

1. Leaves elliptic or elliptic-lanceolate; perianth linear-oblong 2
- + Leaves oblanceolate; perianth segments obtuse *P. gammieana*
2. Mid-nerve slightly swollen and raised in lower surface *P. clarkeana*
- + Mid-nerve neither swollen nor raised in lower surface *P. duthiei*

Persea clarkeana (King ex Hook.f.) Kosterm., in Reinwardtia 6: 191. 1962; Hara in Enum. Fl. Pl. Nepal 3: 186. 1982; Long in Grierson & Long, Fl. Bhutan 1(2): 265. 1984. *Machilus clarkeana* King ex Hook.f., Fl. Brit. India 5: 137. 1886. *M. gammieana* Hook. f., Fl. Brit. India 5: 137. 1886; Hara in Fl. E. Him. 2: 39. 1971; 3: 42. 1975.

Local Name: Chiplay Kawlo, Seto kawlo (Nep.).

Trees evergreen. **Leaves** alternate; petioles to 1cm long; **lamina** narrowly elliptic-lanceolate, 7.5 -16 x 1 - 3.2 cm, acuminate, base narrowed, glabrous, brownish on both surface, mid-nerve slightly swollen and prominently raised on lower surface. **Panicles** to 8cm, few flowered, glaucous, in maturity; **peduncles** and pedicels often stout. **Flowers** large; **perianth** to 1 cm across, linear-oblong, glabrous; **filaments** hairy at the base; anthers linear-oblong. **Fruits** globose.

Flower : May - July *Fruit:* August - December.
Exsiccatus : Tungsay 2690m, **SR Lepcha & AP. Das** 32914, dated 29.10. 2004.
Status : Less Common.
Local Distribution : Dorok - Rachela, Premlakha 2400 - 2700 m.
General Distribution : INDIA (Sikkim - Darjeeling), BHUTAN
Note : Endemic to E. Himalaya

Persea duthiei (Hook. f.) Kosterm., Reinwardtia 6: 191. 1962; Hara *et al.*, Enum. Fl. Pl. Nepal 3:186.1982; Long in Grierson & Long, Fl. Bhutan 1(2):266. 1984. *Machilus duthiei* Hook.f. in Fl. Brit. India 5: 861. 1886; Hara in Fl. E. Him. 102. 1966; 2: 39. 1971; 3: 42. 1975.

Trees evergreen to 22 m tall. Branches often compact bud scale scars. **Petioles** to 1.6 cm long; **lamina** elliptic, 13 - 19 x 2.5 - 4.3 cm, acuminate, base cuneate-attenuate, lateral nerves upto 10 - 20 pairs, silky hairy. **Panicles** to 17 cm, sub-erect, usually few flowered and pubescent. **Flowers** to 1cm across; **perianth** segments to 0.6 cm, linear-oblong, greenish. **Fruits** globose.

Flower : February - May *Fruit:* August - November.
Exsiccatus : Phusrey dara, 2250 m, **SR Lepcha & AP. Das** 32915, dated 29.10.2004
Status : Sparse / Less common
Local Distribution : Durpiney NNP border, Hangey, 2000 - 2450 m.
General Distribution : HIMALAYAS, INDIA (Chamba to Sikkim, Meghalaya).
Note : Endemic to Himalaya.

Persea gammieana (King ex Hook.f.) Kosterm. in Reinwardtia 6: 191. 1962; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 186. 1982. *Machilus gammieana* King ex Hook.f., Fl. Brit. India 5: 137. 1886.

Local Name: Seto Kawlo (Nep.).

Tree upto 20m tall with stout branches. **Petioles** upto 3.3 cm long; **lamina** oblanceolate, 9 -19 x 2.4 - 5.5 cm, acuminate, base attenuate, glabrous, leteral veins 10 - 20 pairs. **Panicles** usually with short peduncled, corymbose, few flowered, with spreading branches. **Perianth** segments greenish, obtuse, silky. **Fruits** upto 3.5 cm in diam.

Flower : April - July *Fruit:* August - November.
Exsiccatus : Deorali dara NNP border 2300 m, **SR Lepcha & AP. Das** 32916, dated 29.10.2004.
Status : Less common
Local Distribution : Chandaney, Gumsay 1900 - 2260 m .
General Distribution : E. HIMALAYA; INDIA,(Darjeeling & Sikkim), NEPAL, BHUTAN
Note : Endemic to Eastern Himalaya.

Phoebe Nees

Phoebe lanceolata (Nees) Nees, Syst. Laurin. 109. 1836; Momiyama in Fl. E. Him. 2: 40. 1971; Hook.f. in Fl. Brit. India 5: 141 1886; Long in Grierson & Long, Fl. Bhutan 1(2): 261. 1984. *Ocotea lanceolata* Nees in Wallich, Pl. Asiat. Rar. 2: 71. 1831. *Phoebe angustifolia* Meissn. in DC., Prodr. 15 (1): 34. 1864; Fl. Brit. India 5: 141 1886.

Trees medium sized upto 15 m tall. Bark whitish. **Leaves** alternate; petioles to 3cm, clustered on the branch ends; **lamina** narrowly elliptic or lanceolate, 4.8 - 18 x 2 - 5.8 cm, acuminate, base attenuate, glabrous or thinly pubescent in lowers surface, lateral nerves 6-10 pairs. **Panicles** to 18 cm, aggregated at branch tips. **Flowers** to 0.60 cm in diam., greenish white or yellow; perianth segments ca 0.22 cm, ovate, glabrous. **Fruits** ellipsoid, blackish-purple

Flower & Fruit : April - December.
Exsiccatus : Beausa 1750 m, *SR Lepcha & AP. Das* 32917, dated 29. 10. 2004.
Status : Less Frequent.
Local Distribution : Sikkim-Neora Border. 1200 - 1600 m.
General Distribution : HIMALAYAS; INDIA, BHUTAN, BURMA.

PIPERACEAE C.A. Agardh

Key to the Genera:

1. Erect or diffused herbs; leaf opposite or whorls; drupes sessile *Peperomia*
+ Climber or erect shrubs; leaf alternate; drupe shortly stalked rarely sessile *Piper*

Peperomia Ruiz et Pavon

Key to the species

1. Leaf base rounded; spike terminal; 3 veined form base *P. tetraphylla*
+ Leaf based attenuate; pinntaely veined; spike terminal or axillary *P. heyneana*

Peperomia heyneana Miq., Syst. Pip. 123. 1843; Hook.f. in Fl. Brit. India 5: 99. 1885; Hara in Fl. E. Him. 42. 1966; 2:14. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 181. 1982; Long in Grierson & Long, Fl. Bhutan 1(2): 344. 1984.

Herbs, tufted epiphytic, succulent, glabrous, usually prostrate, upto 20 cm long branches. **Leaves** opposite, 2-4 nate; fleshy, petioles 0.40 - 0.7 cm, glabrous; **lamina** 1 - 2.2 x 0.5 - 1.6 cm, oblanceolate or narrowly obovate, obtuse, base attenuate, pinnately veined with distinct midrib. **Spikes** terminal and axillary, fascicled, to 3.8 cm long, often glabrous.

Flower & Fruit : May - June
Exsiccatus : Rachela, 2680 m, *SR Lepcha & AP. Das*, 02700. 13. 10. 2003
Status : Common
Local Distribution : Phusrey, Rachela below, NVNP border 1500 - 2200 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN.
Note : Endemic to Himalaya.

Peperomia tetraphylla (Forst.) Hook. *et* Arnt., Bot. Beech. Voy. 97. 1832; Hara in Fl. E. Him. 42. 1966; 2: 14. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 181. 1982; Long in Grierson & Long,

Fl. Bhutan 1(2): 344. 1975. *Piper tetraphyllum* Forst. f., Prodr. 5:1786. *P. reflexa* (L.f.) Dietrich, Sp. Pl. 1:180. 1831, non Kunth, Fl. Brit. India 5: 99. 1886.

Herbs succulent, profusely branched upto to 24 cm tall, like epiphytes. **Stem** rooting at lower nodes, ribbed. **Leaves** opposite or in whorls of 4; petioles to 0.5 cm; lamina 0.7 - 1.8 x 0.35 - 1cm, obovate-orbicular, obtuse, base rounded, fleshy, 3-veined from base, pubescent. **Spikes** solitary, erect, terminal, densely pubescent. **Flowers** bisexual; stamens 2, reniform. **Drupes** sessile, ellipsoid.

Flower & Fruit : July – September
Exsiccatu : Rachela middle 2500 m, **SR Lepcha & AP. Das** 30235, dated 07.10.2004.
Status : Abundant.
Local Distribution : Rachela, Panglakha 1400 – 2600 m.
General Distribution : AMERICA, AFRICA, HIMALAYAS; INDIA, NEPAL, BHUTAN, SRI LANKA, CHINA, MALAYSIA.

Piper Linnaeus

Key to the Species:

1. Shrubs 2
+ Climbing *P. mullesua*
2. Leaf base oblique; veins 6 – 10 *P. bioemerifolium*
+ Leaf base rounded; veins upto 5 *P. hamiltonii*

Piper boehmeriifolium Wall. [Cat no. 6654 A (1832), *nom. nud.*] ex C. DC., prodr. 16(1): 348. 1869; Hook.f. in Fl. Brit. India 5: 85. 1885; Hara in Fl. E. Him. 1:43.1966: *Chavica boehmeriifolia* Miquel, Syst. Piperac. 265. 1843.

Local Name: Bhalay Chabo (Nep.).

Shrubs erect, upto 5m tall. **Stems** terete or ridged. **Leaves**: petiole to 10 mm, glabrous or sparsely pubescent; lamina 2.5 - 7 x 0.6 – 2cm, elliptic, narrowly elliptic, oblong-lanceolate, or ± ovate, densely glandular, abaxially glabrous, adaxially glabrous, base oblique, apex acute to long acuminate; veins 6 - 10, alternate. **Spikes** mostly leaf-opposed, often terminal in male plants. **Male spikes**, bracts ± orbicular, peltate, glabrous, obconical, shorter than wide; **stamens** 2; **filaments** thick, short; **anthers** reniform. **Female spikes**; peduncle and bracts as in male spikes; rachis sparsely pubescent; **stigmas** deciduous. **Drupes** densely clustered, subglobose.

var. *boehmeriifolium*

Subshrubs upto 5m tall, glabrous to ± uniformly hairy. **Stems** ridged when dry, rarely minutely papillate. **Petiole** 4.5 - 12 mm; **leaf lamina** 9 - 23 x 3.5 - 10 cm, blades elliptic, oblong, oblong-lanceolate, or ± ovate, papery, veins (6 or)7 or 8(or 9). **Female spikes** upto 13cm.

Flower & Fruit : April- July
Excisecat : Dohrok 2300 m, **SR Lepcha & AP. Das** 30235, dated 07.10.2004.
Status : Abundant.
Local Distribution : Dohrok- Phusrey 1500 – 2200 m.
General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, MALAYSIA, THAILAND, VIETNAM

Note : Used as medicine.

Piper hamiltonii C.DC. prodr. 16. 1. 360; Hook.f. in Fl. Brit. India 5: 88.1885; Long in Grierson & Long, Fl. Bhutan 1(2): 351. 1984.

Shrubs, large, climbing. **Stem** deeply striate, when dry. **Leaf**; petiole to 2.4 cm ; coriaceous, pale in dry, elliptic or elliptic obovate, **lamina** 6 – 13 x 3.5 – 7 cm, obtuse, base rounded, 5 – veined, in lower most, 4.5 mm, without lateral veins. **Fruiting spike** interrupted, 10 – 16 cm, on peduncle 1- 2.5 cm. **Drupe** ovoid- subglobose, to 2.8 mm.

Flower : February - May
Excisscatus : Rachela 3000 m, **SR Lepcha & AP. Das** 30288, dated 13.09. 2006.
Status : Frequent.
Local Distribution : Panglakha, Rachela,, Kyongnosla Rachela upto 3100 m.
General Distribution : INDIA, NEPAL, BHUTAN.

Piper mullesua D. Don, Prodr. 20. 1825; Ohashi in Hara Fl. E. Him. 43. 1966; Long in Grierson & Long, Fl. Bhutan 1(2): 347. 1984. *P. brachystachyum* Wall. ex Hook.f., Fl. Brit. India 5: 87. 1885.

Local Name: Peepla (Nep.).

Climbers, branched, ascending. Stems warty in maturity. **Leaves**: petioles to 1.5 cm long; **lamina** 4.5 -13 x 3 – 5.5 cm, ovate-cordate or elliptic-ovate, long acuminate, base rounded or cuneate, glabrescent, basally 5-nerved, lateral nerves 1-2 pairs, prominent. **Inflorescence** in spike , male spikes upto 8.5cm long, erect. Peduncles 0.22 - 0.6 cm long; **bracts** sub-sessile. **Male flowers**: **stamens** 2; **anthers** 2-celled, kidney -shaped. **Female spikes** cylindrical or globose. **Stigma** 3. Fruiting spikes much elongated. **Drapes** densely clustered.

Flower & Fruit : March – October.
Excisscatus : NNP boundary 1750 m, **SR Lepcha & AP. Das** 333, dated 03.06. 2004.
Status : Frequent.
Local Distribution : Neora Valley-Sikkim Border, Sakam Forest. 1500 – 2400 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN.
Note : Endemic to Himalaya

ARISTOLOCHIACEAE A. Jussieu

Aristolochia Linnaeus

Key to the species:

1. Plants glabrous; leaf ovate – orbicular *A. tagala*
+ Plants hairy; leaf lanceolate *A. griffithii*

Aristolochia griffithii Ducharte, in DC., Prodr. 15(1): 437. 1864; Hara in Fl.E.Him. 1: 66. 1966; 2: 21. 1971; Hara *et al.* Enum.Fl. Pl. Nepal 3: 180. 1982; Grierson & Long, Fl.Bhutan 1(2): 353. 1984. *Isotrema griffithii* (Ducharte) Fischer in Kew Bull. 1940: 98. 1940.

Climbers. **Leaves** ; petiole upto 1.9 cm long, woolly hairy; leaves lamina 3 - 6 x 1.2 – 6.5m, broadly ovate to orbicular-cordate, entire, acute, base articulate-cordate, pubescent above, shining woolly haired beneath, nerves 6 - 9 from base. **Bracteoles** small, leafy. Pedicels upto 3.5cm long. **Flowers** in solitary, axillary, pendulous. **Perianth** curved, ribbed, tube folded, pubescent, green

with purple veins, limb enlarged into a broad rhombic-orbicular yellow spotted mouth, warted and brownish-purple within. **Column** trilobed with 12 light brown anthers. **Ovary** narrow cylindrical. **Fruit** long upto 22cm long, oblong, ribbed into 6; seeds many, ovate.

Flowering & Fruiting : April – August

Exsiccatus : Phusrey, 2160 - 2490m, **SR Lepcha & AP. Das** 1001, dated 08.10.2004

Status : Common.

Local Distribution : Rachelia middle, border to NNP, WB. 1600 – 2300 m.

General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN.

Note : Endemic to Himalaya.

Aristolochia tagala Chamisso, in Linnaea 7: 207, t. 5 f. 3. 1832; Hara in Fl. E. Him.3: 29.1975, Hara *et al.* Enum. Fl. Pl. Nepal 3: 180. 1982; Grierson & Long in Fl. Bhutan 1(2): 354. 1984. *A. roxburghiana* Klotzsch in Monatsb. Berl. Akad. 596. 1859; Hara *et al.* Fl. E. Him.1: 66. 1966.

Twinnings or climbers. **Leaves** ; petiole 1.5 – 4.5cm long, often coiled; leaves lamina 6.5 x 3-7.5cm, ovate-oblong, upper one lanceolate, acuminate, base cordate, cordate-sagitate in upper leaves, margin entire, 5-nerved, thinly pubescent beneath. **Flowers** in cymes, lax, pubescent, flowers dark-brown. **Peduncles** and pedicels slender. **Bracts** oblong. Perianth swollen base, tube inflated, glabrous and with purple marks, mouth curved, white-yellow, lip 2.- 3.5 cm long, villous. **Stamens** 6; filaments united. **Anthers** 6, extrorse. **Capsule** pyriform or oblong, 6-angled, seeds winged and triangular.

Flower & Fruit : April - June

Exsiccatus : Haticherey towards WB border, 1150m, **SR Lepcha & AP. Das**, 1000, dated 03.08.2002.

Status : Rare

Local Distribution : Haticherey area.

General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, MALAYSIA.

SCHISANDRACEAE Blume

Schisandra Michaux

Key to the species:

1. Leaf margin denticulate or rarely sinuous; lateral nerves 4 - 5 pair *S. grandiflora*
- + Leaf margin remotely cartilaginous-denticulate; lateral nerves 6 - 10 pairs..... *S. neglecta*

Schisandra grandiflora A.C. Smith in Sargentia 7: 127, t. 17 g 1947; Hara & Ohashi in Fl. E. Him. 96. 1996. Hara *et al.* Enum. Fl. Pl. Nepal 2: 26. 1979. Grierson in Grierson & Long, Fl. Bhutan 1(2): 248. 1984. *Sphaerostema elongatum auct. non* Blume; Hook. f. & Thomson, Fl. India 1: 85. 1855. *Schizandra elongata* Hook. f. & Thomson in Fl. Brit. India 1: 44. 1872; Sharma *et al.* Fl. India 1: 191-192. 1993

Climbers woody, with thin branchlets. **Lamina** ovate oblong lanceolate, rounded, 5 – 12 x 2 - 5cm, cuneate, entire, unequal at base denticulate or rarely sinuous along margins acute or shortly acuminate at apex membranous glabrous above varicose subglaucous beneath; **lateral nerves** 4 - 5 pair petiole usually channel above. **Flowers** yellowish, pedicels slender. **Perianth** segments 7 - 8 orbicular, green outside, yellowish inside. **Male flower**; stamens spirally arranged; outer ones long; filaments often monodelphous 1 - 2mm long with thick connective. **Female flowers** carpels 20 – 24 column ellipsoid. **Fruitlets** 10 - 30 sessile, oblong ellipsoid or globose, not beaked, 1 - 2 Seeded.

Flower : April *Fruit*: September.
Exsiccatus : Rachela 2800 m , **SR Lepcha & AP. Das 31085**, dated 02.10.2004.
Status : Common
Local Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN.
Note : Endemic to Himalaya

Schisandra neglecta A.C.Smith in *Sargentia* 7:127.f.17,g.1947; Hara in *Fl.E.Him.* 1:96.1966; Hara *et al.* *Enum. Fl. Pl. Nepal* 2: 26. 1979; Grierson in *Grierson & Long, Fl. Bhutan* 1(2):249. 1984; Sharma *et al.* *Fl. India* 1:193. 1993.

S. elongata Hk.f. & Thoms.in *Fl. Brit. India* 1:44.1872, excl. *syn.*

Local Name: Sighatta Lahara (Nep.).

Climber shrubby. Branches short. Stem glabrous. **Leaves**; petiole to 2 cm; **lamina** 3.5 – 10 x 1 - 3cm, ovate to oblong-lanceolate, remotely cartilaginous-denticulate, acuminate, base acute or cuneate, glabrous, glaucous beneath, nerves much prominent below, **lateral nerves** 6 - 10 pairs. **Pedice** borne on axils of scale on leafy short lateral branch, glabrous. **Flowers** solitary, axillary, drooping, unisexual. **Petaloid**, outer ones larger, nearly round, glabrous, vertically nerved; **stamens** numerous, in a fleshy head.

Flower : May – June *Fruit*: August - September.
Exsiccatus : Rachela below, 2550 m , **SR Lepcha & AP. Das 03054**, dated 15.06. 2005.
Status : Not Common
Local Distribution : Middle Rachela, Singhaney – Panglakha upto 2600 m.
Local Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.
Notes : Fruit edible; used in local traditional medicine.

RANUNCULACEAE A.L. Jussieu

Key to the Genera:

1. Erect or scandent herbs or shrubs 2
 + Climbing shrub or sub-shrub ***Clematis***
2. Plants rhizomatous 3
 + Plants non-rhizomatous 4
3. Fruits elliptic achene ***Anemone***
 + Fruits oblong follicle ***Caltha***
4. Flowers actinomorphic 5
 + Flowers zygomorphic 6
5. Leaves sheathing at base ***Thalictrum***
 + Leaves non-sheathing at base ***Ranunculus***
6. Petals usually – 4 ***Delphinium***
 + Petals usually – 2 ***Aconitum***

Aconitum Linnaeus

Key to the Species:

- | | |
|---|----------------------|
| 1. Leaves 5 lobed; spur recurved | 2 |
| + Leave with many pointed segment; spur not recurved | A. <i>bisma</i> |
| 2. Lamina deeply cut into segment; follicles usually – 3, linear oblong | A. <i>laciniatum</i> |
| + Lamina less deeply dissected; Follicle usually – 5, oblong | A. <i>spicatum</i> |

Aconitum *bisma* (Buch-Ham.) Rapaics in Nov. Kozlem. 6: 164. 1907; Hara & Ohashi in Fl. E. Him. 86. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 9. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 320. 1984; Hajra *et al.*, Fl. India (4): 7. 1997. *Caltha bisma* Buch-Ham. in Edinburgh J. Sci. 1: 251. 1824. *Aconitum palmatum* D. Don, Prodr. Fl. Nepal 196. 1825. Hook. f. & Thoms., Fl. India 1: 56. 1855; in Fl. Brit. India 1: 28. 1872. *Aconitum ferox* Subsp. *palmatum* (D. Don) Bruhl in Ann. B.G. Calc. 5: 111, t. 111. f. 9-13, 24, 25, 31. 1895.

Local Name: Nyingmon (Lep), Seto Bikhuma (Nep.)

Herbs, biennial; root paired, tuberous; **Stems** erect, 50 - 150cm high, glabrous. **Petioles** slender, 2 - 12cm long; **lamina** upto 17 cm in diam, reniform to cordate., deeply 5 lobed, sub-glabrous; Segment sharply cut, ovate, cuneate at base. Flowers usually in loose panicle, pedicels 3 - 11 cm. **Calyx** bluish white or greenish blue; uppermost sepal helmet-shaped, oblique, very shortly beaked, ca 2 x 1.6cm; upper lateral sepal ca 1.5 x 2 cm, obovate; lower lateral sepals elliptic. Petal head S-shaped glabrous; limb very short, ca 1.5 mm long. **Filaments** and nectaries glabrous. Carpel 5, glabrous. **Follicles** oblong, glabrous, thick.

Flower & Fruit : August - September.
Exsiccatus : Kupup 4250 m, **SR Lepcha & AP. Das 107**, dated 13.10.2005.
Status : Rare & Threatened
Local Distribution : Kupup, 4000 - 4500 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, S.E. TIBET.
Note : Use in traditional medicine

Aconitum *laciniatum* (Bruhl) Stapf in Ann. B.G. Calc 10: 168. t. 108. 1905 ; Hara & Ohashi in Fl. E. Him. 86. 1966; 2: 27. 1971; Hara *et al.*, Enum Fl. Pl. Nepal 2: 10. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 319. 1984; Hajra *et al.*, Fl. India (1): 17. 1993. var *laciniatum*. *Aconitum ferox* Wall. ex Seringe var *laciniata* Bruhl in Ann R.B.G. Calc. 5: 111. 1895. Hajra & Sharma *et al.*, Fl. India 1: 17. 1993.

Local Name: Re Nyingmon (Lep.), Seto Bikhuma (Nep.)

Herbs, roots paired, tuberous; **Stems** 0.7 - 1.8m, erect, finely pubescent. **Lamina** less deeply dissected, upto 18cm diam. scattered, basal one decayed at flowering time, uniform fleshy., 5-partite. **Flowers** in a lax raceme or panicle widely spaced few to many flowered. **Calyx** pubescent, dark red or reddish purple; uppermost sepal helmet shaped, 1.5 - 2.3 x 1.4 - 1.6cm; upper lateral sepals obovate, Ca 1.3 x 1.2cm in lower lateral sepals 1.2 x 0.6cm. **Corolla** head c 10mm, spur shortly recurved, hispidulous, filaments hisped, Carpels 3., rarely 4 - 5, densely pubescent. **Follicles** usually 3, linear oblong, divergent, finely pubescent.

Flower & Fruit : July. - September
Exsiccatus : Baba mandir, 3600 m, **SR Lepcha & AP. Das 142**, 10.10. 2006.
Status : Rare
Local Distribution : Kupup, Kyongnosla 3800 - 4600 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, S.E. TIBET, CHINA.

Note : Roots used medicinally and for poisoning arrow.

Aconitum spicatum (Bruhl) Stapf in Ann. Bot. Gard. Calc. 10: 165. t. 106 & 107. 1905; Hara & Ohashi in Fl. E. Him. 86. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 11. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 320. 1984; Hajra *et al.*, Fl. India (4): 22. 1997. *Aconitum ferox* var. *spicata* Bruhl in Ann. Bot. Gard. Calc. 5: 110. 1895. *Aconitum ferox* auct. non Wall. ex Seringe : Hook. f. & Thoms., Fl. India 1: 56. 1855, p.p. in Fl. Brit. India 1: 28. 1872 pp.

Local Name: Lungzyi nying (Lep.)

Herbs, biennial upto 2 m tall. **Roots** paired, tuberous. **Stems** erect, simple pubescent. **Basal leaves** usually decayed while flowering; **lamina** reniform, cordate to orbicular, 5.5 - 10.5cm in diam., ovate, lobes deeply cut into toothed or pointed segments. **Flowers** racemose, multi-flowered, 12 - 45 cm long. **Flowers** violet blue to dark blue, usually white, purple tinged. Upper most **sepal** helmet shaped with a stout beak, 2 x 1.5 cm; upper lateral sepals orbicular Ca, 2cm across; lower sepals elliptic, petals hairy or sometimes glabrous, head S-shaped; **Spur** recurved. **Follicles** 5, oblong, hairy.

Flower : July - September *Fruit:* July - September
Exsiccatus : Kupup 4250 m, **SR Lepcha & AP. Das 107**, dated 13. 10. 2005.
Status : Common
Local Distribution : Kupup, Memenchu, Sherathang 1800 - 4200 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, CHINA.
Note : The root contain valuable alkaloids (Stapt in Ann. RBG Calc. 10 (2). 1905)

Anemone Linnaeus

Key to the Species:

1. Plants with woody root stock; leaves compound; leaflet margin serrated *A. rivularis*
+ Plants with fibrous root stock; leaves simple; leaflet margins 3 sect or 3 dentate. *A. obtusiloba*

Anemone obtusiloba D. Don. Prodr. Fl. Nepal 194. 1825; Hook.f. & Thoms., Fl. India. 1: 22 1855; in Hook.f., Fl. Brit. India. 1: 8. 1872; Hara & Ohashi in Fl. E. Him. 87. 1966; Hara *et al* Enum. Fl. Pl. Nepal 2: 12. 1979; Grierson in Grierson & Long, Fl. Bhutan. 1(2): 293. 1984; Hajra *et al*, Fl. India 1: 33. 1993. *Anemone govaniiana* Wall., Cat 166, n. 4688. 1831, *nom. nud.*
Anemone discolor Royal. Ill. Bot. Him. t. ii, f. 1. 1833; 52. 1834.

Var obtusiloba.

Herbs, villous; rootstock fibrous, clothed with old leaf remains. **Leaves** simple; **lamina** usually broadly ovate, sub orbicular, deeply cordate, 2 - 4.5cm across, 3 sect or 3 dentate, terminal leaflet not distinctly stalked, lobes ± obtusely toothed, usually with bracts similar to leaves but smaller, pedicels 2 - 14cm. **Flowers** actinomorphic solitary; scapes erect, ascending, or prostrate, 2 to 3 flowered; **involucral bracts** similar to leaves, 3 partite; pedicels slender 2 - 9cm. **Calyx** 5, elliptic, obovate or oblong, 0.6 - 1.5 x 0.9 - 1.4cm, blue to whitish on both sides or silky to golden yellow outside. **Stamens** many. **Carpels** hairy, sometime glabrous. **Achenes** elliptic, compressed, tip with short hooked beak, densely strigose hairy.

Flower : April - July
Exsiccatus : Donkyala 3850 m, **SR Lepcha & AP. Das 2814**, dated 16.08. 2004.
Status : Sparse
Local Distribution : Donkyala, KAS 3200 - 4200 m.
General Distribution : PAKISTAN, INDIA, NEPAL, BHUTAN, CHINA, TIBET, MYANMAR.

Anemone rivularis Buch-Ham. ex DC., Syst. Nat. I: 211. 1817; Hook. f & Thoms., Fl. India 1: 23. 1855; in Fl. Brit. India 1: 9. 1872; Hara *et al*, Enum. Fl. Pl. Nepal 2: 12. 1979; Grierson in Grierson & Long, Fl. Bhutan. 1(2): 292. 1984; Hajra *et al*, Fl. India 1: 35. 1993. *Anemone geraniifolia* Wallich., Cat. 167, n. 4693. 1831, *nom. nud.* *Anemone hispida* Wallich., Cat. 167. n. 4698. 1831. (*nom. nud.*). *Anemone rivularis* Var. *parviflora* Tamura In Acta. Phyt. Geobot. 23: 102. 1968.

Herbs, perennial, upto 1m tall. Rootstock woody, stout. **Leaves** wide in smaller leaflets, 28 - 32cm in larger ones, 3 to 5 deeply lobed, each lobe again 3 - 5 lobed, hairy on both surface, serrate; cauline leaves palmately dissected into many linear lobes; leaflets broadly elliptic or rhombic, 3 - 6.5 x 3 - 6cm, acute, base cuneate, deeply trilobed, stiffly pubescent, margins serrate; petiole usually 8 - 28cm. **Flowers** actinomorphic solitary; scape 5 - 32cm; involucre bracts usually similar to leaves, segments linear. **Calyx** 12 - 16 x 3 - 10mm; **Achenes** compressed, glabrous, broadly elliptic, style persistent and hooked.

Flower : April-August.
Exsiccatus : KAS upto 3900 m, *SR Lepcha & AP. Das 2813*, dated 25. 08. 2004
Status : Less common
Local Distribution : KAS, PWS, 1980 - 3960 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, CHINA, SRI LANKA, MYANMAR.

Caltha Linnaeus

Key to the species:

1. Herbs less than 20 cm tall; Leaf deltoids; stamens more than 40 *C. palustris*
+ Herbs more than 20 cm tall; Leaf obtuse; stamens 20 - 40 *C. scaposa*

Caltha palustris L., Sp. Pl. 588. 1753; Hook. f. & Thoms., Fl. India 1: 40. 1855, in Fl. Brit. India 1: 21. 1672; Hara in Fl. E. Him. (2): 356. 1971; Hara *et al*, Enum. Fl. Pl. Nepal 2: 13. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2):305. 1984; Hajra *et al*, Fl. India 1:47. 1993. *C. govianana* Wall. (Cat. 167. no. 4710. 1831, *nom. nud.*) ex Royle, Illus. Bot. Him. 54. 1834.

Herbs perennial, rootstock creeping. **Stems** 11-50(-70) cm. erect, branched. **Lamina** deltoid, reniform, 2.5 - 16 (-18) cm long, broad, base cordate, sharply dentate along margins, obtuse at apex. Peduncles short upto 60cm long. **Flowers** with few, bright yellow or pink. **Calyx** 5 - 8, oblong - ovate elliptic or broadly obovate, obtuse or rarely sub-acute. **Stamens** more than 40. **Carpels** 1 or more, free linear oblong

Flower & Fruit : April - September
Exsiccatus : Bhimbase 4280 m, *SR Lepcha & AP. Das 30982*, dated 27.07. 2005.
Status : Common
Local Distribution : Bhimbase, Lampokhri, upto 4400 m.
General Distribution : INDIA, BHUTAN, NEPAL; ASIA, EUROPE, AND N.AMERICA.
Note : *Roots are very poisonous.*

Caltha scaposa Hook. f. & Thoms., Fl. India. 1: 40. 1855; in Fl. Brit. India 1: 21. 1872; Hara in Fl. E. Him. 2: 29. 1971; Hara *et al*, Enum. Fl. Pl. Nepal 2: 13. 1979; Grierson in Grierson & Long Fl. Bhutan 1(2): 305. 1984; Hajra *et al*, Fl. India. (1): 49. 1993

Herbs perennial erect upto 15cm tall. **Rootstock** with branched main roots. **Leaves** usually all radical; petiole narrow, upto 2.3cm long, base with membranous sheath; lamina obtuse, entire or dentate, ovate-cordate, 2 - 2.5 x 1 - 2.5cm. **Scapes** usually leafless or sometime with one small

leaf; **Flowers** solitary or rarely 2. **Calyx** 5 - 9, commonly 6, obovate, obtuse, yellowish. **Stamens** 20 - 40; filaments usually flattened. Carpel upto 20, unequal, linear oblong, prolonging into style; stigma curved, oblique. **Folicles** oblong, flattened, shortly beak, Ca 2 x 8 mm. **Seeds** 2 - 6, black ovoid.

Flower : June - August.
Exsiccatus : Donkyala 3960 m, **SR Lepcha & AP. Das** 31448, dated 27.07.2005.
Status : Common
Local Distribution : Bhimbase, Donkyala 2700 - 5500 m.
General Distribution : INDIA, NEPAL, BHUTAN, TIBET, W. CHINA

Clematis Linnaeus

Key to the Species:

1. Stem branches glabrous 2
- + Stem branches hairy or villous 3
2. Leaf margins coarsely toothed; sepals white *C. montana*
- + Leaf margins serrate; sepal yellowish - brown *C. connata*
3. Stem branches villous - tomentose; filament usually clothed with spreading hairs *C. buchaniana*.
- + Stem branches with coarsely gray- brownish hairs; filament hairy ... 4
4. Leaf margins coarsely serrate; puberulous or nearly glabrous on both surface; achenes ovate or obovate elliptic, wooly *C. acuminata*
- + Leaf margins dentate; brown villous on both sides; achenes ovate compressed hairy *C. wightiana*

Clematis acuminata D.C., Syst. Nat. 1: 148. 1817; Hook.f.& Thoms. In Fl. Brit. India 1: 5. 1872; Hara in Fl. E. Himal. 2: 29. 1974; Hara *et al.* Enum. Fl. Pl. Nepal 2: 14. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 289. 1984; Hajra *et al.* Fl. India 1: 54. 1993.ssp. *sikkimensis* (Hook. f. & Thoms.) Bruhl in Ann. Roy. Bot. Gard. Cal. 5: 75. 1896

Climbers, woody but slender glabrous, base woody. **Leaves** ternate, usually 3 - 5 foliate, leaflets ovate to lanceolate, 3 - 8.5 x 2 - 3.5cm, rounded, acuminate and 5 veined at base, margin finely serrate, sparsely pubescent, reflexed. **Panicles** rarely few flowered, branches usually slender, glabrous; **Sepals** ovate, yellowish, 1.5 - 2 x 0.5 - 0.8cm, erect or recurved at lip, densely pubescent; filament usually clothed with spreading hairs. **Achenes** hairy and silky.

Flower : September
Exsiccatus : Subaney - Panglakha 2800 m, **SR Lepcha & AP. Das** 125, dated 17.09.2004.
Status : Frequent.
Local Distribution : Subaney, Singhaney, Phusrey upto 2700 m.
General Distribution : HIMALAYA; INDIA, NEPAL, BHUTAN.
Note: 1. Endemic to Himalaya
 2. Fume produced through heating of freshly collected roots over the oven is inhaled through to relieve from sinus pain.

Clematis buchananiana DC., Syst. Nat. 1: 140. 1817; Hook.f. & Thoms. in Fl. Brit. India 1: 6. 1872; Hara *et al* Fl. E. Him. 88. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 4. 1979; Grierson in Grierson & Long, Fl. Bhutan 1 (2): 289. 1984; Hajra *et al.*, Fl. India 1: 60. 1993. *Clematis tortuosa* (Hook. f. & Thoms.) Fischer in Kew. Bull. 1929: 1. 1929.

Local Name: Pinasey lahara (Nep.)

Climber woody, coarsely brown hairy throughout. **Leaves** ternate to pinnate; leaflets 3 broadly ovate 4.5 - 12 x 2.8 - 5.5 cm, acute, base rounded, coarsely serrate, usually 3-5 lobed, pubescent. **Flowers** in panicles; bracts dentate, foliaceous. **Sepals** often 4-6, cream to greenish yellow, ovate acute, 1.8-3.1cm, densely brownish hairy outside, recurved, filaments hairy; **styles** usually 2.5-3.5cm. **Achenes** wooly.

Flower : October. *Fruit:* November – January
Exsiccatus : On way to Panglakha 2700 m, *SR Lepcha & AP. Das 20216*, dated 08.10.2004.
Status : Frequent.
Local Distribution : Singhaney – Rachela 1200 – 2800 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, CHINA, MYANMAR.
Note : The fume produced through fleshly collected root by heating over

Clematis connata DC., Prodr. 1: 4. 1824; Hook.f. & Thoms. in Fl. Brit. India 1: 6. 1872; Hajra *et al.*, Fl. India. 4: 61. 1997 ; Grierson in Grierson & Long, 1(2): 290. 1984; Hara *et al.*, Fl. E. Him. 88. 1966

Climber large woody, branches sulcate, glabrous. **Leaves** pinnate; **petiole** base winged, connate; leaflets 2 - 7, simple, of 2-4 lobed broadly ovate-cordate, elliptic or ovate lanceolate, cordate or rounded at base, serrate, acute to acuminate at apex, 3-10 x 2-10 cm, glabrous, pubescence along nerves beneath, with hairs on both surface. **Flowers** in cymose, panicle 3-8cm long; peduncle short 2-4cm, bracts trilobed, lanceolate hairy on surface, without rib; pedicel upto 3.5cm long, flowers showy, light yellowish creamy or white. **Calyx** 4, not ribbed, ovate, acute, tip recurved, yellowish pubescent, brown outside. **Stamens** short 5-7.5 mm; filament, hairy. **Achenes** compressed, with feathery silky hairy tail.

Flower : July – October. *Fruit:* August – October.
Exsiccatus : Rachela 2800 m, *SR Lepcha & AP. Das 31164*, dated 03.09.2004.
Status : Less common
Local Distribution : Panglakha, Subaney, Rachela upto 3200 m.
General Distribution : PAKISTAN, INDIA , NEPAL, BHUTAN, CHINA, TIBET.

Clematis montana Buch-Ham. ex DC., Syst. Nat. 1: 164. 1817; Hook.f.& Thoms. in Fl. Brit. India 1: 2. 1872; Hara & Ohashi in Fl. E. Him. 89. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 15. 1979; Grierson in Grierson & Long .Fl. Bhutan 1 (2): 286. 1984; Hajra & Sharma *et al.*, Fl. India 1: 69. 1993.

Local Name: Kaneshi Lahara (Nep.).

Climber, woody deciduous. **Leaves** ternate, rarely 2 foliate; leaflets ovate-lanceolate, 2.5 - 6.8 x 2 - 3.8cm, coarsely toothed, acute, glabrescent; **petioles** 3 - 9cm. **Flowers** 2 - 4 in axillary fascicles, 2.5 - 6.8cm across. **Pedicels** 3 - 4.5 cm. **Calyx** usually 4, acute, petaloid, pubescent outside, white elliptic. **Stamens** many; filament glabrous; **anthers** yellow, introrse. **Styles** plumose. **Achenes** ovate, glabrous or sparsely hairy.

Flower : June – October. *Fruit:* August –December.

Exsiccatus : Bhimbase 4350 m, **SR Lepcha & AP. Das 31439**, dated 27.07.2005:
Status : Sparse.
Local Distribution : Kupup, Bhimbase, Lampokhri upto 4500 m.
General Distribution : INDIA, NEPAL, BHUTAN, W. & C. CHINA, TAIWAN.
Note : The fume produced from heating over oven is inhaled through nose to get relieve from sinus pain (Bhujel,1996).

Clematis wightiana Wall. (Cat.no. 4674. 1828, *nom. nud.*) ex Wight & Arns., Prodr. 2. 1834; Hook.f.& Thoms. in Fl. Brit India 1: 5.1872; Hajra *et al.*, Fl. India 1: 80.1993

Climbers woody; branches covered by grayish or brownish hairs. **Leaves** pinnately 3 – 5foliate; petiole short 10 – 12 cm long hairy; leaflets oblong –ovate or orbicular, rarely 3 -5 lobes, dentate, brown villous on both sides, usually prominent beneath.; **Flowers** usually axillary paniculate , bracts and bracteole ovate to linear. **Flower** 1.5 -5 cm across, white or pale or golden yellow. **Sepals** 4, ovate, glabrous inside, filament hairy in middle. **Achenes** ovate, compressed hairy.

Flower : November – March *Fruit:* January - May.
Exsiccatus : Rachela 2860 m, **SR Lepcha & AP. Das 31042**, dated 07.10.2004.
Status : Less common
Local Distribution : Singhaney, Rachela to 3150 m.
General Distribution : E..HIMALAYA; INDIA
Note : Endemic to Eastern Himalaya

Delphinium Linnaeus

Key to the species:

1. Plant more than 40 cm tall; leaf lamina reniform or suborbicular; lower petals oblong; Seeds winged on angles *D. viscosum*
- + Plant less than 40 cm tall; leaf lamina suborbicular, with fewer lanceolate segments; lower petals broadly elliptic; Seeds winged or wingless *D. candelabrum*

Delphinium viscosum Hook.f. & Thoms., Fl. India 1: 52. 1855; in Fl. Brit. India 1: 27. 1892; Hara *et al.* Enum. Fl. Pl. Nepal 2: 18. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 31. 1984; Hajra *et al.*, Fl. India 1: 101.1993. *Delphinium trilobatum* Huth in Bull. Herb. Boiss. 1: 330. 1893. *Delphinium conocentrum* Chatterjee in Kew Bull. 1948: 47. 1948.

Herbs perennial, erect. **Stem** upto 55 cm tall, with yellowish glandular hairs. **Leaves** radical palmately 6 - 7 lobed; lower leaves with petiole upto 18 cm upper sessile or shortly petiolated; lamina reniform, suborbicular longer; lobes cuneate, toothed at apex. **Flowers** very few, in lax corymbs or racemes; pedicels upto 8 cm long, ascending with glandular hairs; bracts entire or lobed; oblong; bracteoles borne near flowers. **Calyx** violet blue to purple; lamina of upper calyx broadly ovate. **Spurs** incurved. **Corolla** dark purple, lower bearded; lamina of upper corolla divided into 2 narrow lobes; lamina of lower corolla, oblong, bifid upto middle into linear lobes, stiff pubescent. **Stamens** 6 – 7 mm long, glabrous. **Follicles** 3, glabrous. Seeds winged on angles.

Flower : July – October.
Exsiccatus : Bhimbase 4350m, **SR Lepcha & AP. Das 2811**, dated 12.08.2004.
Status : Not Common
Local Distribution : Sherapthang, Chhangu, Bhimbase above 3500 - 4500m.
General Distribution : INDIA, NEPAL, BHUTAN, TIBET.

Delphinium candelebrum Ostenfield in Hedin, S. Tibet, 6(3): 80.1922. Grierson in Grierson & Long, Fl. Bhutan 1(2): 312. 1984

Herbs perennial, erect. Stem upto 50 cm. **Leaves** suborbicular, with fewer lanceolate segments, ultimate segments of leaves elliptic – lanceolate, 2.5 – 4 x 2.5 – 4 mm. **Flowers** few – many in terminal raceme. Pedicel to 5cm; **bracteole** to 5mm, lamina of **upper calyx** broadly ovate, spur straight or uncurved; **lateral calyx** ovate elliptic. Lamina of **upper corolla** straight, curved; lamina of **lower corolla** broadly elliptic, pubescent, stamen many, Seeds winged or wingless.

Flower : October.
Exsiccatus : Donkyala 3900 m, **SR Lepcha & AP. Das 2812**, dated 16.08.2004.
Status : Not common
Local Distribution : Donkyala upto 4570 m.
General Distribution : E.HIMALAYA; INDIA, BHUTAN.
Note : Endemic to Eastern Himalaya

Ranunculus Linnaeus

Key to species:

1. Plants erect 2
- + Plants decumbent or prostrate 3
2. Calyx purplish or yellow, anther basified *R. pulchellus*
- + Calyx yellowish- green, anther dorsified *R. brotherusii*
3. Achenes globose, suborbicular 4
- + Achenes ellipsoid *R. ficarifolius*
4. Corolla oblong- ovate, flowers yellow *R. diffuses*
- + Corolla obovate, flowers white or yellow *R. hirtellus*

Ranunculus pulchellus C.A. Meyer in Ledeb., Fl. Alt. 2: 333. 1830. Hook. f. & Thoms. Fl. India 1: 31. 1855; in Fl. Brit. India 1: 17. 1872; Hara in Fl. E. Him. 2: 32. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 20. 1979; Grierson in Grierson & Long. Fl. Bhutan. 1(2): 302. 1984 ; Hajra *et al* , Fl. India 1: 113, 128. 1993. *Ranunculus salsuginosus auct. non.* Pallas: Wall., Cat. 167.n. 4708. 1831. *Ranunculus flammula auct. non.* L., D. Don in Royle, Ill. Bot. Him. 53. 1831. *Ranunculus lingual.* var. *subvillosus* Tamura in Acta Phyt. Geobot. 23: 32. 1968.

Herbs, perennial, upto 30cm tall. Stem erect, simple, or branched. **Petioles** longer than blades, 2 - 10cm; basal leaves 1 - 5; **lamina** reniform or ovate-elliptic oblong, entire or usually of 3 lobed, crenate. **Leaves** bases subtruncate or round; lower and middle leaves narrowly elliptic or deeply 3 lobed, sheathing at base, sometime leaves linear-elliptic. **Flowers** solitary or 1 - 3 per leaf, yellow; **pedicels** sulcate, seraceous. **Calyx** 5, oblong, elliptic, purplish along margins, blackish at tip, hairy. **Corolla** 5, obovate to ovate, entire or slightly emarginate, yellow, nectarines cup shaped. **Anthers** long 0.6 - 1.4 mm, basifixed. **Achenes** obovoid, inflated; stylar beak straight or curved.

Flower : May - July
Exsiccatus : Kupup 4280 m, **SR Lepcha & AP. Das 30939**, dated 24.07.2005.,
Status : Not Common
Local Distribution : Kupup, Bhimbase to 4400 m.
General Distribution : C. ASIA, SIBERIA, HIMALAYA; INDIA, TIBET, MONGOLIA,

AND W & C. CHINA

Ranunculus diffuses DC., Prodr. 1: 38. 1824; Hook. f. & Thoms., Fl. India 1: 36. 1855; in Hook.f., Fl. Brit. India 1: 19. 1872; Hara & Ohashi in Fl. E. Him. 90. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 19. 1979; Grierson in Grierson & Long. Fl. Bhutan. 1(2): 303. 1984; Hajra *et al.*, Fl. India 1: 119. 1993. *Ranunculus hydrocotyloides* Wall., Cat. 167, n. 4703. 1831. *nom. nud.* *Ranunculus mollis* Wall. (Cat. 167, n., 4704. 1831, *nom. nud.*) ex D. Don in Royle. Ill. Bot. Him.. 53. 1834.

Herbs, perennial, prostrate or decumbent. **Stems** usually procumbent, covered by densely hirsute spreading brownish hair. **Lamina** broad and long, orbicular to ovate, usually cordate, mostly divided into 3 obovate lobes; lobes, cuneate, scarcely segmented, sometime sharply and shallowly dentate-deltoid, pubescent beneath; petioles narrowly upto 12cm long, hirsute, auricle brown scarious. **Flowers** usually solitary, small, axillary, white, or yellowish. Calyx elliptic spreading. **Corolla** obovate, yellow. **Achenes** globose heads, sub-orbicular, acute, compressed; style hooked.

Flower : April – October.
Exsiccatae : Ramitey dara (Rachela) 2700 m, **SR Lepcha & AP. Das 31169**, dated 04.09.2004. Nathang – Pangkha 2950 m, **SR Lepcha & AP. Das 32971**, dated 28.07. 2005.
Status : Common
Local Distribution : Rachela, Singhaney, Premlakha 1400 – 2700 m.
General Distribution : INDIA, NEPAL, BHUTAN, CHINA, MYANMAR.

Ranunculus hirtellus Royle ex D. Don in Royle, Ill. Bot. Him. 53. 1834; Hook. f. & Thoms., Fl. India 1: 34. 1855; in Hook.f., Fl. Brit. India 1: 18. 1872; Hara *et al.*, Enum Fl. Pl. Nepal 2: 19. 1979; Hajra *et al.*, Fl. India 1: 121. 1993. *Ranunculus attenuatus* Royle ex D. Don in Royle, Ill: Bot. Him. 53. 1834. *Ranunculus nivalis auct. non L.*: Hook.f. & Thoms., Fl. India. 1: 35. 1855. *Ranunculus dielsianus auct. non*. Ulbr.: Tamura in Acta Phyt. Geobot. 23: 32. 1968.

Herbs perennial, erect, or sometime decumbent. **Stem** ascending, erect or decumbent. **Petioles** vaginate at base ; basal leaves oftenly 3 or more; **lamina** reniform to orbicular, 4.5 - 16 x 4.5 - 18mm, deeply 3-partite; segments not more than 3 toothed; middle lobes large, oblong to obovate, entire or tricuspidate; lateral lobes obliquely ovate, coarsely toothed or entire; leaf base cordate-truncate. Cauline leaves vaginate and amplexicaul at base, 3 partite, lobes linear lanceolate. **Flowers** solitary or several, yellow; pedicel sulcate-pilose. **Calyx** navicular, hairy. **Corolla** 5 clawed, oblong to ovate, obtuse rounded; nectaries cup shaped or forked. **Anthers** basifixed; filament flattered. **Achenes** oblong to suborbicular, glabrous, styler beak hairy.

Flower & Fruit : June - September
Exsiccatae : Bhimbase 4350 m, **SR Lepcha & AP. Das 31417**, dated 27.07. 2005. Lampokhri 4400 m, **SR Lepcha & AP. Das 30992**, dated 27.07. 2005.
Status : Status
Local Distribution : Kupup, Bhimbase, Lampokhri upto 4450 m.
General Distribution : INDIA, NEPAL, BHUTAN

Ranunculus brotherusii Freyn in Bull.Herb.Boiss.6:885.1898; Hara *et al* in Fl.E.Him.1:90 .1966; Grierson & Long Fl. Bhutan 1(2): 302. 1984; Hajra *et al.* Fl. India 1: 116. 1993; Hajra *et al.*, Fl. India 1: 116. 1993. *R. affinis* Hook.f.& Thomson in Fl.Brit. India 1: 18. 1872 p.p.(non.R.Br.). *R. brotherusii* Freyn var.*lasisectus* H.Riedi in Kew Bull. 34: 362. 1979.

Herbs perennial. **Stem** erect upto 27cm long, white hairs or glabrous. **Basal leaves** 1-3.5 cm long and broad leafy cut into linear lanceolate segments 1.5-25 mm , broad, sparsely hirsute beneath

glabrous above, reniform 1.5 – 25 (4) x 0.5 – 3 (-4)cm, partially 3-lobed, lateral lobes deeply lobes, sessile, oblong ovate or oblong cordate at base, petioles 2-6, yellow. **Calyx** spreading ovate to oblong, yellowish green. **Corolla** 5 broadly ovate. **Anthers** long dorsified and obovoid; filament dilated. **Carpel** glabrous. **Achenes** glabrous or pubescent.

Flower : April *Fruiting*: September
Exsiccatus : Panglaxha- Nathang 3400m, *SR Lepcha & AP. Das 30817*, dated 29.07.2005.
Status : Sparse
Local Distribution : Nathang, Kupup, 3200 – 4200 m.
General Distribution : C. ASIA, HIMALAYA; INDIA, NEPAL, BHUTAN, TIBET, CHINA; RUSSIA.

Ranunculus ficariifolius Leveille & Veniot in Bull. Soc. Bot. Fr. 51. 289. 1904. Grierson in Grierson & Long Fl. Bhutan 1(2): 301. 1984; *Ranunculus flacidus* Hook.f. & Thomson, Fl. Ind. 1: 38. 1855 & Hook.f., in Fl. Brit. India 1: 20. 1872, non Pers. 1795; Hajra *et al.*, Fl. India 1: 120. 1993.

Herb perennial, tuft prostrate or decumbent often rooting at nodes. **Lamina** 3.5 – 13 mm long, broadly ovate or suborbicular, acute or subacute, base truncate or cordate, margins with 5 -7 rounded teeth. **Flower** solitary, leaf opposed. **Calyx** to 3.5 mm long, reflexed. **Petals** upto 3 mm long. **Achenes** ± 1.8 mm, ellipsoid, compressed; style weakly hooked, deciduous.

Flower : May *Fruit*: July
Exsiccatus : Sherathang lake 4290 m, *SR Lepcha & AP. Das 2829*, dated 12. 08. 2004.
Status : Common
Local Distribution : Sherathang, Kupup 3200 – 4200 m.
General Distribution : INDIA, NEPAL, BHUTAN, TIBET, CHINA; RUSSIA.

Thalictrum Linnaeus

Key to the species:

1. Plant with prominent stem 2
 + Plant stemless *T. alpinum*
2. Plant more than 1 m tall 3
 + Plant less than 1 m tall 4
3. Petiole sheathed; flowers polygamous usually in dense terminal clusters; calyx greenish white, mauve within *T. foliolosum*
 +. Petiole non-sheathed; flowers in lax panicle; calyx-tinged purple to greenish. .. *T. chelidonii*
4. Anthers mucronate or rounded at apex; achene glabrous 5
 + Anthers apiculate; achene finely glandular – pubescent *T. foetidum*
5. Leaf elliptic – obovate; achenes obovate, incurved beak *T. elegans*
 + Leaflet broadly orbicular or obovate; achene elliptic, tapered beak *T. virgatum*

Thalictrum alpinum L., Sp. Pl. 545. 1753; Hook. f. & Thoms. in Fl. India 1: 18. 1855; in Hook.f., Fl. Brit. India 1: 12. 1972; Hara in Fl. E. Him. 3: 39. 1975; Grierson in Grierson & Long. Fl. Bhutan 1(2): 295. 1984. *Thalictrum Microphyllum* Royle. Ill. Bot. Him. 51.1834.

Herbs perennial, glabrous; stemless very short or leaves all radical, 3.5 – 12 cm, across, bipinnate or pinnate. **Leaves** ; leaflets small, broadly obovate, usually 3-lobed, 3-partite, pale beneath, lobes subacute or rounded at apex, veins usually with permanent beneath. **Flowers**; **scapes** simple, greenish flowers in racemes; pedicel short, reflexed in fruit. **Calyx** 4, elliptic. **Stamens** 5 - 10; **anthers** beaked. **Achenes** 5 - 7, elliptic or narrowly oblong, styles triangular, erect-recurved-erect-recurved.

Flower : May-August
Exsiccatu : Lampokhri 4400 m, **SR Lepcha & AP. Das** 30906, dated 24.07.2005.
Status : Less common
Local Distribution : Bhimbase, Lam- Pokhri 2800 – 5000 m.
General Distribution : INDIA, BHUTAN, N. AMERICA, ARTIC & ALPINE EUROPE.

Thalictrum chelidonii DC., Prodr. 1: 11. 1824. Hook. f. & Thoms. in Hook.f., Fl. Brit. India 1: 11. 1872; Hara in Fl. E. Him. 3: 41. 1975; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 21. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 297. 1984; Hajra *et al.*, Fl. India 1: 134. 1993. *T. reniforma*. Wall. Pl. Asiat. Rar. 2: 261. 1831. 1 (2): 279. 1984; Hajra *et al.*, Fl. India 1: 134. 1993. *Thalictrum cysticarpum* Wall., Pl. Asiat. Rar. 2: 26, t. 129. 1831. *Thalictrum chelidonii* var *cysticarpum* (Wall.) Hook.f. & Thoms., Fl. India 1: 13. 1855.

Herbs perennial upto 2.5m tall, multi branched. **Leaves** 2-pinnate, 3.5 - 8cm long; leaflets suborbicular - codate, coarsely blunt or tooth, pale beneath. Sheaths expanded to adnate stipules. **Flowers** in lax panicle, Ca 1.5cm across, greenish white, **Calyx** elliptic, tinged purple to greenish. **Corolla** purple-mauve, elliptic, stalk often with bulbets. **Stamens** many; anthers shortly mucronate. **Achenes**, obliquely obovate, membranous, with 3 branched vein on each side.

Flower : July – September. *Fruit*: October – December.
Exsiccatu : Sighaney – Rachela 2880 m, **SR Lepcha & AP. Das** 27743, dated 30.09.2004.
Status : Sparse
Local Distribution : Sighaney – Rachela, 2300-3500m.
General Distribution : HIMALAYA; INDIA, NEPAL, BHUTAN.
Note : 1. Endemic to Himalaya.
2. Leaf extract is applied on cuts and wounds by local people.

Thalictrum elegans Wall. (Cat. 167, n. 4728. 831, *nom. nud.*) ex Royle III. Bot. Him. 51. 1834; Hook. f. & Thoms in Fl. India 1: 13. 1855; Hara & Ohashi in Fl. E. Him. 91. 1966; Grierson in Grierson & Long, Fl. Bhutan 1(2): 296. 1984; Hajra *et al.*, Fl. India 1: 135. 1993

Herbs perennial. **Stems** slender upto 42cm tall. **Leaves** usually 2 - 3 pinnate, glaucous beneath; leaflets oftenly elliptic - obovate 1.4 - 4.5 X 1 - 3.5mm, 3-lobed or partite, veins minutely glandular at beneath. **Flowers** in racemose, oftenly sparingly branched panicles. **Calyx** elliptic, greenish purple. **Achenes** obovate, narrowly winged on back, purplish, glabrous, incurved beak.

Flowering : July – October.
Exsiccatu : Kupup 4230 m, **SR Lepcha & AP. Das** 050, dated 15. 64.2004.
Status : Less common
Local distribution : Kupup, Bhimbase, 3100 – 4500 m.
General distribution : HIMALAYA; INDIA, NEPAL, BHUTAN.
Note : Endemic to Himalaya

Thalictrum foetidum L., Sp. Pl. 545. 1753; Grierson in Grierson & Long, Fl. Bhutan 1(2): 298. 1984; Hajra *et al*, Fl. India 1: 143. 1993. *T. minus* var. *foetidum* (L.) Hook. f. & Thoms., Fl. Ind. 1: 17. 1855; in Hook.f., Fl. Brit. India 1: 14. 1872. *T. vaginatum* Royle, Ill. Bot. Him. 52. 1834.

Herbs perennial, upto 80 cm tall. **Lamina** obovate, 4 – 11 x 4 – 9 mm acute, toothed, lobed rounded or cuneate at base, veins prominent below, glandular, pubescence. **Sepals** often narrowly elliptic, 3.2 x 2.4 mm; **anthers** apiculate, **Achenes** many, elliptic, slightly compressed, 2- 2.5 mm, finely glandular – pubescent.

Flower : June – July
Exsiccatus : Bhimbase 4250 m, *SR Lepcha & AP. Das 026*, dated 15.07.2005.
Status : Less common
Local Distribution : Bhimbase 2000 – 3900 m.
General Distribution : EASTERN HIMALAYA; INDIA, NEPAL, BHUTAN.
Note : Endemic to Himalaya

Thalictrum foliolosum DC., Syst. Nat. 1: 175. 1817; Hook.f. & Thoms. in Fl. India 1: 14. 1855; in Hook.f., Fl. Brit. India 1: 14. 1872; Hara & Ohashi in Fl. E. Him. 91. 1966; 2: 33. 1971; Hara *et al*, Enum. Fl. Pl. Nepal 2: 21. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 298. 1984 ; Hajra *et al*, Fl. India 1: 136. 1993. *Thalictrum falconeri* Lecoyer in Bull. Soc. Bot. Belge 24: 192 & 271, t. 4, f. 12. 1855.

Herbs perennial robust upto 2.5 m tall. **Stems** usually branched leafy. **Leaves** pinnately decomposed; **petioles** sheathing and auricled at base, stipulated, 1 - 2.5cm, 3 lobed, obtusely toothed. **Flowers** polygamous usually in dense terminal clusters, bracteate. **Calyx** greenish white, mauve within, deciduous, ovate-obovate. **Stamens** exceeding sepals; filaments filiform; **anthers** 2 – 3 mm long acute, mucronate, sessile; style deciduous.

Flower : June – October.
Exsiccatus : Memenchu lake 3800 m, *SR Lepcha & AP. Das 163*, dated 15.07. 2004.
Status : Common
Local Distribution : Memen chu lake 1300-3600m.
General Distribution : HIMALAYA:INDIA, NEPAL, BHUTAN.
Note : 1. Endemic to Himalaya
2. Root extract used as tonic, purgative, febrifuge and in ophthalmia (Bhujel, 1996).

Thalictrum virgatum Hook.f. & Thoms. in Fl. India 1: 14. 1855; in Hook.f., Fl. Brit. India 1: 12. 1872; Hara & Ohashi in Fl. E. Him. 91. 1966; 2: 34. 1971; Hara *et al*, Enum. Fl. Pl. Nepal 2: 22. 1979; Grierson & Long, Fl. Bhutan 1(2) : 298. 1984; Hajra *et al* Fl. India 1: 143. 1993

Herbs perennial, upto 30cm tall, glabrous. **Leaves** simple or simply ternate, subsessile; lamina broadly orbicular or obovate, 1 - 3.5cm across, obtusely toothed or lobed above, base rounded or cordate, glabrous above, usually glaucous beneath; petioles 4 - 12mm long. **Flowers** small, white in spreading panicles. **Calyx** oftenly narrowly elliptic. **Anthers** rounded at apex. **Achene** many, prominently 1-ribbed, compressed, elliptic, beak tapering.

Flower : June – October
Exsiccatus : Panglakha 2980 m, *SR Lepcha & AP. Das 32993*, dated 28.07.2005.
Status : Less common
Local Distribution : Panglakha , KAS 2400 – 4500 m.
General Distribution : E. HIMALAYA; INDIA, (NEPAL – BHUTAN) s. Tibet, and W. CHINA.

BERBERIDACEAE A. Jussieu

Key to the Genera:

1. Shrubs armed with spines; bracts absent *Berberis*
1. Shrubs strictly unarmed; bracts present *Mahonia*

Berberis (Tournefort) Linnaeus

Key to the Species;

1. Flowers 3 - 6 or many in axillary fascicles 2
+ Flowers solitary or in fascicle of 2 *B. angulosa*
2. Calyx (in 2 whorls) inner elliptic 3
+ Calyx (in 2 whorls) inner obovate *B. umbellata*
3. Stem grooved; berry ovoid to oblong *B. hookeri*
+ Stem not grooved; berry ellipsoid *B. insignis*

Berberis angulosa Hook.f. & Thoms. ex Wallich Cat. N. 1475; Grierson & Long., Fl. Bhutan 1(2): 323. 1984.

Local Name: *Tungbum muuk* (Lep.), *Chutro* (Nep).

Shrubs erect deciduous upto 1.5 m tall. **Stems** strongly grooved, brown. Spine 3 fid, internodes to 2.5 cm. **Leaves** herbaceous, elliptic - obovate, 1.5 - 2 x 0.4 - 1.5 cm, acute, base attenuate, margin entire or rarely spinous toothed. **Flowers** solitary or 2 - 3 in fascicle. **Sepals**: outer ovate, 13 x 8 mm, inner broader, to 8.5 mm. **Petals** obovate 5 x 6 mm. **Fruits** ellipsoid, style short or absent.

Flowering : May *Fruit*: July
Exsiccata : Mid-Rachela 2650 m, *SR Lepcha & AP. Das* 0251, dated 16.09.2005
Status : Common.
Local Distribution : Jorepokri, Kyong nosla, 3000 - 4200 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN.
Note : Endemic to E. Himalaya

Berberis hookeri Lemaire in *Illust. Hort.* 6: 207. 1859; Hara in *Fl. E. Him.* 1: 93. 1966; Hara *et al.* *Enum. Fl. Pl. Nepal* 2: 30. 1979; Grierson in *Grierson & Long, Fl. Bhutan* 1(2): 327. 1984; Sharma *et al.* *Fl. India* 1: 395. 1993. *Berberis wallichiana auct non DC.*, *Prodr.* 1: 107. 1824; Hook., f. in *Fl. Brit. India* 1: 110. 1872; Hara in *Fl. E. Him.* 1: 93. 1966.

Shrubs evergreen upto 3 m tall. Stem grooved, slightly yellowish. **Leaves** lanceolate - elliptic, lamina 2.5 - 6.5 x 0.7 - 2.6 cm, strongly spinose-dentate, acute; pedicels to 2.9 cm, erect, deep pink. **Flower** 3 - 8 in fascicles. **Sepals** pink, in 2 whorls, outer ones ovate, inner ones elliptic; **Petals** 0.3 - 0.69 x 0.3 - 0.50 cm, obovate, yellow; **ovules** 3 - 8. **Berries** ovoid to oblong.

Flower : April - June *Fruit*: September - December
Exsiccatus : Durpin dara - Rachela 2750 m, *SR Lepcha & AP Das* 0250, dated 16.09. 2005
Status : Less common

Local Distribution : Chitray, Tinsimana, Rachela Middle, Jorpokhari. 2300 – 3050 m
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN.
Note : Endemic to E. Himalaya

Berberis insignis Hook.f. et Thoms., Fl. India 1: 226. 1855; Hook.,f. Fl. Brit. India 1: 111. 1872; Hara & Ohashi in Fl. E. Him. 1: 93 1966; Grierson in Grierson & Long., Fl. Bhutan 1(2): 324. 1984; Sharma *et al.* Fl. India 1: 400.1993
Local name: *Tungbunzen* (Lep.) *Chutro* (Nep).

Shrubs erect evergreen upto 1.5 m tall, thickly branched. Spines few; to 7cm. **Leaves** sub-petiolate, **lamina** 5 - 17 x 2 - 4.7cm, spinous toothed, acuminate, base attenuate, shining on both surfaces, veins prominent below, glaucous; pedicels 1.2cm, thick, curved. **Flowers** 5 - many in axillary fascicles. **Calyx** in 2 whorls, outer ovate, 0.2 x 0.19cm, inner ones elliptic. 0.6-0.35cm. **Corolla** 0.5 - 0.3cm, obovate, bifid, yellowish. **Berries** ovoid-ellipsoid, black.

Flower : April – June *Fruit*: August – December
Exsiccatus : Ramitey 2400m, *SR Lepcha & AP Das* 31111, dated 03.10.2004.
Status : Common.
Local Distribution : Singhaney - Panglakha, 2000 – 2600 m.
General Distribution : E. HIMALAYA; INDIA, (NEPAL - BHUTAN).
Note : 1. Endemic to E. Himalaya
2. Cultivated for ornamental

Berberis umbellata Wallich (cat, 40, n 1475. 1829, *nom, nud*) ex. G. Don gen syst 1: 116. 1831; Hook. f. & Thoms in Fl. India 224. 1855; in Fl. Brit. India 1: 110. 1872. Hara in Fl. E. Him. 93. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 31. 1979; Sharma *et al.* Fl. India 1: 389.1993

Shrubs small spiny stems with young shoots depressed. Spines sometime absent, 3-fid rarely 1. **Leaves** oblanceolate to obovate, membranous, to mucronate usually de-current to shortly cuneate at base, sparingly serrulate, along margin densely papillose. **Inflorescence** 3 - 6 flowered rarely 10 flowered, subumbellate; bracts ovate acute. **Sepals** 6, in usually 2 series outer sepals ovate acute inner sepals obovate; **petals** yellow, 6, in 2 series obovate cuneate entire stamens 6, free; ovary simple ovules stipitate, stigma flat subsessile. **Berries** oblong ellipsoid, bright red; **seeds** dark brown,

Flower : March-June *Fruit*: August – September
Exsiccatus : Rachela 2950 m, *SR Lepcha & AP. Das* 31056, Dated 02.10.2004.
Status : Fairly common
Local Distribution : Panglakha, Singhaney, Zuluk below, 2900 – 4200 m.
General Distribution : HIMALAYAS; INDIA (Gharwal - Sikkim), BHUTAN, NEPAL.
Note : Endemic to the Himalaya.

Mahonia Nuttall

Mahonia nepaulensis Prain in Journ. Asia. Soc. Beng. 64: 316. 1895; G. Taylor, Meconopsis 39, t. 7. 1934; Hara in Fl. E. Him. 104 1966; 3: 43. 1975; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 37. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 406 . 1984; Sharma *et al.* Fl. India 1: 411-412. 1993. *Mahonia acanthifolia* G. Don., Gen. Syst. 1: 118. 1831; Guha Bakshi in Sharma *et al.*, Fl. India 1: 407. 1993.

Shrubs erect or small trees upto 4 m tall. **Leaves** oblong-lanceolate; stipules filiform; leaflets 8 - 11 pairs, lowermost pair smaller, semicircular; lateral leaflets 4 - 5.6 cm long, oblong-ovate, margin spinulose; **Inflorescence** racemose upto 20 cm long, in fascicles of 3 - 4; bracts 2 - 3 cm long. **Calyx** in 3 series; outer upto 0.2 cm long, broadly ovate, acute; median calyx to 0.4 mm long, ovate, obtuse; inner ones to 0.6 cm long, oblong-elliptic, 2-lobed at apex. **Stamen** conical apiculate at apex. **Ovules** 2 - 4; **Berries** to 1cm long, ovoid, blue-black.

Flower : October - December *Fruit*: January - May
Exsiccatus : Phusrey 2150 m, *SR Lepcha & AP. Das 31180*, Dated 03.10.2004.
Status : Less Common.
Local Distribution : Dohrok, 1800 - 2700 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL - BHUTAN.
Note: 1. Endemic to Eastern Himalaya.
 2. A potent medicinal plant.

LARDIZABALACEAE Decne.

Holboellia Wallich

Key to the varieties:

1. Leaves digitately 3 - 9 foliolate; leaflet ovate, oblong, or ovate-lanceolate ... *var. latifolia*
- + Leaves digitately 7 - 9 foliate; leaflet lanceolate *var. angustifolia*

Holboellia latifolia Wall., Tent. Fl. Nepal 24. t. 16. 1824; Hook. f & Thoms., in Hook.f., Fl. Brit. India 1: 108. 1872; Hara *et al.*, Fl. E. Him. 2: 34. 1971; Grierson & Long, 1(2): 330. 1984; Sharma & Hajra, Fl. India 1: 423. 1993.

Var. latifolia

Local Name: Gofla (Nep.).

Shrubs evergreen, climbing upto 5.5m tall. Stem usually twinning at apical portion. Leaves digitately 3 - 9 foliolate; Leaflets lamina 3.5 - 13 × 1.5 - 5cm, 3(-9), ovate, oblong, or ovate-lanceolate, leathery, base widely cuneate, margin entire, apex acute, main veins not impressed **Inflorescence** raceme, 3 - 7 flowered, in axillary fascicles; peduncles shorter than petioles filiform, purplish. **Flower** green or purplish green, sweet scented. **Calyx** 6 in 2 series, the outer 3 valvate, the inner 3 imbricate, oblong elliptic, green or purplish. **Corolla** 6, orbicular, brownish red; anthers apiculate. **Staminodes** minutes; carpel free, stigma sessile. **Fruits** monocarpelary, pear shaped red. **Seeds** orbicular, obovoid, blackish.

Flower : April - May *Fruit*: June - September
Exsiccatus : Jorepokhri 2700 m, *SR. Lepcha & AP. Das 31081*, 07.10.2004
Status : Abundant upto 3100m.
Local Distribution : Singaney, Padamchen, Premlakha, 2100-3100m.
General Distribution : HIMALAYAS; INDIA (KUMAON-NEFA), Manipur, Meghalaya, N Assam; W. CHINA.

Note : Fruits edible & the roots are used in treatment of rheumatism.

var. angustifolia (Wallich) Hk.f. *et* Thoms. in Fl. Bhutan India 1: 108. 1879; Hara *et al.* Enum. Fl. Pl. Nepal 2: 32. 1979; Grierson & Long, Fl. Bhutan 1(2): 330. 1984; Fasc. Fl. Ind. 19: 34. 1988. *H. angustifolia* Wallich, Tent. Fl. Nep. 25, t.17. 1824.

Local Name: Gofla (Nep.).

Similar to var. *latifolia* but leaves digitate with 7 - 9 leaflets, lamina 22 -13 x 0.4 - 6.5 cm, lanceolate, narrow, entire to crenate, base cuneate. Flowers 3 - 5 in axillary fascicles, rarely raceme, pendulous. Tepals 5, ovate-elliptic to lanceolate, greenish white or greenish-purple, glabrous, sparsely hairy; stamens free.

Flower : April - May Fruit: Aug. - Nov.
Exsiccatus : Rachela below near Jorpokhari 2980 m, SR Lepcha & AP. Das
03011, dated 11. 09. 2004.
Status : Abundant
Local Distribution : Rachela Park, Jaributti, Jorpokhari, 2000-3000m.
General Distribution : HIMALAYAS (Kumoan-Arunachal Pradesh), Meghalaya, Manipur),
Note : Endemic to Eastern Himalaya.

MENISPERMACEAE A.L. Jussieu

Stephania Loureiro

Key to the species :

1. Leaf ovate, peltate; fruits globose *S. glandulifera*
+ Leaf elongate-deltoid; fruits obovate *S. elegans*

Stephania elegans Hook.f. et Thoms., Fl. Ind. 1: 195. 1855; in Fl. Brit. India 1: 103. 1872; Hara in Fl. E. Him. 96. 1966; 2: 36. 1971; Kitamura in Enum. Fl. Pl. Nepal 2: 28. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 337. 1984; Sharma *et al.*, Fl. India 1: 333. 1993.

Twinnings, slender, shrubby, with tuberous root-stock. Stem terete, ridged, glabrous. **Petioles** to 4.5 cm long; **lamina** 3.5 - 11 x 2 - 5.5 m, elongate-deltoid, entire, acute, rounded-truncate at base, light green, glabrous, 5-7 nerved. **Cymes** axillary, umbellate. Peduncles upto 5cm long. **Flowers** purple-green, smelly. **Male flowers**: sepals to 0.5 cm, obovate, acuminate; petals shorter than sepals, broadly ovate, purple. **Female flowers**: sepals 0.50 x 0.4cm, obovate; petals minute, obovate. **Drupe**s obovoid, fleshy, reddish on ripening.

Flower : May - September Fruit: October - November.
Exsiccatus : 2300m, SR Lepcha & AP. Das 01600, dated 25.07.2004.
Status : Common.
Local Distribution. : Phusrey, Dorok, Hattichery, 1400 - 2100m.
General Distribution. : HIAMALAYA;INDIA (Gharwal to Assam), Khasia, Naga hills.
Note : Endemic to Himalaya.

Stephania glandulifera Miers, Contr. Bot. 3:220. 1871; Hara in Fl. E. Him. 1:95. 1966; 2: 36. 1971; Kitamura in Hara, Enum. Fl. Pl. Nepal 2: 28. 1879; Whitmore in Enum. Fl. Pl. Nepal 2: 28. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 37. 1984; Sharma *et al.* in Fl. India 1:334. 1993. *Stephania rotunda* auct. non Lour.: Hook.f. & Thoms., Fl. India 197. 1855; in Fl. British India 1: 103. 1872 p.p., non. Lour.

Local Name: *Kunthey Paam* (Lep) *Tamarkay* (Nep.).

Twinners perennial with tuberous rootstock. **Petioles** long, upto 10.5 cm; **lamina** 3.5 - 10 x 3.5 - 9cm, peltate, ovate, subacute to acute, rounded at base, margin entire to crenate, glabrous on both

surfaces. **Inflorescence** umbellate cymes, axillary on leafless branches. Peduncles upto 7.5cm long. **Calyx** in male flowers obovate, glandular papillose near apex; **Corolla** absent; terminal column to 0.4cm across; female flowers similar to male ones. **Fruits** globose.

- Flower* : February – May *Fruit*: August – November.
Exsiccatus : Below phusrey, 2300m, *SR Lepcha & AP. Das 301*, dated 13.10.2004.
Status : Less Common.
Local Distribution. : Phusrey, Dorok, Hattichery , Premlakha 500 – 2100m.
General Distribution. : E.HIMALAYA; INDIA, (NEPAL to BHUTAN) and Assam.
Note: 1. Endemic to the Eastern Himalaya
 2. The Root-bulb is used as a drinking pot for poultry to prevent from diseases.

PAPAVERACEAE A.L. Jussieu

Key to the Genera:

1. Leaves elliptic, oblong, lanceolate; placenta attached to style *Meconopsis*
 + Leaves broadly ovate; placenta attached to stigma *Carthartia*

Carthartia Hooker

Carthartia villosa Hook.f., in Bot. Mag. t. 4596 .185 –Phot.-Alb. Fl. E. Himal. F. 174 & 175. 1968; Hook.f. & Thoms. in Hook.f., Fl. Brit. India 1: 119. 1872; Long in Grierson & Long, Fl. Bhutan 1(2): 409. 1984. *Meconopsis villosa* (Hook.f.) G.Taylor in Taylor & Cox, Account Mecopnop. 28, 1934; Hara in Fl. E. Him. 105. 1966.

Herbs perennial, with persistent withered leaf bases upto 1.5m tall. **Stem** erect, usually unbranched, brownish villous throughout. Petiole upto 22cm; stem leaves smaller, upper ones sessile. **Leaves** lamina 5 - 13 x 6 - 16cm, broadly ovate, palmately lobed; basal leaves few, broadly or suborbicular, palmately 3 – 5 lobed. **Inflorescence** in solitary , terminal and axillary, 1 -5 per stem. Born on slender stem. **Corolla** 4, suborbicular, yellow. **Ovary** cylindric, glabrous bearing sessile, stigma 4 -7 radiating lobes **Capsules** cylindric.

- Flower & Fruit* : May - July
Exsiccatus : Panglakha, *SR Lepcha & AP. Das 32967*, 27.07.2005.
Status : Less Common.
Local Distribution : Thegu, Changu lake.2800 – 4000m.
General Distribution : EASTERN HIMALAYAS. INDIA
Note : Endemic to Eastern Himalaya.

Meconopsis Viguier

Key to the species:

1. Leaves lanceolate, ovate or oblong, Corolla yellow *M. paniculata*
 + Leaves elliptic, Corolla red, purple or blue *M. napaulensis*

Meconopsis napaulensis DC. Syst. Nat. 2: 21. 1821, excl. *B. takera* in note. B. C. Eding.6: 216, t. 1-2, 33, f. 1-5 1917; Hiroshima in Fl. E. Him. 94. 1966; Fl. E.Him.(3): 43.1972 Hara *et al.*, Enum. Fl. Pl. Nepal 2: 31. 1979; Long in Grierson & Long, Fl. Bhutan 1(1): 406.1984.

Shrubs monocarpic, large, upto 2.5m tall. Stem, stiffy brownish villous throughout. **Leaves** lamina 25 - 40 x 6 - 22cm, rosette leaves, elliptic, deeply pinnatifid, rarely pinnatisect on base, lobes ovate oblong, acute or obtuse, coarsely crenate or serrate; **basal leaves** often more strongly pinnatisect, segments oblong with large rounded teeth. **Inflorescence** in solitary cymes in short branches, flowers many, pendulous. **Corolla** red, purple or blue. **Capsules** oblong - ellipsoid,

Flower & Fruit : July - September.

Exsiccatus : Panglakha, **SR Lepcha & AP. Das 30980**, dated 27.07.2005.

Status : Less Common.

Local Distribution : Thegu, Changu lake, Rachel, Panglakha 2700 - 3600 m.

General Distribution : E. HIMALAYA; INDIA (NEPAL - BHUTAN), S. TIBET, W. CHINA.

Note : 1. Endemic to Himalaya

2. Root stock highly poisonous (Grierson & Long, 1984).

Meconopsis paniculata (D. Don) Prain in Journ. Asiatic. Soc. Bengal 64 f: 316. 1895; Hara & Ohashi in Fl. E. Him. 1: 104. 1966; Hara *et al* Fl. E. Him. (3):43.1972; Hara *et al*. Enum. Fl. Pl. Nepal 2: 37. 1979; Grierson & Long Fl. Bhutan 1(1):406.1984. Sharma *et al*. Fl. India ; (2): 21. 1993. *Papaver paniculatum* C. Don, Prodr. 197. 1825 p.p. *Meconopsis napaulensis* sensu Hook. f., *et* Thoms., Fl. Brit. India 1: 118. 1872 (ut *nipalensis*) non DC.

Shrubs gregarious upto 2 m tall. Stem hairy. **Leaves** lamina pinnately lobed, lanceolate; **basal leaves** in rosette, upto 40 cm, upper ones clasping on stem, margins variously cut into lobes, lobes lanceolate with long spiny tip, densely shining hairy both sides. **Inflorescence** in solitary, in short branches, flowers yellow, upper one stalked, lower ones on branched stalks; **Calyx** 2, falling before opening of buds. **Corolla** 4, upto 5 cm, rounded, yellow; stamens 4; ovary superior. **Capsule** ellipsoid-oblong, splitting by pores or valves, densely bristly-haired.

Flower & Fruit : June - November

Exsiccatus : Kupup 3900 m, **SR Lepcha & AP. Das 31076**, dated 07.10.2004.

Status : Less Common.

Local Distribution : Changu lake, Sherathang, Rachel, kupup, 3350 - 4260 m.

General Distribution : E. HIMALAYA (Gharwar - NEFA).

Note : 1. Endemic to Himalaya

2. An ornamental plant.

FUMARIACEAE DC.

Key to the Genera:

1. Climber; flowers actinomorphic *Dicentra*
 + Herbs erect or diffuse; flowers zygomorphic *Corydalis*

Dicentra Bernhardi (nom. cons.)

Key to species:

1. Flowers 7 - 10; capsule ovoid - ellipsoid *D. scandens*
 + Flowers 2 - 6; capsule cylindrical *D. lichiangensis*

Dicentra scandens (D. Don) Walpers, Repert. 1: 118. 1842; Hook.f., Fl. Brit. India 1: 121. 1872, p.p.; Hara *et al*. Enum. Fl. Pl. Nepal 2:35.1975; Long in Grierson & Long, Fl. Bhutan 1(2):382 - 383.1984; Ellis & Balakrishnan in in Sharma *et al*., Fl. India 2: 79. 1993. *Dielytra scandens* D.

Don, Prodr. Fl. Nep. 198. 1825. *Dactylicapnos thalictrifolia* Wallich, Tent. Fl. Nep. 51. t.89. 1826. *Dicentra thalictrifolia* (Wall.) Hook.f. & Thomson, Fl. Ind. 272. 1855.

Climbers perennial, upto 3 - 4m tall. Stems grooved. **Leaves** lamina 3.4 – 5.5 cm long, ternately, compound; petioles short *ca* 2.5 cm long; leaflets ovate-elliptic or ovate-spathulate, obtuse, apiculate, base cuneate. **Inflorescence** in cymes with flowers *ca* 1.5cm long, yellow, rarely purple, 7 – 10 flowered; bracts lanceolate; pedicels filiform. **Calyx** triangular, ovate, acuminate, caducous. **Corolla** yellow, acute. Ovary oblong, with slender style and quadrangular flattened stigma. **Capsules** 11 - 18 mm long, many-seeded, ovoid - ellipsoid.

Flower : June – September *Fruit*: September – October
Excisscatus : Rachela 2950 m, *SR Lepcha & AP. Das 20224*, dated 29.10. 2004.
Status : Sparse or Less commn.
Local Distribution : Kyongnosla, Changu, 2500 – 3050 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, INDIA, MYANMAR, CHINA.

Note : An important folk medicine.

Dicentra lichiangensis Fedde, in Fedde Repert. xvii.199.(1921); Long in Grierson & Long Fl. Bhutan 1(2): 383. 1984.

Climber, slender, upto 3m. **Leaves** biternate; lamina of leaflets 2 - 3 x 0.7 – 2 cm, narrowly ovate or elliptic, obtuse and acuminate, base cuneate, 7 - 10 nerves. **Inflorescence** in corymbose cymes, flower 2 - 6, peduncle 3 - 5 cm. bracts linear – lanceolate, 3 – 9 x 0.8 mm, mostly ciliate dentate. **Calyx** similar to bracts but oftenly shorter upto 5mm, yellow in outer side, upto 13 mm. with auricle at base. Nectariferous glands upto 4mm, oftenly slender, curving upwards. **Capsules** cylindric.

Flower & Fruit : April – August
Excisccatus : Panglakha 3050 m, *SR Lepcha & AP. Das 31015*, dated 07.10.2004.
Status : Sparse or less common
Local Distribution : Rachela, Padamchen 2500 m and above.
General Distribution : BHUTAN.

Note : 1. New distribution record for Sikkim
 2. Endemic to Eastern Himalaya

Corydalis Ventenat (*nom. cons*)

Key to the Species:

- 1. Stem less than 50 cm tall; petals spurs slender 2
- + Stem more than 50 cm tall; petals spurs broad *C. flaccida*
- 2. Stem leaves simple, opposite 3
- + Stem leaves branched, alternate 4
- 4. Flower small; corolla spur tip deflexed *C. leptocarpa*
- + Flower large; corolla spur not deflexed *C. changuensis*
- 3. Herb upto 15 cm; stem leaves solitary 5
- + Herb taller than 15cm; stem leaves 2 -4 6
- 5. Stem with short axillary shoot; racemes 5 - 20 flowered *C. polygalina*
- + Stem without axillary shoot; racemes 10 - 15 flowered *C. sikkimensis*
- 6. Bracts obovate; capsule cylindric 7
- + Bracts linear or lanceolate; capsule obovate or oblong 9
- 7. Herbs upto 40cm tall 8
- + Herbs upto 15cm tall *C. fillicina*

8. Inflorescence with very few flowered *C. longipes*
 + Inflorescence with many flowered *C. ophiocarpa*.
 9. Bracts lanceolate, capsule obovate *C. Chaerophylla*
 + Bracts linear ; capsule oblong *C. juncea*

Corydalis flaccida Hook.f. & Thoms., Fl. India 260.1885; in Fl. Brit. India 1: 122.1872; Hara *et al.* Enum. Fl. Pl. Nepal 2: 33.1979; Long in Grierson & Long Fl. Bhutan 1(2): 389.1984; Sharma *et al.* Fl. India 2: 56. 1993.

Herbs erect upto 1m tall. **Leaves** basal very few and broad, 3 - 4pinnatisect, segments ovate, bluntly toothed, obtuse or apiculate. Stem leaves numerous, often sessile.

Inflorescence in racemes 25 - 7.5cm, oblong 9 - 22 flowered. **Bracts** lower pinnatifid, upper linear toothed. Pedicels oftenly equaling bracts. **Calyx**s broadly ovate, cordate acute, dentate. **Corolla** purplish, outer pair broadly crested, slightly upwardly curved spur. **Capsules** linear.

- Flower* : June *Fruit*: July
Exsiccatus : Bhimbase 4200 m, **SR Lepcha & AP. Das**1988, dated 20. 10. 2005
Status : Frequent
Local Distribution : Changu, Serathang. 3100 - 4600 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR.

Corydalis leptocarpa Hook. f. & Thoms., Fl. India 1: 260. 1855; Hook.f., in Fl. Brit. India 1: 122. 1872; Fl. E. Him. 2: 40. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 2: 34. 1979; Long in Grierson & Long, Fl. Bhutan 1(2): 389. 1984. Ellis & Balakrishnan in Sharma *et al.*, Fl. India 2: 65. 1993.

Corydalis leptocarpa Hook. f. & Thoms., Fl. India 1: 260. 1855; Hara, Fl. E. Him 2: 40. 1971; Hara *et al.* Enum.Fl. Pl. Nepal 2: 34. 1979.

Herbs annual diffused upto 20 cm tall. Stem glabrous. Petiole 2 - 5.5cm long. **Leaves** bipinnate; **lamina** of leaflets 1.5 - 2.5 x 0.5 - 2.5cm, ovate-elliptic, crenately lobed, glabrous, pale beneath, nerves not so prominent. **Inflorescence** in racemes 2 - 4 cm, 5 - 8 flowered. Bracts obovate. **Flowers** 2 - 4 cm long. Corolla spurred (spurs tip deflexed), upper pair crested, purple or pinkish red. **Capsules** linear.

- Flower* : March *Fruit*: June.
Exsiccatus : Singhaney 2590 m, **SR Lepcha & AP. Das** 0199, dated 20.10. 2005.
Status : Sparse or Less common
Local Distribution : Dohrok, Hangey, Tungya. 1400 - 2500m.
General Distribution : INDIA ,NEPAL, BHUTAN, MYANMAR, CHINA.

Corydalis chaerophylla DC., Prodr. 1: 128. 1824; Hook.f., Fl. Brit. India 1: 126. 1872; Long in Grierson & Long, Fl. Bhutan 1(2): 393. 1984; Ellis & Balakrishnan in Sharma *et al.*, Fl. India 2: 44. 1993.

Herbs perennial, erect, upto 1.3m tall. **Stems** grooved, glabrous to crispate pubescent below. **Lamina** 9 - 15 x 7-14 cm, broadly ovate, long-petiole, bipinnatisect; pinnae sessile, decurrent; segments oblong, obtuse; cauline leaves confined to upper part of stem, petiolules sheathing at base. **Inflorescence** in terminal racemes, up to 20cm, few flowered, rarely dichotomously branched panicles. **Flowers** golden yellow; pedicels upto 3mm long; bracts 3 - 4mm long, ovate-orbicular, serrulate. Outer pair of corolla apiculate, crested; **upper petal** upto 13 mm long; spur straight, nectariferous; lower corolla without a prominent basal pouch. **Ovary** glabrous; style rather flattened and grooved. **Capsules** 2-5 seeded, obovoid or ellipsoid.

Flower & Fruit : May-November
Exsiccatus : Lam-pokhri 4350 m, *SR Lepcha & AP. Das 30936*, dated 26.07.2005.
Status : Common
Local Distribution : Changu, Kyongnosla, Nathang 3500 – 4500 m.
General Distribution : HIMALYAS; INDIA(Kumaon – Sikkim), and Naga Hills, BHUTAN
Note : Endemic to Himalaya.

Corydalis juncea Wall., Tent. Fl. Nap.54, t, 42, f.dextra.1826: Hook.f. & Thoms in Fl. Brit. India 1: 123. 1972; Hara in Fl.E.Him.2: 40.1971; Hara *et al.*Enum. Fl. Pl. Nepal 2: 34.1979; Long in Grierson & Long Fl. Bhutan 1(2):393.1984.

Herbs slender upto 35 cm tall. **Basal leaves** often solitary, biternate, on long petiole upto 10cm ; leaflets variable, simple , elliptic, more often deeply palmatisect, with linear to obovate segments. **Stem leaf** usually solitary, linear, entire. **Inflorescence** in raceme of 5 - 20 flowered. **Bracts** linear, entire. **Pedicels** equaling or exceeding 5 –20 flowered. **Upper petal** 8 – 12mm, including short kneel broadly crested. **Lower lip** usually deflexed, crested. **Capsules** oblong.

Flower & Fruit : June – September.
Exsiccatus : Bhimbase 4350 m, *SR Lepcha & AP. Das 31430*, dated 27.07.2005.
Status : Common.
Local Distribution : Changu lake, Bombay hill (KAS), 3600 – 4600 m.
General Distribution : HIMALAYAS; INDIA, NEPAL to BHUTAN.
Note : Endemic to E. Himalaya

Corydalis filicina Prain in J. Asiat. Soc. Bengal ii, 65(2): 30. 1896; Long in Grierson & Long. Fl. Bhutan 1(1): 396. 1984; Ellis & Balakrishnan in Sharma *et al.* Fl. India 2: 55.1993.

Herbs perennial, upto 15cm tall. **Petiole** upto 3cm. **Lamina** 1.5 – 2.5 x 1.5 – 2cm ,ovate, finely biternatisect; terminal leaflets larger than lateral, pinnate, segments obovate mucronate, upto 2.5mm broad. **Inflorescence** in dense racemes with 10 - 20 flowered. **Bracts** lower upto 6mm, pinnatisect, upper bracts linear upto 4mm, entire. **Pedicel** slender. **Flowers** larger, yellow, upper calyx curved to 17mm, not crested; spur straight.

Flower : July – September.
Exsiccatus : Yakla 3700 m, *SR Lepcha & AP. Das 0198*, dated 19. 10. 2005.
Status : Common
Local Distribution : Nangpo cho, Jalepla. 3200 – 4500 m.
General Distribution : INDIA NEPAL, BHUTAN.
Note : Endemic to Eastern Himalaya.

Corydalis polygalina Hook.f. & Thoms. in Fl. Brit. India 1: 123 .1872; Long in Grierson & Long Fl. Bhutan 1(1): 393. 1984; Ellis & Balakrishnan in Sharma *et al.* Fl. India 2:69.1993

Herbs slender tuberous, upto 35 cm tall. **Stem** with short axillary shoots. **Leaves** basal with pinnatisect or ternatisect into linear – lanceolate segments short upto 2.5cm, stem leaves upto 5, similar but shortly petiolate or sessile ; lower bract usually pinnatisect; upper bracts entire, upto 14 mm, pedicel much exceeding bracts. **Racemes** 5 - 20 flowered. **Corolla** c 14mm including broad spur half its length, keel with broad crest narrowly decurrent along spur.

Flower : June – September.
Exsiccatus : Dokala 4050 m, *SR Lepcha & AP. Das 10680*, dated 03. 17. 2004.
Status : Common
Local Distribution : Changu, Jalepla, Nathula. 3600 – 4600 m.
General Distribution : INDIA, NEPAL, BHUTAN, CHINA, TIBET.

Corydalis opiocarpa Hook.f. & Thoms. in Hook. f., Fl. Brit. India 1: 122. 1872; Long in Grierson & Long., Fl. Bhutan 1(1): 397. 1984; Ellis & Balakrishnan in Sharma *et al* Fl. India 2: 68. 1993

Herbs erect upto 1m tall. **Stem** with short axillary shoots. **Leaves** basal, lamina 8 – 17 x 5 – 13 cm, numerous when young, ovate triangular, bipinnatisect on flattened petiole upto 13 cm, ultimate segments obovate, obtuse or mucronate. Stem leaves numerous, smaller. **Inflorescence** in racemes with many flowered;. **Bracts** lanceolate, pointed, entire. **Calyx** suborbicular. **Upper petal** upto 14mm, included spur, lip winged but not crested. Lower lip equaling upper. **Capsules** linear, strongly undulate.

Flower & Fruit : June
Exsiccatu : Neora phatak 2700 m, **SR Lepcha & AP. Das** 27785, dated 30.09. 2004.
Status : Common
Local Distribution : Changu, Singhaney, Kupup 3000 – 3300m.
General Distribution : HIMALAYA; INDIA, BHUTAN, CHINA.

Corydalis longipes DC., Prodr. 1: 128. 1824; Hara in Fl. E. Himal. 103. 1966; Hara *et al.*, Enum Fl. Pl. Nepal 2: 34. 1979; Long in Grierson & Long Fl. Bhutan 1(2): 396. 1984.

Herbs with diffused stem, upto 35cm tall. **Lamina** 0.5 – 2.5 x 2 – 3.5 cm, slender, numerous, oftenly borne on stems, ovate in outline, ultimate segments obovate or oblanceolate. **Inflorescence** in lax racemes, very few flowered. Lower bracts deeply toothed upper entire. **Calyx** suborbicular, dentate. **Corolla** yellow, 11-14 mm including upwardly curved slender spur 5 – 7.5 mm long, broad at base: **upper lip** with low, entire crest not decurrent on spur: **lower lip** equalling upper; nectariferous gland one third to one half the length of spur. **Capsule** linear with single row of seeds.

Flower & Fruit. : June – September.
Exsiccatu : Bhimbase 4350 m, **SR Lepcha & AP. Das** 31489, dated 27.07.2005.
Status : Common.
Local Distribution : Serabthang, Baba Mandir and above 3800 – 4300 m.
General Distribution : HIMALAYAS; INDIA, (Sikkim to BHUTAN), MYANMAR.

Corydalis sikkimensis (Prain) Fedde, Fedde Repert. Spec. Nov. 17: 201. 1921; Long in Grierson & Long. Fl. Bhutan 1(2): 398. 1984; Ellis & Balakrishnan in Sharma *et al.* 2: 71. 1993. *C. duthiei* Maxim var. *sikkimensis* Prain in Journ. Asiat. Soc. Bengal, 65(2): 33. 1896.

Herbs, erect or diffused with decumbent stem, 12 – 22 cm tall. **Leaves** radical 7.5 – 15 cm long, pinnatisect with 4 -5 pairs of lateral and one terminal pinne; cauline leaves 2 -4, rarely 1, often in subopposite pairs, similar but smaller than radical leaves. **Racemes** 10 – 15 flowered, subcorymbose. **Flowers** 15 – 20 mm long, yellow, spur straight to subfalcate. **Capsules** to 13 mm long, narrowly, obovate – oblong; seeds shiny, smooth.

Flower & Fruit : July – September.
Exsiccatu : Sherathng 4000 m, **Sinha & Shukla**, 20552, dated 17. 10. 2005.
Status : Common.
Local Distribution : Changu, Jalepla. Upto 4500 m.
General Distribution : E. HIMALAYA; INDIA, (Sikkim to BHUTAN).
Note : Endemic to Eastern Himalaya

Corydalis changuensis D.G. Long in Notes Roy. Bot. Gard. Edinburgh, 42(1): 102. 1984; Long in Grierson & Long. Fl. Bhutan 1(2): 397. 1984.

Herbs upto 25 cm tall, much branched. **Leaves** many, born on stems; petiole slender to 4 cm long; broadly ovate, lamina 1 – 2.3 x 1.2 – 2.8 cm, deeply or equally biternatisect. **Racemes** lax, few flowered. **Flower** larger, upper petal 13 – 16 mm, less strongly curved upwards; spur longer and broader, 5 – 9 x 2 – 3 mm, with crest extending almost tip of spur; lower lip with short spur, to 1.2 mm; nectariferous gland much longer to 6 mm long.

- Flower & Fruit* : July – September.
Exsiccatus : Sherathng 4000 m, *Sinha & Shukla*, *BHSI 20539*, dated 17.10. 2005.
Status : Common.
Local Distribution : Changu, Baba mandir, 4000 – 4300 m.
General Distribution : E. HIMALAYA; INDIA (Sikkim).
Note : Endemic to Sikkim.

DAPHNIPHYLLACEAE Muell.

Daphniphyllum Blume

Daphniphyllum himalense (Benth.) Muell. in DC., Prodr. 16(1): 113. 1869, p.p.; Hook.f., Fl. Brit. India 5: 354. 1887, p.p.; Hara in Fl. E. Him. 1: 184. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 200. 1982; Long in Grierson & Long, Fl. Bhutan 1(3): 814. 1987. *Goughia himalensis* Benth. in Hook. Journ. Bot. Kew. Misc. 6: 9. 1854.

Local Name: Lal Chandan (Nep.).

Tree evergreen upto 12 m tall. **Leaves** ; petioles 1.4 - 2.5; lamina 4.2 x 1.8 - 2.8 cm, oblanceolate, entire, acute, base attenuate, coriaceous, glaucous below. **Flowers** in axillary racemes of 3 - 8 cm, unisexual; **perianth** absent; **male flowers** with 5 stamens; filament free; anthers 0.25 x 0.1 cm, narrow, dorsally compressed, apiculate; **female flowers** with 2-chambered superior ovary; ovules 2 in each chamber; styles thick, recurved. **Drupe** 0.5 - 1 x 0.3 - 0.5 cm, ellipsoid with almost round tip, one seeded.

- Flower* : May – July *Fruit*: September – December
Exsiccatus : Rachela below *SR Lepcha & AP. Das 27716*, Dated 20.15.2006.
Status : Rare.
Local Distribution : Durpin dara , Panglakha. 2195 – 2280 m.
General Distribution : INDIA (Darjeeling, Sikkim, Meghalaya), NEPAL, BHUTAN, S. TIBET, MYANMAR.

MORACEAE Link

Key to the Genera:

1. Leaves vein 3- 15; Style bifid or rarely simple *Ficus*
 + Leaves veins 3- 5; Style strictly simple *Morus*

Ficus Linnaeus

Key to the species:

1. Trees or shrubs upto 10 m tall 2
 + Trees upto 20m tall *F. benjamina*

2. Leaves broadly ovate; lateral nerves 3 - 6 pairs *F. auriculata*
 + Leaves lanceolate or elliptic-lanceolate; lateral nerves 5 - 6 pairs *F. nerifolia*

Ficus auriculata Lour., Fl. Cochinch. 666. 1790; Gard. Bull. Singap. 18: 33. 1960; Hara in Fl. E. Him. 1: 53. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 209. 1982; Grierson & Long, Fl. Bhutan 1(1): 92. 1983. *F. roxburghii* Wall. [Cat. No. 4508. 1831, *nom. nud.*] *ex* Miq. in Ann. Mus. Lugd.-Bat. 3: 296. 1867; King in Fl. Brit. India 5: 534. 1885.

Local Name: Kundong kung (Lep.) Nebhara (Nep.).

Tree 8- 10 m tall. **Leaves;** petioles 5.5 – 10 cm long; **stipules** triangular; **lamina** broadly ovate or rounded, 13 - 24 x 8 - 23 cm, acute or mucronate, base deeply cordate strongly 5- 7 nerves, margins toothed or rarely entire, upper surface glabrous, Lower sparsely pubescent, lateral nerves 3 - 6 pairs, raised beneath, ; **peduncles** 3cm long, borne on short leafless branches. **Male flowers** with 1-3 stamens **Female flowers** ovary oblique; receptacles turbinate; **style** simple. **Achene** in **Figs** viscid.

Flower & Fruit : April – September

Exsiccatu : Haticherey – Mulkharkha 1850m, *SR Lepcha & AP Das 2100*, dated 20.03.2004.

Status : Common.

Local Distribution : Mulkharkha, 900 – 1700 m.

General Distribution : HIMALAYAS; INDIA, BHUTAN, MYANMAR, CHINA.

Notes : Domesticated for the fodder.

Ficus benjamina L., Mant. Pl. 129. 1767; Fl. Brit. India 5: 508. 1888; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 209. 1979; Lebbis in Enum. Fl. Pl. Nepal 3: 209. 1982; Grierson & Long, Fl. Bhutan 1(1): 95. 1983

Local Name: Lungzyi kung (Lep.) Kabra (Nep.).

Trees upto 20m tall. **Branches** usually drooping. **Petioles** 1.3 - 2.8 cm long; **lamina** ovate-elliptic, 4.5 - 13 x 5 – 6.5 cm, abruptly acuminate, base cuneate or rounded, glabrous, veins many and parallel. **Figs** globose, orange-red when mature, sessile, axillary; **bracts** usually 3, upto 0.2cm.

Flower & Fruit : October– April

Exsiccatu : Haticherey - Phusey 1600 m, *SR Lepcha & AP. Das 2200*, dated 20.07.2004.

Status : Common.

Local Distribution : Rachela middle, NNP, 1600 – 2300 m.

General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, CHINA, PHILIPPINES, NEW GUINEA.

Note : 1. Dried juvenile buds are used in local pickle.

2. Plant strictly endemic to Eastern Himalaya

Ficus nerifolia J.E. Smith in Rees, Cyclop. 14. no. 21. 1810; Hara in Fl. E. Him. 1: 54. 1966; Lebbis in Enum. Fl. Pl. Nepal. 3: 210. 1982; Grierson & Long, Fl. Bhutan 1(1): 95. 1983. *F. gemella* Wall. *ex* Miq. in Hooker's Lond. Journ. Bot. 7: 454. 1848. *F. nemoralis* Wall. *ex* Miq. var. *genella* (Wall. *ex* Miq.) King in ARBGC 1(2): 162. 1888; 5: 534. 1888.

Local Name: Syit kung (Lep.) Dudhilo (Nep.).

Shrub or small tree, to 10 m tall. **Branchlets** reddish. **Stipules** upto 1- 1.5 cm, lanceolate; petioles 1.5 – 2.2 cm long, light red; **lamina** lanceolate or elliptic-lanceolate, 8 – 13 x 2 – 4.5 cm, entire, sharply acuminate, base cuneate, glabrous both surfaces, lateral nerves 5 – 6 pairs, reticulation conspicuous and dark coloured beneath. **Figs** ellipsoidal-globose, usually sessile, rarely peduncled.

- Flower & Fruit* : June- February.
Exsiccatus : Phusrey below 2100 m, **SR Lepcha & AP. Das 2300**, dated 23.07.2004.
Status : Common.
Local Distribution : Phusrey below 1400 – 2250 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, CHINA.
Note : Leaves are good fodder; figs edibles.

Morus Linnaeus

Morus australis Poir. in Lamk., Ency. 4: 380. 1797; Makai in JAA 8: 236. 1927; Lebbis in Enum. Fl. Pl. Nepal. 3: 209.1982; Grierson & Long, Fl. Bhutan 1(1): 101. 1983. *M. indica auct.non L.*: Hook.f., Fl. Brit. India 5: 492. 1888.

Local Name: Sano Kimbu (Nep.).

Shrubs or **small trees**, deciduous upto 9m tall. **Leaves** alternate; petioles 1 – 2.5 cm; **Stipules** upto 1.5 cm, lateral; **lamina** 3 – 6.5 x 3 – 6 cm, ovate, caudate-acuminate, base cordate or rounded, coarsely serrate, rarely trilobed, pubescent beneath, upper surface minutely strigose. **Male spikes** to 3cm, axillary, perianth segments to 0.4cm; **stamens** 0.3cm. **Female spikes** shorter, perianth segments 4, short to 0.1cm, ovate., overlapping, becoming succulent in fruit; **style** bifid. **Fruiting spikes** purplish-black.

- Flower & Fruit* : March – May
Exsiccatus : Subaney dara 1750 m, **SR Lepcha & AP. Das 2800**, dated 23.08.2004.
Status : Sparse
Local Distribution : Subaney Dara 1500 – 1750 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.
Note : Inflorescence edible.

URTICACEAE A. Jussieu

Key to the Genera

- | | |
|---|--------------------|
| 1. Perennial herbs or shrubs or trees | 2 |
| + Annual herbs | 6 |
| 2. Stinging hairs present | 3 |
| + Stinging hairs absent | <i>Pilea</i> |
| 3. Leaves entire, crenate or serrate | 4 |
| + Leaves palmately 3-7 lobed | <i>Girardinia</i> |
| 4. Achene ellipsoid | <i>Boehmeria</i> |
| + Achene obliquely ovate or ovate..... | 5 |
| 5. Female flowers with equal perianth segments | <i>Urtica</i> |
| + Female flowers with unequal perianth segments | <i>Dendrocnide</i> |
| 6. Stinging hair present | <i>Laportea</i> |
| + Stinging hair absent | 7 |

7. Leaves apparently alternate *Elatostema*
 + Leaves opposite 8
 8. Stipule connate, axillary *Lecanthus*
 + Stipules free, lateral *Chamabainia*

Boehmeria Jacquin

Key to the species

1. Leaves lanceolate 2
 + Leaves ovate - elliptic or suborbicular *B. macrophylla*
 2. Flowers mostly aggregated in globose clusters *B. glomerulifera*
 + Flowers mostly in spikes *B. hamiltoniana*

Boehmeria hamiltoniana Weddell in Ann. Sci. nat. ser. 4, 1: 199. 1854; Monogr. Urt. 371. 1856; Hook.f. in Fl. Brit. India 5: 579. 1885; Symb. Sin. 7: 151. 1929; Hara & Ohashi in Fl. E. Him. 1: 56. 1966; Grierson & Long, Fl. Bhutan 1(1): 127. 1983.

Local Name: Kamley, Chiplay (Nep.).

Shrubs, robust upto 3 m tall. **Branches** slender and glabrous. **Leaves:** petioles 1 - 3cm long; lanceolate, lamina 5 - 12 x 3 - 6cm, margin crenulate or serrulate, acuminate, base cuneate or narrowly rounded, membranous, glabrous, basally 3-nerved, veins sparsely pubescent beneath. **Flowers** in spikes 10 - 12cm long, slender. **Achenes** ellipsoid, glabrous, with the crown of persistent style

Flower : September - November *Fruit:* November - February.
Exsiccatus : Phusrey 2100m, **SR Lepcha & AP. Das** 30267, dated 07.10.2004.
Status : Frequent.
Local Distribution : Dohrok, Phusrey, upto 2400 m,
General Distribution : Tropical HIMALAYAS; INDIA, Khasia and Mishmi hills, (NEPAL-BHUTAN).

Note: 1. Endemic to Himalaya
 2. Foliage are potential fodder for cattle.

Boehmeria glomerulifera Miquel in Zoll., Syst. Verz. Ind. Archip. 101, 104 1854; Hara *et al.*, Fl. Enum. Fl. Pl. Nepal 3: 200.1982; Grierson & Long, Fl. Bhutan 1(1): 124. 1983. *B. malabarica* Weddell in Arch. Mus. Hist. Nat. Paris 8: 355. 1855-56; Hook.f., Fl. Brit. India 5: 575. 1885.

Local Name: Kamle (Nep.).

Shrubs upto 3 m tall. Branches oftenly pubescent. **Leaves** alternate; petioles 2.5 - 6.2cm long; stipules upto 5.5cm, lanceolate; **lamina** 9 - 22 x 4 - 10 cm, ovate, acuminate, base rounded, margins crenulate or sometimes serrulate, glabrous and rugose on upper surface, minutely hairy lower. **Flowers** mostly aggregated in globose clusters, 0.5 - 0.9 cm in diam., pubescent, **female flowers** usually born on upper sides of old branches, males towards base.

Flower : March - July
Exsiccatus : Dohrok 2300m, **SR Lepcha & AP. Das** 30262, dated 07.10.2004.
Status : Frequent.
Local Distribution. : Dorok, Phusrey, Premlakha upto 2300 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, SRI LANKA.

Boehmeria macrophylla D. Don, Prodr. Fl. Nepal 60. 1825; Tuyama in Hara, Fl. E. Him. 56. 1996; Hara *et al.*, in Enum. Fl. Pl. Nepal 3: 200. 1982; Grierson & Long, Fl. Bhutan 1(1): 126. 1983.

Local Name: Kamley (Nep.).

Subshrubs monoecious or dioecious upto 3.5 m tall. **Leaves:** petioles to 10cm long, slender; stipules to 1cm, lanceolate; **lamina** ovate - elliptic or suborbicular, 5 - 22 x 3 - 12 cm, acuminate, rarely cuspidate, base rounded, rarely subcuneate or cordate, serrate or dentate teeth uniform, veins inconspicuous, arching upwards, subglabrous, pubescent. **Male spikes** to 13 cm long, branch at base. **Female spikes** usually simple, solitary, to 25 cm, rarely pendulous. **Achenes** ellipsoid, bearing hook style.

Flower & Fruit : April - August

Exsiccatus : Subaney 1800 m, *SR Lepcha & AP. Das 1350*, dated 15.09.2007.

Status : Frequent.

Local Distribution : Subaney, Premlakha, Above Talkharkha upto 2000 m.

General Distribution : SUBTROPICAL HIMALAYA; INDIA (Kumaon - Mishmi hills), Khasia Burma, Laos, TONKIN, & W. CHINA.

Note : Foliage used as fodder for cattle.

Chamabiana Wight

Chamabiana cuspidata Wight, Icon. t. 1981. 1853; Monogr. Urtic. 387, t.12: 1856; Hook.f. in Fl. Brit. India 5: 580. 1885; Hara & Ohashi in Fl. E. Him. 57. 1966; 3: 19. 1975; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 202. 1982; Grierson & Long, Fl. Bhutan 1(1): 128. 1983. *C. squamigera* Weddell in DC., Prodr. 16 (1): 218. 1869.

Local Name: Kurkuray Jhar (Nep.).

Herbs, creeping, slender, diffused. **Stem** pubescent. **Leaves** opposite; stipules 0.4 - 0.7 cm, 4 at base, broadly ovate, petioles upto 0.22cm; **lamina** 1.4 - 1.3 x 0.6 - 1.4 cm, ovate, serrate, acute, base rounded or cuneate, basally 3-nerved, pubescent. **Flowers** in axillary sessile 4-merous, male above, female below; **male flowers** shortly pedicellate, **perianth** deeply divided, lobes many and mucronate; **female flowers** with hirsute tubular perianth, minutely 4-toothed; stigma ovate, fimbriate, persistent. **Achenes** compressed and enclosed.

Flower & Fruit : March - November

Exsiccatus : Ramitey Dara (2900m) *SR Lepcha & AP. Das 31196*, dated 03.10.2004.

Status : Common

Local Distribution : Rachel below, Singhaney - Panglakha 1900 - 2450 m.

General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, SRI LANKA, MYANMAR, EAST TO CHINA, JAVA.

Elatostema J.R. & J.G.A. Forster

Key to the species

1. Herbs small upto 22 cm tall 2
- + Herbs or under-shrubs more than 22 cm tall 3
2. Leaves ovate - lanceolate; margin deeply serrate from middle 4
- + Leaves obovate, margin with few teeth at apex *E. obtusum*
4. Herbs creeping, slender, leaf oblong-elliptic, flower ciliate *E. hookerianum*

- + Herbs erect, leaves elliptic, flower hairy *E. sessile*.
 3. Leaves ovate – lanceolate; Rudimentary leaves present *E. monandrum*
 + Leaves elliptic-oblong; Rudimentary leaves absent *E. Sikkimensis*

Elatostema hookerianum Weddel, Monogr. Urtic. 309. 1856; Hook.f. in Fl. Brit. India 5: 567. 1885; Hara & Ohashi in Fl. E. Him. 58. 1966; 3: 20. 1975; Greirson & Long, Fl. Bhutan 1(2): 122. 1983.

Local Name: Sunol chim (Lep.)

Herbs, perennial, dioecious upto 40 cm tall. **Stem** glabrous, creeping. **Leaves** usually sessile, **lamina** 3.5 -8.5 x 1 - 3cm, obscurely oblong-elliptic, acuminate, base obliquely cordate-auriculate, margin serrate on upper half, basally 3 - 5 veined; stipules 0.40 - 0.85cm, linear. **Flowers** dioecious; bracts free in male heads, mucronate, that of female heads fused into a receptacle, ciliate. **Achenes** ellipsoid, irregularly ribbed.

Flower : April - June *Fruit:* July - September
Exsiccatus : Rachela 2950 m, **SR Lepcha & AP. Das 31088**, dated 02.10.2004.
Status : Abundant.
Local Distribution : Reshete, Chitray, Rachela Park, 1800 – 2600 m.
General Distribution : E. HIMALAYA; INDIA, (Darjeeling-Arunachal Pradesh), Meghalaya, Naga Hills, S. TIBET.

Note : Endemic to Eastern Himalaya

Elatostema monandrum (Buchanon-Hamilton ex D. Don) H. Hara, Fl. E. Himal. 3: 21. 1975; Hara et al., Enum. Fl. Pl. Nepal 3: 203. 1982; Grierson & Long, Fl. Bhutan 1(1): 122. 1983. *Procris monandra* Buch.-Ham. ex D. Don, Prodr. 61. 1825. *Elastotema surculosum* Wight, Icon. t. 2091, f. 4. 1853; Hook.f. in Fl. Brit. India 5: 572. 1888; Hara in Fl. E. Him. 59. 1966, p.p. *E. surculosum* var. *elegans* Hook.,f. in Fl. Brit. India 5: 573. 1885.

Herbs very small, erect 5 - 15 cm. **Stems** either glabrous or puberulous. **Leaves** sessile, alternate, a small rudimentary leaf placed oppositely; **lamina** ovate - lanceolate, 2 - 4 x 0.3 - 1.2 cm, lower leaves smaller, sub-entire, margin deeply serrate from middle or often below middle, acute or acuminate, base obliquely cuneate-rounded ; rudimentary leaves to 0.8 cm long, oblong, entire. **Flowers heads** of male flowers usually sessile, rarely pedunculate, subtended by free broad bracts. **Female receptacles** sessile and enclosed by connate bracts. **Achenes** fusiform.

Flower : June - August *Fruit:* August - October
Exsiccatus : Premlakha 2200 m, **SR Lepcha & AP. Das 1328**, dated 10.10.2007.
Status : Fairly Common.
Local Distribution : Jorpokharai, Rachela, Premlakha 700 – 3050 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, SRI LANKA, MYANMAR, W. CHINA.

Elastostema obtusum Weddel in Ann. Sci. Nat. ser. 4, 1: 190. 1854; Hook.f., in Fl. Brit. India 5: 573. 1885; Hara et al., Fl. E. Him 58. 1966; Grierson & Long, Fl. Bhutan 1(1): 121. 1983;

Local Name: Gagletto (Nep.).

Herbs, slender upto 22 cm tall. **Stems** with reddish minute glands. **Leaves** alternate, sessile; **stipules** solitary, to 0.5 cm long, often linear-lanceolate; **lamina** obovate; 0.4 - 1.5 x 0.30 - 0.8 cm, obovate, margin with few teeth at apex, obtuse, slightly oblique, basally 2-nerved, veins pubescent. **Peduncles** to 2.5 cm; **bracts** 4, upto 0.5 cm long, ovate-oblong. **Male-heads** 3 - 4 flowered. **Flowers** 0.3 cm across; **perianth** segments 3, obovate, slightly horned. **Fruit** not seen.

Flower : May - July

Exsiccatu : Dohrok 2300 m, *SR Lepcha & AP. Das 1330*, dated 10.10.2007.
Status : Frequent.
Local Distribution : Phusrey, Premlakha, Dohrok, 1800 – 2800 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, W. CHINA

Elatostema sessile Forster, Char. Gen. 106. 1776; Monogr. Urtic. 294, t. 9. 1856; Hook.f. in Fl. Brit. India 5: 563. 1885; Rep. Beih. 83. (1): 30. 1935; Hara & Ohashi in Fl. E. Him. 59. 1966; Grierson & Long, Fl. Bhutan 1(1): 118. 1983.

Local Name: Sunol (Lep.) Gagletto (Nep.).

Herbs or undershrubs upto 60 cm tall. **Stem** hollow. **Leaves** sessile, alternate; stipules 1.5 - 1.8cm long; **lamina** oblong 3.5 – 14.5 x 0.9 - 3.8 cm, elliptic, margin deeply serrate, acuminate, base obliquely cuneate, dark green, scarcely appressed pilose. **Flowers** axillary, sessile or rarely short peduncled, 0.3 - 1.3 cm across. **Male flowers** spurred at apex, perianth segments 0.2 - 0.20cm long, oblong. **Female flowers** accompanied with linear bracteoles, hairy. **Achenes** ellipsoidal.

Flower : May - August *Fruit*: August - November

Exsiccatu : Phusrey 2200m, *SR Lepcha & AP. Das 30254*, dated 06.10.2007.

Status : Common.

Local Distribution : Middle Rachel Chowk. 1750 – 2600 m.

General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, MALAYASIA

Elatostema sikkimense C.B. Clarke in Jour. Lin. Soc. Bot. 15: 125. 1877; Hook.f., in Fl. Brit. India 5: 571. 1885; Grierson & Long, Fl. Bhutan 1(1): 121. 1983

Herbs, sub-erect, much branched, 45 cm tall. **Stem** creeping, succulent. **Leaves** asymmetric; **petioles** to 0.8 cm long; stipules lanceolate; **lamina** 5 - 13 x 3.5 - 4cm, elliptic-oblong, acuminate, base cuneate, margin sharply serrate toward the apex, shallowly serrate on the other, glabrous. **Flowers** monoecious. **Male and female heads** to 1.4cm diam., shortly pedunculate. **Involucral** bracts with horny spur. **Perianth** lobes rounded and gibbous. **Achenes** fusiform, usually ribbed.

Flower : June - August *Fruit*: July - November

Exsiccatu : Talkharka 2280 m, *SR Lepcha & AP. Das 30251*, dated 06.10.2004.

Status : Abundant.

Local Distribution : Talkharka, Subaney, Premlakha 1600 – 2300 m.

General Distribution : E. HIMALAYA; INDIA (Darjeeling-Sikkim).

Note: 1. Endemic to Eastern Himalaya

2. Grows on wet rocks and slopes.

Dendrocnide Miquel

Dendrocnide sinuata (Blume) Chew in Gard. Bull.(Sing.121; 206.1965; Hara in Fl. E. Him. 3: 19. 1975; Grierson & Long, Fl. Bhutan 1(1): 111. 1983. *Urtica sinuata* Blume, Bijdr. Fl. Ned. Ind. 505. 1826

Shrubs upto 3 m tall, stinging hairs spreading on the inflorescence. **Leaves**: stipules ovate, to 2.3 cm long; petiole upto 16 cm long; **lamina** ovate or elliptic, 15 x 33 – 6 – 22 cm, acute, acuminate, base rounded or cordate, with stinging hairs on lower surface. **Flowers** in panicle to

20 cm long. **Female flowers** usually larger than males. **Male flowers** to 3.5 cm. **Female flowers** with ovary beaked at apex. **Achenes** obliquely ovate, white.

Flower & Fruit : July – October

Exsiccatus : Mulkharka below 1400 m, **SR Lepcha & AP. Das** 1346, dated 10.10.2007.

Status : Very Common in lower region

Local Distribution : Mulkharka 1400 – 1400 m.

General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, SRI LANKA, THAILAND MALAYSIA.

Girardinia Gaudichaud

Girardinia diversifolia (Link) Fries in Kew Bull. 36: 145. 1981; Grierson & Long, Fl. Bhutan 1(1): 111. 1983. *Urtica diversifolia* Link, Enum. 2: 385.1822, non Blume 1825. *Girardinia heterophylla* Decaisne in Jacquemont Voy. Inde. 4, Bot. 151. t. 153. 1844; Hook. f., in Fl. Brit. India 5: 550. 1885. *U. palmata* Forssk., Fl. Aeg.- Arab. 159. 1775, non *Girardinia*. *U. heterophylla* Vahl, Symb. Bot. 1:76.1790 nom. illeg. *Girardinia heterophylla* Decne in Jacquemont Voy. Inde. 4, Bot. 151. t. 153. 1844; Hook. f. Fl. Brit. India 5: 550. 1888.

Vern. name : *Kuju Sorong* (Lep.), *Bhangray Sisnu* (Nep.).

Herbs, perennial upto 2m tall with prominent stinging hairs. **Leaves** alternate; petioles upto 12 cm long; stipules 2 – 3 cm, ovate connate; **lamina** 7 – 18.5 x 8 - 19.5cm, broadly ovate, deeply palmately lobed, sometimes lower leaves unlobed, acuminate, base rounded, coarsely serrate, strongly 3-nerved at base. **Inflorescence** axillary in male panicles, flowers 0.13cm diam, perianth segments 4, free. **Female panicles** prickly, condensed to spike-like; flowers equal to male flowers, perianth united, 3-toothed; style subulate. **Achenes** compressed and black.

Flower & Fruit : June – September

Exsiccatus : Pangolakha below 2700 m, **SR Lepcha & AP. Das** 27750, dated 30.9.2004.

Status : Common.

Local Distribution : Rachel Middle, Jaributti, 1400 – 2500 m.

General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, SRI LANKA, MYANMAR, CHINA, MALAYSIA.

Note : Young shoots are eaten as vegetables and the fiber derived from the matured plants are being used in making traditional dresses including bow strings and rope by the Lepchas.

Laportea Gaudichaud (nom. cons.)

Laportea terminalis Wight, Icon. t. 1972. 1853; Monogr. Urtic. 125, t. 2c. 1856; Hook.f. in Fl. Brit. India 5: 549. 1885; Hara & Ohashi in Fl. E. Him. 60. 1966; Hara et al, Enum. Fl. Pl. Nepal 3: 204. 1982; Grierson & Long, Fl. Bhutan 1(1): 110. 1983. *L. bulbifera* auct non Wedd., Chew in Gard. Bull. Singapur 25: 121, f2. 1969, p.p.

Local Name: *Surong bee* (Lep), *Patle Sisnu* (Nep.).

Herbs, perennial, upto 125 cm tall. with white prominent stinging hairs throughout. **Stipules** bifid, 07 – 1.3 cm long, lanceolate. **Leaves** alternate; petioles 1 – 7 cm long slender; **lamina** 4.5 - 14.5 x 2.5 – 13 cm, ovate, margin sharply serrate, acute to acuminate, base rounded, pinnately veined with 3 nerves at base, nerves raised beneath, scaberulous and deep green above, pale green

beneath. Flowers with male flowers 0.3cm across, perianth segments 4 - 5, equal, hairy; stamens 4 - 5. Female flowers on winged stalks, perianth segments 4, unequal; style slender upto 0.2cm. Achenes flattened with elongated fruiting pedicels.

Flower : May - August Fruit: September - February
 Exsiccatus : Phusrey 2100m, SR Lepcha & AP. Das 31183, dated 03.10.2004.
 Status : Less Common.
 Local Distribution : Phusrey, Hangey, 1600 - 2800 m.
 General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, SRI LANKA, TIBET, MYANMAR, CHINA, MALAYSIA.

Lecanthus Weddell

Lecanthus peduncularis (Royle) Weddell in DC., Prodr. 16(1): 164. 1869; Tayuma in Hara Fl. E.Him. 60. 1966; Hara et al, Enum. Fl. Pl. Nepal 3: 204.1982; Grierson & Long, Fl. Bhutan 1(1): 116. 1983. *Procris peduncularis* Royle, III. Bot. Himal t. 83. 1836. *Lecanthus wightii* Wedd. in Ann. Sci. Nat. "Ser. 4", 1: 187. 1854; Hook.,f., in Fl. Brit. India 5:559. 1885.

Herbs small, succulent, dioecious upto 50cm tall. Leaves apparently alternate; stipules to 0.7cm; petioles ca 5 cm; opposite; lamina asymmetric, 1.2 - 3.5 x 0.6 - 1.3 cm, ovate, margin sharply serrate, acuminate, base cuneate or oblique-round, pilose hairy above, 3 - nerved from base, veins pilose hairy beneath. Peduncles simple. Receptacles upto fleshy. Flowers reddish-green: male flowers 4 - 5 merous; female flowers: perianth segmented into 3 unequal lobes; stigmas sessile. Achenes small ovoid, compressed.

Flower & Fruit : July - October
 Exsiccatus : Dohrok below 2200 m, SR Lepcha & AP. Das 20230, dated 28.10.2004.
 Status : Very Common.
 Local Distribution : Phusrey, Premlakha, Talkharka 1800 - 2600 m.
 General Distribution : AFRICA; HIMALAYAS; INDIA, MYANMAR, W. & C CHINA, TAIWAN, JAVA.

Pilea Lindley (nom. cons.)

Key to the species

1. Herbs more than 1 m tall 2
- + Herbs less than 1m tall 3

2. Flowers spike-like, much branched; Achene ovate. *P. anisophylla*
- + Flowers solitary; Achene broadly ovoid,..... *P. scripta*

3. Leaves broadly ovate, elliptic ovate 4
- + Leaves linear oblong *P. ternifolia*

4. Herbs > 50 cm tall 5
- + Herbs < 50 cm tall *P. bracteosa*

5. Leaves margin serrate *P. symmeria*
- + Leaves entire with minute acumen *P. umbrosa*

Pilea anisophylla Weddell, Monogr. Urtic. 193. 1856; Tuyama in Hara Fl. E. Him. 60. 1966; Hara *et al.* in Enum. Fl. Pl. Nepal 3: 205. 1982.

Herbs perennial upto 160 cm tall. **Stems** ascending, succulent. **Leaves:** petioles unequal, upto 3 cm; **lamina** unequal shaped, lanceolate, ovate- or oblong-lanceolate 4 – 13 x 1.7 -5 cm, pale green in both upper surface and lower, 3-veined, base deeply cordate, rarely rounded, margin entire or rarely 1-3-serrate, apex caudate-acuminate, **Flowers male** spikelike, few branched. **Female flowers** cymose - racemose, pubescent. Male perianth lobes 4, ovate, connate; **stamens** 4; **Female perianth** lobes unequal, abaxial lobe. **Achenes** ovate,

Flower : June – September *Fruit:* September - December
Exsiccatus : Talkharka- Dohrok upto 2290 m, *SR Lepcha & AP. Das* 1340, dated 10.10.2007.
Status : Common
Local Distribution : Dorok, Phusrey, Talkharka 1900 – 2400 m
General Distribution : SUB-TROPICAL HIMALAYA (NEPAL – BHUTAN) Naga hills, CHINA & FORMOSA

Pilea bracteosa Weddell, Monogr. Urtic. 245. 1856; Hook.f. in Fl. Brit. India 5: 555. 1885; Hara in Fl. E. Him 3: 24. 1975; Hara *et al.* in Enum. Fl. Pl. Nepal 3: 205. 1982; Grierson & Long, Fl. Bhutan 1(1): 114. 1983

Herbs glabrous to 55 cm tall. **Leaves** opposite; stipules to 1 cm long, ovate-oblong; petioles 2.3 cm long; **lamina** broadly ovate, 4 – 13 x 2 - 4.5 cm, sharply serrate, acuminate, base rounded, glabrous or rarely sparsely pubescent on upper surface, strongly 3-veined. **Panicles** upto 7.5 cm long, spreading. **Male flowers** 3-merous. **Perianth** segments in female flowers 3, unequal; stigmas brush-like.

Flower & Fruit : May – August
Exsiccatus : Neora border 2290 m, *SR Lepcha & AP. Das* 1341, dated 10.10.2007.
Status : Common.
Local Distribution : Sikkim-Neora Boundary, Rachel below. 1600 – 2500 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, W. CHINA.

Pilea scripta (Buchanan-Hamilton ex D. Don) Weddell, Ann. Sci. Nat., Bot., sér. 4. 1: 187. 1854; Grierson & Long, Fl. Bhutan 1(1): 113: 1983. *Urtica scripta* Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 59. 1825.

Herbs perennial stout dioecious or monoecious. **Stems** branched, to 1.8 m tall. Stipules lanceolate, veinless; **petioles** sub-equal, to 5 cm; **lamina** elliptic- or oblong-lanceolate, rarely narrowly elliptic, 4 - 13 x 2 – 6 cm, 3-veined, lateral veins many, **Flowers** solitary, in upper stem, a cymose panicle, often longer than petioles. **Male flowers** pedicellate or sessile; perianth lobes 4, connate 1/2 of length ; **stamens** 4;. **Female flowers** subsessile; perianth lobes connate at base ; **staminodes** 3, scale-like, oblong. **Achenes** purplish spotted, broadly ovoid,

Flower : *June – August* *Fruit:* *September - October*
Exsiccatae : Dorok 2322 m, *SR Lepcha & AP. Das* 30284, dated 06.10.2004; Phusrey 2280 m, *SR Lepcha & AP. Das* 30226, dated 06.10.2004.
Status : Common
Local Distribution : Dohrok, Phusrey 2000 – 3200 m.
General Distribution : TEMPERATE HIMALAYA; INDIA, (NEPAL TO Mishmi hills) Khasia, BURMA, and W.CHINA.

Pilea symmeria Weddel, Monogr. Urtic. 246. 1856; Hook.f. in Fl. Brit. India 5: 554. 1885; Tayuma in Hara Fl. E. Him. 62. 1966; 3: 25. 1975; Hara *et al*, Enum. Fl. Pl. Nepal 3: 206. 1982; Grierson & Long, Fl. Bhutan 1(1): 113. 1983. *P. wightii* sensu Fl. Brit. India 5: 554. 1888, non Wedd.

Local Name: Phusray Gakleto (Nep.).

Herbs small upto 35 cm. **Stipules** upto 0.40 cm, lanceolate, membranous; petioles to 3.7 cm; **lamina** ovate 1.5 - 3 x 1-2 cm, margin serrate, acute, base rounded, dark green, usually glabrous, rarely sparsely pilose on upper surface, strongly 3-veined, reticulation conspicuous in lower surface. **Panicles** to 3.3 cm long, axillary. **Male flowers** trimerous. **Female flowers** with 3 unequal perianth segments. **Achenes** compressed,

Flower & Fruit : May - August
Exsiccatu : Phusray 2260 m, *SR Lepcha & AP. Das* 1342, dated 10.10. 2007.
Status : Common.
Local Distribution : Sikkim-Neora Boundary, , Rachila Chowk. 2300 - 2900 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, W. & C. CHINA.

Pilea ternifolia Weddel, Monogr. Urtic. 202.1856; Hook.f. in Fl. Brit. India 5: 552. 1885; Tayuma in Hara Fl. E. Him. 62. 1966; 3: 26. 1975; Hara *et al*, Enum. Fl. Pl. Nepal 3: 206. 1982; Grierson & Long, Fl. Bhutan 1(1): 116. 1983

Herbs epiphytic upto 35 cm tall. **Stem** unbranched. **Leaves** opposite or ternately whorled, subsessile or rarely shortly petiolate to 0.6 cm long; **lamina** linear-oblong, 3. 5 - 6 x 0.4 - 1.5 cm, acuminate, base obliquely cordate, margin coarsely serrate, glaucous in lower surface, nerves numerous. **Cymes** to 2.5 cm, axillary, densely flowered; peduncles to 0.8 cm long. **Flowers** dioecious, whitish; perianth to 0.2 cm diam. **Achenes** minute, oblong, smooth.

Flower & Fruit : July - December
Exsiccatu : Rachela below 2510 m, *SR Lepcha & AP. Das* 1344, dated 10.10.2007.
Status : Common.
Local Distribution : Sikkim-Neora Boundary, , Rachela Chowk. 1900 - 2500 m.
General Distribution : TEMPERATE HIMALAYA; INDIA, NEPAL - BHUTAN.
Note : Endemic to Eastern Himalaya (Sikkim).

Pilea umbrosa Weddel in Ann. Sci. Nat. ser. 4, 1: 187. 1854; Monogr. Urtic. 243. 1856; 1 5: 556. 1888; Symb. Sin. 7: 121 et 130. 1929; Hara in Fl. E. Him. 62. 1966; Grierson & Long, Fl. Bhutan 1(1): 113. 1983.

Herbs upto 45 cm tall, pubescent. **Leaves** opposite; stipules membranous, often persistent; petioles to 4.3 cm long; **lamina** broadly elliptic-ovate, 6.5-13 x 2-5.5 cm, margin coarsely serrate, caudate-acuminate with entire and minute acumen to 0.4. base sub-cuneate or rounded, 3-nerved at base, dark greenish. **Male panicles** much branched. **Female panicles** shorter than male ones. **Achenes** with a few intra-marginal ridge.

Flower : May - August **Fruit**: August - December
Exsiccatu : Middle Rachela 2680 m, *SR Lepcha & AP. Das* 1345, dated 10.10. 2007.
Status : Common.
Local Distribution : Sikkim-Neora Boundary, Rachela Chowk 1900 - 2500 m.
General Distribution : TEMPERATE HIMALAYAS (Kashmir - Sikkim), Khasia, and W. CHINA.

Urtica Linnaeus

Urtica mairei H. Lev., in Fedde, 12: 183. 1913; Fedde Repert. 12: 183. 1913; Hara in Fl. E. Him. 3: 28. 1975; Hara *et al.*, in Enum. Fl. Pl. Nepal 3: 204. 1982. *U. parviflora* Roxb., Fl. Indica ed. 2, 3: 581. 1832; Hook. f. in Fl. Brit. India 5: 548. 1885; Journ. Linn. Soc. 26: 472. 1899; Grierson & Long, Fl. Bhutan 1(1): 108. 1983.

Local Name: Sorong bee (Lep.) Sisnu (Nep.).

Shrubs or undershrubs upto 3 m tall. **Stem** pubescent. **Leaves** opposite; **stipules** ovate-lanceolate, acuminate; petioles to 6 cm, slender, stinging hairy; **lamina** 5 - 13 x 2.5 - 8 cm, ovate-lanceolate or lanceolate, rarely ovate, margin doubly crenate or serrate, acuminate, base rounded or cordate, veins covered with stiff stinging hairs. **Flowers** in lax panicles. **Male flowers** with 4-lobed perianth and 4 stamens. **Perianth in female flowers** 4-lobed with dissimilar segments; **ovary** ovoid; **stigmas** sessile and brush-like. **Achenes** compressed with 2 broadly ovate.

Flower : March - July *Fruit:* August - January
Exsiccatus : Phusrey Dara, 2300m, **SR Lepcha & AP. Das 20117**, dated 08.10.2004.

Status : Common.

Local Distribution : Phusrey, Subaney, Karponang 1600 - 2200 m.

General Distribution : TEMPERATE HIMALAYAS; INDIA, NEPAL, BHUTAN.

Order : Juglandales

JUGLANDACEAE A. Richard ex Kunth

Engelhardtia Leschen ex Blume

Engelhardtia spicata Leschen. ex Blume, Bijdr. 528. 1826; Hook. f., in Fl. Brit. India 5: 595. 1885; Hara in Fl. E. Him. 47. 1966; 2: 17. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 212. 1982; Grierson & Long, Fl. Bhutan 1(1): 58. 1983. *Engelhardtia roxburgiana* Lindl. ex Wall., Pl. Asiat. Rar. 2: 85, t. 199, t. 7 (fr. only) 1831, p. p.

Local Name: Suvyok kung (Lep.) Mauwa (Nep.)

Trees monoecious rarely dioecious upto 23 m tall. **Leaves** even pinnate, upto 35 cm long; leaflets often oblong lamina, 6 - 16 x 2.5 - 8 cm, obtuse or subacute, base rounded, oblique, unequal, petiolules glabrous or pubescent beneath. **Male catkins** to 11 cm long, each flower composed of 6 - 10 almost sessile; anthers on short side branch. **Female catkins** to 13 cm; bracts to 4.5 mm. **Fruiting catkins** nut ovoid, midlobe of bract largest, oblanceolate.

Flower & Fruit : April - June
Exsiccatus : Lower phusrey 1800 m, **SR Lepcha & AP. Das 32907**, dated 27.10.2004.

Status : Less common

Local Distribution : Mulkharka, 1400 - 2250 m.

General Distribution : HIMALAYA; INDIA (Assam, Naga Hills, Manipur) NEPAL - BHUTAN), TAR, INDO-CHINA, W. CHINA.

Note : Wood useful; bark used in a fish intoxicant, good firewood.

Order: Fagales

FAGACEAE Dumort

Key to the Genera:

1. Rudimentary ovary with pistillode 2
+ Rudimentary ovary without pistillode 3
2. Evergreen trees; leaf margin entire or serrate; female flower with spreading style .. *Lithocarpus*
+ Deciduous trees; leaf margin serrate; female flower with cylindrical style *Castanopsis*
3. Male flower with 6 – 18 stamens; female flower with 6 – 9 styles *Quercus*
+ Male flower with 6- 12 stamens; female flowers with 3 style *Castanea*

Castanopsis Spach

Key to the Species:

1. Petiole ovate-lanceolate, margin serrate only towards apex..... *C. tribuloides*.
+ Petiole oblong-elliptic; margins sharply serrate with subulate teeth... *C. indica*

Castanopsis tribuloides (Smith) A. DC. in Journ. Bot. 1: 182. 1836; Hook.f.in Fl.Brit.India 5: 622. 1888; Hara *et al.* Fl. E. Him. 1: 49. 1966; Chater in Hara Enum. Fl. Pl. Nepal. 3: 214. 1982; Grierson & Long. Fl. Bhutan 1 (1): 82. 1983. *Quercus tribuloides* Smith in Rees, Cyclop. 29: no. 13. 1819.

Local Name: Musre Katus (Nep.).

Trees evergreen; bark dark gray. **Petioles** to 2.2cm long; **lamina** ovate-lanceolate, 5.6 -12 x 2.5 - 5 cm, serrate towards apex, acuminate, base acute, usually coriaceous, lateral nerves 7 - 14 pairs. **Inflorescence** with male spikes paniculate or fascicled, sparsely flowered, more slender, pubescent. **Female spikes** solitary, pale. **Cupules** to 2.6 cm across including basally branched bands of spines. **Nuts** ovoid, glabrous, and mucronate.

Flower : April. - September. *Fruit:* October. - December.
Exsiccatus : Bara-Ramitey 2650 m, , *SR Lepcha & AP. Das 31130*, dated 03.10.2004.

Status : Common.

Local Distribution : Rachel Middle, Panglakha, 1800 – 2400 m.

General Distribution : HIMALAYA; INDIA, (Kumaon – Sikkim) Assam , BURMA, INDO-CHINA, W.CHINA.

Castanopsis indica (Roxb.) A. DC. in Journ. Bot. 1: 182. 1863; Hook.f., in Fl. Brit. India 5: 620. 1888; Hara in Fl. E. Him. 1: 49. 1966; Grierson & Long Fl.Bhutan 1(1): 80. 1983. *Castanea indica* Roxb. [Hort. Beng. 68. 1814, *nom. nud.*] Fl. Ind. ed. 2, 3 : 643. 1832.

Local Name: Aulay Katus (Nep.).

Tree evergreen upto 20 m tall. **Bark** gray, warty. **Juvenile shoots** rusty-tomentose. **Leaves** ; petioles to 1cm long; oblong-elliptic, **lamina** 8 - 20 x 3.5 – 8.5 cm, margins sharply serrate with subulate teeth, acute to acuminate, base cuneate or often rounded, glabrous in upper surface,

rusty-tomentose below; mid-rib strongly depressed in upper surface lateral veins 12-19. **Spikes** to 17 cm long, in lax panicles, sub-erect and tomentose. **Male spikes** many; female spikes 1- 2. **Male flowers** clustered; stamens 12; pistillode villous. **Female flowers** solitary, densely pubescent; styles 3, cylindric. **Cupules** globose. **Nuts** ovoid.

Flower : February - April *Fruit:* October. - December.
Exsiccatus : Rachela below 2700 m , **SR Lepcha & AP. Das 31130**, dated 03.10.2004.
Status : Common.
Local Distribution : Rachela Middle, 600 -1800 m.
General Distribution : HIMALAYA; INDIA, (NEPAL – NEPAL) Assam, BURMA, Bengal, INDO-CHINA. THAI, CHINA.
Note : 1. Nuts edible.
 2. Potential local timber

Quercus Linnaeus

Key to the species:

1. Lamina with 9 - 12 pairs of lateral nerves; nuts oblong *Q. lineata*
 + Lamina with 18 - 25 pairs of lateral nerves; nuts ellipsoid *Q. lamellosa*

Quercus lineata Blume var. *oxydon* (Miq.) Wenzig in Jahrb. Bot. Gart. Berlin 4: 232: 1886; Hook.f., Fl. Brit. India 5: 506. 1888; Hara in Fl. E. Him. 1: 51. 1966. *Quercus oxydon* Miq. in Ann. Mus. Bot. Lugd.- Bat. 1: 114. 1863; Chater in Hara Enum. Fl. Pl. Nepal 3: 216. 1982; Grierson & Long. Fl. Bhutan 1(1): 76. 1983.

Local Name: *Phalant* (Nep.), *Buuk* (Lepcha)

Trees deciduous upto 25 m tall. **Petioles** to 2.8cm; **lamina** oblong, 6.2 - 13.5 x 3.2 – 5 cm, spinous serrate above middle, acuminate, base cuneate, silky hairy, lateral nerves 9 - 12 pairs. **Inflorescence** in spikes. **Flowers** monoecious borne in single spikes. **Male spikes** upto 7.5 cm long, drooping; **flowers** to 0.35 cm across, globose; **bracts** 0.45 - 0.8 cm long, lanceolate; perianth 5 - 6 lobed; stamens 5 - 7. **Female spikes** erect, 2 - 5 flowered; styles 3. **Cupules** to 1 cm in diam, hemispheric, with 5 - 7 overlapping lamellae covering half of the nut. **Nuts** ellipsoid slightly conical tip.

Flower : May - July *Fruit:* October - January
Exsiccatus : Dohrok 2280m, **SR Lepcha & AP. Das 30257**, dated 06.10.2004.
Status : Frequent.
Local Distribution : Rachela below, Singhaney bans, 2000 – 25000m.
General Distribution : HIMALAYAS; INDIA , NEPAL, BHUTAN, MYANMAR, CHINA, MALAYSIA.

Quercus lamellosa Smith in Rees Cyclop. 29: no. 23. 1819; Hook.f. in Fl. Brit. India 5: 606. 1888; Hara *et al* in Fl. E. Him. 1: 51. 1966; Chater in Hara Enum. Fl. Pl. Nepal 3: 216. 1982; Grierson & Long in Fl. Bhutan 1(1): 76. 1983.

Local Name: *Bajranth* (Nep.).

Tree evergreen, gregarious upto 20 m tall. **Petioles** long upto 4 cm; **lamina** oblong-lanceolate, 9 - 19 x 2.5 - 4.5 cm, conspicuously toothed and veined, dark green in upper surface, blue-green in lower surface, nerves 18-25 pairs, straight, elevated below; young Leaves silvery or buff-hairy in surface lower surface. **Male flowers** in drooping, long and flexuous catkins. **Female flowers**

solitary or crowded in short, erect spikes; styles 3, recurved. **Cupules** with concentric lamellate rings, woody, enclosing half of the nut. **Nuts** oblong, solitary or paired.

- Flower & Fruit* : April - June
Exsiccatus : Premlakha - Panglakha 2650 m, *SR Lepcha & AP. Das 1031*, dated 20.09. 2005.
Status : Very Common.
Local Distribution : Rachel, Hangay. 1900 - 2800 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, N. MYANMAR, S. W. CHINA.
Note : Used for timber and as firewood.

Lithocarpus Blume

Lithocarpus pachyphylla (Kurz) Rehder in JAA 1: 129. 1919; Chater in Hara Enum. Fl. Pl. Nepal 3: 215. 1982; Grierson & Long in Fl. Bhutan 1(1): 80. 1983; *Quercus pachyphylla* Kurz in JASB 2: 197, t. 14, f. 1-4. 1875; Hook. f., Fl. Brit. India 5: 608. 1888; Hara *et al* Fl. E. Him 1: 51. 1966.

Local Name: *Sunguray Katus* (Nep.).

Trees evergreen upto 20 m tall. Branches glabrous. **Lamina** elliptic-oblongate, 7-19 x 2.7 - 6 cm, entire, caudate-acuminate, base acute, coriaceous, glabrous, nerves impressed in upper surface, prominent in lower surface. **Male flowers** clusters (catkin) stout, erect; subtending bracts to 0.4 cm, ovate, subulate; **stamens** 12, pistillode present. Female flowers below, usually few, with spreading styles. **Cupules** nearly 3 cm in diam.; bracts fused together at base, enclosing half of the nuts. **Nuts** ovoid, turbinate

- Flower & Fruit* : May - January
Exsiccatus : Rachel 2750 m, *SR Lepcha & AP. Das 31227*, dated 07.08. 2008.
Status : Common
Local Distribution : Singhaney, Panglakha. 2200 - 3100 m.
General Distribution : E. HIMALAYAS; INDIA, BHUTAN, NEPAL, N. MYANMAR
Note : Potential for both timber and wood

Castanea Miller

Castanea sativa Miller, Gard. Dict. ed. 8, 1. 1768; Grierson & Long., Fl. Bhutan 1(1): 79. 1983.
Local Name: *Katus* (Nep.).

Trees deciduous. **Leaves** simple, alternate; petioles 1.5 - 2 cm long; **lamina** 5 - 13 x 2.5 - 5 cm, ovate-elliptic, coarsely serrate, acute-acuminate, base cuneate, glabrous both sides. Inflorescence unbranched, spicate, erect. **Male flowers** 6 - 16, staminate and without pistillode. **Female flowers** with 6 - 9 filiform styles. **Cupule** subglobose, spiny, spines to 1 cm long.

- Flower & Fruit* : May - December
Exsiccatus : Rachel below 2200 - 2600 m, *SR Lepcha & AP. Das 1030*, dated 07.08. 2008.
Status : Frequent
Local Distribution : Pangkha, Ramitey, Dorok above. 2200 - 3100 m.
General Distribution : ENDEMIC TO SOUTH AMERICA
Note : Seeds edible

BETULACEAE S.F. Gray

Key to the genera:

1. Tree upto 10 m tall; stamens 2..... *Corylus*
+ Tree more than 15 m tall; stamens 3 - 20 2.
2. leaf ovate, serrate; male catkins axillary p..... *Betula*
+ Leaf elliptic; entire or serrulate; male catkins in terminal panicles *Alnus*

Alnus Miller

Alnus nepalensis D. Don, Prodr. Fl. Nep. 58. 1825; Hook.f. in Fl. Brit. India 5: 600. 1888; Hara in Fl. E. Him 1: 48. 1966; 2: 17. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 213. 1982; Grierson & Long, Fl. Bhutan 1(1): 72. 1983

Local Name: *Sungru kung* (Lep.) *Utis* (Nep.).

Tree deciduous upto 24 m tall. **Leaves** alternate; petioles 1-1.8 cm; stipules oblong, auriculate; leaves; **lamina** 2.5 - 13 x 2 - 8 cm, broadly elliptic, entire, acute, base cuneate, usually coriaceous, brownish glandular below, veins pubescent. **Flowers** unisexual, monoecious; **male catkins** longer, drooping, paniculate; **female spikes** much shorter, ellipsoid, erect, clustered; scales long, woody cone like on maturity. **Achenes** triangular.

- Flower* : October - December *Fruit:* February - May.
Exsiccatus : Phusrey below, 1600 - 1800 m, *SR Lepcha & AP. Das 0249*, dated 15.09.2005
Status : Common in degraded landscape
Local Distribution : Rigu, Premlakha below, Bhusuk, 1500 - 2300 m.
General Distribution : HIMALAYAS; INDIA (GARHWAL - BHUTAN), MYANMAR, TIBET, W. CHINA.

- Note* : 1. Endemic to Himalaya
2. A good source for timber and firewood; very fast growing tree.

Betula Linnaeus

Key to the species:

1. Bark reddish-brown; Nuts with narrowed winged *B. alnoides*
+ Bark whitish-pink, Nuts with broadened winged *B. utilis*

Betula alnoides D. Don, Prodr. Fl. Nepal 58. 1825; Hook.f., in Fl. Brit. India 5: 599. 1888; Hara & Ohashi in Fl. E. Him 1: 48. 1966; 2: 18. 1971; Hara *et al.* Enum Fl. Pl. Nepal 3: 213. 1982; Grierson & Long, Fl. Bhutan 1(1): 71. 1983. *B. cylindrostachya* Wallich, Pl. As. Rar. 2: 7. 1831.

Local Name: *Saur* (Nep.).

Tree moderate size, deciduous upto 15 m tall. Bark with reddish brown, vertical strips. **Leaves** ; stipules lanceolate; ovate - ovate lanceolate, **lamina** 5 - 10 x 3.5 - 9 cm, irregularly serrate or doubly serrate, acuminate, base rounded or cordate, subglabrous upper surface, lower surface pubescent in young and gland dotted when old, lateral nerves 10 - 15 pairs. **Male catkins** sub solitary, erect, to 0.6 cm broad, fascicled, slender, pendulous. **Female catkins** in paniced, 2.5 - 5.5 x 0.3 - 1 cm; scales to 0.4 cm, lanceolate. **Nuts** with narrowed winged.

- Flower* : January – April *Fruit:* March – June
Exsiccatus : Middle Rachela 2280 - 2549 m, **SR Lepcha & AP. Das** 31129, dated 03.10.2004
Status : Common.
Local Distribution : Rachela, Subaney, 1700 – 2250 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MEGHALAYA, TIBET, CHINA.
Note 1. Endemic to Himalaya
 2. Locally used for timber

Betula utilis D. Don, Prodr. Fl. Nepal 58. 1825; Hook.f., in Fl. Brit. India 5: 599. 1888; Hara in Fl. E. Him. 1: 48. 1966; 2: 18. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 3: 214. 1982; Grierson & Long. Fl. Bhutan 1(1): 71. 1983. *B. bhojpatra* Lindl. in Wallich, Pl. As. Rar. 2: 7. 1831.
Local Name: *Bhujpat* (Nep.).

Trees to upto 17 m tall.. Barks papery, slightly whitish pink. **Leaves** ; stipules short to 1.1cm long, , ovate, usually deciduous; petioles to 1.3 cm long, **lamina** 2.5 - 8 x 2.5 - 8 cm, ovate, serrate, acute, base more or less truncate, veins pubescent in upper surface and glandular in lower, lateral nerves 8 – 12 pairs. **Inflorescence** in axillary solitary catkins. **Male catkins** 5.5. - 10 x 0.7 - 0.9 cm, borne towards shoot tips; scales 0.2 cm, orbicular; perianth 4-lobed; stamens 2. **Female spikes** terminal on side shoots, 2.5 - 6 x 1.5 - 1.3 cm; scales 3 lobes linear; perianth absent; style 2, filiform. **Nuts** with broadened winged.

- Flower* : April – June *Fruit:* July – October
Exsiccatus : Bara-Ramitey 2900-3040m, **SR Lepcha & AP. Das** 31127, dated 13. 10. 2005.
Status : Less Common.
Local Distribution : Jorpokhari, Trijunction, Rachela below 2400 – 3050 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, W. CHINA.
Note : 1. Endemic to Himalaya:
 2. Used for timber, paper making and for a medicine; Foliage is good fodder.

Corylus Linnaeus

Corylus ferox Wallich, Pl. As. Rar. 1: 77, to 87. 1830; Hook.f., Fl. Brit. India 5: 625. 1888; Pfl.-reich IV-61, Ht. 19: 44, f. 13.1904; Pl. Wilson. 2: 448.1916; Hara & Ohashi in Fl. E. Him. 1: 49. 1966; Grierson & Long. Fl. Bhutan 1(1): 72. 1983.
Local Name: *Lekh Katus* (Nep.).

Trees moderate sized, to 12 m tall. **Leaves**; petioles to 2 cm long, appressed pubescent; **lamina** 6.5 - 12 x 3.5 - 4.6 cm, ovate or elliptic, acuminate, base rounded, margin serrate, lowers surface pubescent and glandular-hairy, upper surface sparsely pubescent, lateral veins 11-15 pairs, usually parallel, prominent. **Male catkins** to 6.5 cm long, pendulous, scales ovate, pubescent; stamens 10, crimson; anthers apically pilose. **Female catkins** inconspicuous, usually 6 – 8; perianth adnate to ovary; ovary inferior; styles 2, linear, exerted, reddish. **Fruits** in clusters. Nuts aoid, compressed, and covered with spiny involucre.

- Flower & Fruit* : October – December
Exsiccatus : Below Rachela trijunction 2990 m, **SR Lepcha & AP. Das** 0257, dated 17.09.2005.

- Status* : Rare.
Local Distribution : Jorpokhari, Tinsimana. 2400 – 3050 m.
General Distribution : HIMALAYAS; INDIA(Sikkim) NEPAL, BHUTAN, MEGHALAYA, TIBET, N. MYANMAR, W. CHINA.
Note : 1. Endemic to Himalayas
 2. Nuts edible.

Subclass: Caryophyllidae

Order: Caryophyllales

PHYTOLACCACEAE R. Brown

Phytolacca Linnaeus

Phytolacca acinosa Roxb., Fl. Indica ed. 2, 2: 458. 1832; Hook.f., Fl. Brit. India 5: 21. 1885 p.p.; Hara in Fl. E. Him. 78. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 171. 1982; Grierson & Long, Fl. Bhutan 1(2): 191. 1984.

Local Name: *Jaringo* (Nep.).

Herbs succulent, perennial. **Stem** cymosely branched. **Petioles** 0.8 – 1.5cm. **Leaves** simple, alternate; **lamina** 4.5 -15 x 1.6 - 5.5cm, elliptic-lanceolate, entire, acute or acuminate, base attenuate; membranous, glabrous, pinnately veined, lateral nerves 9-13 pairs. **Inflorescence** terminal racemes erect, many-flowered; bracts short, membranous, linear; bracteoles linear; pedicel coarse, short hairy. **Flowers** actinomorphic, bisexual, greenish-white, upto 0.5cm across; tepals 5, free but shortly connate at base, elliptic, obtuse, spreading; stamens 8-10; carpels 10, free, dark purple. **Fruits** globose to slightly depressed, bluish-black when ripe.

- Flower & Fruit* : May – July
Exsiccatus : Padamchen 2200 m, SR Lepcha & AP. Das 2600, dated 23.07.2004.
Status : Less common
Local Distribution : Padamchen, Premlakha 1300 – 2380 m.
General Distribution : HIMALAYAS; INDIA (Kashmir – BHUTAN), Assam, and W. China.
Note : 1. Endemic to Himalaya.
 2. Leaves eaten as vegetable.

Chenopodium Linnaeus

Chenopodium ambrosioides L., Sp. Pl. 219. 1753; Boiss., Fl. Or. 4: 904. 1879; Hook.f., in Fl. Brit. India 5: 4. 1886, Hara in Fl. E. Him. 76. 1966; Mullin in Hara, Enum. Fl. Nepal 3: 170. 1982; *Ambrina ambrosioides* Spach. in Hist. Nat. Veg. 4: 297. 1836; *Chenopodium integrifolium* Vorosch., Bot. Zhurn. 27: 42. 1942; *Chenopodium suffruticosum* Willd., Enum. Pl. Hort. Berol.: 290. 1809.

Herbs annual, aromatic strongly aromatic, Stem to 80 (-120) cm, ± erect, branches. **Leaves**; petiole to 1.5 cm long; lamina to 13 cm, lanceolate to elliptic, irregularly coarsely serrate, sometimes shallowly sinuate to almost entire, attenuate at base, acute to obtuse at apex; bracts

entire, linear - lanceolate - narrowly obovate, uppermost very small. **Inflorescence** paniculate, flowers sessile in small, dense. Terminal flowers bisexual, **perianth** deeply 5-lobed, lobes; **stamens** usually 5; perianth connate, 5-toothed; glabrous to sparsely pubescent.; **stigmas** usually to 4, slender. **pericarp** free. **Seeds** horizontal, rarely oblique, brown.

Flower & Fruit : May - January.

Exsiccatus : Mulkharka - Phusrey 2120 m, *SR Lepcha & AP. Das 0296*, dated 13.09.2005.

Status : Common.

Local Distribution : Mulkharka, Chitray. 2100 - 3000 m.

General Distribution : PAKISTAN, INDIA, W. CHINA.

Note : Probably endemic to tropical America. Earlier cultivated as medicinal plant and introduced in tropical and subtropical areas of the world, where it is commonly naturalized.

AMARANTHACEAE A. Jussieu

Key to the Genera:

1. Plants sub-erect, undershrubs; bracts concave *Cyathula*
+ Plants erect herbs; bracts ovate *Achyranthes*

Achyranthes Linnaeus.

Key to the species:

1. Plants > 1 m tall; bracts ovate; perianth segments ovate-oblong *A. bidentata*
+ Plants < 1 m tall; bracts subulate; perianth segments ovate-lanceolate *A. aspera*

Achyranthus aspera L., Sp. Plant. 204. 1753; Hara *et al* Fl. E. Him 1:76.1996; Hook.f. in Fl. Brit. India 4: 4. 1885; Long in Grierson & Long Fl. Bhutan 1(2):227. 1984.

Local Name: *Ankhlaj Jhar* (Nep.).

Herbs, perennial, erect, or spreading 20 - 110 cm tall. **Leaves** opposite, ovate-elliptic; petiole to 13 mm; **lamina** 3 - 12 x 1.8 - 7 cm, acute, base cuneate, pubescent. **Flowers** in long slender spike to 30 cm; **bracts** subulate, occasionally spinous, to 2.5 mm, concave. **Perianth** segments rigid, ovate, - lanceolate, to 4.5 mm; **stamens** 5; anthers 2 celled, filament connate at base; **ovary** oblong, style filiform; **stigma** capitate. **Fruits** 1 seeded.

Flower & Fruit : June - August

Exsiccatus : Mulkharka - Phusrey, 1500 m, *SR Lepcha & AP. Das 31256*, dated 13.07.2008.

Status : Abundant

Local Distribution : Premlakha, Mulkharka 1200 - 1500 m.

General Distribution : INDIA (Kashmir - Sikkim), BHUTAN.

Note : Endemic to Himalaya.

Achyranthus bidentata Blume, Bijdr. 545. 1825; Hook.f. in Fl. Brit. India 4: 730. 1885; Hara *et al.*, Fl. E. Him. 1: 76 & 635, f. 57. 1966; 2: 25. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 168. 1982; Long in Grierson & Long, Fl. Bhutan 1(2): 227. 1984.

Local Name: *Ankhlaj Jhar* (Nep.).

Herbs, perennial, erect upto 90 cm tall. **Leaves** petiolate (petioles upto 2.5 cm); **lamina** 3.6 - 12 x 3 - 5 cm, elliptic-lanceolate, repand entire, pubescent. **Flowers** upto 11.5 cm long, nodding;

rachis slender; **bracts** upto 0.6 cm long, ovate; bracteoles longer than bracts, spinous and auricled basally. **Perianth** segments 5, unequal, upto 0.3 cm long, ovate-oblong, greenish; **staminodes** quadrangular, dentate, green. **Capsules** to 0.23 cm long, oblong, enclosed by perianth.

- Flower* : August - November *Fruit* : November - February
Exsiccatus : Dohrok, 2100 m, **SR Lepcha & AP. Das** 30278, dated 06.10.2004;
 Rachela, **SR Lepcha & AP. Das** 31033, dated 02.10.2004
Status : Abundant
Local Distribution : Padamchen, Kyongnosla, 1200 – 2280 m.
General Distribution : TROPICAL AFRICA, HIMALAYAS, (Kashmir - Sikkim), SRI
 LANKA, CHINA, MALAYSIA AND EW GUINEA.

Cyathula Blume

Cyathula capitata Moquin in DC., Prodr. 13 (2): 329. 1849; Hook.f. in Fl. Brit. India 4: 722. 1885; Hara & Ohashi in Fl. E. Him.1: 77. 1966; Hara *et al.*, Enum. Fl. Pl. Nepa 1 (3): 169. 1982; Long in Grierson & Long, Fl. Bhutan 1(2): 225. 1984.

Undershrubs, suberect, perennial upto 1.9 m tall. **Leaves**; petiole 2 - 3 cm long, opposite; lamina 5 - 13 x 3 - 4.5 cm, elliptic-lanceolate, caudate-acuminate, base acute, entire, membranous. **Flowers** 3.5 - 4.5 cm across, clustered in globose heads. Bracts concave. **Perianth** segments 0.4 - 0.6 cm long, linear-lanceolate, 1-nerved and with terminal hooked awns. **Stamens** 5, united. **Staminodes** imbricate and alternating with stamens; style simple; stigma capitellate; **ovule** solitary. **Capsule** covered by persistent perianth and styles.

- Flower* : June - August *Fruit*: September - December
Exsiccatus : Phede 3200 m, **SR Lepcha & AP. Das** 32874, dated 27.10.2004,
Status : Frequent.
Local Distribution : Zeluk, Dohrok above upto 3700 m.
General Distribution : HIMALAYAS; INDIA (Sikkim, Bhutan), BHUTAN, INDO - CHINA.

CARYOPHYLLACEAE A. Jussieu

Key to the Genera:

- | | |
|--|---------------------|
| 1. Sepals united at base | 2 |
| + Sepals free to base | 3 |
| 2. Style 2 | Gypsophylla |
| + Style 3-5 | Silene |
| 3. Stamens less than equal to 5 | 4 |
| + Stamens more than equal to 5 | 5 |
| 4. Leaves lanceolate | Brachystemma |
| + Leaves ovate or suborbicular | Drymaria |
| 5. Slender, prostrate or decumbent herbs | 6 |
| + Diffuse or mat forming herbs | 7 |
| 6. Styles 2-3, capsule 2-6 valved | Arenaria |
| + Style 5, capsule 10 valved | Cerastium |
| 7. Capsule longer than sepals | Sagina |

+ Capsule short *Stellaria*

Arenaria Linnaeus

Arenaria melandriodes Edgew. ex Edgew. & Hook.f. in Fl. Brit. India 1: 241. 1874; Hara *et al.* Enum. Fl. Pl. Nepal 2: 52. 1979. Grierson in Grierson & Long, Fl. Bhutan 1(2): 212. 1984; Sharma *et al.* Fl. India: (2): 82, 504. 1993. *Arenaria cerastiiformis* Williams in Journ. Linn. Soc. Bot. 38: 402. 1909.

Herbs perennial, slender, rhizomatous. Stems ca 10cm. **Leaves** lamina 4.5 – 10 x 3 – 6.5 mm, oftenly elliptic acute, base usually rounded or sometime thicken above, glandular pubescent beneath margins. **Flowers** solitary, ± sessile or nodding on pedicels. **Sepals** ovate to lanceolate or obovate, rounded at apex. **Petals** pink, oblanceolate - obovate, rounded at apex, narrowed and almost clawed at base. **Style** 2.

Flower : July
Exsiccatus : Kupup 4200 m, *SR Lepcha & AP Das* 30917, 24.07.2005.
Status : Rare
Local Distribution : Nathang, Dokala, Tamjay. 3800 – 4200 m,
General Distribution : EASTERN HIMALAYAS; INDIA, NEPAL, BHUTAN, S.TIBET.
Note : Endemic to Eastern Himalaya.

Brachystemma D. Don

Brachystemma calycinum D. Don, Prodr. Fl. Nepal 216. 1825; Hook.f., Fl. Brit. India 1: 235. 1874; Hara in Fl.E.Him.1: 79. 1966; Hara *et al.* Enum Fl. Pl. Nepal. 2: 53. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 209. 1984; Sharma *et al.*, Fl. India: (2): 209. 1993.

Herbs subscaudent. Stem usually overcrowded branched, upto 2.5 m long, quadrangular, glabrous. **Leaves**; petioles short upto 1.9 cm long; lamina 2.5 - 6.5 x 2 – 4 cm, ovate-lanceolate, crenulate, acute, 3-nerved. **Inflorescence** in axillary and terminal cymes. **Cymes** 7 -12.5cm long. **Peduncles** slender; **bracts** 0.4-0.6cm, linear. **Flowers** small 1 - 1.8cm across. **Sepals** 5, oblong – lanceolate. **Petals** 5, shorter than sepals, narrow, whitish. **Stamen** 10; **styles** 2. **Ovaries** one-chambered, ovules 2. **Capsules** globose; seeds reniform.

Flower : April – July *Fruit*: August – December
Exsiccatus : Rachela 3000 m, *S.R. Lepcha & AP. Das* 27721, Dated 30.09.2004.
Status : Less Common.
Local Distribution : Panglakha below. Deorali dara. 1100 – 1750 m
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, W. CHINA.

Drymaria Willdenow

Drymaria villosa Chamisso & Schlacht. in Linnaea 5: 232. 1830; Mizushima in Hara Fl. E. Him. 80. 1966; Grierson in Grierson & Long, Fl. Bhutan 1(2): 216. 1984; Majumdar in Sharma *et al* Fl. India 2: 533. 1993.

Herbs, annual, prostrate or ascending, 25 - 40 cm tall. **Leaves** lamina 5 – 15 mm across, orbicular to reniform, cordate to truncate at base, villous with long whitish hairs; stipules usually entire. **Inflorescence** in paniculate cymes; **bracts** 0.5-1.5 mm long. **Sepals** 5, ovate-elliptic, 2 - 3.5 x 1 -

2 mm. Corolla 5, 2-3.6 mm long, 2-fid up to middle or more; lobes acute to deeply emarginated, with caducous filiform auricles at base. Stamens 5. Ovary ovoid to globose. Capsules ovoid or ellipsoid, 2-3.5 mm long, 3-valved.

Flowers & Fruits : January – December
Exsiccatus : Zuluk boarder 3700 m, **SR Lepcha & AP. Das 20232**, 28.10.2004.,
Status : Abundant
Local Distribution : Karponang, Changu, Kyongnosla. 1700 – 2400 m
General Distribution : SUBTROPICAL ASIA; W. & S. CHINA, OCEANIA, HAWAII.
Note : Having vital folk medicinal value

Cerastium Linnaeus

Cerastium glomeratum Thuillier, Fl. Env. Paris ed. 2: 226. 286. 1799; Sci. Rep. Thoku Univ. Ser. 4, Biol. 29: Grierson in Grierson & Long, Fl. Bhutan 1(2): 205. 1984; Mizushima in Fl. E. Him. 1: 79. 1966; Sharma *et al* Fl. India 2: 523. 1993. *C. vulgatum* L., Fl. Suec. Ed. 2: 158. 1755, *nom ambing*; F.; 38, f. 24. 1936. Hara in Fl. E. Him.(1): 628.1966; Sharma *et al.*, Fl. India (3): 503, 519. 1993. *C. vulgatum var. glomeratum* (Thuill) Edge. *et* Hook. f., in Fl. Brit. India 1: 228. 1874. ut '*glomerata*'.

Herbs, slender and suberect upto 40 cm. **Leaves** lamina 0.8 - 1.5 x 0.5 - 0.9 cm, oblanceolate or ovate, acute or obtuse, base narrowed or rounded, pubescent, sometimes glandular. Inflorescence in terminal cymes. **Calyx** 5, free, 07 - 05 x 0.4 - 0.12 cm, lanceolate, either glandular or eglandular, pubescent, margins scarious. **Corolla** 5; stamens 10; ovary unicelled; **styles** 5, filiform. **Capsule** small 0.7 - 1.4 cm, cylindrical, usually 10-valved and straw - coloured.

Flower & Fruit: May - September
Exsiccatus : Rachela 3050 m, **SR Lepcha & AP. Das 31065**, 02.10.2004.
Status : Abundant.
Local Distribution : Kyongnosla, Phede, 2200 – 3050 m.
General Distribution : PAN-TEMPERATE.

Gypsophylla Linnaeus

Gypsophila cerastioides D. Don, Prodr. Fl. Nepal. 213. 1825. Grierson in Grierson & Long, Fl. Bhutan 1 (2): 200. 1984; Hara in Fl. E. Him. 2: 200. 1971; Sharma *et al* Fl. India. 3. 560. 1993.

Herbs perennial, upto 40cm tall. tomentose. Stems densely aespitose, ascending. **Leaf lamina** 0.3 - 1.5 x 0.4 -1.4cm, obovate-spatulate, both surfaces pubescent, margin ciliate; basal leaves long petiolate; cauline leaves sessile. **Inflorescence** in terminal cymes, 5 - 20-flowered; bracts leaflike, margin ciliate. **Flowers** 4 -13mm in diam.; pedicel short 2 - 6mm. **Calyx** green, broadly campanulate, lobes ovate or lanceolate, margin ciliate, apex obtuse. **Corolla** lilac or white, pale purple-red 3-veined, obovate-cuneate, base narrowed, apex retuse. **Stamens** shorter than petals. Ovary ovoid. **Capsules** ovoid, usually indehiscent. Seeds black, compressed globose minutely tuberculate.

Flower : May *Fruit*: August
Exsiccatus : Lampokri 4200m, **SR Lepcha & AP. Das 31411**, dated 27.07.2005.

Status : Common
Local Distribution : Thamjay, Nathula, 2800 – 4000 m
General Distribution : INDIA, BANGLADESH, BHUTAN, NEPAL, N PAKISTAN.

Sagina Linnaeus

Sagina saginoides (L.) Karsten, *Dentsch. Fl.* 539. 1882; *Journ. Japan. Bot.* 35(7): 194. 1960; Grierson in Grierson & Long, *Fl. Bhutan* 1(2): 214. 1984; Sharma *et al.* *Fl. India* (2): 557. 1993. *Spergula saginoides* L., *Sp. Pl.* 1: 441. 1753. *Sagina procumbens non L.*: Edgew. & Hook.f., *Fl. Brit. India* 1: 243. 1874.

Herbs perennial very small 1 – 3.5cm tall. **Leaves** small, linear, acuminate, sometimes awned at apex.; pedicels glabrous. **Calyx** 0.12 - 0.3 cm, keeled ovate; **Corolla** equal or slightly larger than calyx, white. **Capsules** slightly longer than calyx, 5-valved; **seeds** dorsally grooved, tubercled and pale brown.

Flower & Fruit : May - July
Exsiccatu : Zeluk, 3650 m, *SR. Lepcha & AP. Das 20233*, dated 28.10.2004.
Status : Less Common.
Local Distribution : Kaphyokla, Zeluk, 2100 – 3050 m.
General Distribution : PAN-TEMPERATE.

Silene Linnaeus

Silene gonosperma (Rupr.) Bocquet in *Candollea* 22: 4. 1967; in *Phan. Monogr.* 1: 32. 1969; Subsp. *Himalayensis* (Rupr.) Bocquet in *Candollea* 22: 8. 1967; in *Phan. Monogr.* 1: 33. 1969. *Lychinis apetala* auct, non L. Edgew. & Hook. f. in *Fl. Brit. India* 1: 222. 1874; Mizushima in *Fl. E. Him.* 81. 1966; Grierson in Grierson & Long, *Fl. Bhutan* 1(2): 203. 1984. Sharma *et al.* *Fl. India* (3): 567. 1993. *Lychinis himalayensis* (Rohrb.) Edgew. in *Fl. Brit. India* 1: 223. 1879.

Herbs perennial upto 30 cm tall. **Leaves** lamina 1.5 - 4.5 x 0.5 - 0.4 cm, oblanceolate, acuminate, base attenuate, pubescent. **Inflorescence** in terminal cymes, flowers solitary or a rarely 2 - 3, nodding at first. **Calyx** slightly inflated, campanulate, glandular-pubescent, green with broad dark purple ribs, rarely complete dark purple, teeth oftenly acute, with scarius margins. **Corolla** scarcely exerted. **Calyx**, reddish purple, receptacle scarcely elongated. **Capsules** broadly ovoid.

Flower : February – September
Exsiccatu : Lam-Pokhri, 4300m, *SR Lepcha & AP. Das 30820*, dated 29.09.2005.
Status : Less common
Local distribution : Rongchu, Kupup, 2500 – 4400 m.
General distribution : EASTERN HIMALAYA; INDIA, NEPAL, BHUTAN
Note : Endemic to Eastern Himalaya.

Silene indica Roxb. ex Otth in *DC., Prodr.* 1: 368. 1824. *Hort. Beng.* 34; *Fl. India* ii. 446; Bocquet in *Candollea*, 22: 12. 1967; in *Phan. Monogr.* 1: 65. 1969; Grierson in Grierson & Long, *Fl. Bhutan* 1(2): 202. 1984

Herbs perennial. **Stem** glandular – pubescent. **Lamina** ovate – lanceolate, 3 – 7 x 2 – 3 cm, acute or acuminate, base rounded, glabrous or sparsely pubescent. **Flowers** in cymes, nodding

and becoming erect. **Calyx** green, herbaceous, glandular – pubescent on the nerves, lili oblique, subobtusate, green or brackish. **Corolla** limb exerted to 5mm from calyx, green or purplish. **Receptacle** scarcely elongated. **Capsules** ovoid.

Flower : June – August
Exsiccatus : Gnathang 3800 m, **SR Lepcha & AP. Das 30862**, dated 29.07.2005.
Status : Common
Local distribution : Changu, Dongchula, Tiger hill, 2400 – 4100 m.
General distribution : HIMALAYAS; INDIA, KASHMIR TO ASSAM, S. TIBET.
Note : Endemic to the Himalayas.

Stellaria Linnaeus

Key to the species:

1. Herbs pubescent; calyx lanceolate.....2
+ Herbs glabrous; calyx ovate-lanceolate..... *S. subumbellata*
2. Stems with whitish pilose hairs; Leaves lamina 1.5 - 3 x 0.4 - 0.3cm.....*S. patens*
+ Stem without pilose hairs; Leaves lamina 0.3 - 2.8 x 0.3 - 1.8cm.....*S. vestita*

Stellaria patens D. Don, Prodr. Fl. Nepal 215. 1825; Mizushima in Hara Fl. E. Him. 84. 1966; Hara & Ohashi in Fl. E. Him. 3: 35. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 2: 58. 1979; Grierson in Grierson & Long Fl. Bhutan 1(2): 207. 1984 ; Sharma *et al.* Fl. India: (2): 581. 1993. *Stellaria fenzliana* Klotzsch, B. Reise Pr. Waldem. 141, t. 29 A. 1862. *Stellaria longissima* Wall. ex Edgew. & Hook. f. in Fl. Brit. India 1: 231. 1874.

Herbs weak, grayish, pubescent. **Stems** with whitish pilose hairs; **lamina** ovate- lanceolate, 1.5 - 3 x 0.4 - 0.3 cm, acute or acuminate, base rounded, sessile **Inflorescence** in loose terminal cymes, flowers few. **Sepals** lanceolate ca 5mm; **Corolla** somewhat shorter than sepals. **Receptacle** not elongated. **Ovary** 1-celled; style 3 – 5. **Capsules** short, opening by 6 valves. **Seeds** numerous.

Flower : June.
Exsiccatus : Nathang 3680 m, , **SR Lepcha & AP. Das 32952**, Dated 27.10.2004.
Status : Rare
Local Distribution : Kupup, Tamjay, 1300 – 4000 m.
General Distribution : HIMALAYA; INDIA, (Punjab – Sikkim), BHUTAN.
Note : Endemic to Eastern Himalaya.

Stellaria subumbellata Edgeworth, Fl. Brit. India. 1:233. 1874. Sharma *et al.* Fl. India: (2): 589.1993; Grierson & Long, Fl. Bhutan 1(2): 208. 1984.

Herbs annual, glabrous. **Stems** tufted, ascending, upto 22 cm tall, slender. **Lamina** 4.5 - 13 x 1.2 – 4 mm, sessile, linear to linear-lanceolate, both surfaces glabrous, midvein conspicuous, base rounded, apex obtuse. **Inflorescence** in cymose umbel. **Flowers** 2 – 4, bracts ovate, membranous. Pedicel 1.2 - 2.5 cm, slender. **Calyx** 5, green, ovate-lanceolate, 3-veined, margin broadly membranous, apex acute. **Corolla** absent. Stamens 5; filaments slender. Styles 3, short. **Capsule** ovoid, as long as persistent sepals, 6-valved. **Seeds** pale brown or dark brown, compressed orbicular.

Flower : June – July *Fruit:* July – August.
Exsiccatus : Serabthang 4300 m, , **SR Lepcha & AP Das 24118**, Dated 04.10.2006
Status : Not common

Local distribution : Kupup, Kyongnosla. Kaphyokla 3000 – 4300 m.
General distribution : HIMALAYA; INDIA, (Kashmir – Sikkim), NEPAL.
Note : Endemic to Himalaya

Stellaria vestita Kurz in J. B. 11: 194. 1873; Mizushima in Fl. E. Him.85. 1966; H. Ohashi in Fl. E. Him. 3: 35. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 2: 58. 1979; Grierson & Long Fl. Bhutan 1(2): 206. 1984. Sharma *et al.* Fl. India. 3; 590: 1993. *Stellaria saxatilis* Buch-Ham. ex D.Don., Prodr. Fl. Nepal 215. 1825; Edgew. & Hook. f. in Fl. Brit. India 1: 232. 1874; Hara *et al.* Enum. Fl. Pl. Nepal 2: 58. 1979. *Stellaria hamiltoniana* Majundar in J. India B.S. 44: 142. 1965.

Herbs usually grayish, pubescent. **Stem** normally prostrate upto 45cm tall. **Leaves** oftenly ovate, lamina 0.3 – 2.8 x 0.3 - 1.8cm, acute - acuminate, base rounded, sessile. **Inflorescences** in loose cymes. **Flowers** few. **Sepal** lanceolate ca 5.5mm. **Corolla** usually 3 - 4mm, bifid almost to base longer than calyx. **Capsule** ovoid, ± as long as sepals. **Seeds** numerous ca 10-11.

Flower : February – September
Exsiccatus : Lam-Pokhri 4250 m, *SR Lepcha & AP Das 30948*, dated 24.07.05
Status : Not common
Local Distribution : Lam-pokhri, Bhimbase, Donkyala, 1600-2500m.
General Distribution : INDIA, BHUTAN, NEPAL, TAIWAN, MALAYSIA, CHINA.

Order: Polygonales

POLYGONACEAE A.L. Jussieu

Key to the Genera:

- | | |
|--|-------------------|
| 1. Erect herbs or sub-shrub | 2 |
| + Creeping, climbing, or prostrate herbs | 3 |
| 2. Style capitate or rounded | 4 |
| + Style fimbriate | 6 |
| 3. Flower peduncled | 5 |
| + Flower sessile | <i>Koenigia</i> |
| 4. Leaves large, perianth segments – 6 | <i>Rheum</i> |
| + Leaves small, perianth segments – 5 | <i>Aconogonum</i> |
| 5. Ocreae cylindric | <i>Persicaria</i> |
| + Ocreae lacerate or split obliquely | <i>Bistorta</i> |
| 6. Perianth segments-6, styles -3 | <i>Rumex</i> |
| + Perianth segments – 4, styles – 2 | <i>Oxyria</i> |

Aconogonum (Meisner) Reichenbach

Key to the Species:

1. Plant erect; perianth white *A. polystachyum*.
- + Plant creeping or strangling; perianth not white 2
2. Plant creeping; stem dichotomously branched *A. campanulatum*
- + Plant strangling; stem not dichotomously branched 3
3. Stem glabrous; mid-rib surface dotted above *A. molle* var *frondosum*
- + Stem pubescent; mid-rib dense silky hairy beneath *A. molle* var. *rude*

Aconogonum campanulatum (Hook.f.) Hara & Oashi in Fl. E. Him. 67. 1966; Hara *et al* in Enum. Fl. Pl. Nepal 3: 172. 1982; Grierson & Long, Fl. Bhutan 1(1): 154. 1983. *Polygonum campanulatum* Hook.f., Fl. Brit. India 5: 51. 1885. *Reymoutria campanulata* (Hook.f.) Moldenke in Bull. Torrey Bot. Cl. 68: 675. 1941. *Aconogonum campanulatum* var. *fulvidum* (Hook.f.) Hara & Ohashi in Fl. E. Him. 67. 1966.

Herbs, perennials, creeping upto 1.3 m tall. **Stems** dichotomously branched, tomentose, and stoloniferous. **Leaves** elliptic-ovate or even lanceolate; stipules tubular, enclosing almost all internodal length in young shoots, **lamina** 4.5 - 13 x 1.5 - 4.5 cm simple, alternate, margin entire, finely ciliate, acuminate, base acute to rounded, obscurely oblique, hairs beneath, reticulate, nerves densely pubescent beneath. **Flowers** in axillary cymes and terminal, divaricate. **Panicles** spreading, pubescent. **Bracts**, nearly ovate, acute; pedicels short, jointed under the perianth. **Flowers** bisexual, pendent; **perianth** minute, campanulate, white, glabrous; stamens 8; styles free. **Achenes** 3-winged.

Flower : July - October

Fruit: September - December

Exsiccatus : Panglakha barrack below, **SR Lepcha & AP. Das** 29397 dated 30.09.2004.

Status : Very Common.

Local Distribution : Rachel Peak, Panglakha 2200 - 3100m.

General Distribution : HIMALAYAS; INDIA, (Kumaon - Sikkim), Naga Hills, S. TIBET and W. CHINA.

Note: Endemic to Himalayas

Aconogonum molle (D. Don) Hara & Ohashi in Fl. E. Him. 68. 1966; 2: 21. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 172. 1982; Grierson & Long, Fl. Bhutan 1(1): 156. 1983. var. *molle*. *Polygonum molle* D. Don, Prodr. Fl. Nep. 72. 1825; Hook.f. in Fl. Brit. India 5: 50. 1885; *Ampelgynonum molle* (D. Don) Roberty *et* Vautier in Boissiera 10: 31. 1964.

Local Name: Kundyom dung (Lep.), Thotney (Nep.).

Shrubs, straggling. **Branches** pubescent, terete. **Stipules** upto 5cm, oblique tubular and pubescent; petiole shorter; **lamina** 0.3 - 0.9cm, densely adpressed hairy, 3.5 - 11 x 1.8 - 4.5 cm, elliptic-lanceolate, entire-ciliate, acute to acuminate, rounded to cuneate, hairy, densely haired along mid-nerve, lateral nerves 12 - 17 pairs. **Flowers** axillary and terminal, hirsute with white and flexuous hairs. **Bracts** upto 0.3, rounded, sparsely hairy. **Pedicels** upto 0.2 cm. **Flowers** 0.4 x 0.3 cm across; **tepals** 5, spreading, united at base, elliptic - oblong; **stamens** 8; cylindric, slightly swollen in the middle, brownish red; style trifid, short; brownish red. **Fruits** trigonous and covered.

Flower & Fruit : June - September

Exsiccatus : Jalepla 4100 m, **SR Lepcha & AP. Das** 31021, dated 02.10.2004.

Status : Abundant.
Local Distribution : Kupup, Jalepla 3050 – 4200 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, CHINA, INDO-CHINA, MALAYSIA.

Note : Young shoots are eaten in the form of curry.

var. frondosum (Meisn.) Hara in Fl. E. Him. 68. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 172. 1982; Grierson & Long, Fl. Bhutan 1(1): 156. 1983. *Polygonum paniculatum* Bl., Bijdr. 533 (Dec. 1825-Mar. 1826); Hook.f. in Fl. Brit. India 5: 49. 1885. *P. frondosum* Meisn. in DC., Prodr. 14: 137. 1856; Hook.f. in Fl. Brit. India 5: 50. 1885.

Stem glabrous; **petiole** upto 2 cm; **Leaves lamina** (upto 7.5 - 17 x 1.8 - 7 cm); **mid-rib** surface dotted above.

Flower : July - October. *Fruit*: August - November.
Specimen Cited : Memenchu 4000m, **SR Lepcha & AP. Das 31014**, dated 07.10.2004.
Status : Common.
Local Distribution : Machuki. 1000 – 2600m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, JAVA.
Note : *Stem used as pickle and curry.*

var. rude (Meisn.) Hara & Ohashi in Fl. E. Him. 68. 1966; 2: 22. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 172. 1982; Grierson & Long, Fl. Bhutan 1(1): 156. 1983. *Polygonum rude* Meisn. in DC., Prodr. 14: 137. 1856; Hook.f. in Fl. Brit. India 5: 49. 1885.

Local Name: Kundyom (Lep.), *Thotne* (Nep.).

Stem pubescent with hairs; **Lamina** 4.5 - 11 x 1.2 - 3.5 cm; **petiole** upto 1.5 cm long with dense adpressed hairs; **mid-rib** dense silky hairy beneath

Flower & Fruit : July - November.
Exsiccatus : Kupup(12500ft) **SR Lepcha & AP. Das 32955**, dated 28.07.2005.
Status : Common.
Local Distribution : Kyongnosla 2100 – 2800 m.
General Distribution : HIMALAYAS; INDIA, (Garhwal-BHUTAN).
Note : 1. Endemic to Himalayas
2. Young stem edible and locally consumed as pickle

Aconogonum polystachyum (Wall. ex Meisn.) K. Haraldson in Symb. Bot. Upsal., 22(2): 69. 1978; Grierson & Long, Fl. Bhutan 1(1): 156. 1983.

Shrubs upto 2.2m tall. **Stem** glabrous or pubescent. **Leaves**; sub-sessile or petiolate upto 1.2cm long; ovate elliptic, **lamina** 8.5 – 18.5 x 2.5 – 9 cm, acuminate, base rounded in cuneate, usually glabrous or pubescent on both above and lower, rarely densely covered; **Ocrea** 2.5 – 50mm, usually membranes pubescent. **Inflorescence** racemes in panicle, flower in branching; **Perianth** usually creamy, segment ovovate. **Achenes** trigonous, brown.

Flower & Fruit : July- September
Exsiccatus : Kupup 4150 m, **SR Lepcha & AP. Das 31019**, dated 08.10.2004.
Status : Common
Local Distribution : Kyongnosla, Memenchu, 3300 – 5000 m)
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN.
Note : Endemic to Himalaya.

Bistorta (Linnaeus) Adanson

Key to the species:

1. Herbs strictly erect 2
+ Herbs prostrate, trailing, slender 3
2. Stamens shortly exerted; ocreae non membranous *B. vivipara*.
+ Stamens not exerted; ocreae membranous *B. amplexicaulis*
3. Achene brown 4
+ Achene black *B. emodi*
4. Perianth pink 5
+ Perianth white *B. suffulta*
5. Leaves base lanceolate or linear lanceolate *B. macrophylla*.
+ Leaves base cuneate *B. vacciniifolia*

Bistorta vivipara (L.) S.F. Gray. Nat. Arr. Br. Pl. 2:268. 1821; Ohashi & Hara in Fl. E. Him. 2: 22. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 173. 1982. Grierson & Long, Fl. Bhutan 1(1): 168. 1983. *Polygonum viviparum* L., Sp.Pl. 360. 1753.

Herbs erect with thick and fibrous rhizomes. **Stems** simple, 8-30cm. **Lamina** 2-10 x 1-2.5 cm, lower leaves usually ovate, acute, base rounded or cordate, usually with pubescent beneath; **Ocreae** brown, acute, entire; upper leaves linear. **Flowers** in raceme usually bulbiferous in lower part, aloid; flowers white or sometime deep pink. **Stamens** shortly exerted. **Achene** brown.

Flower : June *Fruit*: September
Exsiccatus : Kupup 4200 m, **SR Lepcha & AP. Das** 31407, dated 27.07.2005.
Status : Common
Local Distribution : Kyongnosla, Nathang, Memenchu, 3300 – 5000 m)
General Distribution : EUROPE, SIBERIA, W. & C. ASIA; HIMALAYA; INDIA, NEPAL, BHUTAN, TIBET, CHINA,

Bistorta amplexicaulis (D. Don) Greene. Leaf. 1: 21.1904; Hara & Ohashi in Fl. E. Him. 69. 1966;3: 29.1975; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 173.1982; Grierson & Long, Fl. Bhutan 1(1): 167. 1983. *Polygonum amplexicaulis* D. Don, Prodr. Fl. Nepal 70. 1825. *Polygonum petiolatum* D. Don, Prodr. Fl. Nepal 70.1825. *Polygonum amplexicaulis* var. *speciosa* (Meisn.)Hook. f. in Fl. Brit. India 5: 33. 1885.

Herbs erect with usually rhizomatous upto 70cm tall. **Unbranched**, rarely branched. **Leaf; petioles** of lower leaves usually upto 18cm, upper ones sessile, **lamina** 5 x 12 (-25) x 3 – 7 (-12) cm, ovate, base cordate acuminate; amplexicaul, glabrous; ocreae 1.8 - 4.2 cm, brown, membranous, entire. **Flowers** in raceme to 6cm, mostly borne on slender peduncles 2 – 9 cm. **Flowers** usually numerous. **Perianth** pink or purple; pedicels normally 5 - 8mm. **Stamens** not exerted. **Achenes** brown, 3 - 7 mm.

Flower & Fruit : June - September
Exsiccatae : Kupup 3950 m, **SR Lepcha & AP. Das** 20920, dated 24.09.2005; on way to Panglakha from Premlakha 2800m, **SR Lepcha & AP. Das** 135, dated 18.09.2004; Singaney 2700 m, **SR Lepcha & AP. Das** 196, dated 25.09. 2004.
Status : Sparse.

Local Distribution : Kupup, Tinsimana, Panglakha 2800 – 3050 m.
General Distribution : AFGANISTAN, HIMALAYAS; INDIA, NEPAL, BHUTAN, W. & C. CHINA.

Bistorta emodi (Meisn.) Hara & Ohashi in Fl. E. Him. 69. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 173. 1982; Grierson & Long, Fl. Bhutan 1(1): 167.1983. *Polygonum meissneri* Wall. Cat. 1693. 1829, *nom. nud.*; *Polygonum emodi* Meisn. in Wall., Pl. Asiat. Rar. 3: 51. t. 287. 1832; Hook. f., Fl. Brit. India 5: 33. 1885; Steward in Contr. Gray Herb. 88: 29. 1930.

Herbs, perennial, prostrate, glabrous, branched. **Stem** with few branches, prostrate, 13 - 18 cm long. **Leaves** lamina 3 – 6.0 x 1.5 - 4.0 cm, lanceolate or linear, grass-like, acute, sessile. **Ochrea** 1.8 - 3 cm long, tubular, ovate, long acuminate, membranous. **Flowers** in erect, terminal, simple or branched, upto 4.5 cm, lax flowered raceme long slender peduncles. Flowers 1.8 - 3mm across. **Ochreolae** tubular, glabrous, ovate, acute. **Perianth** 4 - 5-parted, upto 5 mm long, oblanceolate, obtuse, deep red. **Stamens** 8, filaments long, filiform, equal. **Ovary** trigonous with three styles, free till middle, stigmas capitate. **Fruit** trigonous, black, shining.

Flower & Fruit : July – September
Exsiccatae : Nathang 3890 m, *SR Lepcha & AP. Das 30953*, dated 24.09.2005;
Lungthung , 3850, *SR Lepcha & AP. Das 32827*, dated 25.10.2004.
Status : Rare.
Local Distribution : Rachel Peak. 2800 – 3100 m.
General Distribution : HIMALAYAS; INDIA, (Simla to Sikkim) and W. CHINA

Bistorta suffulta (Maxim.) Green ssp. *pergracilis* (Hemsl.) Sojak in Preslia 46(2): 152. 1974. Grierson & Long, Fl. Bhutan 1(1): 167. 1983; *Polygonum pergracile* Hemsl. In Journ. Linn. Soc. 26: 344. 1891.

Herbs slender upto 40 cm tall. Branched. **Lamina** 5.5 x9 (-22) x 2.5 – 5 (13) cm, ovate, acuminate, base attenuate, subsessile, margins inrolled when young, veins prominent, fine and parallel, glabrous or weakly pubescent above. **Inflorescence** racemes slender, upto 5cm long, branched, flower 4-5; **perianth** ca 3 mm, white; **stamens** not exerted. **Achenes** brown.

Flower : May. – June
Exsiccatu : Panglakha 2890 m, *SR Lepcha & AP. Das 29390*, Dated 30.09.2004.
Status : Common
Local Distribution : Kyongnosla, 3300 – 5000 m)
General Distribution : HIMALAYA; INDIA , NEPAL, BHUTAN.
Note : Endemic to Himalaya.

Bistorta macrophylla (D. Don) Sojak, Preslia 46: 152. 1974; Hara *et al.* in FL.E.Himal. 2: 72.1971; Sojak; Hara *et al.* in Enum. Fl. Pl. Nepal. 3: 173.1982; Grierson & Long, Fl. Bhutan 1(1): 168. 1983. *Polygonum macrophyllum* f. *tomentosum* Kitam., F. & Fl. Nep. Him. 117. 1955. *B. sphaerostachya* (Meisn.) Greene, Leaflet. 1: 21. 1904.

Herbs erect. **Stem** upto 30cm long bearing usually 2 - 4 leaves. **Lamina** 3.5 – 10 x 2.5 – 3.5 cm, ovate – lanceolate , acute or sometime linear, margin often strongly inrolled, marginal veins prominent, base lanceolate or linear lanceolate , pubescent beneath. **Upper leaves** lanceolate or linear, sessile, **ochreae** 1- 4cm, brown, acute entire. **Flowers** in racemes upto 70cm long , erect. **Perianth** pink. **Achenes** brown.

Flower : September
Exsiccatu : Padamchen boundary 2800m, *SR Lepcha & AP. Das 32901*, dated
- 27.10.2004.

Status : Common
Local Distribution : Padamchen,, Zuluk, Kyongnosla upto 5000 m.
General Distribution : HIMALAYA; INDIA, NEPAL, BHUTAN, CHINA
Note : Endemic to Himalaya.

Bistorta vacciniifolia (Meisn.) Green, Leafl. 1: 21. 1904; Grierson & Long, Fl. Bhutan 1(1): 167. 1983; Hara & Ohashi in Fl. E. Him. 69. 1966. *Polygonum vaciniifolium* Meisner, Wall. ex Meisner in Wallich, Pl. Asiat. Rar. 3: 54. 1832; Hook. f. in Fl. Brit. Ind. 5: 33. 1885, Steward, l.c. 27. 1930

Shrubs trailing, sometime stoloniferous. **Stem** slightly sub-erect, upto 17 cm. **Leaves** sessile, **lamina** ovate - elliptic, 1.5 - 2.5 x 0.8 - 1.8 cm, acute, base cuneate, **ocreae** c 1.3 cm., vein lacerated. **Flowers** in terminal racemes, rarely branched, to 7 cm, flower few - many. **Perianth** to 7mm, usually pink; **stamens** and style exerted., **Achenes** brown to 1.8 cm.

Flower : September - November
Exsiccatus : Padamchen boundary, 2800m **SR Lepcha & AP. Das** 32901, dated 27.10.2004.

Status : Common
Local Distribution : Padamchen, Zuluk, Kupup 2800 - 4000 m
General Distribution : HIMALAYA; INDIA (Kashmir - BHUTAN) Manipur, and W. TIBET.

Note : Endemic to Himalaya.

Koenigia Linnaeus

Koenigia nepalensis D. Don, Prodr. Fl. Nep. 74. 1825; Hara in Fl. E. Him 70. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 174. 1982; Grierson & Long, Fl. Bhutan 1(1): 157. 1983. *Polygonum filicaule* Wall. ex Meisn. in Wall., Pl. Asia. Rar. 3: 59. 1832; Hook. f. in Fl. Brit. India 5: 25. 1885.

Herbs annual small upto 35 cm. **Stem** prostrate, creeping. **Leaves**: petioles upto 0.62 cm long, upper leaves sessile; **lamina** 0.57 - 2.5 x 0.35 - 1.5 cm, ovate, acute, base rounded, sparsely hairy both sides; **Ocreae** to 0.5 cm, cup-shaped, pilose; **Flowers** in small flat-topped corymbs; **perianth** to 0.18 cm, segments 5, basally connate, white or pinkish; **stamens** 0.07 cm; styles 3, short and obliquely capitate. **Achenes** trigonous.

Flower & Fruit : June - August.
Exsiccatus : Rachela below, 2850 m, **SR Lepcha & AP. Das** 20296, dated 16.07. 2005

Status : Abundant.
Local Distribution : Panglakh, Rachela Trijunction, 2700 - 3100 m.
General Distribution : HIMALAYAS; INDIA (Kashmir to Sikkim), TIBET, W. CHINA and Formosa

Oxyria Hill

Oxyria digyna (L.) Hill, Hort. Kew. 158. 1768; Grierson & Long, Fl. Bhutan 1(1): 175. 1983. *Rumex digynus* L., Sp. Pl. 1: 337. 1753; Hara *et al.* in Enum. Fl. Pl. Nepal 3: 175. 1982

Herbs perennial. **Stems** solitary or several erect, upto 30 cm tall. **Leaves** ; petiole 3-12 cm; lamina 1.5 - 3 x 2 - 4 cm, nearly all basal, reniform or orbicular-reniform, abaxially sparsely hirtellous along veins, adaxially glabrous, base broadly cordate, margin sub-entire, apex obtuse;

cauline ones usually rudimentary; **ocrea** shortly tubular, membranous, apex oblique. **Flowers** terminal, paniculate; bracts membranous, each 2 - 5-flowered. **Pedicels** slender, articulate below middle. Flowers bisexual. **Perianth** greenish or pinkish; outer **tepals** smaller, deflexed; inner ones accrescent in fruit, obovate, appressed. **Filaments** dilated at base. **Achenes** ovoid, broadly winged.

- Flower & Fruit* : September – October
Exsiccatus : Kupup 3900 m, **SR Lepcha & AP. Das 02400**, dated 25.09. 2003.
Status : Not common
Local Distribution : Kupup, Gnathang, Lampokhri 1300 - 4900m
General Distribution : EUROPE, NORTH AMERICA, TAJIKISTAN, KAZAKHSTAN, RUSSIA, PAKISTAN, SW ASIA, INDIA, NEPAL, BHUTAN, JAPAN, KOREA, MONGOLIA

Persicaria Linnaeus

Key to the species:

1. Petiole winged or articulated at base 2
 + Petiole not winged 3
2. Herbs erect; stems usually with recurved spines; leaf hispidulous on both surfaces *P. pubescens*
 + Herbs climbing; stem without recurved spines; leaf pubescent and setoses on both surfaces *P. thunbergii*
3. Leaves runcinate *P. runcinata*
 + Leaf minutely dissected; ovate or deltoid-ovate 4
4. Flowers in corymbose heads; stamens 8; Perianth pinkish-white *P. chinensis*
 + Inflorescence oftenly axillary or terminal; stamens 3; Perianth light pink *P. nepalensis*

Persicaria chinensis (L.) H. Gross in Engl. Bot. Jaharb. 49: 269. 277 & 315. 1913; Grierson & Long, Fl. Bhutan 1(1): 163. 1983. *Polygonum chinense* L., Sp. Pl. ed. 1, 1: 363. 1753; Fl. Brit. India 5: 44. 1886; Hara *et al* in Fl. E. Him.3: 175. 1982

var. ***ovalifolia*** (Meisn.) Hara & Ohashi in Fl. E. Him. 71. 1966; 2: 22. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 175. 1982. *Polygonum chinense* var. *ovalifolia* Meisn. *sensu* Fl. Brit. India 5: 45. 1885.

Local Name: Ratnawlo (Nep.).

Shrubs, erect. Stem grooved. **Stipules** obliquely truncate tube and enclosed to entire internode, white; **petiole** upto 1cm, winged in few ones, 2-unequally auricled at base; **lamina** 4.5 -13 x 2.5 - 4.5cm, amplexicauled, shape much variable, oblong-lanceolate to oblong-ovate, margins minutely dissected, light red, thinly hairy, acute or acuminate, base variable from rounded, truncate to subcordate, glabrous and dark green above, densely brown hairy along mid-vein beneath, lateral veins 6 - 12 or more. **Flowers** in corymbose heads. **Peduncles** divaricate. Panicles glandular hairy. Bracts scarious, glabrous. **Involucral** leaves 0. **Perianth** pinkish-white, 5-cleft, lobes subequal; **stamens** 8; filaments glandular; styles 3, united below. **Fruits** trigonous.

- Flower* : June - October *Fruit:* August - December
Exsiccatus : Panglakha, **SR Lepcha & AP. Das 31182**, dated 05.10.2004.
Status : Common.
Local Distribution : Rachel, Panglakha, Talkharkha 1600 – 2200 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, CHINA, JAPAN,

MALAYSIA.

Note : A common fodder for cattle.

Persicaria nepalensis (Meisn.) H. Gross in Engl., Bot. Jahrb. 49: 277. 1913; Hara & Ohashi in Fl. E. Him. 72. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 177. 1982; Grierson & Long, Fl. Bhutan 1(1): 164. 1983. *Polygonum nepalense* Meisn., Monog. Polyg. 84, t. 7. fig. 2: 1826. *Polygonum punctatum* Ham. ex D. Don, Prod. Fl. Nep. 72. 1825.

Herbs, annual erect or procumbent. Leaves; stipulate, stipules to 0.6cm long, tubular, obliquely truncate; petioles upto 0.4cm, broadly winged, auricled, basally haired at nodal region; lamina 1.2 - 2.5 x 0.5 - 1.4cm, ovate or deltoid-ovate, slightly repund, little curved downwards, acute, base narrowed to winged petiole, dark green above, paler, glabrous to sparsely glandular hairy beneath, nerves impressed above, prominent below, mid-rib thick. **Inflorescence** oftenly axillary or terminal, with involucre green, sessile, ovate-cordate. Leaves peduncles small or nil, glandular hairy at the tip. Bracts ovate, glabrous. **Perianth** 5-lobed, accrescent, light pink; stamens 3; stigma capitate. **Achenes** biconvex.

Flower : May - November
Exsiccatae : Panglakha 2760 m, **SR Lepcha & AP. Das 29350**, dated 30.9.2004.
 NNP border, **SR Lepcha & AP. Das 29353**, dated 01.10.2004.
Status : Abundant.
Local Distribution : Kyongnosla, Rongchu, Changu below (1500-3100 m).
General Distribution : AFGANISTAN, HIMALAYAS; INDIA, NEPAL, BHUTAN, SRI LANKA, CHINA, KOREA, JAPAN, MALAYSIA.

Persicaria pubescens (Blume) Hara in Journ. Jap. Bot. 17: 335. 1941; Hara *et al* in Fl. E. Him. 73. 1966; in Hara *et al.*, Enum. Fl. Pl. Nepal 3: 177. 1982. Grierson & Long, Fl. Bhutan 1(1): 163. 1983. *Polygonum pubescens* Blume, Bijdr. 1825-26; Steward in Contr. Gray Herb. 88: 62. 1930. *Polygonum pubescens* Blume, Bijdr. 1825-26; Steward in Contr. Gray Herb. 88: 62. 1930; Pl. Jap. 2: 474. 1877; Hara & Ohashi in Fl. E. Him. 74. 1966; *P. hydropiper* ssp. *microcarpa* (Danser) Sojak in Preslia 46: 153. 1974.

Herbs annual or perennial upto 1.2 m tall. Stems erect, often reddish, hispidulous. **Leaves**: petiole to 5 mm ; **lamina** 3.5 - 9 x 1- 4cm ovate-lanceolate or broadly lanceolate, both surfaces hispidulous, base cuneate, margin ciliate, apex acuminate or acute; ocrea tubular, hispid, apex truncate, ciliate. **Inflorescence** terminal or axillary, spicate, pendulous, lax, to 16 cm, interrupted below; funnel-shaped, margin ciliate, each 3- or 4-flowered; pedicels longer than bracts. **Perianth** green, red above, 5-parted, densely purplish glandular punctate; **tepals** elliptic; stamens 8, included; styles 3, connate to below middle. Achenes black, ovoid.

Flower : May - August
Exsiccatus : Singhaney 2200 m, **SR Lepcha & AP. Das 20290**, dated 28.10.2004.
Status : Sparse
Local Distribution : Subaney dara - Singhaney bans upto 2500 m.
General Distribution : EUROPE, N. AFRICA, HIMALAYAS; INDIA, NEPAL, BHUTAN, JAPAN, N. AMERICA.

Persicaria thunbergii (Seib. & Zucc.) H. Gross in Beih. Bot. Centralbl. 37(2): 114. 1919; Hara *et al* in Fl. E.Him. 1: 633. 1966; Hara *et al* Enum. Fl. Pl. Nepal 3:178. 1982; Grierson & Long. Fl. Bhutan 1(1):172.1983. *Polygonum thunbergii* Seib. & Zucc., Fl. Jap. Fam. Nat. 2: 84. 1784.

Herbs climbing upto 1.5 m tall.. Stem usually with small recurved spines. **Leaves:** petiole usually short to 4 mm long; lamina 3 -6.5 x 3 - 7.5 cm, acuminate , basal lobes spreading, acute, pubescent and setoses on both surfaces ; **ochreae** strigose, to 15 mm long with much longer 8 mm long cilia. **Spikes** up to 15 cm long, filiform, which are rather drooping, extremely slender and much interrupted. **Flowers** in terminal ; **perianth** ± gland-dotted. **Stamens** 8. Nuts trigonous, pale brown.

Flower : August - September. *Fruit:* September - October.
Exsiccatus : Memenchu, **SR Lepcha & AP. Das 31013**, dated 02.10.2004.
Local Distribution : Bab-mandir, Chhangu, Zuluk
General Distribution : PAKISTAN, INDIA, NEPAL, BHUTAN, BANGLADESH, CHINA, INDONESIA, JAPAN, KOREA.

Persicaria runcinata (D. Don) H. Gross in Engl., Bot. Jahrb. 49: 277. 1913; Hara in Fl. E.Him. 74. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3:178. 1982; Grierson & Long Fl. Bhutan 1(1): 164. 1983. ***Polygonum runcinatum*** D. Don, Prodr. Fl. Nep. 73. 1825; Hook.f. in Fl. Brit.India 5: 43. 1885.

Local Name: Ratnawlo (Nep.).

Herbs annual, prostrate, or ascending, upto 40 cm tall. **Stem** flaccid, grooved, creeping. **Leaves:** stipules cylindric, truncate, white-membranous; petiole 3 cm long, articulate at base, hairy; **lamina** 3 - 4.5 x 1 - 3.5 cm, runcinate, terminal lobe rhombic-ovate, lateral lobes linear oblong, in 1-3 pairs, amplexicled, pubescent beneath, veins pubescent below. **Flowers** head 2 cm across, globose; peduncle 1.5 - 3cm long, slender; **involucral leaf** absent; bracts enclosing pedicel, nerved in mid vein, hairy outside. **Perianth** light pink or white, 5 - cleft ; **stamens** 8, slightly exceeding perianth; anthers black; filament white; styles 3, united basally. **Achenes** rounded.

Flower & Fruit : April - December
Exsiccatus : Singhaney 2360 m, **SR Lepcha & AP. Das 20294**, dated 28.10.2004.
Status : Common
Local Distribution : distributed widely in altitude from 1200 - 3000 m
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, THAILAND, W. & C. CHINA, FORMOSA, MALAYSIA.

Note : A common fodder.

Rheum Linnaeus

Key to the species:

1. Herbs less than 2 m tall 2
- + Herbs more than 2 m tall *Rheum australe*
2. Leaves basal in rosette; ocrea red *R. nobile*
- + Leaves arranged in stem axis; ocrea brown *R. acuminatum*

Rheum nobile Hook.f., & Thoms., Ill. Himal. Pl. t. 19. 1855; Hara in Fl. E. Him. 75. 1966; Grierson & Long. Fl. Bhutan 1(1): 172. 1983.

Herb usually large, upto 2 m tall. Roots rhizomatous. Stem erect, usually striped. **Basal leaves** in a rosette; stem leaves dense; petiole stout, shorter than blade, to 20 cm, glabrous; leaf lamina large, orbicular, ovate, leathery, glabrous or pilose above, glabrous below, basal veins 5 - 7, conspicuously raised abaxially, base rounded or subcordate, margin entire, apex obtuse; upper leaves smaller, orbicular, to 13 cm; ocrea red, broadly lanceolate. **Panicle** 5- 8-branched, to 8 cm long; bracts light yellow ; pedicel to 3 mm, slender, **Flowers** 5 - 9-fascicled. **Tepals** 6 or fewer,

connected at base, elliptic, inner 3 larger, yellow; **stamens** 8 ; anthers oblong-elliptic; **filaments** base inflated, to 4 mm; **ovary** ovoid; style short; stigma inflated. **Fruit** not seen.

- Flower* : June – July *Fruit*: September
Exsiccatu : Kupup (Tiger hill) 4650 m, **SR Lepcha & AP. Das 31500**, dated 27.07.2005.
Status : Not common
Local Distribution : Top hill of Baba mandir, upto 5000 m.
General Distribution : E. HIMALAYA (NEPAL – BHUTAN).
Note : 1. Endemic to Eastern Himalaya
2. This species is drastically becoming rare in the area and used in making natural dye.

Rheum australe D. Don, Prodr. Fl. Nepal. 75. 1825; Hara in Enum. Fl. Pl. Nepal 3: 179. 1982; Grierson & Long. Fl. Bhutan 1(1): 172. 1983.

Herb upto 3 m tall. Branched above. **Petiole** upto 32cm long; leaves basal upto 40 x 25cm long broad, acute, base cordate, pubescent beneath; upper leaves usually smaller; ocreae 5 – 12 cm long, brown. **Flowers** in axillary or terminal panicles. **Perianth** segments oblong – ovate, ca 2.2 mm, round or acute at apex, red; pedicels jointed near base. **Fruits** orbicular, 6-7.5 cm long and broad not at apex, winged.

- Flower & Fruit* : June – September
Exsiccatu : Sherathang 4200 m, **SR Lepcha & AP. Das 20295**, dated 13.11.2004.
Status : Common
Local Distribution : Manju lake, Serathang, 3400 – 4100 m).
General Distribution : PAKISTAN, INDIA, , NEPAL, BHUTAN, MYANMAR
Note : a potent medicinal plant.

Rheum acuminatum Hook.f. & Thoms., Hara *et al* in Fl. E. Him. 75.1966; Hara in Enum. Fl. Pl. Nepal 3: 179.1982; Grierson & Long. Fl. Bhutan 1(1): 172. 1983.

Herbs perennial upto 1 m tall. Branched usually above. **Leaves**; petiole upto 28 cm long; basal leaves acuminate, base cordate, pubescent beneath; upper leaves usually smaller; Ocreae 5 – 11 cm long, brown. **Flowers** in axillary or terminal panicles. **Perianth** segments oblong – ovate, ca 3mm, dark red; pedicels to 5 mm, jointed near base. **Fruits** orbicular, 6.8 - 7.5 cm long and broad notched base and at apex; achene winged.

- Flower & Fruit* : June – September
Exsiccatu : Manju lake 4290 m, **SR Lepcha & AP. Das 30935**, dated 24.05.2005.
Status : Common
Local Distribution : Manju lake, Serathng, 3400 – 4100 m.
General Distribution : E. HIMALAYA (Sikkim)
Note : Endemic to Eastern Himalaya

Rumex Linnaeus

Rumex nepalensis Spreng., Syst. Veg. 2: 159. 1825; Hook.,f. in Fl. Brit. India 5: 60. 1885; Hara & Ohashi in Fl. E. Him. 75. 1966; Hara *et al*, Enum. Fl. Pl. Nepal 3: 179. 1982; Grierson & Long Fl. Bhutan 1(1): 173. 1983.

Ver. Name: Halhalay (Nep.).

Herbs, perennial, rosette upto 1m tall. **Stem** vertically ridged. **Stipules** white, persistent, sparsely hairy to glabrous; **petiole** upto 6 cm, hairy; **lamina** oblong-ovate, 3.5 – 13 x 1.5 - 5cm,

and of radicals 11 - 15 x 4.5 - 7.5cm, oblong-ovate, subacute, cordate, thinly pubescent to glabrous beneath, dark green above, brown when dry. **Flowers** in axillary or terminal racemes. Flowers minute, polygamous, whorls much crowded upwards, reddish to yellowish-green. **Perianth** segments 6, outer 3 smaller, oblanceolate, entire; inner 3 larger, ovate, persistent and enlarged, distinctly veined and fringed with hooked bristles of 0.4 cm length; **stamens** 6; style 3; stigma fimbriate. **Achenes** light red.

Flower & Fruit : June - October
Exsiccatus : Bhimbase 4350 m, **SR Lepcha & AP. Das** 31432, dated 27.7.2005.
Status : Common
Local Distribution : Kupup, Kyongnosla, Rachel Middle. 1900 - 3200 m.
General Distribution : S. W. EUROPE; W. ASIA, AFGANISTAN ; HIMALAYAS;
 INDIA, MYANMAR, TONKIN, CHINA, JAPAN, JAVA.

Note : Young leaves eaten as vegetable; also used as medicine against eczema and dye obtained from this species is traditionally being used for numerous purposes.

Subclass: Dilleniidae Order: Theales

THEACEAE D. Don

Eurya Thunberg

Key to the species

1. Plants with straight branches; corolla whitish yellow..... *E. cerasifolia*
 + Plants with profuse branched; petals white *E. acuminata*

Eurya acuminata DC., Mem. Ternstr. 26. 1822; Prodr. 1: 525. 1824; C.B. Clarke in Fl. Brit. India 1: 285. 1872; Hara & Ohashi in Fl. E. Him. 208 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 64. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 363. 1984; Sharma *et al.*, Fl. India 3: 178. 1993.

Local Name: *Sanu Jhinguni* (Nep).

Shrubs to small trees with profuse branches, young twigs pubescent. **Leaves**; petioles to 0.6 cm, pubescent; **lamina** 3.5 - 12 x 1 - 3 cm, elliptic-lanceolate, serrulate, short acuminate, cuneate, glabrous, glossy, mid-nerve elevated and pubescent beneath. Pedicels to 0.30 cm. 3 - 5. **Flowers** in axillary fascicles; bracteolate, dioecious. **Sepals** 5, to 0.4 cm, broadly elliptic, glabrous, persistent. **Petals** 0.5 - 0.6 x 0.30 cm, ovate, white; **stamens** 15, shorter than petals; **ovary** subglobose, glabrous; **styles** 3, united at base. **Fruits** subglobose.

Flower : September - November *Fruiting*: November - January
Exsiccatus : Dohrok, 2300m, **S.R.Lepcha & A.P. Das** 1320, dated 06.10.2004.
Status : Common
Local Distribution : Subaney, Phusrey, Beusa 1400 - 2100m.
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, TIBET, MYANMAR,
 THAILAND, CHINA.

Note : Used as fodder & fuel wood.

Eurya cerasifolia (D. Don) Kobuski in Anna. Miss. Bot. Gard. 25: 326. 1938; Hara & Ohashi in Fl. E. Him. 209 1966; Hara *et al.* Enum.Fl.Pl.Nepal 2: 84. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 364. 1984; Sharma *et al.*, Fl. India 3: 183. 1993. *Diospyrus cerasifolia* D. Don, Prodr. Fl. Nepal 144. 1825. *E. symplocina* Blume, Mus. Bot. Lugd.- Bat. 2: 133. 1856; C.B. Clarke in Fl. Brit. India 1: 285. 1872.

Local Name: Tukzel Kung (Lep), Thulo Jhinguni (Nep.).

Shrub or small tree, branches striate. **Lamina** elliptic-lanceolate, 5 - 11.5 x 1.5 - 3.5 cm, margins entire or serrate above middle, acuminate, base cuneate to rounded, glossy, mid-vein raised beneath, depressed above, veins prominent both sides. **Inflorescence** fascicles crowded with few - many flowered, bracteolate. **Flowers** minute. **Calyx** to 0.5 x 0.4cm, obtuse, silky. **Corolla** 5, to 0.5 x 0.4 cm, oblong-elliptic, whitish yellow; **stamens** upto 15; **ovary** glabrous; styles branched. **Fruits** subglobose or broadly ellipsoid, blue- black.

Flower : October - January *Fruiting:* April - October.

Exsiccatus : Dohrok 2250m, , **S.R.Lepcha & AP. Das 30221**, dated 06.10.2004..

Status : Frequent.

Local Distribution : Dorok, Subhaney 1200 - 2100 m.

General Distribution : HIMALAYAS; INDIA, BHUTAN, NEPAL, MYANMAR, THAILAND, INDO-CHINA, MALAYSIA.

Order: Malvales

ELAEOCARPACEAE DC.

Key to the Genera:

1. Flowers solitary or in fascicles; capsule spiny or bristly *Sloanea*
 + Flowers racemed; drupe glabrous *Elaeocarpus*

Elaeocarpus Burmann ex Linnaeus

Elaeocarpus lanceifolius Roxb., Fl. Indica, ed. 2, 1: 598. 1832; Masters in Fl. Brit. India 1: 402. 1872; Indian Trs. 102. 1906; Hara in Fl. E. Him. 1: 201. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 72. 1979; Miller in Grierson & Long, Fl. Bhutan 2(1): 170. 1991.

Local Name: Syapkyu (Lep.) Bhadrasay (Nep.).

Tree 10 - 20 m tall. **Petioles** 0.8 - 2.5 cm long; **lamina** 09 - 16 x 3.5 - 5 cm, elliptic, acute or acuminate, base attenuate, scarcely pubescent beneath or glabrous, minutely blistered on drying, lateral veins axils glandular along midrib beneath. **Racemes** upto 6.5 cm, flower 9 - 10. **Pedicels** 0.07 cm. **Calyx** lanceolate, tomentose or glabrous. **Corolla** obtriangular, whitish, segmented to middle into many segments, hairy; **stamens** numerous, **Ovary** 3-locular. **Fruits** ovoid to ellipsoid; stone 3-grooved, one seeded.

Flower : August - October

Exsiccatus : Neora border 2100 m, **SR Lepcha & AP, Das 1006**, dated 17.10.2004

Status : Common

Local Distribution : Rigu, Dhorok 1300 - 2200 m.

General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR,

S.CHINA.

Note : Fruits edible.

Sloanea Linnaeus

Sloanea dasycarpa (Benth.) Hemsl. in Hook., Ic. Pl. 27: t. 2628. 1901; Hara *et al.* Enum. Fl. Pl. Nepal 2: 73. 1979; Miller in Grierson & Long, Fl. Bhutan 2(1): 167. 1991. *Echinocarpus dasycarpus* Benth. in Jour. Proc. Linn. Soc. 5 suppl. 2: 73. 1861; Masters in Hook.f., Fl. Brit. India 1: 400. 1872.

Trees large, evergreen, upto 28m tall. **Petioles** 1 – 2.8cm long, glabrous; **lamina** 3.5 - 18 x 2.5 – 4.2 cm., oblanceolate or obovate, margin serrulate, acute to acuminate, base cuneate, glabrous except vein axils with tufts of hairs beneath along midnerve, lateral nerves 5 - 6 on either sides; pedicels short 1.5 – 2 cm long, extending upto 5.4 cm in fruit. **Inflorescence** solitary axillary. **Sepals** 4 or 5, unequal, ovate-lanceolate, tomentose. **Petals** 4 or 5, apex lacinate; stamens many; anthers acute; ovary ovoid, villous. **Capsules** globose, 4-valved and covered with deciduous bristles; bristles plumose; **seeds** arillate.

Flower : August – October

Exsiccatus : Phusrey NNP border 2120m, *SR Lepcha & AP. Das* 3790 dated 17.10.2004

Status : Rare

Local Distribution : Phusrey, PWS. 1300 – 2200 m.

General Distribution : E. HIMALAYA; INDIA, (E.NEPAL- BHUTAN), S. BURMA and W. CHINA.

Note : 1. Endemic to Eastern Himalaya.
2. Fruits edible.

MALVACEAE A.L. Jussieu

Urena Linnaeus

Urena lobata L., Sp. Pl. ed. 1, 2:692. 1753; Masters in Fl. Brit. India 1: 329. 1872; Hara in Fl. E. Him. 206. 1966; Hara *et al.*, Enum Fl. Pl. Nepal 2: 69. 1979; ssp. *lobata* Fasc. Fl. India 19: 228. 1988; Miller & Long in Grierson & Long, Fl. Bhutan 2(1): 194. 1991.

Local Name: *Kuray Paat* (Nep.).

Shrubs, annual or perennial small upto 2 m tall. **Leaves** variable; petioles short to 8 cm long; **lamina** 2 - 10.5 x 0.3 – 12.5 cm, ovate to orbicular, unlobed, irregularly incised towards base, lobes usually upto 5, often more, apex and base obtuse to acute or rounded, entire or serrate, stallate usually hairy on both sides, glabrescent, basally 3 - 9 nerved; stipules to 0.5 cm long, filiform; epicalyx segments to 0.68 cm, linear-lanceolate. Pedicels upto short 0.5cm. Flowers solitary or few in clusters, axillary. **Calyx** lobes 0.50 - 0.75 cm, ovate to deltoid. **Corolla** obovoid, pinkish; **staminal** column upto 1.5 cm. **Mericarps** with sharp bristles.

Flower & Fruit : July - January.

Exsiccatus : Dohrok, *SR Lepcha & AP. Das* 30297, dated 07.10.2004.

Status : Common

Local Distribution : Phusrey, Karponang, Rongchu; upto 1900 m.

General Distribution : PANTROPIC.

Note : A noted fibre yielding plant.

Order: Nepenthales

DROSERACEAE Salisbury

Drosera Linnaeus

Drosera peltata Smith ex Willd., Sp. Pl. 1: 1546. 1797; C. B. Clarke in Hook.f., Fl. Brit. India 2: 424.1878; Long in Grierson & Long, Fl. Bhutan 1(2): 379.1984; Hara in F.E. Him. 1: 110. 1996

Herbs annual or perennial, upto 22 cm tall. **Stem** erect or climbing, branched distally, with tuber of glabrous or with black, papillose glands. **Leaves**; petiole 2.5 – 8.5 mm.; basal leaves densely whorled, rarely absent exstipulate, yellowish green, **lamina** 1.5 – 3.5 × 5.5 - 7mm; peltate, orbicular to suborbicular, cauline leaves alternate, exstipulate, yellowish green; leaf blade peltate or lunate to semi-orbicular, margin glandular hairy. **Inflorescence** terminal; 3 - 22-flowered; **bracts** cuneate to oblanceolate or subulate; calyx 5 - 7, yellowish green, lanceolate to ovate, glabrous to glandular hairy, apex 5 - 7-fid. **Corolla** usually white, rarely pink or red, oblong-cuneate. **Stamens** 5, **Ovary** subglobose ; placentas 3; styles 3, 2-5-parted. **Stigma** 2- or 3-fid. **Capsules** subglobose, 3 - 5-valved. **Seeds** ellipsoid-ovoid to globose.

- Flower* : July- August, *Fruit* .: August-September.
Exsiccatus : Kupup lake 4030 m, , *SR Lepcha & AP. Das 1004*, dated 13.10. 2004.
Status : Less common
Local Distribution : Kyongnosla, Changu. 2000 – 4000 m
General Distribution : INDIA, CHINA, SE ASIA; AUSTRALIA

Order: Violales

FLACOURTIACEAE DC.

Gynocardia R. Brown.

Gynocardia odorata R. Brown, in Roxb., Pl. Corom. 4:95, t. 299.1820; Hook.f.& Thoms. in Fl. Brit. India 1: 195. 1872; Hara *et al.* Enum. Fl. Pl. Nepal 2: 49. 1979; Grierson & Long, Fl. Bhutan 2 (1): 219. 1991. Sharma *et al* Fl. India 2: 407. 1993. *Chaulmoogra odorata* (R.Br.) Roxb., Fl. Ind. ed. 2, 3: 835.1832.

Local Name: *Gantay, Bandre, Ramphal* (Nep.).

Trees, upto 20m tall. **Leaves** simple; petiole 1-1.6cm; **lamina** 13 - 18 x 4.5 – 6.5 cm, oblong, apiculate, base nearly rounded, margin uneven, coriaceous, pale beneath, veins decurrent on mid-rib. **Pedicels** to 2.5cm. **Inflorescence** in fascicles, unisexual; male flowers in few flowered racemes, arising from leaf axils. **Calyx**, with obtuse lobes. **Corolla**, oblong, yellowish green; **stamens** many; **anthers** basifixed. **Female flowers** similar to male flowers; **ovary** superior; **styles**

5, short; stigma cordate; staminodes 6 - 15, hairy. Fruits globose berry, clustered, rough textured, brown; seeds 2 cm, obovoid.

- Flower & Fruit* : April – June
Exsiccatu : Below Pushrey barrack 1800 m, *SR Lepcha & AP. Das 750*, dated 21.10. 2008.
Status : Frequent
Local Distribution : Rachela middle, boarder to NNP. 1600 - 2300m.
General Distribution : HIAMALYAS; INDIA, NEPAL, BHUTAN, , MYANMAR.
Note : Fruit pulp is used for fish poisoning by Sherpas.

STACHYURACEAE J.G. Agardh

Stachyurus Siebold et Zuccarini

Stachyurus himalaicus Bentham, J. Linn. Soc. 5: 55. 1861; Dyer in Fl. Brit. India 1: 288. 1872; Hara & Ohashi, Fl. E. Him. 1: 214. 1966; 2: 83. 1971; Hara *et al*, Enum. Fl. Pl. Nepal 2: 65. 1979; Fasc. Fl. India 20. 135. 1990; Grierson in Grierson & Long. Fl. Bhutan 2(1): 228-229. 1991; Sharma *et al.*, Fl. India 3: 204. 1993.

Local Name: Churay Lahara (Nep).

Herbs, deciduous. Branches straggling. **Leaves** simple with linear stipules; **petioles** upto 1.5cm; **lamina** 2.5 – 7.5 x 2 – 4.5 cm, ovate-elliptic, finely serrate, acuminate, rounded, both surfaces glabrous. **Flowers** raceme in spike, axillary, unbranched, 2.5 – 4cm long, pendulous; bracts to 0.5cm, ovate, brown. **Flowers** bisexual, greenish-yellow to pinkish appear before leaves. **Calyx** to 0.5 cm, obovate. **Corolla** longer than sepals, obovate; stamens 0.28 - 0.40cm, ovary superior (in female flower); pistillodes 0.32cm (in male flower). **Fruits** subglobose.

- Flower* : January - April. *Fruit* May - August
Exsiccatu : On way to Rachela 2800 m, *SR Lepcha & AP. Das 31229*, dated 13.09. 2008.
Status : Less Common.
Local Distribution : Middle Rachela, Panglakha below, upto 2850 M,
General Distribution : HIMALAYAS (NEPAL-BHUTAN), Manipur, Naga Hills, S.E. TIBET, MYANMAR, CHINA.

VIOLACEAE Batsch.

Voila Linnaeus

Key to species

1. Herbs perennial *V. diffusa*
+ Herbs perennial 2
2. Flower yellow *V. biflora*
+ Flowers white or purplish 3
3. Leaf lamina slightly –deeply cordate, apex acute -obtuse 4
+ Leaf lamina kidney shaped; apex blunt *V. canescens*

4. Sepal lanceolate, 3 veined *V. hookeri*
 + Sepals ovate *V. hamiltoniana*

Viola biflora L., Sp. Pl. 936. 1753; Hook.f. & Thoms. in Fl. Brit. India 1: 182.1872,p,p; Hara & Ohashi in Fl. E. Him. 212. 1966; Hara *et al*, Enum. Fl. Pl. Nepal 2: 47.1979; Grierson in Grierson & Long, Fl. Bhutan 2(1): 224. 1991; Sharma *et al*. 2: 375-379. 1993.

Herbs perennial upto 20 cm tall. **Leaves** basal leaves 2 to several; stipules ovate or ovate-lanceolate margin entire or denticulate, apex acute; petiole short; reniform, broadly ovate, or suborbicular to orbicular, **lamina** 1 - 4 x 1 - 3.5 cm, abaxially glabrous, upper surface puberulous, base cordate or sub-truncate, margin dentate or shallowly crenate, apex obtuse. **Flowers** yellow. **Sepals** linear-lanceolate apex acute, basal auricles very short. **Petals** oblong-obovate, purple veined; spur shortly cylindrical; ovary glabrous; styles clavate, deeply 2-lobed in upper half. **Capsules** oblong-ovoid.

- Flower* : April - August. *Fruit*: July – October.
Exsiccatus : Kupup Lake 4250 m, **SR Lepcha & AP. Das 30904**, dated 24.07.2005.
Status : Common.
Local Distribution : Kupup 2500 – 4300 m.
General Distribution : EUROPE, RUSSIA, INDIA, NEPAL, BHUTAN, CHINA, MYANMAR, JAPAN, KOREA, MALAYSIA, MONGOLIA.

Viola canescens Wall. in Roxb., Fl. Indica. 2: 450. 1824; Hara *et al*, Enum. Fl. Pl. Nepal 2: 47. 1979. Grierson in Grierson & Long, Fl. Bhutan 2(1): 223. 1991. *V. serpens* Wall. var. *canescens* Thoms. in Fl. Brit. India 1: 184. 1872 p.p.

Herbs perennial stem less, pubescent. **Leaves**; petioles to 6 cm long, hairy; stipules lanceolate, fringed and brown, leaf **lamina** 1.2 - 4 x 1- 3 cm, ovate-cordate to kidney-shaped, sinuate, apex blunt, base cordate, blade thick and gray hairy. **Flowers** 1 cm across, pale violet, spurred; **sepals** 5, free, greenish, hairy externally; **petals** 5, exceeding the sepals in length, free; **stamens** united basally; **ovary** superior.

- Flower* : March – May
Exsiccatus : Dohrok 2155 m, **SR Lepcha & AP. Das 1347**, dated 10.10.2007.
Status : Common.
Local Distribution : Dhamdhamay Dara, PHE Source, Chitray, Reshete. 2100 – 2600 m.
General Distribution : TEMPERATE HIMALAYAS; NILGIRIES; INDIA, NEPAL, BHUTAN, SRI LANKA, JAVA, CHINA.

Viola diffusa Gingins in DC., Prodr. 1: 298. 1824; Hook.f. & Thoms in Fl. Brit. India 1: 183. 1872; W. Becker in Beih. Bot. Centrabl. Abt. 2, 40: 114. 1920; Hara & Ohashi in Fl. E. Him. 212. 1966; Hara *et al*, Enum. Fl. Pl. Nepal 2: 47. 1979; Grierson in Grierson & Long, Fl. Bhutan 2(1): 224. 1991.

Herbs annual spreading by stolons. **Leaves** simple; stipules upto 1cm, lanceolate, pale, ciliate; petioles upto 2cm, pubescent; **lamina** 1.5 – 4 x 1.5 - 2.9 cm, ovate, crenate, ciliate, obtuse, base rounded to cordate, blade decurrent with petiole, slightly pubescent both sides, hairs straight. **Bracts** linear-lanceolate, ciliate. **Peduncles** to 7 cm long, slender, glabrous. **Sepals** 0.4 cm, lanceolate, acute, base slightly ciliate. **Petals** twice longer than sepals, recurved, pale blue, base greenish yellow, glabrous; **styles** slender at base, spur globose. **Capsule** oblong-ovoid, glabrous.

- Flower* : February – April *Fruit*: June – August
Exsiccatus : Below Rachel 2600 m, **SR Lepcha & AP. Das 1348**, dated 10.10.

2007.

- Status* : Common.
Local Distribution : Middle Rachel (NNP Border), 1400 – 2530 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, JAPAN, MALAYSIA.
Note : A medicinal plant.

Viola hookeri Thoms. ex Hook.f. & Thoms in Fl. Brit. India . 1: 183.1872 p.p.; Hara & Ohashi in Fl. E. Him. 213. 1966; Hara *et al*, Enum. Fl. Pl. Nepal 2: 49. 1979; Grierson in Grierson & Long, Fl. Bhutan 2 (1): 225. 1991; Sharma *et al*, Fl. India 2: 374-375. 1993. *Viola sikkimensis* W. Becker, Beih. Bot. Central.bl. 34(2): 260. 1916.

Herbs perennial. **Stipules** brown, lanceolate, 2 - 2.3cm; petiole glabrous; **lamina** broadly ovate or suborbicular, 2 - 2.5 x 2 – 4 cm, both surfaces glabrous or sparsely puberulous, base deeply cordate, margin densely and shallowly crenate, apex obtuse. **Flowers** white or purplish; pedicels exceeding leaves, glabrous, 2-bracteolate above middle; bracteoles sub opposite, **Sepals** narrowly lanceolate, glabrous, 3-veined. **Petals** oblong - obovate, lateral ones glabrous, anterior one purple veined; **ovary** conical, glabrous; **styles** clavate; stigmas flat at apex. **Capsules** ovoid - orbicular.

- Flower* : April.- May. *Fruit*: May – June.
Exsiccatus : Bara –Ramitey 2400m, **SR Lepcha & AP. Das 31107**, dated 03.10.2004
Status : Common.
Local distribution : Bara-Ramitey, Above Dorok, Singhaney 1500 - 2500 m.
General distribution : INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.

Viola hamiltoniana D. Don, Prodr. Fl. Nep. 206. 1825; Hara *et al*, Enum. Fl. Pl. Nepal 2: 47. 1979; Grierson in Grierson & Long, Fl. Bhutan 2(1): 228. 1991; *V. distans* Wall. in Trans. Med. Phys. S. Calc. 7: 227. 1835; Hook.f. & Thoms. in Fl. Brit. India 1: 183. 1872. *V. distans* var. *acaulis* Hook.f. et Thoms. in Fl. Brit. Ind. 1: 184. 1872. *V. arcuata* Bl., Bijdr. 58. 1825 (June-Dec.).

Herbs perennial with slender stolon. **Stipules** upto 1 cm, lanceolate, fimbriate, brownish; petioles to 8 cm long, glabrous or sparsely pubescent; **lamina** 1.3 - 6 x 1 – 5 cm, ovate, crenate-serrate, acute to rounded, deep cordate or deltoid, sparsely pubescent above, glabrous beneath. **Bracts** upto 0.75 cm. Peduncles short 10 cm long. **Sepals** ovate, acute. **Petals** to 1 cm, lower most smaller, white, glabrous or thinly pubescent within; spur rounded; **styles** straight, slightly tapering upward. **Capsules** many seeded.

- Flower* : March - June *Fruit* .: April - August
Exsiccatus : Padamchen below 2450 m, **SR Lepcha & AP. Das 1350**, dated 11.10. 2007.
Status : Common.
Local Distribution : Mulkharka, Rachel Durpinay 2100 – 2600 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, MALAYSIA, PHILIPPINES.

CUCURBITACEAE A. Jussieu

Key to the Genera:

1. Leaves simple, tendrils 2-5 fid 2
+ Leaves pedately 3-5 foliolate, tendrils simple *Gymnostemma*

2. Flowers bracteate, fruits indehiscent *Trichosanthes*
 + Flowers ebracteate, fruits dehiscent 3
3. Calyx tube narrowly cylindrical; seed ellipsoidal; ovary oblong *Edgaria*
 + Calyx tube elongated; seeds oblong; ovary ellipsoidal *Biswara*.

Biswara Cogniaux

Biswara tonglensis Cogn. in Completes- rend. Soc. Bot. Belg. 21: 16. 1882; Grierson in Grierson & Long, Fl. Bhutan 2(1): 267. 1991. Yamazaki in Hara Fl. E. Him 1: 321. 1966.

Climbers large. Leaves simple, deeply lobed; petiole 8 cm long; ovate or suborbicular, lamina 13 – 25 x 13 – 10 cm, 3 – 7 lobed, lobes triangular, lanceolate or sub-linear, acuminate, base deeply cordate. **Male peduncle** often paired with 1 flowered; ebracteate. **Calyx** tube cilliose, teeth lanceolate. Corolla lobe 5.5 x 3 cm. female peduncle to 11 cm long. **Fruits** oblong.

- Flower* : July *Fruit:* September
Exsiccatus : Dorok 2350 m, **SR Lepcha & AP. Das 30283**, dated 07.10.2004.
Status : Less common
Local Distribution : Premlakha, Hangey, Panikharka 1700 – 3000 m.
General Distribution : E. HIMALAYAS; INDIA, BHUTAN
Note : Endemic to Eastern Himalaya.

Edgaria C.B. Clarke

Edgaria darjeelingensis C.B. Clarke in Journ. Linn. Soc.Bot. 15: 114. 1876; in Fl. Brit. India 2: 632. 1879; Mizushine in Fl. E. Him. 322. 1966; Hara et. al. Enum. Fl. Pl. Nepal 2: 178. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 268. 1984.

Climbers annual. Leaves simple; lamina ovate 8 - 10 x 3.5 – 6 cm, un-lobed or very shallowly 5 lobed, acuminate, usually base cordate, margin undulate, denticulate, often pubescent on both surface. **Male peduncle** oftenly with solitary flowers. Female flowers solitary, peduncle short. **Calyx** tube very short upto 2cm. **Corolla** lobes ovate upto 2 cm. **Anthers** upto 4 mm. **Fruits** usually ellipsoid, hirsute. **Seeds** small 0.8 x 1.5 mm.

- Flower* : June – September
Exsiccatus : Hangey 1700 m, **SR Lepcha & AP. Das 1001**, dated 18. 08.2004.,
Status : Not common
Local Distribution : Phusrey, Durpin dara. 1500 – 3200 m.
General Distribution : HIMALAYA; INDIA (Garhwal – Sikkim).BHUTAN
Note : Endemic to Himalayas.

Gynostemma Blume.

Gynostemma pentaphylla (Thunb. ex Murray) Makino in Bot. Mag. Tokyo 16: 179. ?????; Mizushima in Hara Fl. E. Him. 1: 523. 1966; C.Y.WU in Acta . Phytotax. Sin., 21(4):362. 1983; Grierson in Grierson & Long, Fl. Bhutan 1(2): 270. 1984. *Vitis pentaphylla* Thunb. ex Murray in Linnaeus, Syst. Veg. ed. 14: 244. 1784.

Climber woody. **Leaves**; petiole up to 6 cm, petiolules up to 4 mm; pedately 3 - 5 foliolate tendrils simple; leaflets ovate or elliptic lamina 3 - 9 x 2 - 6 cm, acuminate, base attenuate, margin serrate, glabrous. **Flower** minute; male flower up to 50cm, **females flower** short. **Calyx** lobes triangular, to 0.7mm. **Corolla** lobes subulate. **Fruits**; seeds trigonous, compressed, wrinkled.

Flower : August – October *Fruit*: November
Exsiccatus : Phusrey 2130 m, *SR Lepcha & AP. Das 3000*, dated 12.08.2008.
Status : Less common
Local Distribution : upto 3000 m.
General Distribution : INDIA (Simla to Assam), BHUTAN, MYANMAR, CHINA, MALAYSIA.

Trichosanthes Linnaeus

Trichosanthes wallichiana (Seringe) Wight in Ann. & Mag. Nat. Hist 8: 270. 1842; Mizushima in Fl. E. Him. 325. 1966; Hara *et. al.* Enum. Fl. Pl. Nepal 2: 181. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(2): 266. 1984. *Involueraria wallichiana* Seringe in Mem. S. Phys. Hist. Nat. Geneve 3. t. 5. 1825. *Trichosanthes multeloba auct. non.* Miq: C.B. Clarke in Fl. Brit. India 2: 607. 1879.

Climbers annual. **Lamina** sub-orbicular, 8 - 15 x 12 - 18 cm, usually 3 - 8 lobed, lobes, oblong or lanceolate, acuminate, base rounded, margin usually denticulate or sometime dentate, pubescent above; glands clustered between veins on lower surface, tend-rib usually 2-3 fid. **Male peduncles** pubescent usually 6 - 11 flowered; bract ovate, base sheathing tooth above. **Calyx** tube upto 6 cm, upto 12 cm wide at apex. **Petals** obovate, upto 5 cm, female peduncles upto 4.5 cm. **Ovaries** oblong. **Fruits** oblong ovoid, reddish.

Flower : July – August
Exsiccatus : Dohrok 2300 m, *SR Lepcha & AP. Das 30219*, dated 06.10. 2004.
Status : Less common
Local Distribution : Premlakha, Rigu, Bhusuk 1600 – 2700 m.
General Distribution : INDIA (Simla to Assam), BHUTAN, MYANMAR, CHINA, MALAYSIA.

BEGONIACEAE C.A. Agardh

Begonia Linnaeus

Key to the species:

1. Plant with rhizomatous rootstocks 2
- + Plant with tuberous rootstock 4
2. Leaf-lamina ovate or suborbicular ; margin coarsely toothed 3
- + Leaf-lamina ovate; margins deeply lobed *B. flaviflora*
3. Flowers red ; bract ovate *B. sikkimensis*
- + Flowers white or pink.; bract obovate *B. palmata*
4. Plants epiphytic *B. gemmipara*
- + Plants not epiphytic 5

- 5. Leaf-margin finely serrate, dentate or toothed 6
- + Leaf-margin obscurely crenulate- serrulate *B. ovatifolia*

- 6. Leaves only 1 rarely more *B. picta*
- + Leaves more than 1 never 1 7

- 7. Leaf-margin finely serrate; lower veins sparsely pubescent *B. josephi*
- + Leaf-margins dentate or denticulate ; lower veins reddish villous *B. satrapis*

Begonia flaviflora (Clarke) Hara in Journ. Jap. Bot. 45: 91. 1970; Hara & Ohashi in Fl. E. Him. 2: 84. Pl.3b.1971; Grierson in Grierson & Long, Fl. Bhutan 2(1): 245. 1991. *Begonia laciniata* Roxb. var. *flava* Clarke in Fl. Brit. India 2: 645. 1879.

Herbs, upto 55 cm tall with densely tomentose stem. **Rootstock** creeping, rhizomatous. **Lamina** 6 - 20 x 5 - 13 cm, ovate, acuminate, base obscurely cordate, margin deeply lobed, lobes to 4 cm, serrate. Stipules lanceolate; **peduncles** to 13 cm long, tomentose; **bracts** oblong, yellowish. **Flowers** yellow; perianth segments to 1.5 cm, ovate; **stamens** clustered forming a compact mass; **styles** 2, branched. **Capsules** winged.

Flower & Fruit : July - September
Exsiccatus : Dohrok 2300m, **SR.Lepcha & AP. Das 0235**, dated 15.07.2005.
Status : Less common
Local Distribution : Dohrok, Phusrey, Lingtam – Subaney 1700 – 2300 m.
General Distribution : E. HIMALAYA; INDIA, BHUTAN, NEPAL.
Note : Endemic to E. Himalaya.

Begonia gemmipara Hook. f., Ill. Him. Pl. t. 14. 1855; C.B. Clarke in Fl. Brit. India 2: 641. 1879; Fl. E. Him.2: 84. 1971; Hara *et al* Enum.Fl. Pl. Nepal 2: 181. 1979; Grierson in Grierson & Long, Fl. Bhutan 2(1): 242. 1991. *Putzevsia gemmipara* Klotzsch in Abh. Akad. Berl. 135. 1855.

Epiphytic herbs, erect , upto 15cm tall. Rhizome tuberous. Stem erect. **Petioles** 3.5 – 4.5 cm long; **lamina** ovate 4 – 8.5 x 3 – 5.2 cm, acuminate, base asymmetric, truncate or cordate, margin coarsely serrate, glabrous; pedicels bracteate. **Flowers** pendulous, white or pink. **Perianth** segments 0.5 - 0.6cm, suborbicular. **Stamens** grouped in globose mass; styles 3. **Capsules** inflated.0.72 -1.4 cm, wings sub-equal.

Flower : August – October *Fruit*: October – December.
Exsiccatus : Panglakha 2790 m, **SR.Lepcha & AP. Das 31092**, dated 08.10.2004.
Status : Common.
Local Distribution : Rachila. Panglakha 1900 – 2900 m.
General Distribution : E. HIMALAYA;INDIA, NEPAL.
Note : Endemic to E. Himalaya. (Sikkim)

Begonia josephii A. DC. in Ann. Sci. Nat. Ser. 4(11): 126. 1859; Prodr. 15(1): 313. 1864; C.b. Clarke in Fl. Brit. India 2: 639. 1879; Hara & Ohashi in Fl. E. Him. 1: 214. 1966; 2: 84. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 2: 181. 1979; Grierson in Grierson & Long, Fl. Bhutan 2(1): 240. 1991.

Herbs with tuberous rootstock. **Petioles** upto 19 cm long; leaves all basal; **lamina** 3.5 -13 x 2.5 - 7.5 cm, oblong-ovate, acuminate, base rounded, peltate, finely serrate, sometimes 3 - 5 lobed, glabrous above, pubescent on veins beneath; bracts to 0.3 cm, ovate. **Male flowers**: whitish or pink, outer perianth segments suborbicular, inner smaller, elliptic; **stamens** 0.30 cm long. **Female flowers**: perianth equal or slightly smaller; **styles** branched. **Capsules** ellipsoid, glabrous winged.

Flower & Fruit : July - September
Exsiccatus : Dohrok 2100 m, *SR.Lepcha & AP. Das* 0236, dated 16.07.2005.
Status : Less common
Local Distribution : Rigu above, 1800 - 2450 m.
General Distribution : E. HIMALAYA; INDIA, BHUTAN, NEPAL.
Note : Endemic to Eastern Himalaya

Begonia ovatifolia A. DC. in Ann. Sci. Nat. Ser. 4, 11: 132. 1859; Prodr. 15(1): 328. 1864; C. B. Clarke in Fl. Brit. India 2: 642. 1879; Hara in Fl. E. Him. 3: 86. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 2: 182. 1979; Grierson in Grierson in Grierson & Long, Fl. Bhutan 2(1): 241. 1991.

Herbs succulent with tuberous rootstock. Stemless or rarely with stem. **Leaves** alternate, simple; petioles to 4 cm; **lamina** 2.5 - 5.5 x 3 - 1cm, broadly ovate, acute to ± rounded apically, base rounded or cordate, margin obscurely crenulate-serrulate, thinly hairy above, hairy along veins beneath; **peduncles** bearing upto 10 flowers; **perianth** segments to 0.3 x 0.43 cm, pink or white; **stamens** 0.2 cm, united on column. **Capsules** winged, wing acute; **styles** usually persistent in the fruit.

Flower & Fruit : August - September
Exsiccatus : Dohrok 2250 m, *SR.Lepcha & AP. Das* 0237, dated 16.07.2005.
Status : Less common
Local Distribution : Dohrok, Durpiney near NNP border, 1800 - 2450m.
General Distribution : SUB-TROPICAL E. HIMALAYA; INDIA, BHUTAN, NEPAL
Note : Endemic to Eastern Himalaya.

Begonia palmata D. Don, Prodr. Fl. Nep. 233. 1825; Hara & Ohashi in Fl. E. Him. 1: 215. 1966; 2: 84. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 2:182. 1979; Grierson & Long., Fl. Bhutan 2(1): 245. 1991. *B. laciniata* Roxb., Fl. Ind. ed. 2(3): 649. 1832; C.B. Clarke in Fl. Brit. India 2: 645. 1879.

Herbs pubescent, upto 25 cm tall. Rootstock rhizomatous, creeping, rigid. Stems short, shaggy-pubescent. **Petioles** 22 cm long; stipules to 13 cm long, triangular; **lamina** 4 - 8 x 5 - 19 cm, ovate or suborbicular, acutely toothed or lobed, densely pubescent. **Flowers** whitish or pink; bracts 0.50 x 0.70 cm, obovate; perianth segments, pubescent outside; **stamens** numerous in globose; **styles** 2, branches convolute. **Capsules** winged.

Flower & Fruit : May - September
Exsiccatus : Dohrok 2100 m, *SR.Lepcha & AP. Das* 0238, dated 17.07.2005
Status : Common
Local Distribution : Dohrok, Phusrey, Bhusuk, 1800 - 2450m.
General Distribution : E. HIMALAYA; INDIA, BHUTAN, NEPAL, MYANMAR, CHINA.
Note : Endemic to Eastern Himalayas

Begonia picta Smith, Exot. Bot. 2: t. 101. 1805; C.B. Clarke in Fl. Brit. India 2: 638. 1879; Hara & Ohashi in Fl. E. Him. 1: 215. 1966; 2: 84. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 2: 182. 1979; Grierson in Grierson & Long., Fl. Bhutan 2(1): 242. 1981.

Herbs with tuberous rootstock, upto 22 cm tall. **Petioles** to 13 cm long; leaves mostly solitary, basal, with another cauline leaf, **lamina** 3 – 13 x 3 – 9 cm, ovate, base obliquely cordate, margin finely serrate, coarse pubescent both sides; **perianth** 2-seriate, outer ones elliptic, white or pink, inner ones stamens many in globose mass of 0.55cm diam.; styles 3, united at base. **Capsules** to 4 mm, ellipsoid, with triangular winged.

Flower & Fruit : August - September
Exsiccatus : Talkharkha 1700 m, *SR Lepcha & AP. Das 0239*, dated 17.07.2004.
Status : Common
Local Distribution : Talkharkha, Durpiney NNP border 1600 - 2200m.
General Distribution : HIMALAYAS; INDIA, BHUTAN, NEPAL.
Note : Endemic to Himalaya.

Begonia satrapis C.B. Clarke in Fl. Brit. India 2: 638. 1879; Grierson in Grierson & Long. Fl. Bhutan 2(2): 242. 1971.

Herbs with tuberous rootstock, stem, or stemless upto 30 cm tall. Occasionally trailing or rooting at base. **Petioles** to 13 cm long; stipule to reniform; ovate to reniform **lamina** 8 – 11 x 5 – 11 cm, subacute or acuminate, base rounded above or cordate, margin dentate or denticulate, teeth ending in fine hairs, pubescent above reddish villous at vein beneath; peduncle elongated, longer than leaves, reddish pubescent; bract oblong - lanceolate, persistent shaggily hairy. **Flowers** white or pink, outer perianth segment elliptic ciliate and pubescent outside. **Capsules** ± equally winged.

Flower & Fruit : August - September
Exsiccatus : FIDE (W.W. Smith, Nathang 4040 m)
Status : Rare
Local Distribution : PWS, 600 – 1525 m.
General Distribution : INDIA (Sikkim)
Note : Endemic to Sikkim

Begonia sikkimensis A. DC. in Ann. Sci. Nat. Ser. 4, 11: 134.1859; Prodr. 15(1): 349. 1864; C. B. Clarke in Fl. Brit. India 2: 646. 1879; Hara & Ohashi *et al.* Fl. E. Him. 1: 215. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 182. 1979; Grierson in Grierson & Long Fl. Bhutan 2(1): 241. 1991.

Herbs with terrestrial, rhizomatous rootstock upto 45cm tall. **Petioles** 5 - 16cm; stipules 1-2cm, suborbicular or rarely linear-lanceolate; symmetrical, suborbicular, irregularly lacinated with acuminate segments, **lamina** 15 - 31 cm across, margins coarsely toothed, nearly glabrous. **Peduncles** 10-16cm; **bracts** to 2cm, broadly ovate, reddish and deciduous. **Perianth** 1-1.5cm, elliptic, red; **stamens** numerous in a globose mass of 0.55cm diam.; **styles** 2, basally connate, with tortuous branches. **Capsules** inverted, 0.9 - 1 x 0.38 - 0.4cm, inverted wings obovate and finely striate.

Flower & Fruit : August – November
Exsiccatus : Dohrok 2300m, *SR Lepcha & AP. Das 30269*, dated 06.10.2004.
Status : Less Common.

Local Distribution : Dohrok, Bhusuk 1200-2300m.

General Distribution : E. HIMALAYA; INDIA (Darjeeling - Sikkim), BHUTAN, NEPAL.

Note : 1. Endemic to E. Himalaya

2. An ornamental plant.

Order: Salicales

SALICACEAE Mirbel

Key to the Genera:

1. Tree or shrubs > 7 m tall; flowers few or numerous in catkins; capsule 2 valved *Salix*
+ Trees deciduous < 10 m tall; flower solitary in axils of bract; capsule < 2 valved ... *Populus*

Populus Linnaeus

Key to the species

1. Leaves apex acuminate; margin finely crenate-serrate; base cordate *P. ciliata*
+ Leaves apex acute; margin sharply serrulate; base weakly cordate *P. glauca*

Populus ciliata Wall, ex Royle, Ill. Bot. Him. 346, t. 98 (84a), f. 1. 1839; Prodr. 16(2): 329. 1868; Hook.f. in Fl. Brit. India 5: 638. 1885; Hara in Fl. E. Him. 44. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 217. 1982; Grierson & Long, Fl. Bhutan 1(1): 60. 1983. *P. rotundifolia* Griff., Itin. Notes 172. 1848. *P. balsamifera* (non L.) Wesmael in Bull. Soc. Bot. Belg. 26: 379. 1886.

Local Name: Numbun kung (Lep.), *Dude Malata* (Nep.).

Trees deciduous upto 20m tall. Branches slightly angled. Leaves alternate; petioles 6 - 10cm long; lamina ovate, 7 - 18 x 5 - 13 cm, base cordate, rarely rounded, finely crenate-serrate, ciliate, acuminate, base cordate, rarely rounded, 3-nerved at base, sparsely pubescence. Male catkins to 10.5 cm long, with 1.3 cm bracts, obovate, fimbriate. Female catkins upto 30 cm, with flat to obscurely concave disc; ovary to 0.6cm, ovoid; styles broaden and with 2-lobed. Capsules to 1.2 cm, glabrous.

Flower & fruit : April - October

Exsiccatus : Rachela in NNP Border 2540 m, *SR Lepcha & AP. Das* 02833, dated 14.10.2005.

Status : Less Common.

Local Distribution : Rachela NNP border, 2200 - 2600 m.

General Distribution : TEMPERATE HIMALAYAS; INDIA, NEPAL, BHUTAN.

Note : Endemic to Himalaya.

Populus glauca Haines in Journ. Lin. Soc. Bot. 37: 408. 1906; Hara *et al.*, Enum. Fl. Pl. Nepal. 3: 217. 1982; Grierson & Long, Fl. Bhutan 1(1): 60. 1983.

Local Name: Re- Numbing Kung (Lep.), *Lekh ko Malata*, *Dude Malata* (Nep.).

Trees with stem sparingly branched. Leaves simple, alternate; petioles to 8 cm, often slender, pinkish-red, whitish hairy prominent on young leaves; lamina broadly ovate, 5 - 13 x 4.5 - 10 cm, margin sharply serrulate, acute, base weakly cordate, white adpressed-hairy in both sides,

distinctly 3-nerved at base, lateral nerves 5 - 6 pairs and light pink-brown. **Catkins** usually drooping, to 15 cm long; rachis with whitish hairs. **Flowers** bisexual. **Capsules** subglobose.

Flower & fruit : July - October
Exsiccatu : Above Ramitey dara - Rachela 2500 m, **SR Lepcha & AP. Das 2931**, dated 28.07.2005.
Status : Less Common.
Local Distribution : Rachela Middle, NNP border, 2000 - 2900 m
General Distribution : E. HIMALAYA; INDIA, (NEPAL-W. BHUTAN).
Note : Endemic to E. Himalaya.

Salix Linnaeus

Key to the Species:

1. Tree or shrub erect; Leaf elliptic lanceolate, margins entire or obscurely serrulate in upper half *S. daltoniana*
+ Shrub decumbent; Leaves obtuse or sub-acute, margins serrulate near apex, or rarely entire *S. calyculata*

Salix calyculata Hook.f. ex Anders. in Fl. Brit. India 5: 6.1885; Hara *et al*, Enum.. Fl. Pl. Nepal 3: 217. 1982; Grierson & Long, Fl. Bhutan 1(1): 69. 1983

Shrub decumbent, branchlet upto 50cm. **Lamina** obovate, 1.5 x 5 x 1 - 2 cm ; usually obtuse or sub-acute , base cuneate , margins serrulate near apex, or rarely entire , sometime blackish when dry , long silky villous beneath at first, later glabrous ; petiole 5 - mm; stipule minute. **Catkins** terminal on leavy shoots, 2 - 5 cm. **Male catkins** 1.5 - 2 cm ; bracts oblong ,ca 4 x 1mm reddish brown , glabrous to ciliate ;stamen 2, filament free , glabrous . **Female catkins** 2- 2.5 cm ;bracts obovate ,c3 x 2 mm , glabrous. **Capsules** narrowly ovoid, to 4 mm, style divided, bifid.

Flower & Fruit : June - July
Exsiccatu : Rachela 3020 m, **SR Lepcha & AP. Das 27760**, dated 30.09.2004.
Status : Less common
Local Distribution : Rachela, Onway to Panglakha 3800 - 4570 m.
General Distribution : EASTERN HIMALAYA; INDIA, NEPAL, BHUTAN.
Note : Endemic to E. Himalaya

Salix daltoniana Hook.f. ex Anders. in Journ. Linn. Soc.4: 49. 1860; Hook.f. in Fl. Brit. India.5:632. 1885; Hara *et al*, Enum. Fl. Pl. Nepal. 3: 217. 1982; Grierson & Long, Fl. Bhutan 1(1): 66. 1983

Local Name: Behera kapas(Nep.)

Tree or shrubs upto 6m tall. Stems glabrous. **Petioles** short, 2.5 - 13 mm.; **lamina** elliptic lanceolate, 2.5 - 6 x 1.5 cm , acute, base rounded or cuneate , margins entire or obscurely serrulate in upper half, blackish above when dry, pubescent on veins, white or brownish sericeous beneath;. **Catkin** appeared in young leave. **Male catkins**; bracts obovate c 2mm rounded or notched at apex, pale villous with long straight hairs especially on the inner surface ; stamen 2 , filaments free , pubescent . **Female catkins** 5 - 6 x 0.5cm, bracts similar to male but somewhat broader and darker, **Capsules** narrowly ovoid, 3.5 - 4.5 cm usually white, sessile, styles divided to half length, branch bifid.

Flower : June - September

- Exsiccatus* : Rachela 2990 m, *SR Lepcha & AP. Das 02401*, dated 16.10.2004.
Status : Common
Local Distribution : Rachela, Panglakha, upto 3100 m,
General Distribution : HIMALYAS; AFGHANISTAN, INDIA, NEPAL, BHUTAN.

Order: Capparales

CRUCIFERAE A. Jussieu (*nom. cons.*)

BRASSICACEAE Burnett (*nom. alt.*)

Key to the Genera:

- | | |
|--|-------------------|
| 1. Petals white, pink or purple | 2 |
| + Petals yellow | 3 |
| 2. Petals spatulate | <i>Nasturtium</i> |
| + Petals not spatulate | <i>Cardamine</i> |
| 3. Inner sepals pouched at base | <i>Rorripa</i> |
| + Inner sepals not pouched at base | <i>Barbarea</i> |

Barbarea Brown

Barbarea intermedia Boreau, Fl. Centre France. 2: 48. 1840; Grierson in Grierson & Long, Fl. Bhutan 1(2): 434. 1984.

Herbs biennial or perennial upto 75 cm tall. Stems erect, glabrous. **Leaves** cauline leaves petiolate; petiole to 4.5 cm long, glabrous or ciliate; leaf lamina to 13 cm, pinnatifid, 1-4 (-7) lobes on each side of midvein, lateral lobes oblong or ovate, 2-8 × 1-7 mm, entire or repand; terminal lobe ovate, considerably larger than lateral ones; Cauline leaves pinnatifid or pinnatisect, with 1-4 lateral lobes, entire, sessile, auriculate; auricles ovate or narrowly oblong. **Racemes** ebracteate, elongated. **Sepals** yellow, oblong, 2 × 1.5 mm, saccate. **Corolla** obovate; petals yellow, oblanceolate, rounded, to 1.5 mm, attenuate to base; filaments yellow, anthers oblong, ca. 1.3 mm. **Fruits** linear, slightly compressed, torulose,.

- Flower* : May - July
Exsiccatae : Kupup - Bhimbase 4200 m, *SR Lepcha & AP. Das 31450*, dated 27.07.2005; Zuluk 3700 m, *SR Lepcha & AP. Das 30891*, dated 30.07.2005.
Status : Common
Local Distribution : Rachela, Kyongnosla 2800 - 4200 m.
General Distribution : INDIA, BHUTAN, NEPAL, PAKISTAN, NATIVE TO SW ASIA AND C EUROPE

Cardamine Linnaeus

Key to the species:

1. Plant more than 30 cm tall; Leaf ovate, ovate-lanceolate 2.
+ Plant upto 30cm tall; Leaf ovate- orbicular *C. hirsuta*
2. Petals purplish, leaves serrate - crenate *C. macrophylla*
+ Petals white, Leaves entire, rarely sinuate *C. griffithii*

Cardamine griffithii Hook.f. & Thomas. in Journ. Linn. Soc. 5: 146. 1861; Hook.,f. & T. Anderson in Fl. Brit. India 1: 139. 1872; Grierson in Grierson & Long . Fl. Bhutan 1(2): 431. 1984

Herbs annual. **Stem** erect upto 65 cm, glabrous, angular, grooved. **Leaves**; leaflets 3 – 5 pairs, ovate, 2.5 – 9 x 3 – 6, obtuse, rounded base, margin entire or irregularly sinuate; lower most auricular against stem; leaflets terminal sub orbicular to 1.5 cm long. **Flowers** in racemose with few – flowered. **Sepals** oblong – elliptic, obtuse. **Petals** white or purplish, obovate. **Pods** upto 1.2 cm.

Flower : May – July.
Exsiccatus : Padamchen 2100 m, **SR Lepcha & AP. Das** 22739, dated 11.10.2007.
Status : Not common,
Local Distribution : Kyongnosla, Padamchen 2100 - 3500 m.
General Distribution : TEMPETRATE EURASIA; INDIA, BHUTAN.

Cardamine hirsuta L., Sp. Pl. ed. 1(2): 655. 1753; Hook.f. & T. Anderson in Fl. Brit. India 1: 138. 1872; Grierson in Grierson & Long Fl. Bhutan 1(2): 431. 1984. Sharma *et al.* (2): 112-113. 1993; Sharma *et al.*, Fl. India 2: 112. 1993

Herbs annual. **Stem** erect upto 30 cm, pubescent. **Basal leaves** many; **lamina** 0.5 – 1.5 x 0.5 - 0.8 cm, in rosette, 3cm; basal leaves many leaflets variable in shape but usually ovate-orbicular; terminal leaflet larger and 3 -lobed, **Flowers** upto 0.8 cm long, white, clustered in ebracteate racemes. **Sepal** 0.4 – 3cm, elliptic. **petals** absent or **corolla** longer than calyx 0.5 - 0.40 cm, white, narrow; **stamens** cylindrical 4- 6, whitish green. **Seeds** cylindric-round, few to upto 12-13 per pod, usually pale brown.

Flower : March – May *Fruit:* April – October
Exsiccatus : Rachela 2195 – 2280 m, **SR Lepcha & AP. Das** 32849, dated 25.10.2004.
Status : Less Common.
Local Distribution : Rachela Middle, Jorpokhari. 2100 – 3000 m.
General Distribution : TEMPETRATE EURASIA; INDIA, NEPAL, BHUTAN

Cardamine macrophylla Willd., Sp. Pl. 3 (1): 484. 1800; Hook.,f. & T. Anderson in Fl. Brit. India 1: 139. 1872; Hara & Ohashi in Fl. E. Him. 1: 108. 1966; 2: 43. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 2: 40. 1979; Grierson in Grierson & Long Fl. Bhutan 1(2): 430. 1984; Sharma *et al.*, Fl. India 2: 115 – 116. 1993

Herbs usually glabrous, leafy erect upto 45 -130 cm tall. **Leaves** pinnate, lamina 1.5 - 4 x 0.8 - 1.5 cm; leaflets 3 - 5 pairs, elliptic, ovate-lanceolate, serrate-crenate, obtuse or acuminate, margin serrate, base cuneate, glabrous, lateral nerves not so prominent. **Pedicels** 0.8 - 1.5 cm long. **Flower** few to many, 1 - 1.8 cm across. **Sepals** 3.5 - 5.5 x 0.18 - 0.30 cm, oblong-elliptic with papery margins, coarse and sparsely hirsute. **Petals** obovate or oblanceolate, purplish; style thick. **Stigma** rounded or bilobed.

- Flower* : May - July.
Exsiccatae : Kyongnosla 2280 m, *SR Lepcha & AP. Das* 32847, dated 10.5.2005.
Gnathang 3800m, , *SR Lepcha & AP. Das* 30803, dated 24.07.2005.
Lampokhri 4300m, *SR Lepcha & AP. Das* 30923, dated 24.07.2005.
Status : Less Common.
Local Distribution : Zuluk, Donkyala, Trijuention, 2200-4300 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, CHINA, KOREA
Note : Shoots edible.

Nasturtium Brown

Nasturtium officinale Brown, Hook. Kew ed. 2(4): 110. 1812; Hook.f. & T. Anderson in Fl. Brit. India 1: 133. 1872; Hara in Fl. E. Him. 1: 110. 1966; Grierson in Grierson & Long Fl. Bhutan 1(2): 436. 1984; Sharma *et al*, Fl. India 2: 125.1993. *Rorippa nasturtium-aquaticum* (L.) Hayek, Sched. Fl. Stir. Exs. 22. 1905.

Local Name: *Sinrayo* (Nep.).

Herbs, perennial, found in marshy place. **Stem** erect-spreading, 5 - 10 cm, rooting from lower nodes. **Leaves** lamina 0.5 - 1.3 x 0.3 - 2.2 cm, imperipinnate, 1 - 5 cm; lateral leaflets, elliptic; terminal leaflet slightly broader and longer than lateral ones, ovate-cordate, sinuate or entire, obtuse-acute. **Flowers** in short and ebracteate racemes, white. **Calyx** 4, in two pairs, free, 0.27 x 0.4 cm, oblong. **Corolla** 4, free and alternating with sepals, 0.4 x 0.15 cm, obovate, tapering below. **Pods** cylindric, curved upwardly. **Seeds** in two rows.

- Flower* : April - June *Fruit*: May - October
Exsiccata : Panglaxha 2900 m, *SR Lepcha & AP. Das* 32099, Dated 28.07.2005.
Status : Less Common.
Local Distribution : Rachela 1400 - 2200 m.
General Distribution : EURASIA, N. AFRICA; NATURALISED IN INDIA.
Note : Eaten as vegetables.

Rorippa Scopoli

Rorippa dubia (Persoon) H. Hara, J. Jap. Bot. 30: 196. 1955.; Grierson in Grierson & Long Fl. Bhutan 1(2): 437. 1984. *Sisymbrium dubium* Persoon, Syn. Pl. 2: 199. 1807.

Herbs annual or perennial, slender to 50 cm tall. **Stem** glabrous or sparsely pubescent. **Leaf** deeply pinnatifid; Lower and middle cauline leaves auriculate ; petiole to 4 cm, leaf blade pinnatifid or undivided, obovate, oblong, or lanceolate, margin entire or irregularly crenate or serrate, apex obtuse or subacute; apex oblong, elliptic, or oblong-lanceolate, Uppermost leaves usually sessile, auriculate; leaf blade lanceolate or oblong, margin entire or serrulate, apex acute or acuminate. **Racemes** ebracteate. **Fruiting pedicels** slender, to 12 mm. **Sepals** pinkish,

ascending, oblong-linear. **Corolla** yellow; **Petals** mostly absent, rarely present and linear or narrowly oblanceolate; **filaments** to 2.5 mm; anthers oblong. **Ovules** many.; stigma rounded. Fruit linear, Seeds reddish brown.

Flower : April – June
Exsiccatus : Nathang – Panglakha 3000 – 3800 m, **SR Lepcha & AP. Das** 32930, 31.07. 2005.
Status : Less common
Local Distribution : Padamchen, Kyongnosla, Gangtok, 2800 - 4200m.
General Distribution : INDIA, BHUTAN, BANGLADESH, INDONESIA, JAPAN, LAOS, MALAYSIA, MYANMAR, NEPAL, PHILIPPINES, THAILAND, VIETNAM; naturalized in temperate areas.

MORINACEAE J.G.agardh

Key to the Genus:

1. Leaves in pairs or whorls of 3; lamina linear lanceolate; staminodes inserted in upper half of corolla tube **Morina**
- + Leaves in rosette or on sterile shoot or whorls of 4; lamina linear oblong-oblanceolate – lanceolate; staminodes inserted near base of corolla tube **Cryptothladia**

Morina Linnaeus

Morina nepalensis D. Don, Prodr. Fl. Nepal 161. 1825; C.B. Clarke in Fl. Brit. India 3: 217. 1882; Hara in Fl. E. Him. 3: 108. 1975; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 210 1974; Clement in Grierson & Long, Fl. Bhutan 2(3): 1373. 2001. *Morina nana* Wall. [Cat. 14, n. 424. 1829, *nom. nud.*] ex DC., Prodr. 4: 645. 1830. *Morina betonicoides* Benth. in Hook., Ic. Pl. 12: 63, t. 1171. 1873.

Herbs rhizomatous, leave base remains. **Leaves** in pairs or in whorls of 3, linear oblanceolate to lanceolate, lamina 5 – 25 x – 3 cm, margin toothed, teeth spinous in groups of 3, rarely with small spinose teeth, glabrous. **Petiole** sheath to 5 cm. **Flowering** to 90 cm; bracts ovate. **Involucre** tubular, spines 10, villous. **Calyx** tubular – campanulate, glabrous outside, hairy inside; lips emarginated. **Corolla** tubular, white or pink. **Fruits** oblong.

Flower : August – September
Exsiccatus : Bhimbase 4340 m, **SR Lepcha & AP. Das** 30849, Dated 27, 07.2005.
Status : Common
Local distribution : Memenchu lake, Rachela, Sherapthang, 3000 – 4500 m.
General distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET.

Cryptothladia (Bunge) Cannon

Cryptothladia polyphylla (DC.) Cannon in Bull. Brit.Mus. (Nat. Hist.), Bot,12 (1): 20. 1984; Clement in Grierson & Long, Fl. Bhutan 2(3): 1373. 2001. *Morina polyphylla* Wall. ex DC., Prodr. 4: 644. 1830; Hara in Fl. E. Him. 3: 108. 1975.

Herbs rhizomatous, with fibrous leaf remains. **Leaves** in rosette on sterile shoots; **lamina** linear oblong, 7 - 38 x 2 – 5.5 cm, margin toothed, teeth tooth bear 2 - 3 spiny teeth, petiole sheath to

2.5 cm. **Flowers** in several verticals forming spike; flowering stem to 50 cm long; **bracts** ovate - acuminate. exceeding flowers, margin spiny; **Involucre** \pm tubular, widening to apex. hairy; spiny teeth. **Calyx** to 11 mm, pilose; lip 2 lobed equal or shorter than tube, lobes ovate oblong, mucronate. **Corolla** white or pink, lips apparently scarcely opening not exceeding calyx. **Fruits** \pm oblong.

- Flower* : May - August
Exsiccatus : Lampokhri - Bhimbase 4320 m, **SR Lepcha & AP. Das** 30858, dated 27.10.2007.
Status : Very Common.
Local Distribution : Nathang, Lampokhri. 3600 - 4200 m.
General Distribution : HIMALAYAS; INDIA (Gharwal to BHUTAN).
Note : Endemic to Himalaya

Order: Ericales

ERICACEAE A.L. Jussieu

Key to the Genera:

- | | |
|---|---------------------|
| 1. Shrubs dwarf (alpine); leaves imbricate | <i>Cassiope</i> |
| + Shrubs dwarf to large or tree; leave not imbricate | 2 |
| 2. Lamina entire | 3 |
| + Lamina serrate or serrulate | 4 |
| 3. Leaf surface glabrous | <i>Lyonia</i> |
| + Leaf surface with hairs or peltate scales..... | <i>Rhododendron</i> |
| 4. Leaves evenly placed along the branches; corolla urcinate | <i>Gaultheria</i> |
| + Leaves crowded towards the branch ends; corolla campanulate | <i>Enkianthus</i> |

Cassiope D. Don

Key to the species:

- | | |
|---|------------------------|
| 1. Lamina ovate-triangular; pedicel densely crisped-tomentose | <i>C. fastigiata</i> |
| + Lamina lanceolate; pedicel densely pubescent | <i>C. selaginoides</i> |

Cassiope fastigiata (Wall.) D. Don in Edinburge New Philos. Journ.17: 157. 1834; Clarke in Hook.f., Fl. Brit. India 3: 459. 1882; Hara in Fl. E. Him. 234. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal. 3: 55. 1982; Long & Rae in Grierson & Long, Fl. Bhutan 2(1): 392. 1991. *Andromeda fastigiata* Wall. in As. Res.13: 394. 1820. *Andromeda cupressiformis* Wall. ex D. Don in Mem. Wern. Nat. Hist. 5.3: 411. 1821.

Herbs upto 20 cm tall. Stems decumbent but much branched, fastigiated. **Leaves** densely imbricate; , **lamina** ovate - triangular, 4 - 6 \times 1.5 - 2 mm, leathery, abaxially deeply furrowed reaching near apex and diverging near base, furrow-rim densely pubescent, adaxially concave, subglabrous, base divergent, 2 - lobed, margin silvery, membranous, densely ciliolate, apex apiculate; pedicel 1.3 - 7 mm, densely crisped-tomentose. **Calyx** purple; lobes oblong-ovate,

margin broadly membranous. **Corolla** white, broadly campanulate, 6 – 9 mm; lobes spreading, 2 – 3.5 mm; **stamens** ca. 2.5 mm; filaments glabrous. **Capsules** small 2 – 3 mm in diam.

Flower : May-July *Fruit.* : June-September
Exsiccatus : Kupup Lake, **SR Lepcha & AP Das** 32822, dated 25.10.2004.
Status : Common
Local Distribution : Memenchu, Baba mandir, Rongchu, Changu. 4265 - 4470m.
General Distribution : HIMALAYA; INDIA, (Kashmir to BHUTAN).
Note : Endemic to Himalaya

Cassiope selaginoides Hook.f. & Thoms. in Hook., J.B. Kew mist. 7: 126, t. 4.1855; C.B. Clarke in Fl. Brit. India 3: 460. 1882; Hara *et al.* in El. E. Him. 2: 94. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 3: 55. 1982; Long & Rae in Grierson & Long., Fl. Bhutan 2(1): 392. 1991.

Herbs slender, decumbent upto 25 cm. **Lamina** lanceolate 2 – 4 × 1 – 1.5 mm, bristle tipped, leathery, base divergent, 2-lobed, margin silvery, membranous, densely ciliolate; pedicel densely pubescent 6 – 22 mm. **Flowers** solitary axillary, nodding. **Calyx** 5, free, purple; lobes oblong-ovate, margin broadly membranous. **Corolla** 5, white, broadly campanulate, 6 – 9 mm; lobes spreading, 2 – 3.5 mm; **stamens** ca. 2.5 mm; filaments glabrous; **Fruits** capsule.

Flower : May- August *Fruit:* September
Exsiccatus : Kupup Lake 4200 m, **SR Lepcha & AP. Das** 32822, dated 25.10.2004.
Status : Common
Local Distribution : Memenchu, Baba mandir, 3400 – 4400 m.
General Distribution :E. HIMALAYA;INDIA, (Sikkim - BHUTAN) and W. CHINA.
Note : Endemic to Eastern Himalaya

Enkianthus Loureiro

Enkianthus deflexus (Griff.) Schneider, Ill. Handb. Laubh. 2: 521. 1911; Hara *et al.* Fl. E. Him. 1: 234. 1966; EFPN 3: 55. 1982; Long & Rae in Grierson & Long, Fl. Bhutan 2(1): 394: 1991.
Rhodora deflexa Griff., Itin. Not. 148 & 187. 1848. *E. himalaicus* Hk. f. & Thoms. in Hk. Journ. Bot. Kew. Gard. Misc. 7:125, t. 3. 1855; C.B. Clarke in Fl. B. India 3: 461. 1882

Local name: *Khorsanay* (Nep.)

Shrubs or small trees, upto 6 m tall. **Leaves** in terminal clusters; petioles to 1.5 cm ; **lamina** 2.5 – 8 x 0.7 – 20 cm, ovate-elliptic, finely toothed, acute, base acute, hairy beneath. **Inflorescence** with 6-12 flowered umbels. Pedicels to 3cm, long, slender, greenish white. **Flowers** pendulous, light pink-orange ; **sepals** 5, united at base, to 0.5 cm , triangular, greenish; **petals** 5, united, bell-shaped, glabrous, lower greenish white, terminal light pinkish with red vertical lines (veins) beneath on petal tubes; **stamens** 10, epipetalous; **anthers** 2-spurred, ash white, dorsifixed; **ovary** 5-celled superior; style to 0.5cm, hairy. **Capsules** with persistent calyx, 5-partite, light brown when ripe.

Flower : April – June *Fruit:* June - November
Exsiccatus : Rachela 2450 m, **SR Lepcha & AP. Das** 3001, dated 12.08.2006.
Status : Common
Local Distribution : Kyongnosla, Rachela, Panglakha upto 2900 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL - BHUTAN, MYANMAR.

Gaultheria Linnaeus

Key to the species:

1. Calyx lobes ovate- oblong nerer triangular 2
+ Calyx lobes triangular-ovate 3
2. Leaves margin inconspicuously crenulate, Capsule globose.... *G. nummularioides*
+ Leaves margin denticulate-setulose Capsule glabrous..... *G. trichophylla*
3. Leaves veins (seconadary) = or < 4 pairs 4
+ Leaves veins (secondary) = or > 4 pairs *G. griffithiana*
4. Leaves base cuneate to broadly cuneate; pedicel pubescent... *G. fragrantissima*
+ Leaves base obtuse-rounded or attenuate; pedicel glabrous... *G. hookeri*

Gaultheria fragrantissima Wall. in Asiatic. Res. 13: 397, fig. 1820; C. B. Clarke in Fl. Brit. India 3: 457. 1882; Hara & Ohashi in Fl. E. Him. 1: 234. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 55. 1982; Long & Rae in Grierson & Long, Fl. Bhutan 2(1):388. 1991.

Local Name: *Lek Bilounay, Basak* (Nep.).

Shrubss upto 4m tall. **Leaves** scattered; petiole to 7 mm; elliptic, oblong-elliptic, ovate, obovate, or narrowly obovate-lanceolate, **lamina** 4.5 – 15 × 2.5 – 5.5cm, leathery, abaxially scattered punctate, secondary veins 4 – 7 pairs, secondary and fine veins distinctly raised abaxially, base cuneate to broadly cuneate, sometimes obtuse-rounded, margin obtusely serrulate, apex acute. **Flowers** in axillary, racemose, many flowered, pubescent; bracts ovate, to 3 mm, abaxially glabrous or puberulous, margin ciliolate; pedicel pubescent; broadly ovate. **Calyx** glabrous; lobes triangular. **Corolla** white, tubular-urceolate, abaxially glabrous; filaments dilated, puberulous; anthers ca. 1.45 mm; **ovary** pubescent. Calyx at Fruitblue-purple, fleshy. **Capsules** globose.

<i>Flower</i>	: Jan -May.	<i>Fruit:</i> June-August.
<i>Exsiccatus</i>	: Singaney dara 2600 m, , SR Lepcha & AP Das 01018 , dated 16.09.2007.	
<i>Status</i>	: Common	
<i>Local Distribution</i>	: Kyongnosla, Changu, Memenchu, Kupup; 4265 – 4570 m	
<i>General Distribution</i>	: INDIA, NEPAL, BHUTAN, CHINA, MYANMAR, VIETNAM.	

Gaultheria griffithiana Wight in Calcutta. Journ. Nat. Hist. 8: 176. 1847; C.B. Clarke in Fl. Brit. India 3: 458. 1882; Hara & Ohashi in Fl. E. Him.1: 234. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 55. 1982; Long & Rae in Grierson & Long. Fl. Bhutan 2(1): 388. 1991.

Shrubs, rarely tree upto 5m tall. **Leaves**; petiole to 11 mm, glabrous; scattered, oblong, elliptic, or lanceolate-oblong, **lamina** 6 – 17 × 2 – 6 cm, thickly leathery, abaxially densely punctate, adaxially glabrous, veins 3 or 4 pairs, base broadly cuneate to subcordate, margin closely serrulate, apex caudate-acuminate. **Inflorescences** axillary, racemose, clustered, 2 – 6 cm, many flowered, pubescent or lanuginose; bracts ovate to orbicular-ovate, 2 – 7 mm, abaxially glabrous or densely sericeous; **bracteoles** 2, ovate, 1.5 – 3 mm, abaxially glabrous, ciliolate. **Calyx** lobes triangular-ovate, apex obtuse to acute. **Corolla** white, light pink, or pale green, 5 – 7 mm, campanulate, abaxially glabrous; lobes recurved; filaments rhombic, papillate; **anthers** 1 – 1.5 mm; **ovary** sericeous. Calyx at Fruitdark purple, fleshy. **Capsules** globose,

<i>Flower</i>	: April – June	<i>Fruit:</i> May – October
<i>Exsiccatae</i>	: Panglakha 2890m, SR Lepcha & AP. Das 31167 , dated 03.10.2004; Rachela 3000 m, SR Lepcha & AP. Das 29335 , dated 30.09.2004.	

Status : Abundant.
Local Distribution : Rachel, Kyongnosla. 4265 – 4570 m.
General Distribution : INDIA, BHUTAN, NEPAL, MYANMAR.

Gaultheria hookeri C.B. Clarke in Hook.f., Fl. Brit. India 3: 458. 1882; Hara *et al.* Enum. Fl. Pl. Nepal 3: 35. 1982; Long & Rae in Grierson & Long, Fl. Bhutan 2(1): 390. 1991. *G. hookeri* var. *angustifolia* Clarke in Fl. Brit. India 3: 458. 1882.

Shrubs prostrate or erect upto 100 cm tall. **Leaves** scattered; petiole to 5.2 mm, hirsute; elliptic to lanceolate, **lamina** 3.5 – 9.5 × 1.5 – 4.5 cm, leathery, abaxially punctate, ± hirsute, adaxially glabrous, secondary veins (3 or) 4 (–7) pairs, secondary and fine veins raised abaxially, slightly impressed adaxially, base obtuse-rounded or attenuate, margin serrate-mucronate, apex abruptly acute. **Inflorescences** terminal and axillary, racemose, pubescent; bracts orbicular-ovate or ovate, to 8 mm, abaxially glabrous, adaxially puberulous; pedicel to 4.5 mm, glabrous; **bracteoles** 2, similar to bracts but smaller. **Calyx** glabrous, lobes triangular-ovate, margin ciliate. **Corolla** pink or white, 3.5 – 4.6 mm; filaments dilated towards base, puberulous; **ovary** puberulous. **Calyx** at Fruit blue-black. **Capsules** sericeous-puberulous.

Flower : July - October. *Fruit*: March – December.
Exsiccatus : Panglakha ridge 2990 m, , **SR Lepcha & AP Das** 27736, dated 30.09.2004.
Status : Less common/sparse
Local Distribution : Kupup, Nathang, Zuluk. 3800 – 4200 m.
General Distribution : INDIA, NEPAL, BHUTAN, CHINA.

Gaultheria nummularioides D. Don, Prodr. Fl. Nepal 150. 1825; Clarke in Hook.f., Fl. Brit. India 3:457. 1882; Hara & Ohashi in Fl. E. Him. 1: 235. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 55. 1982; Long & Rae in Grierson & Long. Fl. Bhutan 2(1): 39. 1991.

Shrubs, prostrate, with much branched. **Petiole** ca. 1 mm; **lamina** broadly ovate or suborbicular, sometimes ovate or elliptic, 5 – 15 × 3 – 13 mm, papery or leathery, abaxially densely or sparsely setiferous, usually pale, sometimes red punctate, adaxially glabrous, secondary veins 2 or 3 pairs, base obtuse, truncate, rounded, or subcordate, rarely cuneate, margin denticulate-setulose, apex acute, distinctly mucronate. **Flowers** solitary, axillary, bracts ovate-triangular, ca. 1.5 mm; bracteoles 2 – 4, persistent, stramineous, larger than bracts. **Calyx** glabrous; lobes ovate, ca. 3 mm, apex shortly acuminate. **Corolla** white, pink, or crimson, campanulate, ca. 5 mm, abaxially glabrous; triangular. Filaments spindle-shaped, villous, papillate; **Ovary** glabrous. **Calyx** at Fruit blue-purple or black; **Capsules** globose.

Flower : July - October *Fruit*: March - December.
Exsiccatus : Rachel 2950 m, **SR Lepcha & AP Das** 27770, dated 30.09.2004.
Status : common
Local Distribution : PWS, KAS, 4265 – 4570 m.
General Distribution : INDIA, NEPAL, BHUTAN, BANGLADESH, MYANMAR, CHINA, INDO-NESEA.

Gaultheria trichophylla Royle, Ill. Bot. Himal. Mts. 260. 1835; Clarke in Hook.f., Fl. Brit. India 3: 457. 1882; Hook.f., in Bot. Mag. 125: t 7635. 1899; Hara in Fl. E. Him. 235. 1966; Hara *et al.* Enum. Fl. Pl. Nepal. 3: 55. 1982; Long & Rae in Grierson & Long., Fl. Bhutan 2(1): 391. 1991.

Shrubs dwarf, prostrate. **Petiole** very short, to 0.6 mm; **lamina** elliptic or elliptic-oblong, 3.5 – 13 × 2.5 – 5.5 mm, leathery dense, glabrous, rarely abaxially scattered hispidulous on midvein,

veins inconspicuous, both ends obtuse to acute, margin inconspicuously crenulate, long ciliate when mature. **Flowers** solitary, axillary; pedicel to 2.5mm or flower sessile; bracts absent; bracteoles 2, apical, broadly ovate, glabrous. **Calyx** glabrous; lobes ovate-oblong, 1.5 – 3 mm, ciliolate. **Corolla** white, campanulate, ca. upto 5.8 mm, deeply 5-lobed, glabrous; lobes erect, oblong; filaments spindle-shaped; ovary glabrous. Calyx at Fruit blue, fleshy. **Capsules** glabrous.

Var. trichophylla

Lamina elliptic or elliptic-oblong, long ciliate along margin.

Flower : May **Fruit**: July
Exsiccata : Kyongnosla 3700 m, **SR Lepcha & AP. Das 037**, Dated 10.10.2006.
Status : Common
Local Distribution : Panglakha, Rachel, Baba Mandir. 3000 – 4500 m.
General Distribution : INDIA, NEPAL, BHUTAN, CHINA, MYANMAR.

Lyonia Nuttall

Key to the species

- 1. Leaf apex obtuse; calyx lobes oblong or narrowly lanceolate to linear *L. villosa*
- + Leaf apex acuminate; calyx lobes strictly oblong *L. ovalifolia*

Lyonia ovalifolia (Wall.) Drude in Engler., Pfl. Nat. Pflanzenfam 4(1): 44. 1889; Hara & Ohashi in Fl. E. Him.1: 236. 1966; Hara *et al.* Enum.Fl. Pl. Nepal 3: 55. 1982; Long & Rae in Grierson & Long, Fl. Bhutan 2(1): 395. 1991. *Andromeda ovalifolia* Wall. in Asiat. Res. 13: 391, t. 11. 1820. *Pieris ovalifolia* (Wallich) D. Don in Edinb. New Philos. Journ. 17: 159. 1834; Clarke in Hook.f., Fl. Brit. India 3: 460. 1882.

Local Name: Angeri (Nep.).

Shrubss or trees, upto 4 m tall. **Petiole** 3.5 – 8.3mm; **lamina** 2.5 – 18 × 4.5 – 12 cm, glabrous or pubescent; ovate, narrowly to broadly elliptic, lanceolate, or suborbicular, papery to thinly leathery, both surfaces ± with white or brown hairs, rarely abaxially densely white villous on midvein or subglabrous, veins prominently raised to slightly depressed or nearly obscure, base obtuse, cuneate, or sometimes cordate, apex acuminate. **Inflorescence** pubescent; pedicel 2.5 – 8.5mm, densely pubescent. **Calyx** lobes oblong, densely or sparsely pubescent. **Corolla** tubular, 6.2 – 10.5mm, abaxially pubescent; filaments 4.5 – 7.4mm, pilose, with 2 spurs at apex; **ovary** glabrous or rarely pubescent. **Capsules** globose or ovoid, glabrous to pubescent.

Flower : May - June **Fruit**: July - September.
Exsiccatus : Panglakha ridge 2890 m, , **SR Lepcha & AP. Das 27719**, Dated 30.07.2004.
Status : Most common
Local Distribution : 15th Mile, Karponang, Kyongnosla, Padamchem, Premlakha.
General Distribution : EASTERN HIMALYA; INDIA, BHUTAN, NEPAL, MYANMAR, MALAYSIA,

Note : Leaves poisonous to cattle. The tribals of Sikkim used it as an insect repellent.

Lyonia villosa (Wall. ex Clarke) Handel-Mazzetti, Symb. Sin. 7: 789. 1936; Hara *et al.* in Fl. E. Him.(1): 236. 1996; Long & Rae in Grierson & Long, Fl. Bhutan 2(1): 389. 1991; *Xolisma villosa* (Hook.f.) Rehder; J. Arn. Arb. 5: 53. 1924.

Shrubss or small trees upto 3 m tall. **Petiole** pubescent; **lamina** 2 – 5.5 × 1.5 – 4.5 cm, obovate or oblong-obovate, papery to subleathery, abaxially villous or pubescent on veins or sometimes

subglabrous, adaxially pubescent on veins, or glabrous, veins raised abaxially, midvein impressed adaxially, base broadly cuneate to rounded or subcordate, apex obtuse, mucronate. **Inflorescence** pubescent, rarely glabrous; bracts leaflike; **pedicels** 2.5 – 4.5 mm, pubescent to glabrous. **Calyx** lobes oblong or narrowly lanceolate to linear, 3 – 4 mm, glandular hairs. **Corolla** tubular, abaxially pubescent; filaments ca. 5.2 mm, pilose; **ovary** glabrous to pubescent. **Capsules** ovoid, glabrous or rarely pubescent.

Flower : May-August. *Fruit* : September – October.
Exsiccatus : Ramitey dara 2600 m, , **SR Lepcha & AP. Das 31160**, dated 03.10. 2004.
Status : Common
Local Distribution : Rachela, Panglakha, Rongchu, 4265 – 4570 m.
General Distribution : HIMALAYA; INDIA, (Gharwar to Sikkim) and W. CHINA.
Note : Endemic to Himalaya.

Rhododendron Linnaeus

Key to the Species:

- | | |
|--|------------------------|
| 1. Leaf glabrous beneath; scale visible | 3 |
| + Leaf woolly tomentose beneath | 9 |
| 3. Leaves 2.5 – 18 x 1.5 – 8 cm | 4 |
| + Leaves upto 3 x 2 cm | 8 |
| 4. Leaves with conspicuously stiffly bristly..... | <i>R. ciliatum</i> |
| + Leaves not bristly | 5 |
| 5. Leaf base without cilia or slender bristles | 6 |
| + Leaf base with cilia or slender bristles | <i>R. dalhousiae</i> |
| 6 Leaf white or pale green beneath | 18 |
| + Leaf green or brown beneath | 7 |
| 7. Leaves scales over lapping ; dense scaly above | <i>R. baileyi</i> |
| + Leaves scales scarcely overlapping; sparcely scaly above | <i>R. cinnabarinum</i> |
| 8. Leaves densly scaly beneath with overlapping lacerate scales | <i>R. anthopogon</i> |
| + Leaves sparcely scaly , scales not overlapping | <i>R. lepidotum</i> |
| 9. Leaves oblong elliptic , obtuse | 10 |
| + Leaves ovate elliptic; acuminate | <i>R. edgeworthii</i> |
| 10. Petiole covered by thickly borwn or whitist tomentose | <i>R. lanatum</i> |
| + Petiole glabrous | 11 |
| 11. Leaves velvety tomentose; petiole gklabrous | 12 |
| + leaves rough, not velvety | 13 |
| 12. Leaf strongly reflxed at margins , when dry | <i>R. aeriginosum</i> |
| + Laef not reflxed at margins , when dry | <i>R. campanulatum</i> |
| 13. Leaves elliptic-oblanceolate; indementum silvery | 14 |
| + Leaf ovate eillptic to broadly elliptic or suborbicular | 15 |
| 14. Corolla bright red, pink or rarely white, stamens 20 | <i>R. arborium</i> |
| + Corolla crimson or blood red; stamens 10 | <i>R. barbatum</i> |

- | | |
|---|-------------------------|
| 15. Petiole glaucous green; corolla deep crimson | <i>R. thomsonii</i> |
| + Petiole wrinkled; corolla not deep crimson | 16 |
| 16. Leaves glabrous beneath | <i>R. griffithianum</i> |
| + Leaf tomentose beneath | 17 |
| 17. Lateral veins prominent beneath | <i>R. grande</i> |
| + Lateral veins prominent or weakly beneath | <i>R. falconeri</i> |
| 18. Flower rosy-pink, rarely white with pinkish marks | <i>R. glaucophyllum</i> |
| + Flower pale green – greenish yellow | <i>R. triflorum</i> |

Rhododendron aeruginosum Hook.f., Rh.Sikkim Him.t. 22. 1849; U.C. Pradhan in Him. Plant Journ. 3(8):111, 1985; Long & Rae in Grierson & Long, Fl. Bhutan 2(1): 375. 1991; *R. campanulatum* subsp. *aeruginosum* (Hook.f.) Chamberlain in Notes R.B.G. Edinb. 37(2): 329. 1979; U.C. Pradhan in Him. Plant Journ. 3(8): 113. 1985.

Local Name: Nilo-pate chimal (Nep.).

Shrubs upto 1.5 tall. **Leaves;** petiols 4-5mm.long **lamina** 5 – 7.5 x 3 – 4.5 cm, elliptic, leathery, cordate at base and mucronate at apex, margins recurved; leaf surface matt, bright green, glaucous, ventral surface densely covered by deep rusty-brown tomentum, midrib and lateral veins covered by tomentum; pedicels to 2 mm, long, deep rose-pink, spotted purple-crimson on dorsal inside and crimson blotched at base. **Corolla** broadly campanulate, 2.5 – 2.8 x 3 – 3.5 cm 5-lobed, lobes shortly sub-divided, **Stamens** 10, unequal, never exceeds corolla; **filaments** brownish-black; **ovary** 5-celled, glaucous, dark brownish-black.

- Flower* : May - June
Exsiccatus : Kupup 4100 m, **SR Lepcha & AP. Das** 32923, dated 28.07.2005.
Status : Less common
Local Distribution : Kyongnosla, 4500-5000m
General Distribution : EASTERN HIMALAYA; (Sikkim – BHUTAN) AND S. TIBET.
Note : Endemic to Eastern Himalaya.

Rhododendron anthopogon D. Don in Mem. Wren Nat. His. Soc.3: 402. 1821; C.B. Clarke in Hook.f., Fl. Brit. Ind. 3: 472. 1882, p.p.; Hara *et al.* Fl. E. Him. 236. 1966; 2: 95. 1971; U.C.Pradhan in Himal.Plant Journ.3 (8): 111. 1985; Long & Rae in Grierson & Long.Fl. Bhutan (2): 385. 1991

Shrubs up to 40 cm tall. Shoots slightly bristly and scaly; **Petiole** long 7 mm, scaly above; lamina 2 – 4 x 1- 2.5 cm, oval or oblate-elliptic, obtusely mucronate at the apex, base rounded, sparsely scaly above and densely rusty scaly on the underside; petiole long 7 mm, scaly above. **Inflorescence** compact terminal head of 4 - 6 flowers. **Flowers** narrowly tabular with 5 rounded spreading lobes across, pinkish-white to deep pink. **Calyx** deeply lobed, elliptic margins finely ciliate. **Corolla** narrowly tabular glabrous, externally scaly and rainy inside. **Stamens** 5 - 8 include in the corolla-tube, glabrous; **Ovary** 4-5 celled, scaly. **Capsules** enclosed by persistent calyx-lobes.

- Flower* : May – June *Fruit:* September – October.
Exsiccatus : Nathang 4100 m, **SR Lepcha & AP. Das** 32823, Dated 25.10.2004.
Status : Rare
Local Distribution : Kyongnogla, Tiger hill, Chang hills, Nathang (3000m -5500m)
General Distribution : E. HIMALAY; INDIA, (NEPAL – BHUTAN) and S. TIBET.

Note : 1. Endemic to Eastern Himalaya

2. The dried leaves are used as incense in Buddhists monasteries in Sikkim, Tibet and at Bhutan.

Rhododendron arboreum Smith, Exot. Bot. 1: 9, 1.6. 1805; Hook. f., Rhod. Sikkim Him. 4. 1849; C.B. Clarke in Hook.f., Fl. Brit. India 3: 465. 1882; Hara *et al.* Fl. E. Him. 237. 1966; 2: 95. 1971; U.C. Pradhan, Himal. Plant Journ. 3(8): 111. 1985; Long & Rae in Grierson & Long, Fl. Bhutan 2(1): 372. 1991

Local Name: *Lali Gurans* (Nep.)

Trees, 10 - 15m tall. **Lamina** 10 – 25 x 3 – 6 cm, oblong-lanceolate to lanceolate, narrowed to the apex, base wedge-shaped; dark green, glossy and glaucous above and bearing silvery-white to fawn or cinnamon indumentum. **Inflorescence** compact trusses of 15 - 20 flowers, to 15 cm across; rachis tomentose. Pedicels about 8 mm. long downy and sparsely glandular. **Flowers** fleshy, usually blood-red to scarlet, tubular-companulate. **Calyx** to 0.3 cm long, lobes-5, tiny, triangular, slightly glandular and downy and fringed with hairs. **Corolla** tabular, companulate, to 4.5 cm long, lobes bearing dark nectary pouches at the base. **Stamens** 10, sub-equal, filaments white, glaucous. **Pistil** long, ovary conic, white-tomentose. **Capsules** oblong-cylindric, straight, or rarely curved.

Flower & Fruit : March – May

Exsiccatus : Panglakh 3000 m, **SR Lepcha & AP. Das 31080**, Dated 02.10.2004.

Status : Common

Local Distribution : Rachela, Kyongnosla, Lungthung, Karponang, Changu, Kupup.

General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, S.E. TIBET

Note : The wood is used for making handle of Banphok or Khukri's (traditional knife of Sikkim) The wine prepared by the fermentation of the flower by Sherpa tribe is the remedies for antidote and altitude sickness.

Rhododendron baileyi Balfour F. in Notes R.B. G. Edinb. 11.23. 1919; Staple in Bot. Mag. t. 8942. (1922); Alph. Check. Rh. Sp. (1981); U.C. Pradhan in Himal. Plant Journ. 3(8); 112. 1985; Grierson & Long, Fl. Bhutan 2(1): 382. 1991

Vern. Name : *Sano chimal* (Nep.)

Shrubs up to 1.5 m tall. **Leaves**; petioles to 8 mm; lamina 2.2 – 5 x 0.9 – 2.5 cm, elliptic to obovate, very densely brownish, scaly beneath, with overly lapping scales, upper surface densely scaly. **Flower** in 3 – 9 in distinct terminal racemes; pedicels to 2.5 cm. **Corolla** deep wine red or purple **Stamens** 10, stamen smaller than pistil; stigma swollen, 5-lobed; **ovary** 5-celled. **Capsules** cylindric.

Flower : May – July

Exsiccatus : Nathang boundary 4050m, **SR Lepcha & AP. Das 32939**, dated 27.10.2004.

Status : Common

Local Distribution : Serabthang, Changu; 3000 – 4000 m

General Distribution : E. HIMALAYA; INDIA, (BHUTAN- Arunachal Pradesh).

Note : Endemic to Eastern Himalaya.

Rhododendron barbatum Wall. ex G. Don. Gen. Hist. 3: 844. 1834: Hook.f., Rh. Sikkim Him..t. 3. 1849; C.B. Clarke in Hook.f., Fl. Brit. India 3: 468. 1882; Hara *et al.* Fl. E. Him. 237. 1966; 2: 96. 1971; U.C. Pradhan in Himal. Plant Journ. 3(8): 112. 1985; Long & Rae in Grierson & Long, Fl. Bhutan 2(1): 376. 1991

Local Name: Lal-Chimal (Nep.)

Trees upto 10 m tall. etiole bearing glandular bristles; **lamina** 10 – 20 x 3 – 7 cm , elliptic-lanceolate, acute, base rounded, margins reflexed and rough; upper surface shiny, midrib grooved primary nerves deeply impressed; woolly to hairless below, yellowish-green, glabrous on both surfaces. **Inflorescence** a compact globose head to 15cm across, bud scales and bracts very sticky; rachis glaucous. **Flowers** 10 - 20 per truss, blood red to scarlet-red, closely packed and born on pedicels to 0.15cm long, glaucous. **Calyx** large glaucous, ending in 5 ovate lobes at the base. **Corolla** tabular-companulate, bright scarlet, or scarlet-crimson with blakish nectarines at the base. **Stamens** 10, filaments glaucous, white and carrying purplish-black anthers. **Ovary** oblong, greenish-white, glandular hairs. **Capsules** long oblong-cylindric, brown.

Flower : March - April
Exsiccatus : Jorepokhri, **SR Lepcha & AP. Das 31165**, dated 03.10.2004.
Status : Not common
Local Distribution : Rachela, Panglakha. 2800 – 3050 m.
General Distribution : HIMALAYA; INDIA, (Kumaon – BHUTAN).
Note : 1. Endemic to Eastern Himalaya.
2. This species is oftenly found in mixed Abies forest along rivulets, in association with *R. hodgsonii* and other *Rhododendron* species

Rhododendron campanulatum D.Don in Mem. Wern. Soc. 3: 410. 1821; C.B. Clarke in Fl. Brit. India 3: 466.1882; Long & Rae in Grierson & Long. Fl. Bhutan 2(1): 375. 1991.

Shrubs large, upto 4 m tall . Branchlets glabrous. **Leaves** coriaceous, elliptic, rarely elliptic oblong, **lamina** 5.5 – 13 x 2.5- 5 cm, acute or subacute, base rounded or narrowly cordate, margin not reflexed., glabrous, without metallic bloom above, short fawn or pale brown indumentum of capitellate hairs closely apressed in upper and lower. **Racemes** 8 – 15 flowered; **pedicels** to 3 cm, glabrous. **Calyx** c 1.3 mm, glabrous. **Corolla** open –campanulate 5 lobed, white or pink with reddish spots and large blotch within, **stamen** 10; filament with few hairs. **Ovary** glabrous. **Capsules** curved.

Flower : May - June *Fruit* : August
Exsiccatus : Changu 3200 m, **SR Lepcha & AP. Das 3000** m, dated 13.07.2005.
Status : Less common
Local Distribution : Changu, upper Rachela
General Distribution : E. HIMALAYA; INDIA, BHUTAN, TIBET, MYANMAR, CHINA.

Rhododendron lanatum Hook.f., Rh. Sikkim Him.t. 16. 1851; C.B. Clarke in Hook.f., Fl. Brit. India 3: 467 1882; Hara *et al*, Fl. E. Him.239. 1966; U.C. Pradhan in Himal. Plant Journ. 3(8): 120. 1985; Long & Rae in Grierson & Long.Fl. Bhutan 2(1): 374. 1991

Local Name: Bhutle Gurans (Nep.)

Trees upto 3 m tall. **Petioles** 15 – 20 mm.long, thickly tomentose; **lamina** 8 – 12 x 3.5 – 5 cm, obovate to obovate-elliptic, cuneate at the base, shiny dark yellowish green above and densely woolly-tomentose beneath, covering the veins. **Inflorescence** 5 - 7 flowered and borne on pedicels 20 - 23mm.long, covered by thick grayish tomentum. **Calyx** reduced to 5 irrregular lobes or carrying three lobes usually lanceolate and unequal in size. **Corolla** broadly companulate, pale sulphur-yellow flushed and spotted with red and crimson, 4 x 6 cm across. **Stamens** 10, filaments unequal to 2.3 cm long, brownish black; **anthers** dilated; stigma, style glaucous; **ovary** broad, cylindrical, gently curved. **Fruit** not observed.

Flower : May – June *Fruit:* September – October
Exsiccata : Kupup 4200 m, **SR Lepcha & AP. Das** 32962, dated 28.07.2005.
Status : Not common
Local Distribution : Nathula, Kyongnosla. Changu 3800 – 4300 m.
General Distribution : E.HIMALAYA; NEPAL – BHUTAN).
Note : In Tibet the woolly fawn of underside of the leaves is used in oil lamp.

Rhododendron ciliatum Hook.f., Rhod. Sik. Himal. T. 24. 1851; Long & Rae in Grierson & Long., Fl. Bhutan 2(1): 380, 1991.

Shrubs upto 2 m tall. Branchlets with bristly and scaly. **Lamina** elliptic, 4 – 8 x 2 – 3 cm, acute or rounded mucronate, base rounded, upper surface dark green, bristly at base of margins, lower surface pale green, scaly and thinly bristly. **Racemes** corymbose 2 – 5 flowered; pedicels to 13 mm, bristly. **Calyx** unequally divided to base into ovate elliptic, base scaly, ciliate margins. **Corolla** campanulate, white flushed pink. **Stamen** 10; filament pubescent towards base. **Ovary** 5 celled, without scales. **Capsules** ovoid- oblong.

Flower : April – May *Fruit:* June – July
Exsiccatus : Changu 3200 m, **SR Lepcha & AP. Das** 1015, dated 20. 09. 2005.
Status : Less common
Local Distribution : Changu, upper Rechilla. 2900 – 3300 m
General Distribution : E. HIMALAYA; INDIA, (E. NEPAL – BHUTAN) and S. TIBET.
Note : Endemic to Eastern Himalayas.

Rhododendron cinnabarinum Hook.f, Rh. Sikkim Him.t. 8. 1849; C.B. Clarke in Hook.f., Fl. Brit. India 3:474.1882; Hara *et al* Fl. E.Him. 238. 1966; 2: 96. 1971; U.C. Pradhan in Himal Plants Journ. 3(8): 114. 1985; Long & Rae in Grierson & Long.Fl. Bhutan 2(1): 382. 1991

Local Name: Sano chimal (Nep.)

Shrubs upto 2 m tall. Bark reddish. **Leaves;** petioles to 2 cm long, glaucous or slightly scaly. lamina 5 – 10 x 2 – 4.5 cm elliptic to oblanceolate, tapering both ends, grayish- green and finely reticulated above and reddish scaly and glaucous below. **Inflorescence** in terminal cluster of 3 - 7 pendant red waxy flowers. pedicels to 0.7 cm long and scaly. **Calyx** rounded, acute unequally 5-lobed, the uppermost largest. **Stamens** 10, filaments pilose at the base. Stigma swollen, 5-lobed, hairy at the base; **ovary** 5-celled, scaly. **Capsules** long scaly.

Flower. : April- May.
Exsiccatus : Nathang boundary, **SR Lepcha & AP. Das** 32939, dated 27.10.2004.
Status : Common
Local Distribution : Kupup – Nathang. 1900 – 4000 m
General Distribution : E. HIMALAYA; INDIA, (NEPAL – BHUTAN) , S. TIBET.
Note : Endemic to Eastern Himalaya.

Rhododendron dalhousiae Hook.f., Rhod. Sik. Him. t. 1 & 2. 1849; C.B. Clarke in Hook.f., Fl. Brit. India 3: 469. 1882; Hara in Fl. E. Him. 1: 23. 1966; Hara in Enum. Fl. Pl. Nepal 3: 57. 1982; U.C. Pradhan in Sik. Him. Rhod. 40, t. 8. 1990; Long & Rae in Grierson & Long.,Fl. Bhutan 2(1): 379. 1991.

Local Name: Kurlingo, Laharay Chimal (Nep.).

Shrubs upto 3 m tall. Often grows on rock crevices or even epiphytic. Juvenile shoots bristly-scaly. **Leaves** compactly alternate; petioles to 1.5 cm, bristly; **lamina** 8 - 13 x 2.5 – 5 cm, obovate-oblong to oblanceolate, entire, obtuse-acute, rounded or mucronate, base cuneate and

ciliate, dark red sessile glandular scales scattered beneath; pedicels upto 1.4 cm long, pubescent. **Flowers** 2 - 4 in terminal clusters, fragrant. **Sepals** upto 15 x 1 cm, deeply 5-lobed, lobes oblong obtuse, scatterly pubescent, nerves impressed within. **Petals** to 10 cm long, wide campanulate, lobes 5, tips rounded, creamy white to light yellow; **stamens** 10; filament downy and pubescent in lower half part; anthers brown; ovary 5-chambered. **Capsules** 5-ribbed.

Flower : March – May *Fruit*: June – October
Exsiccatus : Middle Rachela 2300 - 2400 m, *SR Lepcha & AP. Das 1013*, dated 10.09. 2005.

Status : Frequent
Local Distribution : Mul-Pokhari, Pangolakha-NP Border, Rachela Middle. 2200 – 2500 m.
General Distribution : EASTERN HIMALAYA; INDIA, (NEPAL – NEFA).
Note : 1. Endemic to Eastern Himalayas
2. Sometime grown in the garden for its asthetic value.

Rhododendron edgeworthii Hook.f. in Rh. Sik. Him. 22. t. 21. 1851; Bot. Mag. t. 4936. 1856; C. B. Clarke in Hook.f., Fl. Brit. India 3: 469. 1882; Hara in Fl. E. Him. 96. 1971; U.C. Pradhan in Him. Pl. Journ. 3 (8): 116. 1985; Long & Rae in Grierson & Long., Fl. Bhutan (2):1. 378. 1991.

Local Name: Edgeworth ko Chimal, Lahare Chimal (Nep.).

Shrubs epiphyte, to 4m tall. **Branchlets** straggling densely pale brown tomentose. **Petioles** to 1.5 cm long; **lamina** 3 - 10 x 1.5 - 4.5 cm, ovate or ovate-elliptic, margin recurved below, acute to shortly acuminate, base rounded, dark shiny green, strongly rugose and glabrous above, lower surface with soft, thick reddish-brown tomentum.; pedicels to 2cm, stout, densely tomentose. **Flowers** terminal, usually 2 or solitary or upto 3 in numbers, highly aromatic. **Calyx** to 1.5 cm, cup-shaped, deeply 5-lobed, pink to green, pubescent and scaly, lobes obovate and spreading. **Corolla** 7.5 cm long, tubular at base and opening into a wide funnel at the mouth, white, often tinged pink or pink, lobes 5 to middle and rounded, scaly outside, margins crisped; **stamens** 10, slightly curved; filaments white, pilose in lower part; **anthers** purple-brown; pistil pale pink, ovary ovoid, tomentose; style pilose at lower part; stigma 5-6 lobed. **Capsules** cylindrical.

Flower : April – May *Fruit*: May – September
Exsiccatus : Middle Rachela 2300 - 2400 m, *SR Lepcha & AP. Das 1014*, dated 19.09. 2005.

Status : Less Frequent
Local Distribution : Pangolakha-NNP border, Rachela middle. 2200 – 2500 m.
General Distribution : E. HIMALAYA: INDIA, BHUTAN, TIBET, MYANMAR, CHINA.

Rhododendron falconeri Hook.f., Rh. Sikkim Himal.t.10. 1849; Bot. Mag .t. 4924. 1856; C.B. Clarke in Hook.f., Fl. Brit. India 3: 465 1882; Hara *et al* Fl. E. Him.239. 1966; 2: 96. 1971; U.C. Pradhan in Himal. Plant Journ. 3(8): 117. 1985; Long & Rae in Grierson & Long.Fl. Bhutan 2(1): 270. 1991

Local Name: Korlinga (Nep.)

Trees upto 15m tall. Leaf buds large, conical, tomentose; **Petiole** long grooved above, covered with grayish-white hairs; **lamina** 15 – 30 x 7 – 15 cm, oblong-ovate to elliptic, dark green and rugose above, dense rusty tomentum beneath; veins and veinlets deeply impressed, slightly raised below. **Inflorescence** round terminal heads to 25 cm across, bearing 20 - 25 flowers. **Corolla** obliquely campanulate, creamy-white to pale yellow with purple blotch at the base; bud scales sticky. **Calyx** small, tomentose. **Stamens** 12 - 16, hairy on the basal half. **Stamens**, exerted. **Stigma** greenish-yellow; ovary conoid, 12 mm long. **Capsules** 16 - 18 chambered, hispid.

Flower : Aprl.- May.
Exsiccatu : Jorepokhri, 2650 m, *SR Lepcha & AP. Das 31136*, dated 03.10.2004.
 Singaney Bans 2530 m, *SR Lepcha & AP. Das 250*, dated 15.05.2007.
Status : Common
Local Distribution : PWS. 3300 – 3600 m.
General Distribution : EASTERN HIMALAYA;INDIA, (NEPAL – NEFA).
Note : Endemic to Eastern Himalaya

Rhododendron glaucophyllum Rehder, Sp. Rh. 804. 1930; NRBGE 36(1): 113. 1978; Rh. Hb. 24 & 151. 1980; Hara in Enum. Fl. Pl. Nepal 3: 58. 1982; Hara in Fl. Him. 232. 1984; U.C. Pradhan in Him. Pl. Journ. 3(8): 118. 1985; Long & Rae in Grierson & Long. Fl. Bhutan 2(1): 384. 1991.
Rhododendron glaucum Hook.f., Rhod. Sik. Him. t. 17. 1849; C.B. Clarke in Hook.f., Fl. Brit. India 3:471. 1882.

Local Name: Takma Chimal (Nep.)

Shrubs usually dwarf upto 1.5m tall. Juvenile shoots often glandular-scaly, glaucous. **Leaves** fragrant; petioles to 0.5 cm long, glandular-scaly; **lamina** 3.5 – 6.5 x 1.5 - 2.5 cm, lanceolate to elliptic-lanceolate, margin recurved, acute, base rounded, dull green above, white and glaucous with brown and yellow scales beneath. **Racemes** subumbellate and in terminal truss of few to 5. peicels 2 cm long, light green, scaly; floral bracts 1.2 x 1cm, ovate. **Flowers** upto 3 cm across, rosy-pink or rarely white with pinkish marks. **Calyx** to 0.80 x - 0.50 cm, deeply 5-lobed, persistent and scaly externally **Corolla** to 3cm, tubular-campanulete or campanulate, with 5 orbicular spreading lobes, marked with distinct light green nerve); **stamens** 10, exerted; filaments hairy; **anthers** dark brown; pistil 1.5cm, pale green turns into reddish pink; **ovary** 5-chambered, scaly towards the apex; stigma 5-lobed. **Capsules** elliptic-globular, scaly, and covered with a little shorter persistant calyx.

Flower : April – May Fruit : August - October
Exsiccatu : Panglakha 3050 m, *SR Lepcha & AP Das 1017*, dated 27.10.2004.
Status : Less Common
Local Distribution : Rachela Trijunction, Jorpokhari. 1600 – 3100 m.
General Distribution : E. HIMALAYA; INDIA, (Sikkim, Darjeeling), BHUTAN.
Note : 1. Endemic to Eastern Himalaya
 : 2. Cultivated for ornamental value.

Rhododendron grande Wight. In Calc. Journ. Nat. Hist. 8:176 (1847); Ic. 4:t. 1202 (1850); Hook.f., Sikkim Him. t. 9 (1849); Bot. Mat.t. 5054 (1858); C.B. Clarke in Fl. Brit. India 3:464 1882; Sp. Rh. 310 (1930); Hara *et al.* Fl. E. Him. 239 (1966)-96 (1971); U.C. Pradhan Him. Plant journ. 3(8):118 (1985) ; Grierson & Long.Fl. Bhutan 2(1): 370. 1991
Vern.name ; Patle korlinga

Tree upto 15m tall. Juvenile leaves silky, imbricated. **Leaves** lamina 15 - 35 x 7.5 – 12.5 cm oblong-lanceolate or oblong-elliptic, shining, deep green above and silvery-white indumentum below, veins impressed. **Inflorescence** with 20 -30 flowers; rachis to 5 cm long. **Flowers** pale rose in bud and white to creamy-white in flowers usually glandular,tufted. **Corolla** 5 – 7 x 5 – 6 cm ventricose-companulate, and nectarines purple blotched, the limb 5-lobed. **Calyx** 8-lobed. **Stamens** 16, unequal; filaments white, anthers purplish-brown. **Stigma** purplish-brown, ovary 10 - 16 celled, densely glandular or tomentose. **Capsule** broad, curved, tomentose.

Flower. : March – April
Exsiccatu : Pokhri chowk 2650 m, *SR Lepcha & AP. Das 31124*, dated 03.10.2004.

Status : Less common
Local Distribution : Kupup, Serabthang. to 4000 m.
General Distribution : E. HIMALAYA; INDIA, (NEPAL to NEFA), S. TIBET
Note : Endemic to Eastern Himalaya

Rhododendron griffithianum Wight, Ic. Plant. 4: t. 1203. 1850; Hook, f., Rh. Sikkim Him. t. 11. 1851 (as *R. aucklandii*); C.B. Clarke in Hook.f., Fl. Brit. India 3: 468. 1882; Hara *et al* Fl. E.Him. 239. 1966; 2: 97. 1971; U.C. Pradhan in Himal. Plant Journ. 3(8): 118. 1985; Long & Rae in Grierson & Long.Fl. Bhutan 2(1): 368. 1991.

Local Name:Seto chimal (Nep.)

Trees small upto 5m tall. Juvenile leaves reddish-pink bark. **Petiole** to 3.5 cm long recurved, light green; **lamina** 5 – 20 x 5 – 7 cm, drooping, oblong-elliptic, leathery, margin and midrib yellowish-green; dark green on dorsal sides, ventral surface light green with clear venation. **Inflorescence** 4 - 5 flowered. **Flowers** very large 10 – 11 cm across, white flushed pink behind and borne on glaucous; pedicels 3.5 cm long, saucer-shaped, green flushed red. **Stamens** 12 - 13, filaments to 4.5 cm long, white, anther pale, brown. **Capsules** 5-chambered.

Flower : April – May

Exsiccatus : Jorepokhri (Rachela) 2700 m, , *SR Lepcha & AP. Das* 31177, dated 03.10.2004.

Status : Not common

Local Distribution : Kyongnosla, Changu. 2000 – 3200 m

General Distribution : E. HIMALAYA; INDIA, (NEPAL to NEFA), S. TIBET

Note : Endemic to Eastern Himalaya

Rhododendron lanatum Hook.f., Rh. Sikkim Him.t. 16. 1851; C.B. Clarke in Hook.f., Fl. Brit. India 3: 467 1882; Hara *et al* Fl. E. Him.239. 1966; U.C. Pradhan in Himal. Plant Journ. 3(8): 120 1985; Long & Rae in Grierson & Long.Fl. Bhutan 2(1): 374. 1991

Local Name:Bhutle Gurans (Nep.)

Trees upto 3 m tall. **Petioles** 15 - 20mm.long, thickly tomentose; **lamina** 8 – 12 x 3.5 – 5 cm, obovate to obovate-elliptic, cuneate at the base, shiny dark yellowish green above and densely wooly-tomentose beneath, covering the veins. **Inflorescence** 5 - 7 flowered and borne on pedicels 20 - 23mm.long, covered by thick grayish tomentum. **Calyx** reduced to 5 irregular lobes or carrying three lobes usually lanceolate and unequal in size. **Corolla** broadly campanulate, pale sulphur-yellow flushed and spotted with red and crimson, 4 x 6 cm across. **Stamens** 10, filaments unequal to 2.3 cm long, brownish black; **anthers** dilated; stigma, style glaucous; ovary broad, cylindrical, gently curved. Fruit not observed.

Flower : May-June *Fruit*: September – October

Exsiccatus : Kupup 4200 m, *SR Lepcha & AP. Das* 32962, dated 28.07.2005.

Status : Not common

Local Distribution : Nathula, Kyongnosla. Changu 3800- 4300 m.

General Distribution : E. HIMALAYA; INDIA, (Sikkim – BHUTAN) and S. TIBET.

Note : 1. Endemic to Eastern Himalaya

2. The wooly fawn of underside of the leaves is used in oil lamp in Tibet.

Rhododendron lepidotum Wall. ex G. Don, Gen. Hist. 3: 845. 1834; Hara *et al*, Fl. E. Him. Wall, ex G. Don, Hist . 3: 845. 1834; C.B. Clarke in Hook.f., Fl. Brit. India 3: 471.1882; Hara, Fl. Himal. 240. 1966; 2: 97. 1971; U.C. Pradhani in Himal. Plant Journ. 3(8): 1230.1985; Long & Rae in Grierson & Long Fl. Bhutan 2(1): 384. 1991

Vern. Name: Baley sunpatey, Balu supatey (Nep.)

Shrubs, aromatic rounded or mat, branlets scaly. **Leaves** scaly; petioles absent or 1.5 mm, obovate; **lamina** oblanceolate or elliptic 0.4 – 1.3 x 0.4 – 0.7 cm, acute or rounded, base cuneate, conspicuously scaly on both surface. **Flowers** 1 -2 terminal, pendant; pedicels slender, to 3 cm, scaly. **Calyx** 5 lobed, lobes rounded to 0.5 cm, scaly. **Corolla** campanulate to 2 cm, red pink purple white or yellow often spotted. **Stamens** 10, filaments pubescent towards at the base. **Ovary** 5-celled, scaly,; **style** very short, deflex. **Capsules** shortly cylindrical.

Flower : May - July.
Exsiccatus : Kupup 4150 m, *SR Lepcha & AP Das* 1012, dated 13. 10. 2005.
Status : Common
Local Distribution : KAS, Changu below. 2500 – 4200 m.
General Distribution : HIMALAYA; INDIA, (Kashmir – BHUTAN) and S. TIBET.
Note : Endemic to Himalaya

Rhododendron thomsonii Hook.f., Rh. Sikkim Him.t. 12. 1851; Bot. Mag. t. 4997. 1857; C.B. Clarke in Hook.f., Fl. Brit. India 3: 468 .1882; Hara *et al* Fl. E. Him. 240. 1966; 2: 98. 1971; U.C. Pradhan in Himal. Plant Journ. 4: 9-10. 1986; Long & Rae in Grierson & Long. Fl. Bhutan 2(1): 377. 1991

Local Name: Dr. Thomson ko Gurans (Nep.)

Shrubs upto 4.5 m tall. Juvenile leaves glaucescent, waxy blue. **Petiole** 10 – 12 mm long green; **Lamina** 4 - 10 x 3 – 6.5 cm, orbicular to elliptic, apex rounded, mucronate, base cordate or rounded; upper surface pale to dark- green in mature, **Inflorescence** of 6 - 10 campanulate flowers of blood-red or deep, crimson, scarlet or blakish-red, **Corolla** to 6 cm, .5-lobed, lobes emarginated, upper lobes spotted; base with honey pouches of purple-red colour. **Calyx** 1.5 – 2 cm long, cup-shaped, unequally 5-lobed, truncate; **Stamens** 10, filaments glaucous, style red, curved upwards; **stigma** globose or rounded. pale greenish; ovary to 0.8 cm long, glaucous, 6 - 10 celled. **Capsules** broadly oblong, purple.

Flower : May – June
Exsiccatus : Padamchen boundary 2600 m, *SR Lepcha & AP. Das* 01008, dated 27.10.2004.
Status : Common.
Local Distribution : Kyongnosla, Rachel, 3300 – 4500 m.
General Distribution : E. HIMALAYA; INDIA, (NEPAL– BHUTAN) and S. TIBET.
Note : Endemic to Eastern Himalaya

Rhododendron triflorum Hook.f., Rh. Sik. Him. t. 19. 1851; C.B. Clarke in Hook.f., Fl. Brit. India 3: 474. 1882; Hara in Fl. E. Him. 1: 240. 1966; 2: 99. 1971; Hara in Enum. Fl. Pl. Nepal 3: 59. 1982; Hara in Fl. Him. 231. 1984; U.C. Pradhan in Him. Pl. Journ. 4: 9-10. 1986; Long & Rae in Grierson & Long. Fl. Bhutan 2(1): 380. 1991.

Local Name: Pahenle Chimal (Nep.)

Shrubs upto 3 m tall. Shoots glaucous and black glandular. **Leaves**; petioles to 0.7 cm long, scaly; **lamina** 3.5 – 7 x 1 – 2.5 cm, lanceolate to oblong-lanceolate, entire, acute, base rounded, glabrous and shiny green above, whitish or pale green and densely minute scaly and glandular beneath, mid-nerve elevated and prominent on under surface, lateral nerves upto 14 pairs, distinctly marked above and faintly impressed beneath. **Racemes** terminal, 2-3 flowered; pedicels to 1cm long, scaly. **Flowers** fragrant, pale yellow to greenish yellow, with green spots. **Calyx** minute, obscurely 5-lobed, lobes very short. **Corolla** zygomorphic, to 5 cm across, funnel-

shaped, pale yellow, with 5 spreading ovate-obtuse lobes, tube to 0.9 cm, densely scaly outside; **stamens** 8 - 10, exerted; filaments hairy towards base; pistil exceeding stamens; **ovary** oblong-cylindrical, scaly; stigma truncate. **Capsule** cylindrical.

- Flower* : April - June *Fruit* : August - September
Exsiccatus : Jore-pokhari, below Rechela 3000 m, *SR Lepcha & AP. Das 1012.*
 dated 19.09.2005
Status : Less Common
Local Distribution : Jorpokhari below. 2400 - 3100 m.
General Distribution : E. HIMALAYA; INDIA, (E. NEPAL- BHUTAN) and S. TIBET .
Note : Endemic to Eastern Himalaya

VACCINIACEAE S.F. Gray

Key to the Genera

1. Plant mostly grows on the tree trunks; Leaf sessile; base rounded; Flowers pendulous, axillary; petals lined with transverse deep red waves-like rings, red..... *Agapetes*
- + Plant mostly grows on rock crevices; leaf (petiolated) petiolule upto 1.5 cm long, base attenuate; Flowers not pendulous, terminal; petals pinkish white..... *Vaccinium*

Agapetes Linnaeus

Key to the species

1. Plants upto 1 m tall 2
- + Plants more than 1 m tall *A. saligna*
2. Petals tube lined with transverse deep red waves-like ring *A. serpens*
- + Petals tube yellow *A. hookeriana*

Agapetes hookeri (Clarke) Sleumer in Bot. Jahrb. 70: 106. 1939; Long & Rae in Grierson & Long, Fl. Bhutan 2 (1): 402. 1991. *Pentapterigium hookeri* C.B. Clarke in Fl. Brit. India 3: 450. 1882. *A. incurvata* (Griff.) Sleumer var. *hookeri* (Clarke) Airy shaw in Kew Bull. 1958: 486. 1959; Hara *et al.* Enum. Fl. Pl. Nepal 3: 54. 1982.

Local Name: Gujru Ganta (Nep.)

Shrubs epiphytic upto 60 cm tall with swollen stem base. **Leaves** sessile, alternate, lamina 4 - 8 x 1 - 3 cm, ovate-lanceolate, crenate-serrate, acuminate, base slightly sub-cordate, coriaceous, nerves prominent, pubescent below, impressed veins above rugose. Pedicels to 3 cm, thick and hairy at the apex. **Flowers** in axillary fascicles, often 2 - 4, pendulous. **Sepals** lobes upto 0.5 cm, ovate, green. **Petals** tubular, long upto 2 cm, yellow, ribs hairy; **anthers** 0.7 cm, spurred; **ovary** pinkish green.

- Flower & fruit* : June - September
Exsiccatus : Panglakh 2100 - 2500 m, *SR Lepcha & AP. Das 1347*, dated 10.10. 2007.
Status : Rare
Local Distribution : Rechila Middle, Phusrey 1900 - 2500 m.
General Distributions : E. HIMALAYA INDIA, (E. NEPAL- BHUTAN).
Note : Endemic to Eastern Himalaya

Agapetes saligna (Hook.f.) Bentham et Hook.f., Gen. Pl. 2: 571. 1876; C.B. Clarke in Fl. Brit. India 3: 444. 1882; Hara in Fl. E. Him. 233. 1966; Hara et al, Enum. Fl. Pl. Nepal 3: 54. 1982; Long & Rae in Grierson & Long, Fl. Bhutan 2(1): 403. 1991. *Vaccinium salignum* Hook.f., Ill. Him. Pl. t. 15A. 1955.

Local Name: Angaray/ Amilay (Nep.)

Shrubs erect, upto 2 m tall. Stem usually brownish-gray. **Petioles** upto 1 cm long; **lamina** lanceolate, 4 - 11 x 1 - 4 cm, entire, acuminate, base cuneate, yellowish green below, dark green above, glabrous. **Flower** in racemes to 6 - 9, to 3 cm long. Peduncles to 4cm, glabrous. Pedicels widened at apex becoming cup-like. **Sepals** 0.3 - 0.5cm, 5-toothed, lanceolate, teeth hairy, greenish inside, red-brown outside (in old ones), young ones greenish red. **Petals** tubular, 5-lobed, 0.4 - 1cm, pinkish green (old ones), yellowish green (young ones); **stamens** 10, short, free, yellowish; **anthers** elongated; **ovary** greenish; style 1, simple. **Berries** subglobose, 5-lobed; seeds ellipsoid.

Flower : May *Fruit:* May - October.

Exsiccatus : Rachela (NVNP border), 2650 m, *SR Lepcha & AP. Das 1348*, dated 10.10.2007.

Status : Common.

Local Distribution : Rachela Middle, Singhaney 2100 - 2600 m.

General Distributions : North-east INDIA, MYANMAR.

Note : 1. Endemic to Himalaya.

2. Fruits edible.

Agapetes serpens (Wight) Sleumer in Engl., Bot. Jahrb. 70: 105. 1939; Hara & Ohashi in Fl. E. Him. 233. 1966; Hara et al, Enum. Fl. Pl. Nepal 3: 54. 1982; Long & Rae in Grierson & Long, Fl. Bhutan 2(1): 401. 1991. *Agapetes serpens* Wight in Calc. Journ. Nat. Hist. 8: 171. 1847. *Pentapterigium serpens* (Wight) Klotzsch in Linnaea 24: 47. 1851; C.B. Clarke in Fl. Brit. India 3: 449. 1882.

Local Name: Bhandaray (Nep.)

Shrubs, pendent, hanging on tree trunks up to 80 cm tall. **Lamina** ovate-lanceolate, 0.5 - 1.6 x 0.3 - 0.5 cm, margin recurved, entire to remotely serrate, sub-acute, sessile, base rounded, thick, leathery.; pedicels to 1.5 cm long, glandular hairy. **Flowers** axillary, solitary, pendulous **Sepals** tube 5-angled with distinct 5 reddish nerves and dissected into 5 on terminal apex, lobes lanceolate, glandular hairy. **Petals** tubular, lined with transverse deep red waves-like rings, red, nerves hairy, lobes 5, recurved; **stamens** 10, free; filaments shorter; **anthers** 0.4 -0.6 cm, elongated; **ovary** 5-celled, inferior; style simple. **Berries** globose.

Flower : December - May *Fruit:* April - June

Exsiccatus : Panglakha 2800m, *SR Lepcha & AP. Das 182*, dated 13.10.2003.

Status : Common.

Local Distribution : Panglakha, Rachela Middle, Thartharay. 1900 - 2500 m.

General Distributions : E. HIMALAYA INDIA, (NEPAL-Arunachal Pradesh).

Note : 1. Endemic to Eastern Himalaya

2. Fruits edible.

Vaccinium Linnaeus

Key to the species

Leaves alternate; leaf margins entire; petals pinkish white *V. retusum*

Leaf whorls; leaf margins crenate - serrate; petals greenish yellow *V. vacciniaceum*

Vaccinium retusum (Griffith) C.B. Clarke in Fl. Brit India 3: 451. 1882; Hara & Ohashi in Fl. E. Him. 241. 1966; Hara *et al*, Enum. Fl. Pl. Nepal 3: 59. 1982; Rae in Grierson & Long, Fl. Bhutan 2(1): 397. 1991. *Thibaudia retusa* Griffith, Not. 4: 300. 1854.

Local Name: Ratay (Nep.).

Shrubs, grows on rocks upto 2 m tall. Branches densely hirsute. **Leaves** alternate; petioles short (upto 0.22 cm), **lamina** 1.5 - 2.5 x 0.5 - 1.5 cm, obovate, margins recurved down, entire, shallowly retuse, base attenuate, glabrous, lower surface faint white. **Inflorescence** in terminal racemes, usually 9 - 20 flowered, pubescent; bracts compact and conspicuous, 0.3 - 0.7 cm, elliptic, pinkish white, caduceus; bracteoles to 0.5cm, scaly. **Flowers** pinkish white. **Sepals** teeth very short, obtusely triangular. **Petals** ovoid with tubular base and constricted at apex, pinkish white, glabrous, lobes pinkish; stamens 10, free; anther tubular, dorsally spurred; filament with long hairs. **Fruits** sub-globose.

Flower : April - June *Fruit:* June - September
Exsiccatae : Sano-Ramitey 2200 m, *SR Lepcha & AP. Das 31166*, dated 03.10.2004; On way to Rachel (Neora Valley National Park border) 2500m, , *SR Lepcha & AP. Das 31190*, dated 03.10.2004.
Status : Frequent.
Local Distribution : Mulkharka Pokhari, 1900 - 2500 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.

Vaccinium vacciniaceum (Roxb.) Sleumer in Bot. Jahrb. 71: 479. 1941; Hara in Fl. E. Him. 242. 1966; 2: 99. 1971; Hara *et al*, Enum. Fl. Pl. Nepal 3: 60. 1982; Rae in Grierson & Long, Fl. Bhutan 2(1): 399. 1991. *Ceratostema vacciniacea* Roxb., Fl. Ind. ed. 2(2): 412. 1832. *V. serratum* (G. Don) Wight, Icon. 4: t. 1184. 1848; C.B. Clarke in Fl. Brit. India 3: 452. 1882.

Vern. name: Rukh Tamarkay (Nep.).

Shrubs epiphytic to 2 m tall. **Leaves** sessile, whorled; **lamina** 4 - 13 x 1.5 - 3.5 cm, lanceolate, crenate-serrate, acute, base slightly rounded, glabrous. **Flower** in racemes with many flowered, both terminal and axillary, to 10 cm long. Pedicels to 1.5 cm, widening above towards the apex, erect; **bracts** to 0.5 cm, lanceolate-triangular, caduceus; **bracteoles** to 0.25cm, linear, persistent. **Sepals** shortly 5-toothed, teeth upto 0.3cm, triangular. **Petals** upto 1x 0.5cm, urn-shaped, upward shortly recurved 5-lobed, greenish yellow; **stamens** 10, free; anthers with 2 tubular tips ; ovary inferior, style simple. **Berries** globose, under persistent sepals.

Flower : March - May *Fruit:* April - July
Exsiccatas : Phusrey 2100 m, *SR Lepcha & AP. Das 1349*, dated 10.10.2007.
Status : Frequent.
Local Distribution : Lower Tinsimana, Mulkharka, Phusrey 2900 - 2900 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR.

MONOTROPACEAE Nuttall

Monotropa Linnaeus

Monotropa uniflora L., Sp. Pl. ed. 1(1): 387. 1753; C.B. Clarke in Hook.f., Fl.Brit.India 3: 476. 1882; Hara in Fl. E. Him. 1: 232. 1966; 2: 93. 1971; Hara in Enum. Fl. Pl. Nepal 3: 60. 1982; Rae in Grierson & Long, Fl. Bhutan 2(1): 356.1991.

Herbs saprophytic glabrous upto 13 cm tall. **Stem** erect, fleshy, scaly, upto 2cm long, ovate-lanceolate, rounded, papery, pinkish-white. Inflorescence solitary, terminal, nodding. **Calyx** 0.35 - 0.48cm, ovate - oblanceolate, glabrous, white. **Corolla** 3, free, almost obovate, entire, hairy within, reddish-white or white, pubescent inside; **stamens** 10, free; anthers with terminal slit on each cell, whitish; filament pubescent below; ovary ovoid, 5-chambered; **style** flattened and stout. **Capsule** globose.

Flower & Fruit : July – October.
Exsiccatus : Towards NNP Border, 2245 m, *SR Lepcha & AP. Das 1900*, dated 20.03.2004.
Status : Rare.
Local Distribution : NNP Border, In between 2195 – 2280 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, CHINA, JAPAN, N & C AMERICA.

Order: Ebenales

SYMPLOCACEAE Desf.

Symplocos Linnaeus

Key to the species

1. Petals yellowish *S. glomerata*
+ Petals whitish 2
2. Leaf margin entire *S. dryophila*
+ Leaf margin serrate, obscurely serrate 3
3. Calyx lobes lanceolate *S. theaeifolia*
+ Calyx lobes rounded or ovate 4
4. Flowers 4-8 *S. ramosissima*
+ Flowers more than 8 (numerous) *S. lucida*

Symplocos dryophila C.B. Clarke in Fl. Brit. India 3: 578. 1882; Pfl. Reich IV-242, Ht. 6: 42. 190; Hara in Fl. E. Him. 250. 1966; Long in Grierson & Long, Fl. Bhutan 2(2): 583. 1999.

Local Name: Kharanay (Nep.)

Tree with gray branchlets. **Leaves**; petioles to 2 cm long; **lamina** 5 – 13 x 3 – 4 cm, oblanceolate or oblong-elliptic, entire, acuminate, base acute, coriaceous, glabrous, mid-rib prominent beneath, lateral nerves 8 - 12 pairs. Racemes to 14 cm long, axillary, lax, fulvous hirsute; bracts orbicular, villous; bracteoles similar to bracts in shape. Pedicels upto 0.30 cm long. **Calyx** tube to 0.20 cm, lobes ovate, hairy at the top. **Petals** to 50 cm, ovate-lanceolate, white; stamens many. **Fruit** globose, reddish-brown.

Flower : May - July *Fruit:* August - September .

Exsiccatu : Ramitey - Phusrey 2300, *SR Lepcha & AP. Das 1300*, dated 03.10.2004.
Status : Less frequent
Local Distribution : Mulkharka, Rachel below, 1900 – 2650 m.
General Distribution : E. HIMALAYA INDIA, (NEPAL - Sikkim).
Note : Endemic to Eastern Himalaya

Symplocos glomerata King ex C.B. Clarke in Fl. Brit. India 3: 577. 1882; Trs. N. Beng. 86. 1929; Hara & Ohashi in Fl. E. Him. 250. 1966; Hara *et al*, Enum. Fl. Pl. Nepal 3: 78. 1982; Fasc. Fl. India 20: 152. 1990; Long in Grierson & Long Fl. of Bhutan 2(2): 582. 1999.
Local Name: Kholme (Nep.).

Tree, small, glabrous. **Leaves**; petiole to 0.9cm; **lamina** lanceolate, 5.5 – 10.5 x 2 – 2.9cm, acute to acuminate, cuneate, serrate, glabrous both sides, usually coriaceous, lateral nerves 8 – 9 pairs on either sides. **Inflorescence** in axillary fascicles; bracts and bracteoles small, ovate, wooly; pedicels short, hairy. **Calyx** small, glabrous within. **Corolla** ca 0.4cm long, yellowish; stamens 25.

Flower & Fruit : April - May.
Exsiccatu : Panglakha 2400m, *SR Lepcha & AP. Das 29381*, dated 30.09.2004.
Dohrok, *SR Lepcha & AP. Das 30241*, dated 06.10.2004.
Status : Common.
Local Distribution : Dhorok, Panglakha 1750 – 2800 m.
General Distribution : E. HIMALAYA; INDIA, Khasia Hills, BHUTAN
Note : Endemic to Eastern Himalaya.

Symplocos lucida (Thunberg) Siebold *et* Zuccarini, Fl. Japan 1:55, t. 24. 1835; Fl. Jow. 1:297. 1981; Fl. Meg. 2: 577. 1987; Long in Grierson & Long, Fl. of Bhutan 2(2): 581. 1999. *Laurus lucida* Thunberg, Fl. Japan 174. 1784. *S. theaefolia* D. Don, Prodr. 145. 1825; C.B. Clarke in Fl. Brit. India 3: 575. 1882.

Local Name: Kharanay (Nep.).

Trees, medium glabrous. **Stem** usually greenish. **Leaves**; **petioles** 0.5 – 1.5cm; **lamina** oblong-lanceolate, 5 - 10.5 x 1.8 -3.5cm, obscurely serrate, acuminate, usually light green beneath, glabrous, glossy, coriaceous, nerves prominent on both sides. **Racemes** axillary with dense flowered; **bracts** 0.5 - 0.6cm. **Calyx** 0.13 - 0.4cm, lobes rounded, ciliate, persistent. **Corolla** larger than calyx, ovate, whitish; stamens many, disc long, whitish hairy. **Fruits** ellipsoid, black when fully ripe.

Flower : March - April. *Fruit*: May - August.
Exsiccatu : Bara-Ramitey 2400 m, , *SR Lepcha & AP. Das 31171*, dated 03.10.2004.
Status : Common.
Local Distribution : Mulkharka, Rachel Chowk, 1900 – 2650 m.
General Distribution : E. HIMALAYA
Note: 1. Endemic to Eastern Himalaya
2. Oil extracted from seeds can be good remedies against spider- bites (stings) (Das & Rai, 2003)

Symplocos ramosissima Wallich ex G. Don, Gen. Hist. 4:3. 1837; Prodr. 8:257.1844; C.B. Clarke in Fl. Brit. India 3: 577. 1882; Hara in Fl. E. Him. 1: 250. 1966; Hara *et al*. Enum. Fl. Pl. Nepal

3: 79. 1982 Fasc. Fl. Ind. 20:167. 1990. *Lodhra ramosissima* (G. Don.) Miers in Journ. Soc. 17. 299. 1880.

Local Name: *Kharanay* (Nep.).

Trees small with glabrous stem. **Leaves:** petioles to 1.4 cm. long, glabrous; **lamina** 4 – 13 x 2 – 3.5 cm, oblong-lanceolate, finely serrate, acuminate, papery, surfaces glossy and glabrous, nerves more distinct beneath. Pedicels to 0.20 cm, yellowish, pubescent. **Racemes** axillary, small, usually 4-8 flowered. **Calyx** small, yellowish pubescent externally, lobes ovate; **Petals** to 0.4 cm, white; stamens 20; anthers slightly exerted. **Fruits** ellipsoid.

Flower : March – June **Fruit:** July – November
Exsiccatus : Ramitey 2300 m, **SR Lepcha & AP. Das 1301**, dated 03.10. 2004.
Status : Common
Local Distribution : Mulkharka, Rachel below, 1900 – 2650 m.
General Distribution : TEMPERATE HIMALAYAS and Khasia Hills.
Note : Endemic to Himalaya

Symplocos theaeifolia D. Don, Prodr. Fl. Nep. 145. 1825; C.B. Clarke in Fl. Brit. India 3: 575. 1882; Hara in Fl. E. Him. 251. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 79. 1982; Facs. Fl. Ind. 20: 170. 1990. *S. phyllocalyx* C.B. Clarke in Fl. Brit. India 3: 575. 1882; Hara in Fl. E. Him. 250. 1966.

Local Name: *Khorsanay* (Nep.).

Trees upto 18 m tall. Branchlets glabrous or patently villous. **Leaves:** petioles to 1.5 cm long; **lamina** 5 – 13 x 3 – 4 cm, oblong-lanceolate, obscurely serrulate, acuminate, base cuneate, coriaceous, nerves many. **Panicles** to 4 cm, axillary, dense; bracts to 0.4 cm long; bractleoles to 0.20 cm, pubescent. **Flowers** sub-sessile, scented. **Calyx** lobes to 0.4 cm long, lanceolate, ciliate. **Petals** to 0.60 cm, lanceolate or ovate, whitish; **stamens** to 30 cm, with hairy disc; **styles** densely pubescent. **Fruits** ellipsoid.

Flower : December – April **Fruiting:** May – August
Exsiccatus : Mulkharka 2380, **SR Lepcha & AP. Das 1302**, dated 03.10. 2004
Status : Common
Local Distribution : Mulkharka, Rachel below, 1600 – 2650 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, THAILAND, MALAYSIA

Order: Primulales

MYRSINACEAE R. Brown

Key to the Genera:

1. Flowers in branched raceme; fruit with few (1-2) seeded *Myrsine*
+ Flowers in axillary fascicle; fruit with many seeded *Maesa*

Maesa Forsskál

Key to the Species:

1. Branches glabrous; berry globose 2
+ Branchelets puberulous; berry sub-globose *M. montana*
2. Lamina 8 – 23 x 2 -5.5 cm; coriaceous, rugose *M. rugosa*
+ Lamina 7 – 13 x 2.3 - 5 cm; herbaceous, not rugose *M. chisia*

Maesa chisia Buch.-Ham. ex D. Don, Prod. Fl. Nep. 148. 1824; C.B. Clarke in Hook.f., Fl. Brit. India 3: 509. 1882; Hara in Fl. E. Him. 243. 1966; Long & Rae in Grierson & Long, 2(2): 507. 1999.

Local Name: *Tukzyel kung* (Lep.) *Bilounay* (Nep.)

Shrub or small tree to 3 – 6m tall. Branches glabrous. **Petioles** to 1.7cm; **lamina** membranous, lanceolate or elliptic 7 – 13 x 2.3 - 5 cm, acuminate, base cuneate, margin sub entire, sinuate or distantly serrate, glabrous, lateral veins reticulate, conspicuous, translucent. **Inflorescence** in simple or branched racemes, to 5.5.cm; pedicels to 2.8 cm. Sepals ovate to 1mm. **Corolla** white, to 1.8 mm. **Fruits** to 4 mm across, globose

Flower & Fruit : February – May

Exsiccata : Singhaney dara 2230 m, *SR Lepcha & AP. Das* 31270, dated 13. 07.2008

Status : Common.

Local Distribution : Rachel Middle, Singhaney dara. 1300 – 2250 m.

General Distribution : E. HIMALAYA; INDIA, (NEPAL – BHUTAN) Khasia, Manipur, and N. BURMA.

Note : Endemic to Eastern Himalaya.

Maesa montana A. DC. in DC., Prodr. 8: 79. 1844; Philip. Journ. Sci. 73: 28. 1940; Hara in Fl. E. Him. 243. 1966; Long & Rae in Grierson & Long, Fl. Bhutan 2(2): 507. 1999. *M. indica auct. non* (Roxb.) A. DC.: C.B. Clarke in Hook.f., Fl. Brit. India 3: 509. 1882 p.p. *M. elongata* Mezz. in Pfreich. Ht. 9: 31. 1902.

Shrub to 4.5 m tall. Branchelets puberulous. Bark dark brown. **Lamina** elliptic or sometime variable, 4.5 - 12 x 2.4 - 5 cm, obscurely dentate at distant, acute to caudate-acuminate, base cuneate, rounded, sometimes obtuse, midrib puberulous in lower surface, glabrous. **Racemes** 3.5 – 5 cm long, simple or branched, puberulous. **Flowers** to 0.3 cm diam., white. **Fruits** 0.45-0.55 cm across, sub-globose, creamy white, many seeded.

Flower & Fruit : February - November

Exsiccatus : Singhaney dara 2200 m, *SR Lepcha & AP. Das* 31272, dated 13.07.2008.

Status : Frequent.

Local Distribution : Premlakha, Singhaney dara, Subhaney. 1200 – 2250 m.

General Distribution : TROPICAL HIMALAYAS; INDIA, NEPAL, BHUTAN, W.CHINA.

Maesa rugosa Clarke in Hook.f., Fl. Brit. India 3: 508. 1882; Hara & Ohashi in Hara, Fl. E. Him. 246. 1966; Long & Rae in Grierson & Long, Fl. Bhutan 2(2): 506. 1996. *Maesa rugosa* var. *griffithii* Clarke in Hook.f., Fl. Brit. India 3: 509. 1882.

Local Name: *Thulo Bilounay* (Nep.)

Tree or shrubs, stout upto 4 -5 m tall. **Petioles** short 1 – 1.9cm, glabrous; **lamina** narrowly ovate – lanceolate, 8 – 23 x 2 -5.5cm, distantly obscure-denticulate, caudate, base cuneate, rugose, both sides glabrous, slightly coarse beneath, nerves prominent and raised beneath, slightly impressed above, lateral nerves 12-15 on either halves. **Racemes** many flowered, upto 4cm long, paniced, glabrous. **Flowers** small, tetramerous. **Calyx** 4-lobed, sepals ovate. **Corolla**, campanulate, lobes round, whitish-yellow; **stamens** 5, inserted on the corolla tube; style short. **Berry** globose, almost completely enclosed.

Flower : January - April. *Fruit*: June - October
Exsiccatus : Bhutan border (near Rachel) 2950 m, **SR Lepcha & AP. Das** 27727, dated 30.10.2004.
Status : Less Common.
Local Distribution : Mulkharka, Pangolkha - NNP Border, 1600 – 2150 m.
General Distribution : E. HIMALAYA; INDIA (Sikkim – BHUTAN) TIBET, W. CHINA.

Myrsine Linnaeus

Myrsine semiserrata Wall, in Roxb., Fl. Indica 2: 293. 1824; Hook.f., Fl. Brit. India 3: 511. 1882; Hara & Ohashi in Hara, Fl. E. Him. 243. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 76. 1982; Long & Rae in Grierson & Long, Fl. Bhutan 2(2): 508-509. 2001. *M. semiserrata* var. *subspinosa* (D. Don) Clarke in Hook.f., Fl. Brit. India 3: 512. 1882.

Local Name: Phalame (Nep.).

Shrubs, bushy, sparingly branched. **Leaves** shortly petiolate; **lamina** 3.5 – 10.5 x 1.5 - 3.5cm; lanceolate, dentato-serrate, acute or short-acuminate, cuneate, coriaceous, glabrous, light red when young, lateral nerves 10-15 pairs, thick beneath, impressed above; pedicel to 0.4cm. **Flowers** numerous in axillary fascicles, 4-merous, whitish-green; **Calyx** persistent; **styles** branched. **Berries** blue to reddish-purple.

Flower : December. - March. *Fruit*: January - June.
Exsiccatus : Zuluk –PWS boarder 3800 m, **SR Lepcha & AP. Das** 20243, dated 28.10.2004.
Status : Common.
Local Distribution : Rachel Middle, Zuluk. 2000 – 2400 m.
General Distribution : INDIA, NEPAL, BHUTAN, TIBET, N. MYANMAR, W.C. CHINA.

PRIMULACEAE Ventenat

Key to the Genera:

1. Leaves all radical; flower umbellate *Lysimachia*
 + Leaves cauline; flowers axillary or raceme s 2
2. Rhizomatous herbs; Corolla rotate with cylindric or saucer ahaped *Primula*
 + Rhizomatous or stoloniferous herbs; corolla campanulate or saucer shaped *Androsace*

Androsace Linnaeus

Key to the species:

1. Plants forming cushion or mat *A. globifera*
 + Plants forming clumps 3

3. Plant rhizomatous..... 4
 + Plant non rhizomatous *A. hookeriana*
4. Leaf densely hirsute on both surfaces; flower 4 – 10 (25); calyx pubescent ... *A. geraniifolia*
 + Leaf sparsely hirsute; flower 3 – 8; calyx ciliated *A. croftii*

Androsace croftii Watt. in Journ. Linn. Soc. 20. 17. 1884; Aitken in Grierson & Long, Fl. Bhutan 2(2): 558. 1999.

Herbs perennial, rhizomatous, decumbent, smaller. **Leaves** 2 – 4 cm, not much hirsute as *A. geraniifolia*; petiole upto 3.5 cm long; suborbicular. 4-5 lobed. Peduncle to 6.5 cm long, covered with densely silvery pubescent. **Umbels** 3 – 8 flowered; peduncle 1 – several per rosette. Pedicels to 13 mm, bracts linear. **Calyx** to 6 mm sparsely ciliate; teeth acute. **Corolla** pink or white, eye greenish; limb to 6 mm in diam. lobes obcordate.

Flower : April *Fruit:* August
Exsiccatus : Gnathang 4000 m, **SR Lepcha & AP. Das 2803**, dated 15.10. 2003.
Status : Less Common
Local Distribution : Gnathang, Tukula, 3600 – 4000 m
General Distribution : E. HIMALAYA; INDIA (Sikkim).
Note : Endemic to Eastern Himalaya.

Androsace geraniifolia Watt. in Journ. Linn. Soc. 20: 17. 1882; Hook.f. in Fl. Brit. India 3: 407. 1882; Hara in Fl. E. Him. 2:100. 1971; Aitken in Grierson & Long., Fl. Bhutan 2(2): 556. 1991. *A. rhizomatosa* Hand.- Mazz. In Journ. Bot. Lond. 76: 281. 1938.

Herbs perennial, rhizomatous, decumbent occasionally stoloniferous. **Petiole** to 13 cm, white, pubescent; **lamina** suborbicular, 0.3 - 0.5 x 4 – 6 cm, 5 -6 lobed, each of 3 -5 apical teeth, both surface covered with white hirsute. **Peduncle** 1 – many., densely pubescent. **Umbels** 4-10(25) flowered. Occasionally with a small leafy rosette later developed into new plant; bracts linear or lanceolate; pedicels 20 mm. **Calyx** campanulate, pubescent; teeth acute, equals to the tube. **Corolla** pink or white with yellow eye; limb upto 10 mm, lobes oblong or obovate, entire. **Capsule** globose.

Flower : April *Fruit:* August
Exsiccatus : Kupup 4200 m, **SR Lepcha & AP. Das 2802**, dated 15.10. 2003.
Status : Less Common
Local Distribution : Kupup, Changu, 2300 – 4200; Tinsimana, Rachel, 2200 – 2600 m.
General Distribution : HIMALAYA; INDIA, NEPAL, BHUTAN and W, CHINA
Note : 1. An ornamental plant

Androsace globifera Duby, in DC. Prodr. 8. 48. 1844; Hook.f. in Fl. Brit. India 3: 500. 1882; Aitken in Grierson & Long. Fl. Bhutan 2(2): 561. 1999.

Herbs with cushion forming. Rosette globose, 7 – 13 mm in diam. **Lamina** elliptic, 2.5 – 5 x 1 – 2 mm apex acute, margins entire, usually with white straight hairs on both surfaces, more prominent on apex and beneath. **Flower** 1 – 2 rosette, peduncles very short; pedicels to 1.5 cm, pubescent. **Calyx** to 3 mm, sparsely pubescent, teeth acute. **Corolla** lilac or white with yellow eye; lobes obovate. **Capsules** oblong.

Flower : June *Fruit:* August
Exsiccata : Nathula 4400 m, **SR Lepcha & AP. Das 2805**, dated 15. 10. 2003.
Status : Less Common
Local Distribution : Nathula, Changu, Jalepla, 3700 – 4550 m

General Distribution : E.HIMALAYA; INDIA, BHUTAN, NEPAL, CHINA

Note : 1. Endemic to Eastern Himalaya.

2. An ornamental plant

Androsace hookeriana Klatt. In *Linnaea*, 32: 293. 1863; Hook.f. in *Fl. Brit. India* 3: 490. 1882; Aitken in *Grierson & Long. Fl. Bhutan* 2(2): 558. 1999.

Herbs stoloniferous usually forming a clumps. **Lamina** obovate, ovate or elliptic, - spathulate **lamina** 3 – 13 x 2.5 - 7 mm. acute, obtuse or emarginated, base rounded or attenuate to petiolate (Petiole upto 2 cm, long), margin entire, sparsely pubescent on both surfaces. **Peduncle** sparsely pubescent. **Umbels** 2 – 10 flowered; bract linear; pedicels to 4 mm. **Calyx** pubescent, slightly more on margins; teeth acute - rounded. **Corolla** pink with green, orange or dark red eye, lobes obovate, entire. **Capsules** ovoid.

Flower : June *Fruit:* August

Exsiccata : Jalepla 4200 m, **SR Lepcha & AP. Das** 2804, dated 15. 10. 2003.

Status : Less Common

Local Distribution : Chakung Chu, Jalepla, 3300 – 4600 m

General Distribution : E.HIMALAYA; INDIA (sikkim), NEPAL, CHINA.

Note : Endemic to Eastern Himalaya.

Lysimachia Linnaeus

Key to the species:

1. Herbs plants..... *L. laxa*
+ Herbs prostrate 3
3. Branches not ferruginous-villous; Flowers in terminal clusters *L. congestiflora*
+ Branches ferruginous villous; Flowers axillary, solitary *L. debilis*

Lysimachia congestiflora Hemsl. in *Jour. Linn. Soc.* 26:50. 1889; Hara in *Fl. E. Him.* 245. 1966; 2: 101. 1971; Gould in *Hara et al Enum. Fl. Pl. Nepal* 3: 64. 1982; Aitken in *Grierson & Long. Fl. Bhutan* 2(2): 568. 1999. *L. japonica* Thunb. *sensu* *Fl. Brit. India* 3:505. 1882, p.p. *L. japonica* var. *cephalantha* Franchet in *Journ. de. Bot.* 9: 461. 1895.

Herbs perennial prostrate upto 32 cm tall. Stem terete, puberulous, rooting from lower nodes. **Lamina** opposite; 5 x 1 – 4 cm, ovate, entire-gland dotted, acute, base cordate. Peduncles to 0.8 cm. **Flowers** solitary or 2-nate, congested in terminal clusters. **Sepals** lanceolate, villous; corolla subrotate, yellowish, lobes to 1 cm long, oblong, acute and gland dotted; filaments basally united; ovary villous; styles glabrous. **Capsules** small to 0.6 cm.

Flower : May - July *Fruir:* August - September.

Exsiccata : Rachela 2780 m, **SR lepcha & AP. Das** 2600, dated 13. 10. 2003

Status : Less Common.

Local Distribution : Rachela. Padamchen 1800 – 2450 m.

General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, CHINA, TAIWAN, MYANMAR, THAILAND.

Lysimachia debilis Wall. in *Roxb., Fl. Indica. ed. Carey* 2: 25. 1824; Hara in *Fl. E. Him.* 1: 245. 1966; 2: 101. 1971; Hara *et al. Enum. Fl. Pl. Nepal* 3: 64. 1982. *L. japonica auct. non* Thunb., Hook. f., *Fl. Brir.India* 3: 505. 1882, p.p.

Similar to *L. congestiflora* but **branches** ferruginous-villous; peduncles axillary, slightly elongating in fruit, with solitary flower. **Corolla** campanulate, lobes smaller, reflexed in fruit.

Flower : May - July *Fruit*: Jul.y- Decrmbcr
Exsiccate : Panglakha 2460 m, **SR Lepcha & AP. Das 2700**, dated 13.10.2003.
Status : Frequent.
Local Distribution : Rechilla Middle, Mulkharka. 1600 - 2500 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, THAILAND.

Lysimachia laxa Baudo, Ann. Soc. Nat. (Bot.) II, 20: 347. 1843; Aitken in Grierson & Long, Fl. Bhutan 2(2): 567. 1999; *L. ramosa* Wall. ex Duby in DC., Prodr. 8: 65. 1844; Hook.f. in Fl. Brit. India 3: 503. 1882; Hara *et al*, Enum. Fl. Pl. Nepal 3: 65. 1982.

Herbs annual with sub erect- stem , to 50 cm tall, branched. **Leaves** simple, alternate; petiole to 1.5 cm, glabrous; lamina 2.5 - 12 x 1.5 - 3 cm, lanceolate, entire, acute to acuminate, base attenuate, sparsely hairy and faintly gland-dotted above, glabrous beneath. Pedicels axillary, slender, to 5 cm, glabrous. Flowers solitary. **Sepals** 5, to 0.5 cm long, ovate-acuminate, basally united. **Corolla** rotate, longer than sepals, yellow, segments elliptic-oblong; stamens 4, broad below, inserted on petal lobes; anthers 2-celled; filament short, basifixed; ovary swollen, subglobose; style 1, filiform. **Capsules** globose, splitting irregularly.

Flower : May - August *Fruit*: September - December
Exsiccata : Panglakha - Singhaney 2155 m, **SR Lepcha & AP. Das 2801**, dated 15.10.2003.
Status : Rare.
Local Distribution : PHE Source, Ruka Hill, Lava, Jaributti. 1900 - 2600 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, SRI LANKA, MYANMAR, S.W. CHINA, THAILAND.

Primula Linnaeus

Key to the species:

1. Flowers weakly zygomorphic *P. munroe*
- + Flowers strongly zygomorphic 2
2. Leaves suborbicular or broadly ovate; petiole non-decurrent.. 3
- + Leaves ovate or oblong; petiole decurrent 7
3. Lamina deeply lobbed 4
- + Lamina shallowly lobed 5
4. Petioles sheathing at base *P. vaginata*
- + Petioles not sheathing at base *P. geranifolia*
5. Leaf palmately veined; corolla pink. *P. listera*
- + Leaf pinnately veined; corolla white or rarely pale mauve ... *P. filipes*
7. Leaf pubescent with multicellular hairs 8
- + Leaves glabrous or rarely farinose- papilose 14
9. Leaf margins entire *P. walshii*
- + Leaf toothed 10

10. Inflorescence with 1-4 flowered	<i>P. primulina</i>
+ Inflorescence with (3) 6 – 30 flowered	11
12. Flowers upto 5	<i>P. assaminca</i>
+ Flowers more than 5	13
13. Flowers upto 4; corolla purple	<i>P. sapphirina</i>
+ Flowers upto 2; corolla pale blue violet	<i>P. klattii</i>
14. Leaf ovate oblong; Corolla creamy or pale yellow	<i>P. reticulata</i>
+ Leaf oblong –elliptic; Corolla white, mauve bluish purple, or yellow ...	18
18. Corolla white.	<i>P. soldanelloides</i>
+ Corolla mauve or bluish purple, or yellow	19.
19. Leaf entire ; corolla pink	<i>P. concinna</i>
+ Leaf serrate, or toothed	20
20. Corolla lilac-purplish with yellow (white eye)	<i>P. muscoides</i>
+ Corolla white or yellow	21
21. Corolla white; tube pubescent outside	<i>P. tenuiloba</i>
+ Corolla tube glabrous outside	22
22. Corolla lobes deeply bifid	<i>P. drummodiana</i>
+ Corolla lobes 3 or more toothed	23.
23. Corolla pink to magenta with greenish yellow eye	<i>P. bracteosa</i>
+ Corolla white or creamy, claret red and pink	24.
24. Bud scale present at Flower	<i>P. elongata</i>
+ Bud scale absent at Flower	25
25. Corolla deep claret red; lobes entire	<i>P. kingii</i>
+ Corolla yellow, white- purplish, purplish blue	26
26. Corolla white or creamy white or pink	27
+ Corolla yellow, white or purplish	29
27. Flowers white or creamy	28
+ Flowers pink	<i>P. tibetica</i>
28. Inflorescence with > 10 flowered	<i>P. sikkimensis</i>
+ Inflorescence < 10 flowered	<i>P. capitata</i>
29. Flowers upto 30 per umbel; farinose	<i>P. calderiana</i>
+ Flowers upto 12 per umbel; Efarinose	<i>P. glabra</i>

Primula assaminca Fletcher in Trans & Proct. Bot. Soc. Edinb. 33. 107. 1941; Grierson & Long, Fl. Bhutan 2(2): 545. 1999.

Herbs, perennial, evergreen with persistent withered leaf remains at base. **Lamina** oblanceolate, 1.5 - 4.3 x 0.8 – 1.5 cm. obtuse; base attenuate into short winged petiole, white farinose beneath, minutely glandular-puberulous above; peduncle to 4cm (-8cm in fruit). **Umbels** single or 1- 5 flowered ; bracts lanceolate to 10 mm long, glandular - puberulous; pedicels to 6 mm. **Calyx** 8 – 12 mm, glandular puberulous, divided to 2/3 into lanceolate teeth. **Corolla** mauve with white-eye, tube to 11 mm, limbs rotate.

Flower & Fruit : May – June

Exsiccatus : **FIDE**, SMITH, W.W. (1913). The Alpine and Sub-alpine vegetation of

South-Eastern Sikkim. Rec.Bot. Surv. India 4(7): 323-431.

- Status* : Rare
Local Distribution : Chakung chhu (Sub-alpine East Sikkim) 3550-4600m
General Distribution : E. HIMALAYA, Sikkim (BHUTAN – Assam).
Note : Endemic to Eastern Himalaya.

Primula bracteosa Craib in Notes Bot. Gard. Edin. 6: 250. 1917; Grierson & Long, Fl. Bhutan 2' (2): 528. 1999. *P. boothii* Craib in Notes Bot. Gard. Edin. 6: 249. 1917.

Herbs evergreen, sparsely farinose or efarinose; with winter buds and persistent bud scales absent. **Lamina** rugose, spatulate or broadly obovate, 2.5 - 7 x 2 - 3 cm, obtuse, base tapering into short broadly winged petiole, obtuse, margin denticulate, glabrous and efarinose or sparsely farinose on both surfaces in Flower, whereas ovate, to 6 x 5 cm, truncate or cordate at base with reddish narrowly winged petiole to 9 cm after Flower; peduncle at Flower 1- 5 cm, occasionally sparsely farinose at apex. **Umbels** single 3 -17 flowered. **Calyx** campanulate, keeled at base, to 13 mm puberulous, farinose or not, cut to middle into entire, ovate- yellow eye surrounded by white, lobes obovate, margin sinuous or trilobed. **Capsules** globose.

- Flower & Fruit* : April – July
Exsiccatus : FIDE, SMITH, W.W. (1913). The Alpine and Sub-alpine vegetation of South-Eastern Sikkim. Rec.Bot. Surv. India 4(7): 323-431.

- Status* : Frequent
Local Distribution : Changu, Yakla, Kupup, Sherabthang, Chola upto 4300 m.
General Distribution : E. HIMALAYA (Sikkim – NEFA) and S. TIBET.
Note : Endemic to Eastern Himalaya

Primula capitata Hook., Bot. Mag. 76: t. 4550. 1850; Hook.f.in Fl. Brit. India 3: 486.1882; Hara *et al* in Fl. E. Him. 246.1966; S. Gould in Enum. Fl. Pl. Nepal 3: 70. 1980; Grierson & Long, Fl. Bhutan 2(2): 550. 1999;

Herb upto 50 cm tall. **Leaves** forming a rosette; petiole winged by decurrent leaf blade; **Lamina** oblong-oblong-oblanceolate to oblong-spatulate, 1.5 -13 x 0.4 -3.5 cm, white or yellow farinose in upper surface, glandular beneath, base attenuate, margin denticulate, apex acute to rounded. **Umbel** in capitata, numerous flowered; bracts ovate to broadly lanceolate, often with tuft or crown at apex. Flowers nodding. **Calyx** tinged with purple, campanulate, lobes broadly ovate to elliptic, apex obtuse to acute. **Corolla** purple. limb lobes obovate, deeply 2-lobed, tube to 8 mm; stamens usually above the base of corolla tube. **Capsules** subglobose,

- Flower & Fruit* : May – August)
Exsiccatus : Kupup, 3950 m, *SR Lepcha & AP. Das 03140*, dated 10. 17. 2005
Status : Common
Local Distribution : Kupup, Bhimbase, upto 4350 m.
General Distribution : E. HIMALAYA (Sikkim, BHUTAN) and S. TIBET.
Note : Endemic to E. Himalaya.

Primula capitata ssp. *crispata* Hook.f., Not. B. G. Edinb. 16: 18 .1928.

Leaves often white farinose on upper surface. **Inflorescence** appeared from undeveloped flowers at apex.

- Flower & Fruit* : June – August
Exsiccatus : On way to Bhimfakha 4350m, *SR. Lepcha & AP. Das 0268*, dated 07.10.2006.

Status : Common
Local Distribution : Bhimlakha 2700 - 4500 m.
General Distribution : E. HIMALAYA (Sikkim, BHUTAN) and TIBET and N. BURMA.

Primula capitata ssp. *lacteocapitata* (I.B. Balfour & W.W. Smith) W.W. Smith & Forrest, Notes Roy. Bot. Gard. Edinburgh. 16: 18. 1928. Hara in Fl. E. Him. 246.1966. *Primula lacteocapitata* I. B. Balfour & W. W. Smith in I. B. Balfour, Notes Roy. Bot. Gard. Edinburgh 9: 178. 1916.

Leaves sharply pointed; petiole red at base; farina on lower surface creamy

Flower & fruit : August - September
Exsiccatae : Kupup 4250m, SR. Lepcha & AP. Das 31428, dated 27.07.2005.
Gnathang 4100 m, SR Lepcha & AP. Das 34131, dated 27.07. 2005.

Status : Common
Local Distribution : Kupup, Gnathang 2700 - 3900 m.
General Distribution : E. HIMALAYA; INDIA Sikkim, BHUTAN, CHINA.
Note : Endemic to Eastern Himalaya.

Primula calderina I.B. Balf. & Cooper in Notes Bot. Gard. Edinb. 9: 7.1915; Hara in Fl. E. Him. 246.1966; Hara et al, Enum. Fl. Pl. Nepal 3: 70. 1982. *P. dianae* Balfour f. & Cooper in Notes Bot. Gard. Edinb. 9: 163. 1916.

Herbs deciduous with prominent winter resting buds, scales persistent at flower, ovate, yellow farinose. Lamina oblanceolate or spatulate, 4 - 35 x 1.5 - 6.8 cm, obtuse to acute, base tapering to winged petiole, margin crenate-denticulate weakly farinose beneath. Peduncle to 30 cm at Flower, farinose near apex. Umbels 5 - 25 flowered; pedicels to 3 cm, farinose; bracts lanceolate 13 mm, farinose. Calyx campanulate, to 11 mm, cut to middle into lanceolate and blunt teeth farinose. Corolla purple white, with yellow eye, limb to 3 cm diam., lobes obcordate, emarginated. Capsules globose, included within calyx.

Flower & Fruit : May - August
*Exsiccatu*s : Jalepla 4200 m, SR Lepcha & AP. Das 2827, dated 12. 10. 2005.
Status : Not common
Local Distribution : Jelepla, 3000 - 4880 m.
General Distribution : E.HIMALAYA; INDIA, NEPAL, BHUTAN, CHINA

Primula concinna Watt in Journ. Linn. Soc. 20: 5. 1882; Grierson & Long, Fl. Bhutan 2(2): 544. 1999.

Herbs or lower shrubs, dwarf cushion-forming or turf-forming upto 2.5 cm tall. Lamina oblanceolate or obovate, 1.5 - 2 x 0.5 cm including petiole, acute or subacute, base attenuate, margin entire or obscurely crenate, glabrous above, yellowish farinose beneath; peduncle concealed among leaves, to 12 mm long. Umbels 1-5 fragrant flowered; bracts linear; pedicels slender, to 9 mm. Calyx campanulate, to 5 mm, ± farinose, divided to middle into oblong subacute teeth. Corolla purplish or white with yellow eye, tube to 6 mm, limb rotate, with obovate emarginated lobes. Capsules oblong, as long as calyx.

Flower & Fruit : June - July
*Exsiccatu*s : FIDE, SMITH, W.W. (1913). The Alpine and Sub-alpine vegetation of South-Eastern Sikkim. Rec.Bot. Surv. India 4(7): 323-431.
Status : Less frequent
Local Distribution : Changu, Nathula 4265 - 4880 m.

General Distribution : E. HIMALAYA (NEPAL, BHUTAN) and S. TIBET.

Note : Endemic to Eastern Himalaya.

Primula drummondiana Craib, in Journ. Roy. Hort. Soc., Lond. 39: 190. 1913; Grierson & Long; Fl. Bhutan 2 (2). 532. 1999. *P. cunninghamii* King & Craib. in Notes Bot. Gard. Edin. 6: 258. 1917.

Herbs evergreen; usually without winter resting buds. **Lamina** oblanceolate or spatulate, 2 – 13 x 1 – 4.5 cm, obtuse, base tapering to winged petiole, sharply and unequally spreading – denticulate, puberulous above, later glabrous, sparsely farinose at first, efarinose at maturity. **Flowers** numerous, borne amongst basal rosette leaves; pedicels slender, 0.5 – 6 cm, puberulous, farinose, divided 1/2 - 2/3 into lanceolate teeth. **Corolla** pink or purplish with a brown spot at base of lobes, eye yellow, tube 2 x length of calyx, limb to 15 mm in diam., lobes obcordate, bifid. **Capsules** not seen.

Flower & Fruit : September – February.

Exsiccatus : FIDE, SMITH, W.W. (1913). The Alpine and Sub-alpine vegetation of South-Eastern Sikkim. Rec.Bot. Surv. India 4(7): 323-431.

Status : Frequent

Local Distribution : Changu, Gnatong, Karponang, Lingtoo, Sherabthang 2200 – 4000 m.

General Distribution : E.HIMALAYA; INDIA (Sikkim).

Note : Probably endemic to Alpine East Sikkim and endemic to Eastern Himalaya.

Primula elongata E.H.L. Krause in Sturn, Fl. Deutschland, ed 2, 9: 267.1901; Grierson & Long, Fl. Bhutan 2(2): 536. 1999.

Herbs deciduous with persistent winter resting- buds and scales oblong, farinose. **Lamina** oblanceolate, 5 - 13 x 2.5 - 5 cm, obtuse or subacute, base tapering to winged petiole, covered at first beneath by weal farina; peduncle long upto 15- 30 (- 45) cm, farinose above. **Flowers** usually with a single or occasionally double of 5- 10; pedicels upto 12 mm ; bracts subulate, 2 .5 – 4. 5mm. Calyx tubular, to 8 mm , cut to middle into lanceolate teeth. **Corolla** zygomorphic, sulphur- yellow, limb to 2 cm diameter, lobes obcordate, crenulate – toothed at apex. **Capsules** cylindrical.

Flower & Fruit : April – July

Exsiccatus : FIDE, SMITH, W.W. (1913). The Alpine and Sub-alpine vegetation of South-Eastern Sikkim. Rec.Bot. Surv. India 4(7): 323-431.

Status : Frequent

Local Distribution : Changu , Yakla, Kupup , Gnathong, Sherabthang, upto 4350 m.

General Distribution : E. HIMALAYA; INDIA, BHUTAN.

Primula filipes Watt, in Journ. Linn. Soc. 20. 5. 1882; Hook.f. in Fl. Brit. India 3: 485. 1882; Grierson & Long, Fl. Bhutan 2(2): 527. 1999.

Herbs rhizomatous; **Petiole** 1.5 – 5.5 cm long, pubescent; **lamina** broadly ovate, 1.5 - 6 x 1.5 - 5 cm, base rounded, truncate or cordate, margin undulate or shallowly lobed, denticulate, pinnately veined to base, reddish pubescent beneath; peduncle 1- 6 cm. **Umbel** single and 4 - 10 flowered; pedicels to 22 mm. **Calyx**, limb to 13 mm. **Corolla** white to pale mauve with yellow eye, tube 2 - 3 x length of calyx, limb to 13 mm in diam.

Flower & Fruit : November - February

Exsiccatus : FIDE, SMITH, W.W. (1913). The Alpine and Sub-alpine vegetation of South-Eastern Sikkim. Rec.Bot. Surv. India 4(7): 323-431.

Status : Less frequent
Local Distribution : Subalpine- east Sikkim 1980 – 2740 m.
General Distribution : E.HIMALAYA; INDIA, BHUTAN, CHINA

Primula geraniifolia Hook.f., in Fl. Brit. India 3. 484. 1882; Grierson & Long, Fl. Bhutan 2(2): 529. 1999.

Herbs slightly larger than *p. vaginata*. **Petiole** upto 15 mm long, ± shaggily pubescent, without sheathing at base; **lamina** sub-orbicular, to 2.5 – 10 cm in diam., base deeply ordate, sharply toothed and lobed up to 1/3 width, hairy, especially beneath; peduncle to 45 cm, pubescent. **Umbel** (rarely 2superposed umbels) with 2 - 7 flowers; pedicels to 17 mm. **Calyx** reddish, campanulate, ribbed, 4 – 10 mm, divided to middle into lanceolate teeth. **Corolla** deep pink or red, tube to 10 mm, limb to 15 mm in diam., lobes emarginated. **Capsules** as long as calyx.

Flower & Fruit : May – August
Exsiccatu : Kupup 4280 m, **SR Lepcha & AP. Das 2821**, dated 12. 08. 2006.
Status : Not Common
Local Distribution : Karponang, Kupup, 2740 – 3660 m.
General Distribution : INDIA, BHUTAN, MYANMAR, NEPAL, CHINA

Primula glabra Klatt in Linnaeae 37: 500.1871-73. *P. genestieriana* Handel- Mazzetti in Anz. Akad.wiss. wein, math, -nat, 59: 250. 1922.

Herbs rosette, glabrous forming a small clumps. **Leaves** spathulate, 1 – 4 x 0.5 – 1.5cm, subacute or obtuse, base tapering to winged petiole, margin sharply denticulate, usually glandular punctuate beneath. Peduncle slender, to 12 cm. **Umbel** upto 12 flowers; bracts ovate to lanceolate pedicels to 5 mm. **Calyx** campanulate, lobes rounded. **Corolla** blue or purplish rarely white, yellow eye; limb to 5 mm diameter with obovate deeply emarginated lobes. **Capsule** short, as long as calyx.

Flower & Fruit : April – August
Exsiccatu : Kupup 4250 m, **SR Lepcha & AP. Das 2806**, dated 17.10. 2003.
Status : Not common
Local Distribution : Kupup, 3650 – 4510 m.
General Distribution : E.HIMALAYA; INDIA, BHUTAN, NEPAL, CHINA, MYANMAR.

Primula kingii Watt., Journ. Lin. Soc. 9:20. 1882; Hook.f. in Fl. Brit. India 3:491. 1882; Grierson & Long, Fl. Bhutan 2 (2): 538. 1999. *P. gageana* I.B. Balf & W.W. Smith in Notes Bot. gard. Edinb. 9:18.1915;

Herbs perennial efarinose with resting-buds; scales oblong, to 2.5 cm. **Lamina** fleshy, elliptic-oblancheolate, 3.5 – 13 x 1.5 – 2.5 cm including petiole, acute, base attenuate, margin horny, remotely denticulate, gland-pitted beneath. Peduncle to 8 cm long. **Umbels** 3 - 7 (-12) flowered, pendent; bracts linear; pedicels to 13 mm puberulous. **Calyx** narrowly campanulate, to 9 mm. divided to middle into triangular teeth. **Corolla** dark claret to almost black, campanulate, to 18 mm long, lower tubular part as long as calyx, limb to 17 mm, diameter lobes oblong or elliptic, entire or emarginated. **Capsules** ovoid, to 1.7 x length of calyx.

Flower & Fruit : September - October
Exsiccata : Rachela below- Jorepokri, 3000, **SR Lepcha & AP. Das 02823**, dated 12.08.2006.
Status : Extremely Rare
Local Distribution : Kupup, Nathula, Gnathang, Sherabthang, 35000 – 4265 m.
General Distribution : INDIA, BHUTAN,

- Notes** : 1. Endemic to Eastern Himalaya (Sikkim, Darjeeling)
2. Flowers much attractive, ornamental.

Primula kiatti Balakrishnan in Journ. Bombay Nat. Hist. Soc. 67:63. 1970. Grierson & Long, Fl. Bhutan 2(2): 553. 1999.

Herbs efarinose. **Leaves**; petiole upto 22cm long; elliptic or oblong, **lamina** 5 - 20 x 4.5 - 7.5 mm, acute, base cuneate, margin crenate to incised-dentate, white pubescent on both surfaces; peduncle upto 13 cm, glabrous. **Flower** solitary(rarely 2) + horizontal; bract ovate, minute. **Calyx** reddish, campanulate, to 7 mm, teeth oblong, apiculate, farinose within. **Corolla** blue-violet, broadly funnel-shaped, to 2.5 cm long, limb saucer-shaped, to 3 cm diameter, farinose within; lobes oblong, coarsely crenate at apex.

Flower & Fruit : July- August

Exsiccatus : FIDE, SMITH, W.W. (1913). The Alpine and Sub-alpine vegetation of South-Eastern Sikkim. Rec.Bot. Surv. India 4(7): 323-431.

Status : Rare

Local Distribution : Alpine -East Sikkim 3960 - 4720 m.

General Distribution : E. HIMALAYA; INDIA, BHUTAN.

Note ; Endemic to E. Himalaya.

Primula listeri King ex Hook.f.; in Fl. Brit. India 3: 485. 1882; Grierson & Long, Fl. Bhutan 2(2): 527. 1999.

Herbs rhizomatous clump - forming ; efarinose. **Petiole** 2 - 13 cm, pubescent; **lamina** suborbicular 1 - 6 x 1.5 - 5.5 cm, obtuse cordate, lobes up to 1/3 width, palmately 5-veined at base, pubescent especially above; peduncle to 13 cm, pubescent. **Umbels** 2 - 4 flowered ; pedicels to 14 mm long; bracts linear-lanceolate 2 - 8mm. **Calyx** widely campanulate, to 8 mm, pubescent, mouth to 11 mm broad when pressed, teeth short, acute. **Corolla** pink, tube as long as calyx, limb to 13 mm diameter, lobes obcordate, emarginated. **Capsules** subglobose included within calyx.

Flower & Fruit : April- June

Exsiccatus : Karponang 3000m, SR Lepcha & AP. Das 30955, dated 24.07.2005.

Status : Not common

Local Distribution : Jorepokhri, Karponang, 2440 - 3800 m)

General Distribution : E. HIMALAYAS; INDIA, BHUTAN.

Note : Endemic to E. Himalaya.

Primula minutissima Jacq. ex Duby in A. de Candolle, Prodr. 8: 42. 1844. Hook.f. in Fl. Brit. India 3: 494 . 1882. **Primula heydei** Wat; S.Gould in Enum. Fl. Pl. Nepal 3: 73.1982.

Herbs small perennial. **Leaves** rosettes; petiole sometime as long as leaf blade; leaf blade narrowly oblong to lanceolate or oblanceolate, **lamina** 4 -12 x 2 -3.5 mm, upper surface yellow farinose, sparsely glandular beneath, base attenuate, margin denticulate, apex acute to acuminate. **Umbel** to 7 ; bracts 2 or 3, lanceolate, apex acute. **Flowers** sessile. **Calyx** tubular to tubular-campanulate, to 5 mm, farinose ; lobes lanceolate, apex acute. **Corolla** dark reddish purple, lobes obovate, deeply emarginate. **stamens** above base of corolla tube. **Capsule** cylindrical.

Flower : June

Exsiccatus : PWS 3500 - 4500 m, SR. Lepcha & AP. Das 19285, dated 18. 12. 2004.

Status : Less frequent
Local Distribution : PWS. 3500 - 4500 m
General Distribution : PAKISTAN, INDIA; NEPAL, CHINA.

Primula munroi Lindl. Bot. Reg. t. 5. 1847; Grierson & Long, Fl. Bhutan 2(2): 542. 1999. *P. involucrata* Sweet, Cat. 562; ex Duby. in DC. Prodr. 8. 35; otto, ex Hook, Bot. Mag.t. 2842.

Herbs perennial glabrous. **Petiole** winged, to 6 cm; **lamina** ovate or oblong, 1 - 4 x 0.5 - 1.5 cm, obtuse, base abruptly narrowed, entire or denticulate, farinose; **peduncle** to 30 cm long. **Umbel** single 2 - 6 nodding flowers, flower fragrant; bracts oblong-lanceolate, prolonged below insertion into a broad 1-3-toothed auricle to 7 mm; pedicels slender, 1 - 3 cm. **Calyx** tubular - campanulate, to 7.5 mm, divided in upper third into lanceolate teeth. **Corolla** white with yellow eye rarely pink tinged or purplish, ± zygomorphic, tube 12 mm, limb to 2 cm diam., lobes obovate, deeply emarginated. **Capsules** oblong.

Flower & Fruit : May & September
Exsiccatus : Kupup 4250 m, *SR Lepcha & AP. Das 2809*, dated 13.10 2007.
Status : Less frequent
Local Distribution : Kupup, Nathula, Lhonak, 3650 - 4570 m
General Distribution : E.HIMALAYA; INDIA, BHUTAN.
Note : Endemic to E. Himalaya.

Primula muscoides Hook.f. ex Watt. in Journ. Linn. Soc. 20: 15.1882; et Fl. Brit. India 3: 434. 1882; Grierson & Long, Fl. Bhutan 2 (2): 546. 1999.

Herbs dwarf with cushion-forming and elongated slender wiry stems upto 8 cm. **Lamina** slightly leathery, narrowly ob-triangular, to 13 x 7 mm, apex rounded or almost truncate with 3 - 5 blunt teeth, margins entire, base ± sessile, glabrous, efarinose. **Flowers** solitary, peduncle absent at Flower time, to 3 cm at fruiting; pedicels less than 1 mm, farinose. **Calyx** campanulate, to 4 mm, divided to middle into triangular teeth, farinose on both surfaces. **Corolla** lilac-purplish with yellow or white eye, tube usually pubescent in throat, lobes ascending, narrowly oblong, shortly bifid. **Capsules** globose.

Flower & Fruit : June - August
Exsiccatus : FIDE, SMITH, W.W. (1913). The Alpine and Sub-alpine vegetation of South-Eastern Sikkim. Rec.Bot. Surv. India 4(7): 323-431.
Status : Less frequent
Local Distribution : Sherabthang, 4000 - 4600 m.
General Distribution : INDIA, BHUTAN, NEPAL, CHINA

Primula primulina (Spreng.) Hara, ; Journ. Jap. Bot. 37: 99. 1962; in Fl. E. Him. 248. 1966; Grierson & Long Fl. Bhutan 2(2): 545. 1999. *Androsace primulina* Spreng., Syst. Veg. 4(2): 57. 1827; S. Gould in Enum. Fl. Pl. Nepal.3: 70. 1982; Hara in Fl. E. Him.244. 1966.

Herbs perennial. Leaves; **petiole** narrowly winged; **lamina** spatulate to oblanceolate, 8 - 25 x 4 - 6 mm, upper surface minutely glandular, mid vein pubescent, lower surface scabrous, glandular pubescent, base attenuate, margin deeply pinnatifid - dentate, apex rounded. Scapes to 8 cm, glandular. **Umbels** 2 -4; bracts ovate to linear-lanceolate. **Flowers** usually sessile. **Calyx** campanulate, to 5 mm, glandular outside, lobes triangular to oblong, white farinose inside, apex acute to obtuse. **Corolla** purple or blue-purple, rarely white; tube, pubescent outside, limb to 13 mm wide; lobes obovate, deeply emarginated. **Stamens** near base of corolla tube. **Capsules** cylindrical.

Flower : September

Exsiccatus : On way to Panglakha from Gnathang 3200 m, *SR Lepcha & AP. Das* 30831, dated 29.07.2005.
Status : Frequent
Local Distribution : Panglakha, Rachel 4000 - 4500 m
General Distribution : INDIA, BHUTAN, NEPAL, CHINA.

Primula reticulata Wall. in Roxb. Fl. Indica ed Cary 2: 21. 1824; Grierson & Long, Fl. Bhutan 2(2): 541. 1999.

Herbs perennial. **Petiole** 2 - 12 cm, long; **lamina** membranous, ovate, oblong, 2 - 10 x 1 - 3.5 cm, obtuse, base shallowly cordate, margin \pm doubly crenate-denticulate, veins \pm prominent and minutely papillate beneath; peduncle to 28 cm. **Umbel** of 2 - 8 flowered, sparsely farinose above; pedicels to 4 cm; bracts leafy, lanceolate, to 15 x 5 mm. **Calyx**, upto 8 mm sparsely farinose. **Corolla** creamy or pale yellow, to 22 mm long, thinly farinose within.

Flower & Fruit : May - August

Exsiccatus : **FIDE, SMITH, W.W.** (1913). The Alpine and Sub-alpine vegetation of South-Eastern Sikkim. Rec.Bot. Surv. India 4(7): 323-431.

Status : Less frequent

Local Distribution : Changu, Kupup, Nathula 3500 - 4265 m.

General Distribution : INDIA, BHUTAN, NEPAL, CHINA

Primula sapphirina Hook.f. & Thoms. ex Watt., in Journ. Linn. Soc. 20: 10. 1882; ex Hook. f., in Fl. Brit. India 3: 492. 1882.

Herbs perennial, dwarf, e-farinose. **Lamina** oblanceolate, 4 - 11 x 2 - 6 mm, obtuse, base attenuate, margin pinnatifid-dentate, with scattered white hairs on midrib beneath or also glabrous; peduncle slender, to 5 cm, minutely glandular. **Flowers** 1-2(-4) sessile, semi - pendent; bract lanceolate. **Calyx** blackish - purple, to 3.5 mm, divided to middle into acute teeth. **Corolla** bluish - purple or lilac, funnel - shape, to 7.5 mm long, limb to 5 mm in diam., lobes c 1.5 mm long. **Capsules** subglobose, usually included within calyx.

Flower & Fruit : June - August

Exsiccatus : Gnathang - Panglakha 3100 m, *SR Lepcha & AP. Das* 32932, dated 31.07. 2005.

Status : Less frequent

Local Distribution : Changu, Kupup, Nathang, Nathula. 3800 - 4680 m)

General Distribution : INDIA, NEPAL, BHUTAN, TAR - REGION.

Note ; Endemic to E. Himalaya.

Primula sikkimensis Hook.f., B. Mag. 77: t. 4597. 1851; in Fl. Brit. India 3: 491.1882; var *sikkimensis*: Grierson & Long, Fl. Bhutan 2(2): 540. 1999. *Primula sikkimensis* var. *pubibunda* (W.W. Sm.) W. W. Sm. & Fletcher, Trans. Bot. Soc. Edinb. 33: 454. 1943.

Herbs perennial. **Leaves** in rosette; **lamina** oblanceolate, 5 - 36 x 1 - 6 cm (including petiole), tip obtuse, base attenuate, (rarely abruptly at base), margin crenate-serrate to finely dentate, upper surface reticulate veins. Efarinose. **Umbels** usually 1, rarely 2 - flowered, fragrant; bracts linear lanceolate, to 13 mm, distinct midrib. **Calyx** campanulate; farinose divided to middle into lanceolate teeth. **Corolla** yellow, occasionally cream-white, tube slightly longer than calyx; limb lobes obovate to obovate-oblong to 2 cm. **Capsules** oblong,

Flower & Fruit : May - August

Exsiccatus : Kupup lake 3900 m, *SR Lepcha & AP. Das* 313, dated 13.08. 2005.
Lampokhri 4380 m, *SR Lepcha & AP. Das* 30944, dated 24.07. 2005.

Status : Common
Local Distribution : Kupup, Lampokhri, Bhimbase 2600 - 4400 m
General Distribution : INDIA, NEPAL, BHUTAN, CHINA, MYANMAR.

Primula soldanelloides Wall. in Jour. Linn. Soc. 20: 10. 1882; *et ex* Hook.f., Fl. Brit. India 3: 49.1882; Grierson & Long, Fl. Bhutan 2(2): 552. 1999.

Herbs perennial, dwarf, e-farinose. **Petiole** upto 13 mm long; **lamina** elliptic, 6 - 15 x 1.5 - 6 mm, subacute, base attenuate, margin deeply pinnatifid-dentate, glabrous; peduncles to 4.5 cm, ebracteate. **Flower** solitary and pendant. **Calyx** dark purple, to 4 mm, campanulate, divided to middle into acute teeth. **Corolla** white, broadly funnel-shaped, to 13 mm long, limb to 14 mm diameter, lobes oblong, entire, or emarginated.

Flower & Fruit : June - August

Exsiccatus : FIDE, SMITH, W.W. (1913). The Alpine and Sub-alpine vegetation of South-Eastern Sikkim. Rec.Bot. Surv. India 4(7): 323-431.

Status : Less frequent

Local Distribution : Changu, Lam pokhri, 4100 - 4730 m.

General Distribution : INDIA, NEPAL, BHUTAN, TIBET

Note ; Endemic to E. Himalaya.

Primula tenuiloba Pax in Bot. Jahrb. 10: 204. 1888; Grierson & Long, Fl. Bhutan 2 (2): 546. 1999. *P. indobella* I.b. Balf & W.W. Smith. in Notes Bot. Gard. Edin. 9: 24. 1915.

Herbs, dwarf, tuft, efarinose. **Lamina** spathulate, 4 - 25 x 3 - 8 mm, obtuse, based tapered to winged petiole, sharply denticulate or serrulate, glabrous on both surfaces; peduncle slender, upto 13 mm. **Calyx** to 6.8 mm. **Corolla** deep blue with white eye, sometimes all white, tube up to 12 mm, white villous outside, limb to 2 cm diam., lobes ascending, deeply obcordate, divided into 2 linear teeth longer than broad. **Capsules** not seen.

Flower & Fruit : June - August

Exsiccatus : FIDE, SMITH, W.W. (1913). The Alpine and Sub-alpine vegetation of South-Eastern Sikkim. Rec.Bot. Surv. India 4(7): 323-431.

Status : Frequent

Local Distribution : Lhonak, Sherabthang, Zemu valley, 4100 - 4500 m.

General Distribution : INDIA, NEPAL, BHUTAN, CHINA.

Primula tibetica Watt in Journ. Linn. Soc. 20: 6. 1882; *et ex* Hook.f., Fl. Brit. India 3: 488.1882. Grierson & Long, Fl. Bhutan 2(2): 542. 1999

Herbs perennial, dwarf, glabrous. **Lamina** ovate - elliptic, 1 - 3 x 0.5 - 2.5 cm. obtuse of subacute base cuneate; margins entire, efarinose; petiole winged to 3 cm. Peduncle to 23 cm long. usually hidden among leaves. **Flowers** 1 - 12; bracts oblong, to 5 mm acute base sacuate or shortly auricled. Pedicels often longer than peduncles 5 cm. **Calyx** narrowly campanulate to 4 mm, usually with 5 prominent dark purple ribs, divided to 1/3 into oblong obtuse teeth, tube saccate at base. **Corolla** pink with yellow eye, limb to 11 mm diam., with obcordate deeply emarginated lobes. **Capsules** cylindric.

Flower & Fruit : May - September

Exsiccatus : Bhimbase 4350 m, *SR Lepcha & AP. Das 02824*, dated 12.07.2006.

Status : Not common

Local Distribution : Bhimbase, Jalepla, 3600-4570m.

General Distribution : INDIA, NEPAL, BHUTAN, CHINA

Note ; Endemic to E. Himalaya.

Primula vaginata Watt in Journ. Linn. Soc. 20: 4. 1882; Hook.f. in Fl. Brit. India 3: 484. 1882. Grierson & Long. Fl. Bhutan 2(2): 526. 1999.

Herbs with creeping rhizome; efarinose. **Petioles** to 8 cm, sparsely pubescent, with sheathing, channeled base up to 6 mm broad; **lamina** orbicular, 1 - 4 cm in diam, base cordate, sharply toothed and lobed to 1/3 width, veins palmately radiating from base, pubescent especially beneath; peduncle to 12 cm, pubescent. **Umbels** with compact 2 - 8 flowered; pedicels to 13 mm; bracts linear. **Calyx** obconic, to 6 mm, longitudinally veined, teeth to 3 mm. **Corolla** mauve, tube 4 - 7 mm, limb to 13 mm diameter, lobes toothed. **Capsules** subglobose, + as long as calyx.

Flower & Fruit : April - June
Exsiccatus : Kyonglhasa 2970 m, **SR Lepcha & AP. Das** 2820, dated 12. 18. 2006.
Status : Less frequent
Local Distribution : Karponang, Kyonglhasa, Laghep; 2740 - 4050 m.
General Distribution : INDIA, BHUTAN, CHINA, MYANMAR.

Primula walshii. Craib in Journ. Roy. Hort. Soc., Lond. 39: 190. 1913; Grierson & Long, Fl. Bhutan 2(2): 546. 1999

Herbs rosette, dwarf. **Petioles** upto 4 mm long, winged; **lamina** oblanceolate, 7 - 13 x 3 - 6 mm, acute, base cuneate, entire or obscurely serrate at apex, glandular puberulous on each side, efarinose; peduncle at Flower time upto 6 mm, mostly hidden among leaves and in fruit up to 3 cm. **Umbels** 1-4 flowered; bracts upto 2 mm long; ovate or lanceolate, broadly clasping at base forming a cup shaped involucre; pedicels to 4 mm. **Calyx** tubular, to 6 mm, glandular pubescent divided to half into lanceolate teeth. **Corolla** pink or pale mauve with yellow or white eye, tube without hairs in throat, limb rotate; lobes broadly obovate, deeply emarginated. **Capsules** oblong.

Flower & Fruit : May - July
Exsiccatus : **FIDE, SMITH, W.W.** (1913). The Alpine and Sub-alpine vegetation of South-Eastern Sikkim. Rec.Bot. Surv. India 4(7): 323-431.
Status : Less frequent
Local Distribution : Changu, 3960 - 4570 m
General Distribution : INDIA, NEPAL, BHUTAN, SE TIBET
Note ; Endemic to E. Himalaya.

Subclass: Rosidae

Order: Rosales

HYDRANGEACEAE Dumort

Key to the Genera:

1. Shrub upto 2 m tall, petals elliptic; styles 3-5 *Dichroa*
- + Shrub upto 4 m tall, petals lanceolate, spreading; styles 2 *Hydrangea*

Dichroa Louriero

Dichroa febrifuga Lour., Fl. Cochinch. 1: 301. 1970; C.B. Clarke in Hook.f., Fl. Brit. India 2: 406. 1879; Hara & Ohashi in Fl. E. Him. 114. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 157. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(3): 522. 1987. *Adamia cyanea* Wallich, Tent. Fl. Nepal 46. T. 36. 1826.

Local Name: Gaybu kanung (Lep.), Basak (Nep.)

Shrubs perennial upto 2m tall. **Lamina** elliptic to oblanceolate, 10 - 14 x 4-5 cm, usually acuminate, base cuneate or rarely attenuate, margin serrate, sparsely pubescent on both surfaces. **Calyx** including acute lobes upto 4mm. **Petals** elliptic, pale blue, becoming reflexed. **Stamens** short upto 5mm purplish. **Styles** 3-5, thickened at apex. **Berries** sub-globosa, blue.

Flower : May - September. *Fruit:* July - December
Exsiccatus : Phusrey 2150 m, *SR Lepcha & AP. Das 30300*, dated 15.10.2007
Status : Common
Local Distribution : Premlakha, Rigu, Subaney dara, Mulkharka, 900 - 2400 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, MALAYSIA, TAIWAN.

Note : Shoot and Bark of the roots are used in preparing febrifuge.

Hydrangea Linnaeus

Key to the Species:

1. Shrubs, erect upto 4 m tall 2
+ Climber, epiphytic *H. anomala*
2. Leaves lamina 4.5 -10 x 4 - 6.5 cm; obovate *H. microphylla*
+ leaves lamina 10 - 25 x 5 -13 cm; ovate-lanceolate *H. aspera*

Hydrangea aspera D. Don, ssp. *robusta* (Hook.f. & Thoms.) Mc Clintock in JAA 37: 373. 1956; Hook.f., Fl. Brit. India (3): 520. 1879; Grierson in Grierson & Long, Fl. Bhutan 1(3): 520. 1987. *H. robusta* Hook.f., & Thoms. in Journ. Linn. Soc 2: 76. 1885; Hook. f. in Fl. Brit. India 2: 404. 1878; Hara & Ohashi in Fl. E. Him. 1: 115. 1966.

Local Name: Bhogatay (Nep.).

Shrubs, erect, upto 4m tall. Twigs are usually densely pubescent. **Petiole** to 8 cm long, pubescent; **lamina** 10 - 25 x 5 -13cm, broadly ovate-lanceolate, margin finely double-serrate, teeth acuminate, alternately large and small, pilose, acute, base rounded to even cordate. Bracts lanceolate, deciduous. Fertile flowers light orange yellow; **Calyx** long, lobes acute; **Petals** free, lanceolate, spreading; **stamens** 8; styles 2 upto 0.2.5cm, broadened above, apex nearly kidney-shaped. **Capsule** truncate above; seeds ellipsoid. Sterile flowers with ovate-elliptic calyx lobes, white.

Flower : July - September. *Fruit:* October - January
Exsiccatus : Dohrok 2300 m, *SR Lepcha & AP. Das 30249*, dated 06.10.2004.
Padamchen 2000 m, *SR Lepcha & AP. Das 31035*, dated 07.10.2004.
Status : Common.
Local Distribution : Rachel Chowk, Zuluk. Hangey 2000 - 3500 m.
General Distribution : HIMALAYAS; INDIA, BHUTAN, E. TIBET, MYANMAR, TONKIN, W. & C. CHINA, FORMOSA.

Hydrangea macrophylla (Thunb.) Seringe in DC., Prodr. 4:15. 1830; Journ. Japan Bot. 30: 277. 1955; Hara *et al.* Enum. Fl. Pl. Nepal 2: 157. 1979; Grierson in Grierson & Long. Fl. Bhutan 1(3): 521. 1987; *Viburnum macrophyllum* Thunb., Fl. Jap. 125. 1784.

Shrubs, glabrous, with several branches. **Leaves** opposite; lamina 4.5 - 10 x 4 - 6.5 cm, obovate, shallowly serrate, teeth obtuse, abrupt acuminate, base cuneate, glabrous above, vein axils hairy in lower surface. **nerves** usually 7 - 9 pairs. **Flowers** in cymosely branched corymbs, bisexual, fertile flowers. **Calyx** to 0.4cm, lobes broadly ovate or elliptic, white or sometime bluish lobed. **Petals** to 0.32 cm, lanceolate, purple or whitish, recurved; **stamens** equal to corollas; sterile flowers many.

Flower : June - August *Fruit*: August - October
Exsiccatus : Dorok 2300 m, *SR Lepcha & AP. Das* 30249, dated 06.10.2004.
Status : Common
Local Distribution : Rachela below, KAS 2000 - 3000 m.
General Distribution : Native of JAPAN.
Note : 1. A new distribution record for Sikkim.
2. A common garden shrub.

Hydrangea anomala D. Don, Prodr. Fl. Nep. 211. 1825; Hook.f., Fl. Brit. India 2: 405. 1879; Hara in Fl. E. Him. 114. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 157. 1979; Grierson in Grierson & Long. Fl. Bhutan 1(3): 520. 1987. *H. altissima* Wallich, Tent. Fl. Nep. 2 t. 50. 1826; Hook.f., Fl. Brit. India 2: 404. 1878.

Climber, epiphytic, seen mostly on trees with branches of rooting. **Stem** pubescent, hairy, white. **Leaves** opposite; petioles to 0.7 cm; **lamina** 3.5 - 13 x 1 - 3 cm, ovate, serrate, teeth acute and pubescent above, acuminate, base cuneate or rounded, nerve axils brownish hairs below. **Flowers** in terminal corymbs to 17 cm across, branched. **Bracts** to 1cm cm, elliptic, glabrous. **petals** upto 0.30 cm and usually cohering in a conical cap; **stamens** 10, to 0.40 cm; **styles** 2, broaden at top. **Capsule** subglobose, ribbed; seeds elliptic.

Flower : March - June *Fruit*: June - October
Exsiccatus : Singhaney 2300 m, *SR Lepcha & AP. Das* 32906, dated 27.10 2004.
Status : Common.
Local Distribution : Mulkharka, Jorpokhari 2200 - 3050 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, W. & C. CHINA.

GROSSULARIACEAE DC.

Ribes Linnaeus

Key to the Species:

1. Bracts glabrous; berries globose *R. glaciale*
+ Bracts sparsely ciliate; berries ellipsoid *R. lacinatum*

Ribes glaciale Wall. in Roxb., Fl. Indica 513. 1824 p.p.; C.B. Clarke in Hook.f., Fl. Brit. India 2: 410. 1879 p.p.; Grierson in Grierson & Long, Fl. Bhutan 1(3): 525. 1987. *R. takare* D. Don, Prodr. 208. 1825; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 159. 1979. *R. acuminatum* Wall. ex G. Don, Gen. Hist. 3: 187. 1834; Hara in Fl.E.Him.1: 115. 1966.

Shrubs upto 5 m tall. **Stem** shining and glabrous. **Petioles** upto 2.5 cm, coarsely short-hairy; **lamina** 2.5 - 4.8 x 1.5 - 4.5 cm, cordate-ovate, shallowly 3-5 lobed, lobes sharply inciso-serrate,

middle lobe elongate, acute or acuminate, base sub-cordate to cordate, a few scattered white hairs above; glabrous beneath, nerves pubescent beneath. **Flowers** in racemes upto 2.5cm, elongated, erect to slightly pendent, many flowered, shortly white pubescent. **Bracts** exceeding pedicels, linear lanceolate, glabrous, brownish. Pedicels glabrous, greenish or upper half faded red. **Calyx** minutely pubescent. **Corolla** 5, reddish brown, glabrous; **stamens** 5, short; styles bifid. **Berries** globose, reddish.

Flower : August – July
Exsiccatus : Singhaney dara 2240m, **SR Lepcha & AP. Das 0146**, dated 16.09.2004.
Status : Frequent.
Local Distribution : Middle Rachela 2100- 2750m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.

Ribes lacinatum Hook.f. & Thoms. in Journ. Linn. Soc. Bot. 2: 87. 1857; Hara in Enum. Fl. Pl. Nepal 2: 158. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(3): 525. 1987.

Shrubs slender dioecious upto 4m tall. **Leaves** 3 lobed; petioles to 3 cm; **lamina** 2.5 – 3 x 2 – 5 cm, mid lob longer slightly longer than lateral lobes, gradually acuminate, base rounded cordate, trunket ot cordate, margin coarsely-sharply serrate; sparsely glandular, pubescent in upper surface, glandular sub-sessile, below. **Flowers** in racemes up to .5cm, elongated; bracts lanceolate, sparsely ciliate. **Flower** crimson or purple. **Calyx** lobes ovate – lanceolate. **Berries** ellipsoid, glabrous, red.

Flower : April- June
Exsiccatus : Tungya 2255 m, **SR Lepcha & AP. Das 075**, dated 16.09. 2004
Status : Frequent
Local Distribution : Middle Rachela 2100 – 3950 m
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.

CRASSULACEAE DC.

Key to the Genera:

1. Plant rhizomatous; flowers terminal; bisexual or unisexual **Rhodiola**
 + Plant non- rhizomatous; flowers in loosely corymbose; bisexual **Sedum**

Rhodiola Linnaeus

Key to the Species:

1. Leaf linear - elliptic; flowers in dense compact corymbs, petals yellowish - white - greenish yellow; stamens longer than or \pm as long as petals 2
 + Leaf oblanceolate or obovate; flowers in subumbelately loose corymbs; petals dark reddish purple; stamen shorter than petals **R. himalayensis**
 2. Flowers usually 5 to dense; leaf margin with 2 – pairs of teeth **R. wallichiana**
 + Flowers 6 – 15; leaf margin entire..... **R. fastigiata**

Rhodiola fastigiata (Hook.f. & Thoms.) Fu, in Acta Phytotax. Sin., Addit. 122. 1965; Grierson in Grierson & Long, Fl. Bhutan 1(3): 478. 1987.

Herbs with sub-erect rhizome. Stems to 17 cm long, glabrous. **Leaves** linear – elliptic, lamina 6 – 13 x 1 – 1.5 cm, subobtusate, base attenuate, margin entire. **Flowers** 6 – 15 forming compact

corymbose cymes. **Calyx** tube to 0.7 mm, lobes ovate – triangular, upto 2.5 - 3.5 x 1.8 mm. **Petals** yellowish white, narrowly linear obovate; **stamens** longer than petals; **carpels** to 8 mm; style c 2 mm, curve outwards.

Flower & fruit : June – August
Exsiccatus : Donkyala 3900 m, *SR Lepcha & AP. Das 1000*, dated 18.09.2004.
Status : Common.
Local Distribution : Dongkyala, Bhimbase below, 3800 – 4400 m.
General Distribution : INDIA, NEPAL, BHUTAN, CHINA.

Rhodiola himalayensis (D. Don.) S.H. Fu, Acta Phytotax. Sin., Addit. 1: 121. 1965; Grierson in Grierson & Long, Fl. Bhutan 1(3): 477. 1987. *Sedum himalense* D. Don, Prodr. Fl. Nepal. 212. 1825

Herbs rhizomatous. **Rhizome** elongated, suberect, to 3.2 cm thick. **Leaves** oblanceolate or obovate, lamina 5 – 22 x 2 – 4.5 mm, acute, base attenuate, sub-entire or denticulate, papilose near margin. **Flowers** in dense in male than female, cymes, subumbelately in loose corymb. Flower 5 merous, unisexual. **Calyx** tube to 3.2 mm lobes triangular, acuminate; **petals** dark reddish purple, oblong-ovate, 2 – 3.5 x 1.7 mm; **stamens** shorter than petals; **carpels** to 5.8 mm, **styles** to 0.5 mm long.

Flower : May – June *Fruit*: June: August
Exsiccatus : Kupup 4100 m, *SR Lepcha & AP. Das 0270*, dated 25.09.2005
Status : Common
Local Distribution : Bhimbase, Donkyala, Bhimbase, 3500 – 4200 m.
General Distribution : INDIA, NEPAL, BHUTAN, S.CHINA
Note : Endemic to Eastern Himalaya

Rhodiola wallichiana (Hooker) S.H. Fu, Acta Phytotax. Sin., Addit. 1: 125. 1965; Grierson in Grierson & Long, Fl. Bhutan 1(3): 478. 1987. *Sedum wallichianum* Hooker, Icon. Pl. 7: t. 604. 1844.

Herbs rhizomatous. **Rhizome** to 3.5 cm. **Stem** to 32 cm, glabrous. **Leaves** deciduous, linear, lamina 8 – 28 x 1 – 3.5 mm, acuminate, base attenuate, small teeth 2 -3 pairs towards apex. **Flowers** in dense compact corymbs, bisexual, usually 5. **Calyx** tube to 1.2 mm, lobes triangular, acuminate. **Petals** greenish yellow; **stamens** ± as long as petals; **carpels** to 13 mm, **styles** to 3.5 mm, spreading.

Flower : August – September *Fruit*: October
Exsiccata : Changu 4000 m, *SR Lepcha & AP. Das 0271*, dated 15.09.2005
Status : Common
Local Distribution : Kyongnosla, Gnathang, Donkya upto 3990 m,
General Distribution : INDIA, BHUTAN, NEPAL, MYANMAR, CHINA.

Sedum Linnaeus

Sedum triactina A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2. 18a: 460. 1930. Grierson in Grierson & Long, Fl. Bhutan 1(3): 482. 1987. *Triactina verticillata* J.D. Hooker & Thoms., J. Linn. Soc. 2: 103. 1858

Herbs perennial slender, weak. Flowering stems to 40 cm. **Leaves** often 3-verticillate or opposite, with pseudopetiolate, persistent around middle of stem; leaf spatulate-oblong, **lamina**

0.5 - 3.8 × 0.3- 0.8 base narrowly cuneate, apex emarginate to obtuse. **Inflorescence** corymbiform, lax; bracts obovate-orbicular to suborbicular. **Flowers** 5-merous. **Sepals** narrowly triangular-oblong, 1.5 × 0.6 mm, apex obtuse. **Petals** yellow, narrowly oblong, -6 × 3.5 mm, apex obtuse. **Stamens** 10, slightly shorter than petals; **Nectar** scales 3, linear or linear-spatulate, apex emarginate or obtuse. **Carpels** 3, divergent, base connate. **Styles** ca. 2 mm. **Follicles** divergent, 1- or 2-seeded. **Seeds** oblong-ovoid.

Flower : June – August *Fruit*: September
Exsiccatu : Bombay hill (Kyongnosla) 3700m, **SR Lepcha & AP. Das** 0272, dated 15. 09. 2005
Status : Common
Local Distribution : Me-Menchu lake, Baba mandir, Kupup, 2000 – 3800 m,
General Distribution : INDIA, BHUTAN, NEPAL, W. CHINA

SAXIFRAGACEAE A.J.C. Grierson

Key to the Genera

1. Perennial rhizomatous herbs 2
 + Perennial non-rhizomatous herbs *Saxifraga*
 2. Leaves alternate, bi- or triternate *Astilbe*
 + Leaves rosetted *Berginia*

Astilbe Buchanon-Hamilton

Astilbe rivularis Buchanon-Hamilton in D. Don, Prodr. Fl. Nep. 211. 1825; C.B. Clarke in Fl. Brit. India 2: 389. 1878; Hara & Ohashi in Fl. E. Him. 1: 111. 1966; Hara *et al*, Enum. Fl. Pl. Nepal 2: 149. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(3): 488. 1987.

Local Name: Buro Okhati (Nep.).

Herbs, perennial, rhizomatous upto 2.5m tall. Stem short. Stipules sheathing. **Leaves** large, bi- or tri-ternate; stipules sheathing; **petioles** long, slender, brown hairy with long (upto 1.8 cm) hairs at leaflet axils, base sheathing; **lamina** of leaflets 5 - 8 x 2.5 - 5 cm, ovate or elliptic, biserrate, acuminate, base rounded or sub-cordate, nerves prominent and appressed brown hirsute beneath. **Panicles** terminal, upto 126 cm, branched. Peduncles pubescent; **bracts** brown; pedicels 0.4 - 0.19cm. **Calyx** deeply 5-lobed, lobes 0.18 - 0.3 cm, oblong, obtuse, green. **Corolla** absent; stamens 5; carpels 2, connate below, divaricating when ripe. **Capsules** ovoid – ellipsoid; seeds numerous.

Var. rivularis

Leaflets rhombic-elliptic or obovate (terminal ones), or ovate (lateral ones). **Petals** absent.

Flower : June - September *Fruit*: July – October.
Exsiccatu : Singhaney dara 2700 m, **SR Lepcha & AP. Das** 3710, dated 03.10. 2005.
Status : Less Common.
Local Distribution : Singhaney, upto 3000m.
General Distribution : INDIA, NEPAL, BHUTAN, CHINA, INDONESIA, LAOS, N. MYANMAR, THAILAND, VIETNAM

Note : Root decoction is used for the treatment of post-natal women.

Berginia W.H. Harvey ex Bentham & Hook.f.

Key to the species

1. Petals obovate 2
+ Petals orbicular *B. pacumbis*
2. Leaves sub-orbicular or broadly obovate; flower 1 *B. purpurascens*
+ Leaves elliptic or ovate-elliptic; flowers upto 18 *B. ciliata*

Berginia ciliata (Haworth) Sternberg in Gartenfl. 307.1886; Clos, in Bull. Soc. Bot. Fr. 41: 397. 1894; Hara *et al* in Fl. E. Him. 2: 46.1971; Grierson in Grierson & Long, Fl. Bhutan 1(3): 492. 1987. *Berginia ciliata* f. *ligulata* (Haworth) Sternberg; Kew Bull. 20: 134. 1966.

Local Name: Pakhanbed (Nep.)

Herbs perennial. Rhizomes thick. **Lamina** 5 – 17 x 5 – 13 cm, sub-orbicular or broadly obovate; rounded at base and apex, margin fine reticulate, densely ciliate. **Flowers** 1- 18. **Calyx** cup-shaped, sepals 5, 4– 13 mm, green, lobed acute, denticulate at apex. **Petals** 5, obovate, 10 – 16 x 5 14 mm, white tinged pink. **Stamens** 10, 5 – 11 mm

Flowering : June – July.

Fruiting: October.

Exsiccatus : Karponang 2200m, *SR Lepcha & AP. Das* 3702, dated 13.10.2005.

Status : Common

Local Distribution : Karponang, KAS 2300 – 2400 m

General Distribution : PAKISTAN, AFGHANISTAN, INDIA, NEPAL, BHUTAN.

Note : The roots are used in traditional medicine .

Berginia pacumbis (Buchanan-Hamilton ex D. Don) C.Y. Wu & J.T. Pan in J.T. Pan, Acta Phytotax. Sin. 26: 126. 1988. *Saxifraga pacumbis* Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 209. 1825.

Herbs perennial, ca. 25 cm tall. Rhizomes thick. **Leaves** all basal; petiole 3.5 -9cm or longer, sheathless, sheathing base rigidly ciliate at margin; leaf blade orbicular or broadly ovate to broadly obovate, **lamina** 5.5 – 13 x 4.5 -13 cm, leathery, both surfaces glabrous, base rounded, margin entire or obscurely crenate, rigidly ciliate, apex obtuse. **Inflorescence** cymose, pedicels sparsely sub-sessile, glandular. **Hypanthium** sparsely glandular hairy. **Sepals** spreading, broadly ovate, 2.5 – 4 mm, leathery, glabrous, veins many. **Petals** white or pink, orbicular, ca. 6.5 x 5.5 mm, veins many, apex obtuse. **Stamens** short, 4 mm. **Ovary** ovoid.

Flower : June – July.

Fruit: October.

Exsiccatus : Changu – Sherathang 3900 m, *SR Lepcha & AP. Das* 168, dated 17.10. 2005.

Status : Threatened

Local Distribution : Sherathang. Kupup 2300 – 2400 m

General Distribution : AFGHANISTAN, PAKISTAN, INDIA, NEPAL, BHUTAN.

Berginia purpurascens (Hook.f. & Thomson) Engler in B. Zeith 26: 841. 1868; Hara & Ohashi in Fl. E. Him. 111: 1966; Hara *et. al.* Enum, Fl. Pl. Nepal 2: 150. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(3): 492. 1987. *Saxifraga purpurascens* Hook.f. & Thomson in J. Linn. Soc. Bot. 2: 61. 1857; C.B. Clarke in Fl. Brit. India 2: 398. 1879.

Herbs perennial with thick rhizome 15 -30cm tall. **Stems** reddish brown, glandular pubescent. **Leaves** elliptic or ovate-elliptic, 8 - 23 x 6-14cm, base cuneate or rounded, margin usually entire but sometime shallowly sinuate, glabrous or ciliate near base; basal sheathing . **Flowers** usually

1-, nodding. **Calyx** dull crimson, lobes oblong, rounded. **Petals** obovate, tapering to a basal, bright pink; stamens as long as style. **Capsule** ellipsoid, base surrounded by persistent calyx.

Flower : May – July *Fruit:* October
Exsiccatus : Kyonglasha – Changu 3700 m, **SR Lepcha & AP. Das 3340**, dated 20.10. 2006.

Status : Threatened

Local Distribution : Kyongnosla, 2700 – 4800 m.

General Distribution : E. HIMALAYA; INDIA (Khasia, Manipur) (NEPAL – NEFA), THAI, TONKIN, and W. CHINA.

Note : Traditionally used as a medicine. It is a source of the drug Bergenin

Saxifraga Linnaeus

Key to the species:

- 1. Herbs more than 25 cm tall 2
- + Herbs less than 25 cm tall 3

- 2. Leaf ovate ; base rounded *S. hookeri*,
- + Leaf elliptic oblong; base cordate *S. moorcroftiana*2

- 3. Herbs less than 15cm tall *S. montana*
- + Herbs more than 15 cm tall 4

- 4. Flower solitary one rarely 2 – 3; petals yellow spotted with orange ... *S. parnassiifolia*
- + Flower 6 – 11; petals yellow not spotted with orange. *S. latiflora*,

Saxifraga hookeri Engler & Irmischer in Engl. Jahrb. 48: 582 1912; Grierson in Grierson & Long, Fl. Bhutan 1(3): 507 – 508. 1987.

Herbs perennial to 40 cm tall. **Leaf lamina** ovate, 6 – 13 × 6 - 13cm, sub-acute acute, base rounded; lower one petiolate, upper one sessile, glandular to pubescent. **Flowers** 3 – 10, loosely racemose or corymbose, pedicel glandular to pubescent. **Calyx** ovate, usually glandular to pubescent. **Petals** obovate to 7.5 x 3 mm, yellow.

Flower : August – September *Fruit:* October
Exsiccatus : Donkyala 3890 m, **SR Lepcha & AP. Das 2835**, dated 23.10.2004.

Status : Common

Local Distribution : Bhimbase, Kupup, 2600 – 4500 m.

General Distribution : NE INDIA (Sikkim), BHUTAN, NEPAL, CHINA,

Note : Endemic to Eastern Himalaya

Saxifraga latiflora Hook.f. & Thomson in, J. Linn. Soc. Bot. 2: 71. 1857; Hara *et al* in Fl. E. Him. 117. 1966. C.B. Clarke in Hook.f., Fl. Brit. India 2: 392.1879; Grierson in Grierson & Long, Fl. Bhutan 1(3): 506.1987

Herbs perennial. **Stem** simple, erect to 20 mm, glandular to pubescent towards apex. **Lamina** elliptic – oblanceolate, 4 – 7 x 1.5 – 2.3 cm, acute lower one narrowed at base into a broad petiolate upper one sessile, glabrous or sparsely ciliate. **Flower** solitary one rarely 2 – 3; pedicels glandular to pubescent. **Calyx** 8 – 12 mm, lobes broadly ovate to 10 mm, slightly obtuse,

glandular to ciliate. **Petals** oblong to obovate to 7 – 13 x 5 – 7 mm, yellow spotted with orange within.

Flower : July – August *Fruit:* August - October
Exsiccatus : Tamjay 3750 m, *SR Lepcha & AP. Das* 2840, dated 15.11.2004.
Status : Less common
Local Distribution : Tamjay, Kupup, 4000 – 4400 m.
General Distribution : E.HIMALAYA; INDIA, NEPAL, BHUTAN.
Note : Endemic to Eastern Himalaya

Saxifraga montana H. Smith, Acta H. Gotob. 1: 9, f. 2 e-l, t. 6. 1924; Grierson in Grierson & Long, Fl. Bhutan 1(3): 511. 1987. *Saxifraga montanella* H. Smith, Bull. Brit. Mus. (Nat. Hist.), Bot. 2: 238. 1960.

Herbs perennial, caespitose perennial. **Stem** to 13 cm, brownish and lanate,. **Leaves:** petiole to 13 mm, glabrous; **lamina** of basal leaves elliptic – oblanceolate, 4.5 – 16 x 1.5 – 5 mm, subacute, base attenuate. **Flowers** solitary or few. **Calyx** 4 – 8 mm lobes oblong- ovate 4 – 13 x 1.6 – 2.2 mm brown pubescent and ciliate. **Petals** elliptic or obovate, 4 – 8 x 3 5 mm, yellow.

Flower : July – August *Fruit:* August – October
Exsiccatus : Nathang – Bhimbase 4220 m, *SR Lepcha & AP. Das* 2836, dated 10.10 2004.
Status : Less common
Local Distribution : Nathang, Bhim, base 4000 - 4400 m.
General Distribution : E.HIMALAYA; INDIA, NEPAL, BHUTAN.
Note : Endemic to Eastern Himalaya

Saxifraga moorcroftiana (Seringe) Wallich ex Sternberg, Revis. Saxifrag. Suppl. 2: 28. 1831; Hara *et al.*, Fl. E. Him. 117. 1966; Grierson in Grierson & Long, Fl. Bhutan 1(3): 487: 1987. *Saxifraga diversifolia* Wallich ex Seringe var. *moorcroftiana* Seringe in de Candolle, Prodr. 4: 44. 1830; *S. reflexa* T.C. Ku (1989), not Hooker (1832), nor Saint-Lager (1880).

Herbs perennial, upto 50 cm tall. **Stem** glandular villous. **Basal leaves** deciduous at anthesis; petiole ca. 2.5 cm, abaxially sparsely brown glandular villous; **lamina** elliptic to oblong, 2 x 2.2 cm, abaxially brown glandular pilose, apex acute; cauline leaves sessile; proximal ones oblong **lamina** 1.2 x 0.6 – 2.5cm, abaxially glandular pilose, base cordate, apex rounded or acute; most distal leaf ovate to ovate-elliptic, surfaces glabrous, base cordate, margin sparsely glandular ciliate. **Flowers** in corymbose, upto 7.5 cm, 2 - 12-flowered; bracts elliptic, glandular ciliate at margin. **Sepals** ovate-elliptic, abaxially dark purple hairy or glabrous, margin dark purple, veins 5 – 7. **Petals** yellow, obovate, 5 - 7-veined. **Ovary** ovoid.

Flower : July. *Fruit:* August – October
Exsiccatus : Kupup 4180m, *SR Lepcha & AP. Das* 057, dated 16.07.2005.
Status : Sparce
Local Distribution : Nathang, Bhimbase, Kupup 3500 – 4400 m.
General Distribution : HIMALAYA (Kashmir- BHUTAN), S. TIBET, and W. CHINA.
Note : Endemic to Himalaya.

Saxifraga parnassifolia D. Don, Trans. Linn. Soc. London, Bot. 13: 405. 1822; Hara *et al.* Fl. E. Him. 117.1966; Grierson in Grierson & Long, Fl. Bhutan 1(3): 507. 1987;

Herbs perennial upto 24 cm tall. **Stem** branched, villous. **Basal leaves** with petiole 1 - 2.5 cm, crisped glandular villous; cordate-ovate, 1 – 4.5 x 1.2 – 3.5 cm, crisped villous on both surfaces at margin or glabrous, base cordate, apex acute; cauline leaves 6 or 7, sessile, ovate to cordate,

0.7 – 3.2 × 0.4 - 3.2 cm, base cordate, semi-amplexicaul, apex obtuse or acute; proximal leaves glandular villous on both surfaces ; distal leaves shortly glandular hairy on both surfaces, margin shortly glandular hairy. **Flower** 6 - 11; pedicels shortly glandular hairy. **Sepals** erect to spreading, ovate to broad, brown glandular hairy, veins 5 – 7. **Petals** yellow, obovate to broadly ovate, 5 - 7-veined, apex obtuse. **Ovary** ovoid

Flower : July – September. *Fruit*: October
Exsiccatus : Bhimbase 4350 m, **SR Lepcha & AP. Das 041**, dated 16.10.2004.
Status : Less common
Local Distribution : Bhimbase, Jalepla, 2700 – 4400 m.
General Distribution : HIMALAYA (Gharwal – BHUTAN)
Note : Endemic to Himalaya.

PARNASSIACEAE S.F.Gray.

Parnassia Linnaeus

Key to the species:

1. Herbs less than 30 cm tall 2
- + Herbs more than 30 cm tall *P. nubicola*
2. Flowers white or creamy white 3
- + Flowers greenish *P. tenella*
3. Petals lanceolate; margins ciliate at base *P. chinensis*
- + Petals obovate; margins ciliate all around, except at base of claw ... *P. cooperi*

Parnassia chinensis Franch., in Bull. S. Bot. Fr. 44: 252. 1897; Hara in Fl. E. Him. 3:48. 1974; Grierson in Grierson & Long, Fl. Bhutan 1(3): 516. 1987.

Herbs annual, erect to 15 cm tall. **Radical leaves** 2 – 13 mm long, broadly ovate, cordate at base; cauline leaves smaller, usually with a few long brown hairs on margin in base. **Flowers** white or creamy – white. **Calyx** lobes 2.5 – 3.5 mm long, ovate, with brown hairs at base. **Petals** 3 – 10 mm long., obovate, ciliate or dentate at base; **staminodes** to 3.5 mm long., 3 lobed at apex.

Flower : June *Fruit*: September
Exsiccatus : Serabthang 3900 m, **SR Lepcha & AP. Das 1900**, dated 15.10.2003; Kupup 4200m, **Sinha & Shukla 20449** dated 18.08.2006
Status : Common
Local Distribution : Nathang, Kupup, Rachel, 2700 – 3900 m
General Distribution : HIMALAYA; INDIA (NEPAL – BHUTAN), S. TIBET, N. BURMA, AND W.CHINA.

Parnassia cooperi Evans in Not. Roy. Bot. Gard. Edinb. 13: 172. 1921; Grierson in Grierson & Long, Fl. Bhutan 1(3): 517. 1987.

Herbs annual, erect to 22 cm tall. **Lamina** 1.5 – 4.5 cm long and broad, acute or subacute, deeply cordate at base. **Flowers** white or creamy white. **Calyx** to 8.5 mm long oblong ovate, ciliate with long brown hairs at base. **Petals** ± 13 mm long lanceolate, acuminate tapering

abruptly in lower third in to a narrow claw, margin ciliate all around except in claw; **staminodes** 3-lobed, midlobed minute; **style** to 2 mm bearing 3 branches.

Flower : June *Fruit*: September
Exsiccatu : Kupup 4250 m, *SR Lepcha & AP. Das* 2400, dated 20.08.2004.
Status : Not common
Local Distribution : Kupup, Gnathang 3900 m
General Distribution : HIMALAYA; (Sikkim – BHUTAN).
Note : Endemic to Himalaya.

Parnassia nubicola Wall. (cat.34.n.1246.1829. *nom.nud.*) ex Royle, Ill. Bot. Him. 227, t.50. 7.3. 1835; C. B. Clarke in Hook.f., Fl. Brit. India 2: 402.1879; Hara in Fl. E.Him.115.1966; Hara *et al.*, Enum Fl. Pl. Nepal 2: 156. 1979; Grierson in Grierson & Long, Fl. Bhutan 1(3): 516. 1987

Herbs upto 40 cm tall. Single leaf appears near base. Basal leaves 3 - 8; **petioles** 2.5 – 13 cm; **lamina** abaxially greenish, adaxially deep green or brown-green, elliptic or ovate-oblong, rarely oblong, 2.5 – 6.5 × 2.5 - 3.5 cm, papery, base subcuneate, sometimes truncate, apex acute or shortly acuminate; Cauline leaves similar to basal ones but smaller, often with a few rusty brown appendages at base. **Flower**: hypanthium campanulate. **Sepals** densely brown punctate, ovate-oblong or ovate-lanceolate, ca. 6.5 × 3.5 mm, margin entire, apex obtuse. **Petals** white, purple-brown punctate, broadly ovate, 1 - 1.3cm × 7 - 13mm, margin entire or erose proximally, apex rounded. **Anthers** ellipsoid, **staminodes** flat, lamina 3-lobed lobes lanceolate or ovate-lanceolate. **Ovary** semi-inferior, ovoid; stigma 3-lobed. **Capsules** ovoid; 3- or 4-lobed. Seeds brown, oblong.

Flower : August - September. *Fruit*: September – October
Exsiccatu : Kupup - Gnathang, 4000 m, *SR Lepcha & AP. Das* 31468, dated 27.07.2008
Status : Common
Local Distribution : Kupup, Gnathang, Changu, Padamchen 2700 – 3900 m
General Distribution : AFGHANISTAN, PAKISTAN, HIMALAYAS; INDIA, NEPAL, BHUTAN.

Parnasia tenella Hook.f. & Thoms. in Joun. Linn. Soc. Bot. 2: 80. 1857; C.B. Clarke in Hook.f., Fl. Brit. India 2: 403. 1879; Grierson in Grierson & Long, Fl. Bhutan 1(3): 517. 1987.

Herbs annual, erect to 12 cm tall. **Leaves**; radical leaves upto 3 cm long; suborbicular, rounded or emarginated; deeply cordate at base; cauline leaves inserted in upper half of stem. **Flowers** greenish. **Calyx** to 3 mm long, oblong; petals to 5 mm long, obovate, dark green, minutely ciliate. **Staminodes** to 1.5 long, undivided, flattened, and suborbicular at apex; **styles** 3.

Flower : July *Fruit*: September
Exsiccata : Sherathang, *SR Lepcha & AP. Das* 2500, dated 19.07.2007.
Status : Common
Local distribution : Changu, Memenchu upto 3900 m
General distribution : HIMALAYAS; INDIA, (NEPAL – BHUTAN).
Note : Endemic to Himalaya.

ROSACEAE A.L. Jussieu

Key to the Genera:

- | | |
|--|--------------------|
| 1. Leaves simple | 2 |
| + Leaves compound | 3 |
| 2. Stipules present | 4 |
| + Stipules absent | <i>Spiraea</i> |
| 3. Stipules adnate to petiole | 5 |
| + Stipules free | 8 |
| 4. Leaves 3 lobed | 6 |
| + Leaves unlobed | 7 |
| 5. Prostrate or scrambling herb or shrubs | 10 |
| + Erect or rosette herb | <i>Potentilla</i> |
| 6. Herbs often with prickles or bristles, 1-seeded | <i>Rubus</i> |
| + Herbs without prickles or bristles, 2-10 seeded | <i>Neillia</i> |
| 7. Hypanthium tubular or obconical | 9 |
| + Hypanthium turbinate | <i>Cotoneaster</i> |
| 8. Deciduous tree | <i>Sorbus</i> |
| + Erect or spreading shrubs or creeping herbs | <i>Rubus</i> |
| 9. Ovary 1- celled | <i>Prunus</i> |
| + Ovary 2-5 celled | <i>Sorbus</i> |
| 10. Stem without prickles | 11 |
| + Stem bearing prickles | <i>Rosa</i> |
| 11. Plants stoloniferous | <i>Fragaria</i> |
| + Plants mat forming, without stolon | <i>Sibbaldia</i> |

Cotoneaster Rupp

Cotoneaster microphyllus Lindl., Bot. Reg. 13:t. 1114. 1827; Hook.f. in Fl. Brit. India 2: 387. 1879; Hara & Ohashi in Fl. E. Him.1: 119. 1966; 2: 5. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 2: 135. 1979; Grierson & Long, Fl. Bhutan 1(3): 589. 1987. *C. congestus* Baker in Saunders, Refug. Bot. 1: t. 51. 1869; Hara & Ohashi in Fl. E. Him. 119. 1966

Local Name: Broosh Jhar (Nep.).

Shrubs annual, ramose. **Stem** racemosely branched, woody. **Leaves** simple; **petioles** to 0.35cm; **lamina** 0.50 - 1.5 x 0.25 - 0.50cm, elliptic-obovate, obtuse to subacute, base cuneate, glabrous above, appressed hairy beneath, dark green. **Flowers** solitary; calyx to 0.7cm, 5-lobed, pubescent; petals 5, suborbicular, 0.3cm, white, tinged pink; carpels adnate to calyx tube. **Fruits** 0.60 - 0.80 cm, subglobose to globose, scarlet.

Flower & Fruit : April – July

Exsiccata: : Rachela 2970 m, **SR Lepcha & AP. Das** 31281, Dated 13.09.2008

Status : Common

Local Distribution : Panglakha, Rachela, KAS, 2280 – 3100 m.

General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, S. W. CHINA

Fragaria (Tournefort) Linnaeus

Key to the species:

1. Leaflets obovate or elliptic; margins 7-14 toothed; petals white *F. nubicola*
+ Leaflets, oblong or ovate; margins 4 - 6 toothed; petals blotched reddish *F. daltoniana*

Fragaria daltoniana Gay in Ann. Sci. Nat. Ser. 4, 8:204. 1857, *e typo*; Hook.f., in Fl. Brit. India 2:345. 1878; Hara & Ohashi in Fl. E. Him. 121. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 137. 1979; Long in Grierson & Long, Fl. Bhutan 1(3): 578. 1987. *F. sikkimensis* Kurz., Jour. Asiat. Soc. Beng. 44 (3): 206. 1876.

Herbs annual, upto 7 cm tall. **Stems** usually slender, subglabrous. **Leaves** 3 lobes; **petioles** appressed pilose; **leaflets** shortly petiolulate, abaxially greenish, adaxially dark green, oblong or ovate, 1 - 2.8 × 0.5 - 2 cm, abaxially appressed pilose, adaxially subglabrous, base cuneate or oblique, margin incised serrate, 4 - 6 toothed, apex rounded or acute. **Flower** solitary, axillary; pedicel upto 4.5 cm. **Sepals** ovate, apex caudate; epicalyx segments oblong, nearly equaling calyx, apex 2 - or 3-lobed. **Petals** blotched reddish, usually suborbicular. **Stamens** and **carpels** many. **Fruits** red in mature, conic, ovoid, **Achenes** glabrous.

Flower & Fruit : June - July

Exsiccatus : Singhaney dara 2420 m, *SR Lepcha & AP. Das 31094*, dated 02.10.2004.

Status : Less Common

Local Distribution : Singhaney dara 2400 - 3500 m.

General Distribution : INDIA, NEPAL, BHUTAN, CHINA, MYANMAR.

Fragaria nubicola Lindl. [in Wall., Cat. N. 1288. 1829, *nom. nud.*] ex Lacaita in Journ. Linn. Soc. Bot. 43: 467. 1916. Hara & Ohashi in Fl. E. Him. 121: 1966; Long in Grierson & Long, Fl. Bhutan 1 (3): 578. 1987. *Fragaria vesca* var. *nubicola* Hook. f. in Fl. Brit. India 2: 344. 1879. *Fragaria vesca* auct. non L. : C.R. Rao in India for. 93: 47. 1967.

Herbs perennial prostrate with short rootstock. **Leaves** palmately 3 foliate; **Petioles** oppressed or erect spreading pale pubescent, rarely 2 additional minor leaflets; **leaflets** obovate or elliptic, lamina 2 - 4.5 x 2 - 2.5 cm, obtuse, base cuneate, sessile, margin sharply serrate with usually 7 - 14 teeth on each side, with silky whitish pubescent at lower surface. **Flowers** scape 1 - 3 flowered. **Calyx** cup lobes, triangular entire; epicalyxes segments elliptic lanceolate, acuminate, bifid at apex. **Petals** obovate, white. **Achenes** borne on succulent red, globose.

Flower & Fruit : April - June

Exsiccatae : Kupup 4200 m, *SR Lepcha & AP. Das 31492*, dated 27.07.2005;
Thamey dara 2570 m, *SR Lepcha & AP. Das 31048*, dated 07.10.2004.

Status : Less Common

Local Distribution : Kupup, Hangey, Rachel 1600 - 4000 m.

General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR.

Neillia D. Don

Key to the species:

1. Leaf margins serrate; stipules serrate; stamens upto 8 - 10 *N. thirsiflora*
+ Leaf margins entire; stipules entire; stamens 22 - 25 *N. rubiflora*

Neillia thirsiflora D. Don, Prodr. Fl. Nepal 229. 1825; Hook. f. in Fl. Brit. India 2: 1. 1879; Hara & Ohashi in Fl. E. Him. 122. 1966; Grierson in Grierson & Long, Fl. Bhutan 1(3): 537. 1987.

Local Name: Jikre (Nep.)

Shrubs, erect, 1 - 3.5cm tall. **Leaves** simple, ovate; stipules ovate, to 8.3 mm, serrate; lamina 3 - 12 x 1.5 - 4.5cm, shallowly 3 lobed, base deeply cordate, margin irregularly serrate; stipules ovate, serrate. **Flower** in large compact leafy panicle or narrowly raceme, flowering shoots scaly at base and without dormant buds. **Calyx** cup broadly campanulate, with densely velutinous, often reddish. **Corolla** pink or white. **Stamens** upto 8-10, fruiting calyx cups with stalked capitate glands at base. **Fruiting calyx** cup bearing glands. **Seeds** 8 - 12.

Flower & Fruit : July - August

Exsiccatus : Phusrey 2120 m, **SR Lepcha & AP. Das** 20 286, dated 28.10.2004

Status : Less Common

Local Distribution : Hangey, Dohrok, 1300 - 2500 m.

General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, INDONESIA.

Neillia rubiflora D. Don, Prodr. Fl. Nepal. 122. 1825; Grierson in Grierson & Long, Fl. Bhutan 1(3): 537. 1987; Hara & Ohashi in FL. E. Him. 122. 1966.

Local Name: Jikre (Nep.)

Shrub erect upto 3 cm tall. **Leaves** simple, ovate; petiole to 2.5 cm; stipules to 1cm, entire; lamina 3 - 9 x 2 - 4.5cm, more deeply 3 lobed, base oftenly deeply cordate, margin irregularly serrate. **Flower** in panicle or narrowly raceme, flowering shoots scaly at base and without dormant buds. **Calyx** cup broadly campanulate, usually with densely velutinous, often reddish. **Corolla** pink or white, **Stamens** 22 - 25. **Fruiting calyx** cups with stalked capitate glands at base.

Flower & Fruit : May - July

Exsiccatus : Rachela below 2790 m, **SR Lepcha & AP. Das** 31020, dated 07.10. 2004.

Status : Less Common

Local Distribution : Rachela, Panglaxha, KAS, Changu, 2000 - 3100 m.

General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, CHINA

Potentilla Linnaeus

Key to the species:

1. Leaflets more than 4 pairs 2
- + Leaflets upto 2 pairs or (5 foliate) *P. fructicosa*

2. Corolla yellow 3
- + Corolla white to deep crimson at base *P. coraindifolia*

3. Leaflets upto 8 pairs; achenes ovoid 4
- + Leaflets more than 9; achenes obovoid *P. peduncularis*

4. Leaf margins sharply serrate *P. fulgens*
- + Leaf margins more bluntly dentate *P. polyphylla*.

Potentilla coraindifolia D. Don, Prodr. Fl. Nep. 232. 1825; Grierson & Long Fl. Bhutan 1(3): 573. 1987. *Potentilla meifolia* Wall. ex Lehm., Pugill. 3: 29 (1831).

Herbs with thick with persistent leaves remain. **Leaves** pinnate upto 11cm long; lateral leaflets 4 - 9 pairs, deeply pinnatisect, segments linear, sparsely pubescent. **Flower** upto 5, corymbs on peduncles upto 13cm. **Calyx** lobes upto 4mm long. **Corolla** obovate, emarginated, white to deep crimson at base. **Achenes** oblong - ellipsoids.

Flower & Fruit : July - August
Exsiccatae : Bhimbase 4400 m, *SR Lepcha & AP. Das 30940*, dated 27.07.2005;
Baba Mandir 3700m, *SR Lepcha & AP. Das 0151*, dated 22.07.2003.
Status : Less Common
Local Distribution : Kupup, Bhimbase, Nathang 2300 - 4500 m.
General Distribution : E. HIMALYA; INDIA, NEPAL, BHUTAN, CHINA

Potentilla fruticosa L., Sp. Pl. 495. 1753; Hook. f. in Fl. Brit. India 2: 347. 1879; Hara *et. al.* Enum. Fl. Pl. Nepal 2: 139. 1987. *Dasiphora fruticosa* (L.) Rydb. In Mem. Dept. Bot. Columbia Univ. 2: 188. 1898. *Potentilla arbuscula* D. Don var. *rigida* (Wall. ex. Lahm.) Wolf, Mongr. Pot. 57. 1908; Murata in Fl. E. Him. 122: 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 139. 1979; Grierson & Long, Fl. Bhutan 1 (3): 565. 1987. *Potentilla nepalensis* D. Don., Prodr. Fl. Nepal 229. 1825. *non.* Hook. 1824.

Local Name: Chariya phal (Nep.)

Shrubs perennial upto 2 m tall. **Leaves** pinnately 5 - foliate or 2 pairs; **leaflets** elliptic 4 - 13 x 4 - 5.5mm, acute or obtuse, apiculate, base rounded, margin entire, sparsely or densely silky pubescent on both surfaces; stipules ovate - lanceolate, brown scarious. **Flowers** solitary, terminal on lateral shoots. **Calyx** cup often reddish, lobes ovate, epicalyxes segment elliptic. **Corolla** obovate, rounded, yellow. **Achenes** conical or ovoid, white pilose.

Flower & Fruit : May - August
Exsiccatae : Kupup 4180 m, *SR Lepcha & AP. Das 31425*, dated 27.07.2005;
Lam-pokhri below 4390 m, *SR Lepcha & AP. Das 30997*, dated 27.07.2005.
Status : Less Common
Local Distribution : Lampokhri, Kupup, Donkyala 3000 - 4200 m.
General Distribution : INDIA, NEPAL, BHUTAN, CHINA.

Potentilla fulgens Wall. ex Hook. in B. Meg. 53: t. 2700. 1826. Lehm., Rev. Pot. 54. 1856; Hook. f. in Fl. Brit. India 2: 349. 1879; Murata in Fl. E. Him. 125. 1966; 2: 53. 1971; Hara *et. Al.* Enum. Fl. Pl. Nepal 2: 140. 1987. *Potentilla siemersiana* Lehm., [Ind. Sem. H.B. Hamburg 8: 1821, *nom. nud.*]. *Potentilla fulgens* var. *intermedia* Hook.f. in Fl. Brit. India 2: 350. 1878; Grierson & Long, Fl. Bhutan 1 (3): 571. 1987.

Herbs perennial, erect spreading upto 50cm tall, usually with whitish hairy. **Leaves** interrupted pinnate, 5 - 22 cm; larger **leaflets** 4 - 8 pairs, **lamina** usually narrowly obovate to elliptic, 1 - 3.5 x 1 - 3cm, obtuse, base cuneate or rounded, margins sharply serrate, pubescent sparsely and in veins usually impressed above, thick silvery white sericeous beneath; **stipules** of basal leaves ovate lanceolate, brown; stipules of cauline leaves similar leaflets. **Flowers** in corymbose cymes. **Calyx** lobes ovate, sericeous. **Corolla** obovate, rounded yellow. **Achenes** ovoid, glabrous.

- Flower & Fruit* : June - August
Exsiccatae : Neora pathak 2750 m, *SR Lepcha & AP. Das 20271* dated 28.10.2004
 Bhimbase 4400 m, *SR Lepcha & AP. Das 31462*, dated 27.07.2005.
Status : Less Common
Local Distribution : Bhimbase, Neora pathak 1600 – 4800 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, W.CHINA.

Potentilla peduncularis D. Don, Prodr. Fl. Nepal 230. 1825: Hook. f. in Fl. Brit. India 2: 351. 1879; Murata in Fl. E. Him. 124. 1966; Hara *et al.*, Enum, Fl. Pl. Nepal 2: 140 1979; Grierson & Long, Fl. Bhutan 1(3): 571. 1987. *Potentilla velutina* Wall., Cat. 28, n. 1016. 1829, *nom. nud.*
Potentilla pedumularis var. *obscura* Hook. f. in Fl. Brit. India 2: 352. 1879.

Herbs perennial, rosette with their woody rootstock 50 cm tall. **Leaves** mostly regularly pinnate, oblong or oblanceolate, 7 - 18cm; lateral leaflets 9 - 21 pairs; **lamina** oblong elliptic, 1 - 2.5 x 1.5 - 2cm, + obtuse, base rounded or cuneate, margins serrate, sparsely pubescent above, oftely with white sericeous beneath; stipules ovate-lanceolate, brown. **Flowers** usually 2 - 6; + coymbose, borne on almost leafless peduncle. **Calyx** lobes ovate. **Petals** obovate, rounded, yellow. **Achenes** obovoid, glabrous.

- Flower & Fruit* : June – July
Exsiccatae : Lampokhri 4390 m, *SR Lepcha & AP. Das 30945*, dated 24.07.2005;
 Kupup tiger hill 4400m, *SR Lepcha & AP. Das 31414*, dated 27.07.2005.
Status : Less Common
Local Distribution : Kupup, Lampokhri, Donkyala 3000 – 4600 m.
General Distribution : E.HIMALAYA, INDIA, NEPAL, BHUTAN, S.E. TIBET, W.CHINA.

Potentilla polyphylla Wall. [Cat. 28, n. 1026. 1829, *nom. nud.*] ex Lehm., Pugil. 3: 13. 1831; Hara *et al.* Enum. Fl. Pl. Nepal 2: 141. 1979; Grierson & Long, Fl. Bhutan 1(3): 572. 1987;
Potentilla monniana Wight. Ic. Pl. India Dr. 1.t. 233. 1839; Hook. f. in Fl. Brit. India 2: 349, 1879; Murata in Fl. E. Him. 124. 1966. *Potentilla polyphylla* B. barbata Lehm., 1: c. 53. 1856.
Potentilla sordida Klotzsch in B. Reise Pr. Waldem. t. 9. 1862.

Herbs perennial spreading upto 55 cm. **Stem** with pilose hairy slightly silky when young. **Leaves** leaflets similar; stipules of basal leaves usually ovate-lanceolate; larger leaflets usually in 4 - 8 pairs; **lamina** broadly obovate to elliptic, 0.5 - 3.5 x 1 - 2.5cm, obtuse, base cuneate or rounded, margins more bluntly toothed, green and sparsely pubescent leaflets similar; **Flowers** in corymbose cymes. **Calyx** lobes ovate sericeous. **Corolla** ovate, rounded, yellow. **Achenes** ovoid glabrous.

- Flower & Fruit* : June - August
Exsiccatae : Bhimbase 4380 m, *SR Lepcha & AP. Das, 30946*, dated 24.07.2005.;
 Kupup 4100 m, *SR Lepcha & AP. Das 30996*, dated 24.07.2005.
Status : Less Common
Local Distribution : Donkyala, Bhimbase, Lampokhri 2700 – 4600 m.
General Distribution : INDIA, NEPAL, BHUTAN, SRI LANKA

Prunus Linnaeus

Key to the species:

1. Flowers in corymbs or fascicles; Drupes ellipsoid or oblong,..... *P. cerasoides*.
 + Flowers in racemes usually on new shoot; Drupe ovoid..... *P. napaulensis*

Prunus cerasoides D. Don, Prodr. 239. 1825; Brittonia 4: 89. 1941; Journ. Jap. Bot. 51: 9. 1976; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 141. 1979; Grierson & Long, Fl. Bhutan 1(3): 540. 1987. *Cerasus puddum* Seringe in DC., Prodr. 2: 537. Nov. 1825; Hara & Ohashi in Fl. E. Him. 125. 1996. *Prunus puddum* (Wall.) Roxb. ex Brandis, For. Fl. Ind. 194. 1874; Hook.f. in Fl. Brit. India 2:314. 1879.

Local Name: Painsyun (Nep.).

Tree robust, deciduous upto 22 m tall. Bark dark-brown, often peel off in strips. Leaves simple; stipules linear-lanceolate; petioles to 1.8 cm, usually with 1-3 glands at tip; lamina 4 - 16 x 3.3 - 6.3 cm, ovate-oblong elliptic, or ovate-lanceolate, margin serrate, shortly acuminate, base truncate or rounded, lateral nerves 7 - 12 on either half. Flowers in corymb or fascicles 1-3 flowered, pink, slightly fading to white. Calyx-tube to 1.5 cm long, campanulate, lobes ovate, acute. Petals to 1.3 cm long, obovate; stamens many; ovary glabrous; style exerted. Drupes ellipsoid or oblong, yellow or rarely red.

Flower & Fruit : October - January

Exsiccatus : Panglakha below 2600 m, *SR Lepcha & AP. Das* 2025, 15.08.2004.

Status : Frequent.

Local Distribution : 1600 - 2400 m.

General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.

Note : The twigs and branchles are used for making many household tools.

Prunus napaulensis (Seringe) Steud., Nom. Bot. ed 2, 2: 403. 1841; Hook.f., in Fl. Brit. India 2: 316. 1879; Hara in Fl. E. Him. 126. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 142. 1979; Grierson & Long, Fl. Bhutan 1(3): 540. 1987. *Cerasus napaulensis* Ser., in DC., Prodr. 2: 540. 1825.

Local Name: Arupatey (Nep.).

Trees upto 23 m tall. Leaves simple, alternate; petioles to 1.5 cm; lamina narrowly elliptic-lanceolate, 3 - 7.8 x 1 - 3.7 cm, finely serrate, acute to short acuminate, base rounded or subcordate, upper surface glabrous; lower glaucous, lateral vein axils with or without hair-tufts. Flowers in racemes usually on new shoot, elongate, leafy at base, 6 - 11 cm long; rachis pubescent beneath. Flowers to 1.2 cm across, white. Calyx green, gray-pubescent, 5-lobed, teeth to 0.13 cm long, obtuse-sub-acute. Petals 5, to 0.38 cm, obovate; stamens many; anthers brown; filament whitish; carpel 1. Drupes ovoid, seeds not seen.

Flower : April - May *Fruit:* May - August

Exsiccatus : Neora pathak 2750 m, *SR Lepcha & AP. Das* 22795, dated 17.10.2004.

Status : Common

Local Distribution : Rachel Chowk, Neora pathak 2200 - 2800 m.

General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, CHINA, MYANMAR.

Rosa Linnaeus

Rosa sericea Lindl., Monogr. Rosa 105, t. 12. 1820; Hook. f. in Fl. Brit. India 2: 367. 1879; Hara & Ohashi in Fl. E. Him. 127. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 143. 1947; Grierson & Long, Fl. Bhutan 1(3): 586. 1987. *R. tetrasepala* Royle III. Bot. Him. 23. 1833. *nom. nud.*

Shrubs erect upto 5m, stems naked or sometime with paired or scattered broad prickles. Leaves

2 – 8 cm; leaflets 6 - 12 (17); lamina oblong or usually narrowly ovate 1- 2.5 x 1.5 - 2cm, acute or rounded base cuneate, margins usually serrate near apex, or sometime entire, usually pubescent above, densely sericeous beneath. Flowers solitary on short lateral shoots. 5-merous. Calyx tube turbinate, lobes lanceolate, + obovate long and broad. Style free. Fruits obovoid or sub-globose orange-red.

- Flower & Fruit : April – June
 Exsiccatae : Kupup 3970 m, SR Lepcha & AP. Das 31436, dated 27.07.2005;
 Rachela 2990 m, SR Lepcha & AP. Das 31053, dated 08.10.2004;
 Changu 4000 m, SR Lepcha & AP. Das 146, dated 23.07.2006.
 Status : Less Common
 Local Distribution : Rachela, Kupup, Changu 2000 – 4600 m.
 General Distribution : INDIA, NEPAL, BHUTAN, TIBET, CHINA, MYANMAR.
 Note : Flowers used medicinally; fruit edible.

Rubus Linnaeus

Key to the Species:

- | | |
|--|-------------------------|
| 1. Stems creeping; leaves 3- 5 foliate | 2 |
| + Stems erect; leaves 3 – 11 foliate | 3 |
| 2. Petals white | <i>R. calycinus</i> |
| + Petals pink | <i>R. pectinaroides</i> |
| 3. Leaves simple, rarely lobed. | 4 |
| + Leaves compound | 5 |
| 4. Panicles with long spreading branches; Bracts with linear teeth. | <i>R. paniculatus</i> |
| + Panicles narrow; bracts with linear teeth | 6 |
| 6. Stems and petioles glandular- bristly | <i>R. treutleri</i> |
| + Stems and petioles eglandular | 7. |
| 7. Leaf-lobes acute | <i>R. reticulatus</i> |
| + Leaf-lobes rounded or subacute | <i>R. rugosus</i> |
| 5. Leaflets with 8- 12 lateral veins | 8 |
| + Leaflets with 25 – 50 pairs of lateral veins | 9 |
| 8. Calyx lobes to 13 mm long; petals greenish white | <i>R. lineatus</i> |
| + Calyx lobes to 6 mm; petals red | <i>R. thomsonii</i> |
| 9. Leaves pinnately 3 foliate | 10 |
| + Leaves pinnate, leaflets 5 – 11 | 13 |
| 10. Leaflets elliptic or obovate, rounded | <i>R. ellipticus</i> |
| + Leaflets ovate, acute or acuminate | 12 |
| 12. Stipules linear entire. | <i>R. sikkimensis</i> |
| + Stipules ovate, lanceolate | <i>R. wardii</i> |
| 13. Leaves 3 foliate; margins coarsely serrate; petals red | <i>R. hypargyrus</i> |
| + Leaves 5, 7 or 9 foliate ; margins sharply serrate; petals pink | <i>R. niveus</i> |

Rubus calycinus Wall. ex. D. Don. Prodr. Fl. Nepal 235: 1825; Hook. f., in Brit. India 2: 237. 1879; Hara & Ohashi in Fl. E. Him. 128. 1966; Hara *et al.* Enum. Fl. PL. Nepal 2: 144. 1979; Long in Grierson & Long. Fl. Bhutan 1(3): 549. 1987. *Rubus lanatus* Wall., Cat. 22, n. 737. 1829, nom. nud.

Herbs, perennial, creeping woody stems, usually with hirsute and with scattered slender prickles. **Leaves** simple, cordate-orbicular to reniform, apex rounded, base oftenly deeply cordate, unlobed or shallowly lobed, margins denticulate, hirsute on veins, of slender prickles on veins beneath; petiole usually prickly and hirsute. **Stipules**, broadly ovate serrulate. **Flowers** 2 -3 erect. **Flowering** braches sub-erect, bearing 1 - 4 leaves. **Pedicels** prickly. **Calyx** lobes green, ovate, obtuse. **Corolla** white, obovate. **Fruits** red, globose.

Flower : April - May
Exsiccatu : Panglakha 2900 m, *SR Lepcha & AP. Das* 30894, dated 30.07.2004.
Status : Less Common
Local Distribution : Nathang, Panglakha 2100 - 3500 m
General Distribution : HIMALAYAS; INDIA, (NEPAL-Arunachal Pradesh), Meghalaya, Manipur, N. MYANMAR, W. CHINA.

Note : Fruits edible.

Rubus ellipticus Smith in Rees, Cyclop. 30: no.16. 1819; Hook.f. in Fl. Brit. India 2: 336. 1878; Hara & Ohashi in Fl. E. Him. 129. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 144. 1979; Long in Grierson & Long, Fl. Bhutan 1(3): 557. 1987.

Local Name: Ainselu (Nep.).

Shrubs, bushy, branches stout, pubescent with flexuous stiff brown hairs to 0.5 cm; prickles deflexed, scattered. **Leaves**; stipules to 0.5 cm, linear; petioles upto 6 cm, densely pubescent; leaflets 3, pinnate, **lamina** 2.5 - 10 x 3 - 9 cm, terminal one larger, elliptic-obovate to suborbicular, serrate, obtuse or subacute, base rounded, dark green and glabrate above, pale and thinly pubescent beneath along distantly prickled mid-nerve, veins thick and prominent beneath. **Panicles** both terminal and axillary, many flowered. **Calyx** cup bristly, segments 5, ovate, acute, entire, persistent, softly pale pubescent. **Petals** larger than sepals, obovate, white. **Drupe** succulent and sweet, orange-yellow.

Flower : December Fruit: March - May
Exsiccatu : Subhane 1900 m, *SR Lepcha & AP. Das* 03004, dated 14.08.2006
Status : Abundant
Local Distribution : Subaney, Rigu, Lingtam upto 2000 m,
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, SRI LANKA, MYANMAR, INDO-CHINA.

Note : Fruits sweet and edible.

Rubus hyperigyus Edgew., Tr. Linn. Soc. 20: 45. 1846; Long in Grierson & Long, Fl. Bhutan 1 (3): 559. 1987. *R. pedunculatus* var. *hypargyus* (Edgew.) Kitam., F. & Fl. Nep. Him. 158. 1955.

Shrubs, scrambling upto 3m, with leafy shoots, scattered prickles, pubescent. **Leaves** 3 foliate, ; leaflets ovate, terminal to 2 - 9 x 2.5 - 5 cm, acuminate, base rounded or cuneate, margins often doubly serrated, pubescent above, white tomentose - almost glabrous beneath, terminal petiolules to 18 mm. **Flowers** solitary or 2 - 5 in short axillary racemes; pedicles to 2 cm. **Calyx** cup usually with few prickles, lobes lanceolate to 13 mm, subulate apex. **Corolla** pinks or white, obovate to 7mm. **Fruits** red or orange, drupelets 30 - 60, pubescent.

Flower & Fruit : June - August
Exsiccatu : Panglakha m, *SR Lepcha & AP. Das* 31082, dated 13.09.2008.

Status : Less Common
Local Distribution : Rachela, Jorepokri, 2600 – 3600 m.
General Distribution : E. HIMALAYA; INDIA,
Note : Endemic to Eastern Himalaya.

Rubus lineatus Reinw. in Blume, Bijdr. 1108. 1826; Hook. f. in Brit. India 2: 333. 1879; Hara & Ohashi in Fl. E. Him. 130. 1966; Hara *et al.*, Enum. Fl. PL. Nepal 2: 145. 1979; Long in Grierson & Long, Fl. Bhutan 1 (3): 555. 1987.

Shrubs scrambling upto 3.5m, usually eglandular; **Stem** with few prickles or unarmed; branchlets sericeous whitish. **Leaves** pedately 5-foliolate, but sometime 3 to 7 foliolate; petiole unarmed or prickly rarely with few prickles at base leaflets terminal elliptic - oblanceolate, lamina 7 - 12 x 2 - 4.5cm acuminate, base oftenly cuneate, margins serrated sharply, white sericeous beneath, lateral veins 23 - 48 pairs, midrib rarely with few prickles at base; **Stipules** ovate, entire. **Flowers** few in short axillary clusters or cymes. **Calyx** lobes triangular, acuminate, entire. **Corolla** greenish white. **Fruits** red.

Flower : July – August *Fruit*: September – October
Exsiccatus : Singhaney 2500 m, **SR Lepcha & AP. Das 30214** Dated. 23.10.2010
Status : Less Common
Local Distribution : 2100 – 4300 m
General Distribution : AFGHANISTAN, E. HIMALAYA; INDIA, (NEPAL-BHUTAN),
Assam, MYANMAR, CHINA, MALAYSIA.
Note : Dried root used to cure food poisoning. Stem used for fencing.

Rubus niveus Thunb., Diss. Rubo. 7 & 9, f. 3. 1813; Hook.f. in Fl. Brit. India 2: 335. 1872; Hara & Ohashi in Fl. E. Him. 130. 1966; 2: 58. 1971; Hara *et al.*, Enum. Fl. PL. Nepal 2: 146. 1979; Long in Grierson & Long, Fl. Bhutan 1(3): 560. 1987. *Rubus lasiocarpus* Smith in Rees Cyclop. 30: Rubus n. 6. 1819. *Rubus pinnatus* D. Don., Prodr. Fl. Nep. 234. 1825. *Rubus rosaeflorus* Roxb, Fl. Indica ed. 2, 2: 519. 1832. *Rubus nibeus* var. *pauciflorus* (Wall ex Lindl.) Focke, in Bibl. B. 17. (Ht. 72): 183. 1911.

Shrubs reddish shorts with white and scattered recurved prickles, oftenly eglandular. **Leaves** pinnate, petiole oftenly prickly, usually 5, 7 and 9 foliolate, **lamina** of leaflets usually ovate rarely lanceolate or elliptic, 2.5- 5.5 x 0.5 - 4cm, sub-acute or acute, base narrowly rounded, margins sharply serrate, sub glabrous, white tomentose and veins beneath; stipules linear lanceolate. **Flowers** upto 25 in terminal, rarely in axillary corymbs. **Calyx** white tomentose, not prickly, lobes ovate, shortly acuminate. **Corolla** pink, fruit red, becoming bleakish when ripe.

Flower : April – May.
Exsiccatae : Thamey dara 2400m, **SR Lepcha & AP. Das 30222**, dated 06.10.2004;
Padamchen 2600 m, **SR Lepcha & AP. Das 30999**, dated 27.07.2005;
Nathang 3840 m, **SR Lepcha & AP. Das 30897**, dated 30.07.2005.
Status : Less Common
Local Distribution : Dorok, Thamey dara, Nathang 2000 – 3900 m
General Distribution : AFGHANISTAN HIMALAYAS; (Kashmir-Sikkim), S. INDIA,
MYANMAR, INDO-CHINA, MALAYSIA.

Rubus paniculatus Smith in Rees, Cyclop. 30: Rubus n. 40. 1819; Hook f. in Fl. Brit. India 2: 329. 1879; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 146. 1979; Hara *et al* in Fl. E. Him 1:131. 1966; Long in Grierson & Long Fl. Bhutan 1 (3): 552. 1987.

Shrubs climbing, stems with scattered small recurved prickled; branch-lets tomentose creamy white. **Lamina** ovate, shallowly 2 - 4 lobed on each side, 9 - 15 x 4 - 10cm usually acuminate, base deeply cordate on lower leaves, truncate on uppermost leaves, margin serrate, lateral veins 6-8 pairs, pubescent above, white tomentose beneath; petiole prickly or not; stipules oblong-lanceolate. **Flowers** in broad tomentose. **Bracts** lanceolate, laciniate with lanceolate teeth. **Calyx** lobes triangular, entire, sericeous. **Corolla** white, oblong.

var. paniculatus

Leaves abaxially persistently tomentose, margin coarsely serrate.

- Flower* : June – November
Exsiccatae : Neora Pathak 2740m, *SR Lepcha & AP. Das* 31217, dated 13.09.2008;
Deorali dara 2290m, *SR Lepcha & AP. Das* 30231, dated 06.10.2004;
Chitray 2680 m, *SR Lepcha & AP. Das* 31012, dated 02.10.2004.
Status : Less Common
Local Distribution : Singhaney, chitray, Hangey, Rachela 2100 – 3200 m
General Distribution : HIMALAYAS; INDIA (Rajori-Sikkim), Meghalaya.
Note : Endemic to Himalaya

Rubus pectinaroides H. Hara, J. Jap. Bot. 47: 111. 1972; Long in Grierson & Long, Fl. Bhutan 1(3): 549. 1987.

Herbs, creeping. **Stem**, slender flexus bristles, pubescence. **Leaves** alternate simple, cordate orbicular to reniform, apex rounded, base cordate, shallowly lobed, margin denticulated; **stipules** ovate oblong, lamina 4.5 x 8 x 2.5 x 6mm, apex serrate. **Flower** nodding. **Calyx** lobes purple, entire, rarely 3 – 5 toothed. **Corolla** deep pink.

- Flower & Fruit* : July - September
Exsiccatu : Nathang 3780 m, *SR Lepcha & AP Das* 30894, dated 30.07.2005.
Status : Less Common
Local Distribution : Rachila, Jorepokri, 2500 - 3800m.
General Distribution : E. HIMALAYA; INDIA, BHUTAN.
Note : Endemic to Eastern Himalaya.

Rubus reticulatus Wall. ex Hook.f. in Fl. Brit. India. 2: 331. 1879; Long in Grierson & Long Fl. Bhutan 1 (3); 554. 1987; Hara & Ohashi in F.E.Him. 1:131.1966

Shrubs scandent upto 1.2 cm tall. **Leaves** simple; petiole 3.5 – 8 cm, gray, soft hairs, stipules pectinately lobed; **lamina** ovate to suborbicular, 10 – 15 x 9 – 15 cm, palmately 5-veined, lateral veins 5 – 7 pairs, abaxially densely hairs along veins, cordate, margin distinctly 5-lobed, lobes apically acute or ± obtuse, unevenly densely serrate. **Flower** terminal, axillary; **bracts** elliptic, margin entire, tomentose, soft hairy. **Calyx**, broadly ovate, margin entire, apex acuminate. **Corolla** white or yellowish white, obovate to suborbicular. **Stamens** many, glabrous; filaments linear. **Fruits** red, globose.

- Flower* : July – August *Fruit:* September – October
Exsiccatae : Panglakha 2300m, *SR Lepcha & AP. Das* 23716, dated. 27.11.2003;
Tungya 2190 m, *SR Lepcha & AP. Das* 30234, dated 06.10.2004.
Status : Less Common
Local Distribution : Rachela, Panglakha, Tungya 2200 – 3800 m
General Distribution : HIMALAYA; INDIA, (Kumaon - Sikkim)
Note : Endemic to Eastern Himalaya

Rubus rugosus Smith in Rees, Cyclop. 30: Rubus n. 34. 1819; Hara & Ohashi in Fl. E. Him. 3: 53. 1975; Hara *et al.*, Enum. Fl. PL. Nepal 2: 146. 1979; Long in Grierson & Long, Fl. Bhutan 1(3): 554. 1987. *Rubus rugosa* Buch.-Ham. ex D. Don., Prodr. Fl. Nep. 234. 1825. *Rubus hamiltonianus* Seringe in DC., Prodr. 2: 566. 1825, p.p. *Rubus molucanus auct. non L.*: Hook. f. in Fl. Brit. India 2: 330. 1879, p.p.

Shrubs, large scrambling, stems with brownish pubescent, with recurved prickles, eglandular. **Leaves** alternate smaller; **lamina** 7 - 11 X 5-11 cm, lobes rounded or sub-acute, margins crenate-serrate; **Stipules** smaller, early caduceous **Flower** clusters dense; pedicels short. **Calyx** lobes upto 10mm, entire or minutely toothed at apex.

Flower : June – November
Exsiccata: : Bara Ramitey 2500m, **SR Lepcha & AP. Das 31012**, dated 02.10.2004; Rachela below 2750 m, **SR Lepcha & AP. Das 31079**, dated 08.10.2004.
Status : Less Common
Local Distribution : Rachela, Panglakha, Subaney, Bara Ramitey 1400 – 2900 m.
General Distribution : C. & E. HIMALAYAS, Assam, Meghalaya, W. Ghats, Nilgiris, MYANMAR, MALAYSIA.

Rubus sikkimensis Hook.f. in Fl. Brit. India. 2: 336. 1878; Long in Grierson & Long .Fl. Bhutan 1(3): 558. 1987.

Shrubs upto 2 m tall. **Stem** densely covered with slender straight prickles and gland tipped bristle. **Leaves** alternate, 3 foliate, leaflets white, pubescent, white tomentose at lower surface, glandular upper surface. **Flower** solitary or paired. **Calyx** cup glandular – prickly, lobes ovate, usually pubescent, caudate acuminate. **Corolla** red, pink.

Flower : July
Exsiccatus : Chitray 2690 m, **SR Lepcha & AP. Das 31139**, dated 03.10.2004.
Status : Less Common
Local Distribution : Rachela, Jorepokri, Chitray 3000 – 3650 m.
General Distribution : E. HIMALAYA; INDIA(Sikkim), BHUTAN.
Note : Endemic to Eastern Himalaya

Rubus treutleri Hook.f. in Fl. Brit. India 2: 331. 1879; Hara & Ohashi in Fl. E. Him. 3: 53. 1975; Long in Grierson & Long, Fl. Bhutan 1 (3): 554. 1987.

Local Name: Thalumboo

Shrubs, scrambling or climbing. Stem, branchlets, with bristles and prickles. **Leaves**; petiole to 6cm, covered with soft hairs. sub orbicular, lamina 5 – 13 x 4 – 12 cm, base cordate, lobed broadly avute, serrate, pubescent above; **Flowers** in racemes, **Calyx** lobe ovate, to 14 mm, 3 -5 toothed at apex, tomentose with bristle and prickles. **Corolla** to 11 mm, pink. **Fruits** many drupelets.

Flower & Fruit : June – August
Exsiccatus : Panglakha 2850 m, **SR Lepcha & AP. Das 03017**, Dated. 18.09.2005
Status : Less Common
Local Distribution : Rachela, Jorepokri, 2500 – 3700 m.
General Distribution : E. HIMALAYA; INDIA (Sikkim), NEPAL, BHUTAN. W. CHINA
Note : Endemic to Eastern Himalaya

Rubus thomsonii Focke, Abh. Nat. Ver. Bremen 4: 198. 1874; Hook.f., in Fl. Brit. India 2: 332. 1878; Hara *et. al.*, Fl. E. Him. 132. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 147. 1979; Long in Grierson & Long Fl. Bhutan (3): 556. 1987.

Shrubs small, scrambling. **Stem** with slender prickles 0.2 - 0.3 cm. **Stipules** segments linear; petioles 1.2 - 3 cm; petiolules very short; leaflets 3; **lamina** 3.5 - 9 x 1.6 - 3 cm, ovate, terminal one much bigger, serrate-doubly serrate, acute to acuminate, base narrow cuneate, sparsely pubescent above, glabrous and glassy beneath. **Calyx** lobes lanceolate, entire, eglandular. **Corolla** red. **Fruit** drupelets, pubescent.

Flower : August *Fruiting*: October
Exsiccatus : Panglakha 2300m, **SR Lepcha & AP. Das** 25900 dated 09.07.2010
Status : Less Common
Local Distribution : Rachel, Jorepokri, Panglakha 2200 - 3050 m.
General Distribution : E. HIMALAYA; INDIA (Sikkim), NEPAL, BHUTAN.
Note : Endemic to Eastern Himalaya

Rubus wardii Merr. in Brittonia 4: 84. 1941; Hara in Journ. Jap. Bot.47: 142. 1972; Hara & Ohashi in Fl. E. Him. India 3: 53. 1972; Long in Grierson & Long, Fl. Bhutan 1(3): 559. 1987.

Shrubs, trailing or scrambling. **Stem**, with scattered prickles. **Leaves**; pinnate 3 foliate, leaflets terminal rhombic obovate, to 11 x 4 - 8 cm, apex caudate acuminate, base rounded; margin lobed, glandular or pubescent on both surface; stipule ovate, lanceolate, hairy. **Flowers** solitary, axillary; pedicels to 7cm. **Calyx** to 2 cm in diam. prickly, lobe ovate caudate or lanceolate, pubescent or glandular. **Corolla** white, orbicular to 13 mm. **Fruits** globose, red, numerous drupelets.

Flower & Fruit : May - July
Exsiccatus : Neora Pathak 2720m, **SR Lepcha & AP, Das** 2900, dated 13.10.2007
Status : Less Common
Local Distribution : Rachel, Jorepokri, Singhaney 2400 - 3100 m.
General Distribution : E. HIMALAYA (Darjeeling-Sikkim), S.E. TIBET, N. MYANMAR, W. CHINA.

Sibbaldia Linnaeus

Key to the species:

1. Leaflets oblong - obovate; flower in 5-merous, 3-10+ sub-umbellate *S. cuneata*
+ Leaflets obovate - cuneate; flower solitary or in pairs *S. perpusilla*

Sibbaldia cuneata Hornem. ex Kuntze in Linnaea 20: 59. 1847; Hara & Ohashi in Fl. E. Him. 132. 1966; Hara *et. al.* Enum. Fl. Pl. Nepal 2: 147. 1979. *Sibbaldia parviflora* Edgew. in Trans. Linn. Soc. 20: 44. 1846; Grierson & Long, Fl. Bhutan 1(3): 575. 1987. *Potentilla sibbaldi* Hook.f. in Fl. Brit. India 2: 345. 1879.

Herbs perennial upto 12cm tall. Branches usually covered by leaf remains. **Leaves** 3-foliate; **leaflets** usually oblong-obovate, 1 - 2.5 x 0.5 - 2 cm, apex truncately 3 fid, base cuneate or rounded, sparsely pilose beneath; **stipules** linear-lanceolate. **Flowers** normally in 5-merous, 3-10+ sub-umbellate, peduncles, usually lengthening in fruit. **Calyx** lobes ovate, epi-calyx segment linear-lanceolate. **Petals** yellow, narrowly obovate. **Stamens** usually 5, rarely 10. **Achenes** ovoid, glabrous.

Flower & Fruit : May – October
Exsiccatae : Kupup 4120 m, *SR Lepcha & AP. Das* 31444, dated 27.07.2005;
 Dokala 3950 m, *SR Lepcha & AP. Das* 32956, 15.08.2005.
Status : Less Common
Local Distribution : Dokala, Kupup, 3300 – 4500 m.
General Distribution : C. ASIA; RUSSIA, AFGHANISTAN, PAKISTAN, INDIA, NEPAL,
 BHUTAN, CHINA

Sibbaldia perpusilloides (W.W. Sm.) Hand.-Mazz., Symb. Sin. 7: 520. 1933; Grierson & Long, Fl. Bhutan 1(3): 576. 1987. *Potentilla perpusilloides* W.W. Sm., Rec. Bot. Surv. Ind. 4: 188. 1911.

Herbs robust slender with many persistent dead leaves. Stem to 6cm. **Leaves** 3-foliolate; petiole to 5mm; **leaflets** obovate – cuneate to 8mm, fid at apex, densely silky pubescent; lamina 1 - 2.5 x 0.5 - 2cm, apex truncately 3 fid, late. **Flower** solitary or in pairs or sessile, unisexual, 4 merous. limb to 5mm in diam. **Calyx** pale yellow,. **Stamens** 4. **Achenes** 3 – 4

Flower & Fruit : May – October
Exsiccatus : Dokala 3970 m, *SR Lepcha & AP. Das* 30908, dated 24.07.2005.
Status : Less Common
Local Distribution : Kupup, Bhimbase, Dokala 4000 - 4800m.
General Distribution : E. HIMALAYA; INDIA Sikkim, E. NEPAL, BHUTAN and W.
 CHINA .

Sorbus Linnaeus

Key to the species:

- | | |
|---|-----------------------|
| 1. Leaflets oblong | 2 |
| + Leaflets oblong-elliptic, elliptic-obovate | 3 |
| 2. Stipules ovate or suborbicular | <i>S. arachnoidea</i> |
| + Stipules ovate or lanceolate | <i>S. foliolosa</i> |
| 3. TreeS more-than 5 m tall | 4 |
| + Shrub or small tree less than 5 m tall | <i>S. microphylla</i> |
| 4. Leaf lateral veins 6-11 pairs; margins crenate-serrate | <i>S. cuspidata</i> |
| + Leaf lateral veins 10 -15 pairs; margins serrulate | <i>S. griffithii</i> |

Surbus arachnoidea Kochner, Feddes Repert. 10: 514 9 .1912. Long in Grierson & Long. Fl. Bhutan 1(3): 597. 1987.

Tree up to 10 m tall. **Leaves** pinnate 13-18cm; rachis winged, glabrous; leaflets 7 – 9 pairs, pale green beneath, oblong, apex acute, mucronate, base obliquely cuneate, margin serrate in above, sessile, brownish pubescent, on veins lower surface; stipules leafy persistent, ovate or suborbicular, entire or serrate, glabrous. **Flowers** in large corymbs, to 8cm in diam., numerous flowers; pedicel brown tomentose. **Calyx** lobe triangular, to 3-mm. **Corolla** white or pink, ovate, to 3 mm. **Stamens** pinkish. **Styles** 5 free, **Fruits** globose, pink.

Flower : May – July
Exsiccatus : Kupup – Bhimbase 4230 m, *SR Lepcha & AP. Das* 30979, dated
 27.07.2005
Status : Common

Local Distribution : Kupup, Bhimbase, Lampokhri, 3000 – 4300 m.
General Distribution : EASTERN HIMALAYA; INDIA, BHUTAN
Note : Endemic to Eastern Himalaya.

Sorbus cuspidata (Spach) Hedlund in Kong. Svenska vet-Akad. Handl. 35. 89. 1901; Hara & Ohashi in Fl. E. Him. 133:1966; 2: 60. 1971; Hara *et. al.*, Enum, Fl. Pl. Nepal 2: 147. 1979; Long in Grierson & Long, Fl. Bhutan 1(3): 595. 1979. *Crataegus cuspidata* Spach. Hist. Nat. Veg. 2: 106. 1834. *Pyrus crenata* auct. non D. Don. Lindl. in B. Reg. 20: t. 1655. 1835. *Sorbus crenata* C. Koch. Dendr. 1: 196. 1869.

Trees deciduous upto 12 m tall. **Leaflets** elliptic, occasionally obovate, never doubly, crenate-serrate, **lateral veins** 6-11 pairs. Flower cymes corymbose. Corolla woolly within; fragrant; pedicel white tomentose. **Calyx** tube funnel shaped, tomentose, lobes lanceolate. **Fruits** orange or yellow, globose.

Flower & Fruit : April – May
Exsiccatu : Changu – Kupup 3550 m, *SR Lepcha & AP. Das* 2786, dated 13.08.2005
Status : Less Common
Local Distribution : Changu, Kyongnosla 2500 - 3200 m.
General Distribution : HIMALAYAS, INDIA (Gharwal – Sikkim) NEPAL, BHUTAN.
Note : Endemic to Eastern Himalaya

Sorbus foliolosa (Wall.) Spach. Hist. Nat. Veg. 2: 96. 1834; Hara & Ohashi in Fl. E. Him. 133: 1966; 2: 61. 1971; Hara *et. al.*, Enum, Fl. Pl. Nepal 2: 148. 1979; Long in Grierson & Long, Fl. Bhutan 2(3): 138. 1979. *Pyrus foliolosa* Wall., Pl. As. Rar. 2: 81, t. 189. 1831, p.p. Hook. f. in Fl. Brit. India 2: 376. 1879. p. p. *S. himalaica* Gabelian in B. Zhurn. s.s.s. R. 56: 658. t. 1-2. 1971.

Trees 5 - 10cm tall. **Leaves** brown on branch-let usually stout; stipules upper leaves ovate or lanceolate; petioles and rachises narrowly winged; **leaflets** oblong, proportionately longer and narrower, 23 - 42 x 5 – 12mm, mucronate or shortly acuminate; stipules of upper leaves ovate or lanceolate, bifid or sharply serrate into cuspidate teeth; petioles and rachises narrowly winged. **Corolla** white or creamy, rarely pinkish. **Fruit** upto 7 mm, white or flushed with pink.

Flower & Fruit : May – June
Exsiccatae : Changu 3960 m, *SR Lepcha & AP. Das* 152, dated 10.09.2003; Padamchen – Pangalakha 2800 m, *SR Lepcha & AP. Das* 20237, dated 28.10.2004; RamiteyDara 2700 m, *SR Lepcha & AP. Das* 31182, dated 05.10.2004.
Status : Less Common
Local Distribution : Changu, Padamchen, Ramitey Dara 2500 – 4000 m.
General Distribution : E. HIMALAYAS; INDIA((Sikkim), NEPAL, BHUTAN
Note : Endemic to Eastern Himalaya

Sorbus griffithii Rehder in Sargent, Pl. Wilson. 2: 277. 1915; Long in Grierson & Long. Fl. Bhutan 1(3): 595. 1987. *Pyrus griffithii* (Decaisne) Hook. f. in Fl. Brit. India 2: 377. 1879.

Trees to 15 m tall. **Leaflets** obovate elliptic, oblong elliptic, 12 - 20 x 6 - 10mm, base cuneate, margins regularly serrulate ; white tomentose beneath, prominent on veins, glabrous above, lateral veins 10 -15 pairs; petiole densely white tomentose. **Flowers** in corymbs, woolly, **Calyx** tubes white tomentose, woolly outside. **Corolla** white, obovate. Style 2. **Fruits** globose, upto 2 seeded.

Flower : April. – May.
Exsiccatus : Zeluk 3200 m, **SR Lepcha & AP. Das 31982**, dated 10.10.2004.
Status : Not common
Local Distribution : Zeluk, Nathang, Changu, 3500 – 2700 m.
General Distribution : EAST HIMALAYA; INDIA, BHUTAN. \

Note : Endemic to Eastern Himalaya
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Sorbus microphylla Wenzling in *Linnaea* 38: 76. 1873; Hara & Ohashi in *Fl. E. Him.* 133: 1966; 2: 61. 1971; 3: 53. 1975; Hara *et. al.* *Enum. Fl. Brit. India* 2: 148. 1979; Long in *Grierson & Long, Fl. Bhutan* 1(3): 597. 1987. *Pyrus microphylla* Wall. [Cat. 20, n. 676. 1828, *nom. nud.*] ex Hook. f., in *Fl. Brit. India* 2: 376. 1879.

Shrub or small tree to 3 – 4 m tall. **Leaves** brown on short lateral shoots, pinnate, rachis winged and usually glandular; **leaflets** usually 9-12 pairs, oblong elliptic, 12 - 20 x 6 - 10mm, acute or mucronate, base obliquely rounded, sessile, margins sharply serrate almost to base; pubescent or glabrous of white to pale brown on surfaces; stipules subulate, lanceolate or bifid. **Flowers** in corymbs upto 8 cm across, 15 - 50 flowered; pedicels brownish pubescent. **Calyx** lobes broadly triangular. **Petals** rose pink or white tinged pink. **Stamens** pinkish. **Style** 5. **Fruits** globose, white, or pink.

Flower : April. – May.
Exsiccatae : Changu 3890 m, **SR Lepcha & AP. Das 021**, dated 10.09.2003; Dokala 3960 m, **SR Lepcha & AP. Das 30976**, dated 27.07.2005.
Status : Common
Local Distribution : Changu, Dokala, 3000 – 4500 m.
General Distribution : E.HIMALAYAS; INDIA (Sikkim), and W. CHINA

Spiraea Linnaeus

Key to the species:

1. Leaves base cuneate, margin coarsely double serrate *S. micrantha*
 + Leaves base attenuate or sub-sessile, margin entire or rarely teeth near apex .. *S. canescens*

Spiraea canescens D. Don, *Prodr. Fl. Nep.* 227. 1825; Hook.f.in *Fl. Brit. India* 2: 325. 1879; Grierson in *Grierson & Long, Fl. Bhutan* 1(3): 535. 1987. *Spiraea cuneifolia* Wall. ex Cambess., in *Jacquem., Voy. 4 (Bot.): 47, t. 57.* 1835.

Shrubs upto 5 m, branched, twigs ribbed **Leaves** elliptic – oblanceolate, 0.6 – 5 x 0.3 - 0.6cm obtuse or sub acute, base attenuate, sub-sessile, margin entire or rarely teeth near apex, glabrous in upper surface, pubescent beneath. **Flowers** in corymbs to 3 cm. **Calyx** to 6mm, pubescent lobes c 1.5mm. **Corolla** obovate, 2 - 2.5 x 4 mm, white or pink. **Follicles** pubescent, immersed in **calyx** cup.

Flower & Fruit : May – June
Exsiccatus : Kyongnosla 3600m, **SR Lepcha & AP. Das 112**, dated 17.08.2005.
Status : Less Common
Local Distribution : Changu, Kyongnosla, Zeluk, 2600 – 3600 m.
General Distribution : INDIA, NEPAL, BHUTAN., TIBET.
Note : Endemic to Eastern Himalaya

Spiraea micrantha Hooker f. in *Fl. Brit. India* 2: 325. 1879; Hara & Ohashi in *Fl. E. Him.* 134: 1966; Hara *et al.*, *Enum. Fl. PL. Nepal* 2: 149. 1979; Grierson in *Grierson & Long, Fl. Bhutan* 1 (3): 534. 1987. *S. japonica* var *himalaica* Kitamura in *Act. Phytotax, Geobot.* 15: 160. 1954.

Shrubs rhizomatous, stems, simple, sparsely fine pubescent. Leaves ovate-lanceolate lamina 3-13 x 1.5 - 6 cm, gradually acuminate, base usually cuneate, margin usually coarsely double serrated. **Flowers** in terminal corymbs **Dioceous**; flowers in terminal corymbs; panicle usually 6-18 cm broad. **Corolla** white or pink; follicles pubescent, immersed or from calyx cup few seeded.

Flower & Fruit : May - June
Exsiccatus : Changu 4100 m, *SR Lepcha & AP. Das* 240, dated 17.98.2005.
Status : Less Common
Local Distribution : Kyongnosla, Changu, 2200 - 3800 m.
General Distribution : E. HIMALAYA (NEPAL - BHUTAN) INDIA (Khasia and Manipur).
Note : Endemic to Eastern Himalaya

Order: Fabales

MIMOSACEAE R. Brown

Key to the Genera:

1. Straggling undershrubs, very sensitive; fruits jointed *Mimosa*
+ Erect trees; not sensitive; fruits not jointed *Albizia*

Albizia Duraz

Albizia lebbeck (L.) Benth. in Hooker, Lond. Jour. Bot. 3: 87. 1844; Baker in Hook.f., Fl. Brit. India 2: 298. 1879; Hara in Fl. E. Him. 136. 1966; 2: 61. 1971; Ohashi in Hara *et al.*, Enum. Fl. Pl. Nepal 2: 104. 1979; Clement in Grierson & Long, Fl. Bhutan 1(3): 644. 1987. *Mimosa lebbeck* L., Sp. Pl. 516. 1753.

Local Name: Sundyong kung (Lep.), *Siris* (Nep.).

Trees 20- 30m tall, deciduous. **Leaves** ; Leaf rachis glandular at the base and apex, glands few, oval; pinnae 2 - 4 pairs, leaflets upto 16 pairs; leaves lamina 3 - 4. 8 x 1.5 - 3.7 cm, oblong to ovate, asymmetric, glabrous to thinly pubescent beneath, pale-green. **Flowers** in solitary axillary with many flowered, or many in lines forming terminal raceme. **Calyx** 0.22 - 0.4 cm, pubescent. **Corolla** 0.5 - 0.75cm, segmented to middle; **stamens** greenish-white. **Pods** 12 - 25 x 3.5 - 4.8 cm; **seeds** upto 15, suborbicular.

Flower & Fruit : April - December.
Exsiccatus : Mulkharka 1400 -1600 m, *SR Lepcha & AP. Das* 01400, dated 20.13.2004.
Status : Frequent
Local Distribution : Mulkharka, Phusrey below, 600 - 1400 m.
General Distribution : TROP. HIMALAYAS; INDIA, SRI LANKA, S.E. ASIA, CHINA.
Notes : Used for fuel-wood, timber and planted for shades.

Mimosa Linnaeus

Mimosa pudica L., Sp. Pl. 1, 518 1753; Ohashi in Hara Fl. E. Him. 1: 159. 1966. Clement in Grierson & Long, Fl. Bhutan 1(3): 639. 1987.

Local Name: Nyom-uuk muuk (Lep.), *Bhuwari Jhar* (Nep.).

Herbs or undreshrubs straggling and sensitive due to turgor pressure. **Branches** covered with bristles. Stem prickly. **Stipules** linear-lanceolate, margin bristly; **leaves** sensitive deflated on touching, pinnae 4, digitate, to 7.5 cm long; **leaflets** 11-19 pairs, to 1.5 cm long, narrowly oblong acute, adpressed bristly beneath; peduncles covered with spreading bristle. **Flower** heads axillary, to 1.5 cm across. **Flowers** pink or white; **stamens** 4, exerted. **Pods** to 3 cm long, prickly along the sutures, joints usually 3-5.

Flower & Fruit : July – October

Exsiccatus : Mulkharka – Haticherey 1500 m, *SR Lepcha & AP. Das 01500*, dated 20.03.2004.

Status : Common

Local Distribution : Mulkharka, 600 – 1300 m.

General Distribution : Native of Tropical AMERICA, but now Pnatropic .

FABACEAE Lindley (*nom. alt.*)

PAPILIONACEAE Giseke (*nom. alt.*)

Key to the Genera:

1. Leaves 3- foliate 2
+ Leaves bipinnate or odd pinnate *Astragalus*
2. Annual or perennial herbs 4
+ Shrub or trees with stem and branchlet armed..... *Erythrina*
4. Pod 1 or few seeded *Trifolium*
+ Pod 8 - 20 seeded *Parochetus*

Astragalus Linnaeus

Astragalus donianus DC., Prodr.2: 283. 1825; Baker in Hook.f., Fl. Brit. India 2: 119. 1876; Charter in Enum. Fl. Pl. Nepal 2: 106. 1979; Grierson & Long in Fl. Bhutan 1(3): 719. 1987. *A. pycnorhizus* Wall. ex Benth. in Royle, Ill. Bot. Him. 199. 1835; Hara in Fl. E. Him. 160. 1966.

Herbs prostrate or ascending, glabrous upto 20 cm tall. **Leaves** to 4cm; leaflets 8 - 15, obovate oblong, 2.2 - 3.5 x 2 - 3mm , emarginated, base rounded, pubescent beneath, stipules oavt. **Flowers** 1 -2 on peduncles. **Calyx** divided into middle into ovate – acuminate teeth. **Corolla** brownish purple, suborbicular. **Ovary** pubescent. **Pods** oblong, inflated, subsessile, acuminate at apex into fine sting 12- 15 seeded.

Flower : June

Fruit: August

Exsiccatus : Changu 3800 m, *SR Lepcha & AP. Das 2779*, dated 15.09.2006.

Status : Rare

Local Distribution : Changu, above Panglakha 2130 – 4400 m.
General Distribution : E. HIMALAYA; INDIA, (NEPAL, Sikkim).
Note : Endemic to Eastern Himalaya

Erythrina Linnaeus

Erythrina arborescens Roxb., Fl. India ed. 3:256. 1832; Baker in Hook.f., Fl. Brit. India 2: 190. 1876; Hara in Fl. E. Him. 1: 156. 1966; 3: 63. 1975; Hara & Ohashi in Enum. Fl. Pl. Nepal 2: 120. 1979; Grierson & Long, Fl. Bhutan (3): 684. 1987.

Local name: Jasey Kung (Lep.), Phaledo (Nep.).

Trees deciduous to 23 m tall, spiny in stem and branches. **Leaves** pinnately 3-foliolate; petioles, often spiny; leaflets **lamina** 7 - 18 x 5 - 19 cm, broadly ovate, acute to shortly acuminate, base slightly cordate or rounded, pubescent in lower surface. **Stipules** usually, lanceolate. **Flowers** in axillary racemes to 35 cm long. Peduncles to 30 cm. **Calyx** to 1.3 cm, campanulate, slightly truncate, hairy; ovate-elliptic, orange-scarlet; wings oblong; keel upto 2.3 cm, white. **Pods** oblong-ellipsoid, slightly narrowed towards end; seeds few to 5, blackish.

Flower : September *Fruit*: October - January
Exsiccatus : Mulkharka 1350 m, **SR Lepcha & AP. Das** 2781, dated 20.10.2004
Status : Frequent.
Local Distribution : Premlakha, Padamchen, 1200 – 2460 m.
General Distribution HIMALAYAS; INDIA, (Kumaon-BHUTAN), MYANMAR, CHINA.
Note : Planted near fields for fencing.

Parochetus Hamilton

Parochetus communis Buch.-Ham. ex D. Don, Prodr. Fl. Nep. 240. 1825; Baker in Fl. Bri. India 2: 86. 1876; Hara in Fl. E. Him. 1: 160. 1966; Kitamura in Enum. Fl. Pl. Nepal 2: 127. 1979; Grierson & Long Fl. Bhutan 1(3): 728. 1987.

Herbs perennial runner. Stem slender rooting from nodes. **Leaves** palmately trifoliolate; stipules to 0.5 cm, lanceolate; petioles to 8 cm, glabrous; leaflet **lamina** 0.7 – 2 x 0.7 – 2.5 cm, broadly obovate, emarginate or crenate, entire, base cuneate, glabrous above, pubescent beneath, lateral nerves 3-5 pairs. **Bracts** linear, basally connate. **Flowers** solitary, axillary, 1.3 cm long. **Calyx** campanulate, to 0.8 cm, 5-toothed, teeth unequal, bluish-purple, whitish beneath, broadly obovate, longer than wings; **stamens** (9)+1. **Pods** linear, greenish, glabrous; seeds rounded.

Flower : March. - September. *Fruit*: July- November.
Exsiccatae : Singhaney 2450 m, **SR Lepcha & AP Das** 27769, dated 30.09.2004;
Dohrok above 2350 m, **SR Lepcha & AP Das** 20284, dated 13.09.2005.
Status : Abundant
Local Distribution : Singhaney, Dohrok, 1600 - 2400m.
General Distribution : SUBTROPICAL TO ALPINE HIMALAYAN RANGES; INDIA (Sikkim), NILGIRI, SRI LANKA, MYANMAR, JAVA, ETC.

Trifolium Linnaeus

T. repens L., Sp. Pl. 718. 1753; Baker in Fl. Brit. India 2: 86.1879; Grierson & Long Fl. Bhutan 1(3): 731. 1987

Herbs annual or perennial to 80cm tall. **Stem** appressed, pubescent, prostrate. **Leaves** pinnately or digitally 3 foliate; petioles to 181cm long; **leaflets** elliptic or obovate, lamina 2 – 4 x 1 – 2 cm., obtuse or acute, base cuneate, margin denticulate, glabrous above. **Flowers** heads sessile, among upper leaves. **Calyx** tube to 4mm, teeth triangular or lanceolate, lowest one longest. **Corolla** to 2cm, narrow purplish pink. **Pod** to 4mm, 1 seeded.

Flower : May – August
Exsiccatus : Rachela 2700 m, *SR Lepcha & AP Das*, 2780, dated 15.10.2006
Status : Not common
Local Distribution : upto 2700 m.
General Distribution : Native to N AFRICA, SW ASIA, and EUROPE, CHINA.

CAESALPINIACEAE R. Brown

Bauhinia L.

Bauhinia vahlii Wight et Arnt., Prodr. 297. 1834; Baker in Fl. Brit. India 2:279. 1878; Hara in Fl. E.Him. 1:141. 1966; 3:57. 1957. 1975; Hara & Ohashi Enum. Fl. Pl. Nepal 2: 108. 1979; Grierson & Long Fl. Bhutan 1(3):634. 1987.

Local Name: Bharla (Nep.).

Liana, brown pubescent young shoot; tendrils circinate, in opposite pairs. **Petioles** to 2.5 cm long; **lamina** 10 - 17 x 16 - 24 cm, suborbicular, entire, lobed at apex, lobes rounded or obtuse, base cordate, pubescent, basally 10-13 nerved. **Flowers** in corymbose terminal, many-flowered. **Bracteoles** acuminate. Peduncles long to 13 cm, terate. **Calyx** 2 lobed, slender, pubescent. **Corolla** obovate, whitish, with distinct midvein, pubescent outside; fertile stamens 2 or 3; **anthers** red; ovary shortly stalked; style coiled. **Pods** to 28 cm long, oblong, brownish; seeds upto 12, oblong, brown.

Flower : April - July *Fruit*: November - January
Exsiccatus : Mulkharka below 1250 m, *SR Lepcha & AP. Das* 2782, dated 20.10.2004.
Status : Common.
Local Distribution : Mulkharka, Lingtam above 700 – 2100 m.
General Distribution : HIMALAYA; INDIA (Assam, Bihar, W. Peninsula), (Kumaon-BHUTAN)

Order: Proteales

ELAEAGNACEAE A. Jussieu

Key to the Genera:

1. Plant monoecious bearing silvery, yellow, brown scales; fruit drupelike *Elaeagnus*
+ Plant dioecious without scales; Fruit globose or elliptic berry *Hippophae*

Elaeagnus Linnaeus

Elaeagnus conferta Roxb., Fl. Ind. ed. Carey. 1:460. 1820; Hara in Fl.E.Him.1: 216. 1966; Clement in Grierson & Long, Fl. Bhutan 2(1): 214. 1991. *E. arborea* Roxb., Fl. Ind. ed. Carey 1: 461.1820; *E. latifolia sensu* Fl. Brit. India 5: 202. 1890, p.p. non L.

Local Name: Mallero (Nep.).

Shrubs straggling. Branches often thorny. **Leaves** simple, alternate.; petiole to 1.2 cm long; elliptic-lanceolate, lamina 7 - 13 x 2 - 4 cm, entire to slightly repund, shortly acuminate, base narrow and rounded, glabrous, light brown above, silvery white in lowers surface with scattered scales, uncostate, nerves prominent, impressed in upper surface; pedicels upto 0.7 cm long. **Inflorescence** in axillary clusters of 2 - 5. **Tepals** tube constricted above the ovary, lobes ovate and spreading; **stamens** 4, inserted within tepal throat; **filaments** short; style inserted, hairy. **Drupes** ellipsoid.

Flower & Fruit : February - April.

Exsiccatus : Phusrey 2190 - 2280 m, *SR Lepcha & AP. Das 1005*, dated 15.09. 2006

Status : Rare.

Local Distribution : Hangey, Rigu, Premlakha 1800 - 2600 m.

General Distribution : SUBTROPICAL AND TEMPERATE HIMALAYAS; INDIA, CHINA, NEPAL, MYANMAR, MALAYSIA.

Note : Use in making pickles.

Hippophae Linnaeus

Hippophae rhamnoides L., Sp. Pl. 1023. 1753; Clement in Grierson & Long, Fl. Bhutan 2(1): 216. 1991.

Shrubs, deciduous, upto 3 m tall. **Leaves** linear oblong, slightly narrower lamina, 2.5 - 5.5 x 0.2 - 0.6 cm, margin revolute, lower surface whitish including midrib. **Flowers** grouped at base of lateral shoot. **Male flowers** to 4 mm, anther to 3 mm. **Female flowers** to 2.2 mm. **Fruits** elliptic, 7 x 5 mm.

Flower & Fruit : February - April.

Exsiccatus : Nathula 4500 m, **FIDE, SMITH, W.W.** (1913). The Alpine and Sub-alpine vegetation of South-Eastern Sikkim. Rec.Bot. Surv. India 4(7): 323-431.

Status : Rare.

Local Distribution : Nathula 1800 - 2600m.

General Distribution : INDIA (Sikkim, Kashmir).

Order: Myrtales

SONNERATIACEAE Engler et E.F. Gilg

Duabanga Buchanon-Hamilton

Duabanga grandiflora (Roxburgh ex DC.) Walpers, Repert. 2: 114. 1843; JAA 48: 96. 1967; Long & Rae in Grierson & Long, Fl. Bhutan 2(1): 287. 1991. *Lagerstoemia grandiflora* Roxb. ex DC., Mem. Soc. Hist. Nat. Geneve 32:84. 1826. *Duabanga sonneratioides* Buch.-Ham. in Trans. Lin. Soc. 17: 177-178. 1835; C.B. Clarke in Fl. Brit. India 2: 579. 1879.

Local Name: Lampatey (Nep.).

Trees robust, upto 28 m tall. Branches drooping. **Leaves:** petioles to 0.53 cm; **lamina** ovate-oblong, 13 - 33 x 5.5 - 13 cm, acuminate, base cordate, dark green above, pale beneath, veins conspicuous beneath and parallel. **Inflorescence** terminal corymbs and drooping, with 4 - 22 flowered; pedicels to 2.5 cm, stout. **Flowers** actinomorphic, bisexual, with pungent odour. **Calyx-cup** 2 - 3 cm across; funnel-shaped, tubular base adnate to ovary-base, lobes triangular, greenish. **Corollas** free, obovate, **stamens** numerous, inserted on calyx tubes; anthers versatile; ovary superior; style to 8cm; stigma capitate; ovules many and axile. **Capsules** subglobose, 6 - 8 valved; seeds many.

Flower & Fruit : December - April

Exsiccatus : Haticherey - Lower Phusrey 1700m, **SR Lepcha & AP. Das 1507**, dated 10.10.2007.

Status : Frequent

Local Distribution : Southern boundary of PWS, upto 1700 m.

General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, CHINA, MYANMAR, MALAYSIA.

Note : Used as a timber wood.

ONAGRACEAE A.L. Jussieu

Key to the Genera :

1. Petals 2, sepals 2, stamens 2 *Circaea*
+ Petals 4, sepals 4, stamens 8 *Epilobium*

Circaea Linnaeus

Key to the species/ variety:

1. Plants minutely pubescent; leaf elliptic ; apex acute *C. alpina* ssp. *angustifolia*
+.Plants thickly pubescent; leaf ovate ; apex acuminate *C. alpina* ssp. *micrantha*

Circaea alpina ssp. *angustifolia* (Hand. -Mazz.) Boufford, Ann. Missouri Bot. Gard. 69: 910. 1983; Boufford in Grierson & Long, Fl. Bhutan 2(1): 314. 1981. *Circaea imaicola* (Ascherson & Magnus) Hand. -Mazz. var. *angustifolia* Hand. -Mazz., Symb. Sin. 7: 603. 1933.

Herbs 10 - 40cm tall. Stem thickly pubescent. **Leaves lamina** 1.5 - 5.5 × 0.8 - 3.5cm, elliptic, broadly trullate, or ovate, rarely broadly ovate, base narrowly to broadly cuneate, margin shallowly denticulate, apex acute. **Inflorescence** simple or with lateral racemes at base, glabrous or pubescent, ; pedicels glabrous or, rarely, sparsely pubescent with short glandular hairs. **Flowers** opening during or after elongation of raceme and ± widely spaced, with a setaceous bracteole at base; ovary with hairs; **hypanthium** to 0.4 mm. **Calyx** broadly to broadly ovate or oblong-ovate, apex rounded to obtuse. **Corolla** white or pink, narrowly to broadly obovate, corolla lobes rounded, truncate, or minutely crenulate. **Fruits** with purple hairs.

Flower : July. - September. *Fruit*: August - November
Exsiccatus : Panglakha 2780m, **SR Lepcha & AP. Das** 27726, 30.07.2004.
Status : Less Common.
Local Distribution : Padamchen, Nathang, Bombay hill (KAS), 2300 - 3600 m.
General Distribution : AFGHANISTAN, HIMALAYA; INDIA Khasia, CHINA, and FORMUSA.

Circaea alpina ssp. *micrantha* (A.K. Skvortsov) Boufford, Ann. Missouri Bot. Gard. 69: 959. 1983; Boufford in Grierson & Long, Fl. Bhutan 2(1): 314. 1981. *Circaea micrantha* A.K. Skvortsov, Byull. Glavn. Bot. Sada (Moscow) 103: 36. 1977.

Herbs upto 30 cm tall. Stem glabrous or minutely pubescent. **Lamina** narrowly ovate to broadly triangular, 2 - 5.5 × 0.4 - 5 cm, base cordate, less often truncate, margin sharply dentate to serrate, apex shortly acuminate. **Inflorescence** a simple raceme or with 1 or 2, rarely more, densely to sparsely pubescent with glandular hairs; flowering pedicel 1 erect, glabrous or glandular pubescent. **Flower** buds glabrous; ovary glabrous or rarely with minute uncinat hairs at anthesis; **hypanthium** reduced to absent to 0.6 mm. **Sepals** ovate to broadly ovate to oblong ovate, apex rounded. **Petals** white or pink, obtriangular to obovate, lobes truncate to rounded

Flower : June- November
Exsiccatus : Changu 4000 m, **SR Lepcha & AP. Das** 32921, dated 29.10.2004.
Status : Less common
Local distribution : Changu, KAS, Padamchen. 2000 - 4000 m.
General distribution : INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.

Epilobium Linnaeus

Key to the species:

- 1. Herbs less than 40 cm tall 2
- + Herbs more than 50 cm tall 3

- 2. Herbs erect 4
- + Herbs slender *E. clarkeanum*

- 4. Stems with scales; stigma clavate rarely capitate *E. cylindricum*
- + Stems without scales; stigma capitate *E. royleanum*

- 3. Plant annual 5
- + Plants perennial *E. roseum*

- 5. Leaf lamina ovate to elliptic oblong 6

- + Leaf lanceolate- ovate lanceolate *E. tibeticum*
 6. leaf glabrous to strigilose at margins and veins *E. sikkimensis*
 + Leaf with stiffly hairy at margins and veins *E. wallichianum*

Epilobium clarkeanum Hausskn., Monog. Epil. 220, t. 9, f. 53. 1884; Boufford in Grierson & Long, Fl. Bhutna 2(1): 321. 1991. *E. alpinum non L.*, C.B. Clarke in Hook.f., Fl. Brit. India 2: 586. 1879.

Herbs sender upto 18 cm tall. Stem with leafy with scales at base, less branched, appressed stiffly hairy. Leaves sessile or shortly petioled to 0.20cm long; **lamina** 1 - 1.5 x 0.3 - 1cm, ovate to elliptic, obscurely serrulate, obtuse to subacute, cuneate or subrounded, both surfaces almost glabrous, veins appressed stiffly hairy; pedicel to 0.3cm. **Hypanthium** tubular and hairy ring within. **Sepals** to 0.25 x 0.2 - 0.13 cm, keeled. **Petals** to 0.7 x 0.4 cm, light red or white, apical notched; **ovary** stiffly hairy; stigma subcapitate. **Capsules**; seeds obovoid, reticulate, papillose.

- Flower* : August *Fruit*: October
Exsiccatus : Rachela below 2870m, **SR Lepcha & AP. Das** 2790, dated 18.09. 2005.
Status : Rare
Local Distribution : Rachela Middle 2200 - 2900 m.
General Distribution : HIMALAYAS; INDIA (Sikkim – BHUTAN)
Note : Endemic to Himalaya

Epilobium cylindricum D. Don, Prodr. Fl. Nep. 222. 1825; Hara in Fl. E. Him. 224. 1966; Kitamura in Enum. Fl. Pl. Nepal 2: 174. 1979; Boufford in Grierson & Long, Fl. Bhutan 2(1): 317. 1991. *E. roseum* var. *cylindricum* (D. Don) C.B. Clarke in Hook.f., Fl. Brit. India 2: 585. 1879.

Herbs erect to 30 cm, much branched. Stem glabrescent or thinly appressed stiffly hairy. **Leaves** shortly petiolate; **lamina** 1- 2 x 0.3 - 0.8 cm, narrowly lanceolate, serrulate, acute, attenuate, subglabrous except nerves. **Flowers** axillary. **Sepals** to 0.5 x 0.17 cm, with appressed stiff hairs. **Petals** to 0.6 x 0.1 - 0.38 cm, rose; **ovary** appressed hairy; **stigma** clavate or capitate. **Capsules** fruiting pedicel elongated; **seeds** obovoid, papillose.

- Flower* : June *Fruit*: October
Exsiccatus : Rachela below 2400 m, **SR Lepcha & AP. Das** 2791, dated 18.09. 2005.
Status : Not common
Local Distribution : Rachela Middle 2000 - 2800 m.
General distribution : HIMALAYAS; AFGANISTAN, INDIA, NEPAL, BHUTAN, TIBET, W. CHINA.

Epilobium roseum Schreber, Spicil. Fl. Lips. 147. 1771. C.B. Clarke in Hook.f., Fl. Brit. India 2: 584.1879.

Herbs erect, perennial. Stems to 50 cm tall, simple, or branched, strigillose, with glandular hairs throughout upper stem. **Leaves** sessile or petioles to 10 mm; **lamina** of cauline leaves elliptic to oblong or lanceolate to narrowly ovate, 25 - 5.5 x 0.5 - 2 cm, subglabrous, base cuneate to

rounded or subcordate, margin denticulate with 9 - 40 teeth per side, apex acute. **Inflorescence** and flowers erect. **Sepals** to 5 mm. **Petals** pink to rose-purple; stigma clavate to subcapitate, entire. **Capsules** to 5 cm, glandular pubescent, Seeds dark brown.

Flower & Fruit : June – August
Exsiccatus : Kupup –Gnathang 4200 m, **SR Lepcha & AP. Das** 32925, dated 13.10.2004.
Status : Less Common.
Local Distribution : Changu, KAS, Padamchen. 2000 – 3900 m.
General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, SW ASIA, RUSSIA, KAZAKHSTAN, EUROPE

Epilobium royleanum Hausskn. in Oesterr. Bot. Zeitschr. 29: 55. 1879; Boufford in Grierson & Long, Fl. Bhutna 2 (1): 318. 1991. *E. roseum* var *indicum* Clarke in Fl. Brit. India 2: 584. 1879. *E. roseum* var *dalhousieanum* Clarke in Fl. Brit. India 2 :584. 1879.

Herbs erect or ascending upto 25 cm tall. Stem with scales, simple or branched above, appressed stiffly hairy, rarely subglabrous. **Leaves**; petiole to 0.40 cm, lamina slightly clasping, 1 - 3 x 0.2 - 0.70 cm, narrowly ovate to lanceolate, serrulate with 13 - 16 teeth on each side, acute, attenuate to cuneate, appressed hairy along margin beneath, lateral nerves not distinct. **Flower** erect, hypanthium elongated, hairy within. **Sepals** 4, basally connate. **Petals** 4, rose-purple; **ovary** stiffly appressed pubescent; **stigma** subcapitate. **Capsules** hairy; seeds obovoid, papillose.

Flower : August *Fruit* : November
Exsiccatus : Neora pathak 2750m, **SR Lepcha & AP. Das** 2792, 18.09.2005.
Status : Common
Local Distribution : Neora Pathak, Rachel Middle 1800 - 2800 m.
General Distribution : TEMPERATE HIMALAYAS.
Note : Endemic to Himalaya.

Epilobium sikkimense Hausskn., Oesterr. Bot. Z. 29: 52. 1879. Raven in BBMB 2(12): 372. 1962; Hara *et al.*, Fl.E.Him. 2:175.1979; Grierson & Long Fl. Bhutan 2(1): 320. 1991. *Epilobium alsinifolium* auct. Non vill.; C.B. Clarke in Hook.f., Fl. Brit. India 2: 586.1879,p.p.

Herbs annual, erect. Stems upto 60 cm tall, sometimes branched. **Leaves** sessile and slightly clasping above, lower ones rarely with very short petioles 1.5 – 3 mm; cauline blade ovate to elliptic or oblong, narrower below, **lamina** 1.8 - 8.5 x 1 - 3.5cm, glabrous except for sparsely strigillose margin and midvein, base broadly cuneate or rounded, margin serrulate with 10 - 35 teeth per side, apex subobtuse to acute. **Inflorescence** and flowers nodding to suberect. **Corolla** pink to rose-purple, 7-1

Flower : July - August. *Fruit*: August - September
Exsiccatus : Bhimbase 4350 m, **SR Lepcha & AP. Das** 31140, dated 30.10.2004.
Status : Less Common.
Local Distribution : Bhimbase, Kupup, Lampokhri. 4000 – 4600 m.
General Distribution : HIMALAYA; INDIA (Gharwal – BHUTAN) S. TIBET, N. BURMA, and W. CHINA.

Epilobium tibeticum Hausskn. in Oesterr. B. Z. 29: 54. 1879; Boufford in Grierson & Long, Fl. Bhutan 2(1): 319. 1991.

Herbs annual, erect much-branched upto 60 cm tall. **Leaves** lanceolate to narrowly oblanceolate, acute at apex, serrulate along margins. **Inflorescence** a spike. **Flowers** pink to rose purple, rarely white. **Capsule** to 6.5 mm long, cylindric. Seeds \pm 1.3 mm obovoid, reticulate, tuft of hairs dull white, prone to detach.

Flower : June *Fruit* : September
Exsiccatus : Kupup lake 4230 m, **SR Lepcha & AP. Das** 32924, dated 29.10. 2004.
Status : Less Common.
Local Distribution : Bhimbase, Kupup. 4100 – 4400 m.
General Distribution : E. HIMALAYA; INDIA (NEPAL to BHUTAN
Note : Endemic to E. Himalaya.

Epilobium wallichianum Hausskn. in Oesterr. B. Z. 29: 54. 1879; Hara in Fl. E. Him. 1: 224. 1966; Boufford in Grierson & Long, Fl. Bhutan 2(1): 320. 1991. *Epilobium tetragonum* auct. Non L.: C.B. Clarke in Fl. Brit. India 2: 586. 1879, p.p.

Herbs annual, sub-erect leafy to 65 cm tall. **Leaves** oblong elliptic, obtuse or acute at apex, subcordate to broadly cuneate at base, sparsely stiffly hairy on veins and margins. **Inflorescence** nodding. **Flowers** 4 – 13 mm long, pink to rose- purple. **Capsules** to 8mm long, cylindrical stiffly hairy and glandular ; seed obovoid, papilose.

Flower : June *Fruit* : October
Exsiccata : Kupup lake 4250 m, **SR Lepcha & AP. Das** 32923, dated 29.10. 2004.
Status : Less Common.
Local Distribution : Bhimbase, Kupup, Gnathang 4000 – 4400 m.
General Distribution : E. HIMALAYA; INDIA, (NEPAL – BHUTAN) S. TIBET, Khasia, Naga Hills, and W. CHINA.
Note : Endemic to E. Himalaya.

MELASTOMATACEAE A.L. Jussieu

Key to the Genera :

1. Herbs or shrubs with 4-angled stem 2
- + Shrubs with terete stem 3
2. Leaf with white crystalliferous cells at base of hairs *Osbeckia*
- + Leaf without crystalliferous cells at base of hairs *Sarcopyramis*
3. Petals 5, stamen 10, ovary 5-celled *Melastoma*
- + Petals 4, stamens 8, ovary 4-celled *Oxyspora*

Melastoma Linnaeus

Key to the species:

1. Shrubs upto 4 m tall; fruits subglobose *M. normale*
- + Shrubs upto 6 m tall; fruits truncate *M. malabathricum*

Melastoma malabathricum L., Sp. Pl. ed. 1(1): 390. 1753 -ut *malabathrica* C.B. Clarke in Hook.f., Fl. Brit. India 2: 523. 1879; Hara & Ohashi in Fl. E. Him. 221. 1966; Hara et al., Enum. Fl. Pl. Nepal 2: 170. 1979; Clement in Grierson & Long, Fl. Bhutan 2(1): 296. 199.

Local Name: Chulasi (Nep.).

Shrub, upto 4m tall. Juvenile plant with densely appressed hairy. **Stem** and petiole strigose and with subulate-echinate scales. **Leaf** opposite, lanceolate-elliptic lamina 6 - 13 x 2.2 - 4.5 cm, acuminate, base rounded or cuneate, 5-veined, row of white cells at the hair-base above, shortly hairy below. **Flowers** clustered at branch ends. **Calyx** usually fimbriate, tube scaly hairy, lobes 0.55 - 0.6cm, oblong. **Corolla** 2 - 4cm, obovate, mauve-purple. **Fruit** sub-globose, apically truncate.

Flower : February - July. *Fruit*: September - January.
Exsiccatus : On way to Premiakha & Panglakha, 1300m, **SR Lepcha & AP. Das** 30824, dated 30.09.2004.
Status : Common.
Local Distribution : Premiakha, Hangay, Mulkharka 600 - 1200 m.
General Distribution : INDIA, NEPAL, BHUTAN, CHINA, SRILANKA, MYANMAR, MALAYSIA, AUSTRALIA.

Melastoma normale D. Don, Prodr. 220. 1825; C.B. Clarke in Hook.f., Fl. Brit. India 2: 524. 1879. Man. Ind. Timb. 367. 1902; Clement in Grierson & Long Fl. Bhutan 2(1): 296. 1991.
Melastoma nepalensis Lodd, Bot. Cab. T. 707. 1824, Fl. Jow. 1: 202. 1981.

Shrubs 4.5 - 6 m tall. **Stems** hairy and with subulate bristles at nodes. **Petioles** 0.4 - 2.5 cm long, bristly hairy and with scales; **lamina** ovate-lanceolate, oblong-lanceolate or elliptic-lanceolate 5 - 15 x 3.8 - 6 cm, acute to shortly acuminate, base rounded, truncate, pubescent above and hairs under surface, densely villous or silky, basal nerves 3 - 7. **Flowers** 5.5 - 7 cm diam., 4 - 10 in terminal fascicles, rose-purple; **bracts** upto 1.5cm long, ovate or linear-lanceolate, caducous, hairy; **pedicels** upto 1.5cm long, bearing with serrulate scales. **Calyx** 1 - 1.5 cm long, silky, lobes slightly hairy. **Fruits** truncate, rather warty and transversely dehiscent.

Flower & Fruit : June - December.
Exsiccatus : Padamchen boundary 1800 m, **SR Lepcha & AP. Das** 332, dated 23.10.2003.
Status : Fairly Common.
Local Distribution : Aritar, Rigu, 1400 - 2200 m.
General Distribution : INDIA, NEPAL, BHUTAN, THAILAND, CHINA, JAPAN, MALAYSIA, N. AUSTRALIA.

Osbeckia Linnaeus

Key to the species:

1. Leaf veins (lateral) 5 - 7; stamens to 8 *O. stellata*
+ Leaf veins (lateral) 3; stamens to 10 *O. nepalensis*

Osbeckia nepalensis Hook., Exot. Fl. 1:t.31. 1822; C.B. Clarke in Hook.f., Fl. Brit. India 2: 521.1879; Clement in Grierson & Long, Fl. Bhutan 2 (1): 293. 1991. *O. speciosa* D. Don, Prodr. Fl. Nep. 222. 1825.

Shrubs perennial upto 2 m tall. **Stem** branched adpressed hairy. **Leaves** narrowly ovate - oblong to elliptic, lamina 3 - 13 x 3.5 - 5 cm, acute, base rounded, margin entire thinly ciliate, adpressed hairy, long strait hairs on veins; nerves 3, prominent. **Flowers** terminal paniculate, few - numerous flowered. **Calyx** to 20 mm, tube adpressed cilliate appendages; lobes 5 oblong ovate, ciliate. **Corolla** 5 broadly obovate, pink, white or moave, oftenly ciliate at apex; **Stamens** 10. **Capsule** hairy at apex.

- Flower* : July – October *Fruit*: November
Exsiccatus : Subaney Dara 1900 m, **SR Lepcha & AP. Das 01445**, dated 13.10.2007.
Status : Common.
Local Distribution : Subaney dara, upto 2000 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, THAILAND.

Osbeckia stellata Ker-Gawl. in Edgw., Bot. Reg. 8: t. 674. 1822; Hara *et al.* FL E. Him. 222. 1966; Clement in Grierson & Long, Fl. Bhutan 2(1): 293-294:1991. *O. crinita* Naud. in Ann. Sci. Nat. Bot. Ser. III, 14: 72. 1850; C.B. Clarke in Hook.f., Fl. Brit. India 2: 517. 1879 p.p.

Shrub perennial upto 160 cm tall. **Stem** predominantly branched and hairy. **Leaves** ; petioles short to 1.5cm; ovate to oblong-lanceolate, **lamina** 4.3 - 12 x 2 - 4.3 cm, acuminate, base subcordate to rounded, adpressed hairy both sides, nerves usually 5 - 7; **bracts** ovate, often suborbicular, densely hairy on the margin; pedicels upto 0.50 cm long. **Flowers** 2 - 3.5 cm across, 4-merous, or very rarely 5-merous. **Calyx**-tube with dense tufts of stellate hairs, lobes subulate. **Petals** upto 2 cm long, obovate; **stamens** 8; anthers with incurved beaks, **ovary** slightly bristly.

- Flower* : July – October *Fruit*: November - January.
Exsiccatus : On the way Premlakha to Panglakha, **SR Lepcha & AP. Das 27707**, dated 30.09.2004.
Status : Common.
Local Distribution : Premlakha, Hangey 500 - 1500 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.

Oxyspora DC.

Oxyspora paniculata (D. Don) DC., Prodr. 3: 123. 1828; Hara in Fl. E. Him. 2: 89. 1971; C.B. Clarke in Hook.f., Fl. Brit. India 2: 525. 1879; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 171. 1979; Clement in Grierson & Long, Fl. Bhutan 2(1): 297. 1984. *Arthrostemma paniculata* D. Don in Mem. Worn. Not. Hist. s. 4: 299. 1822. *Oxyspora vegans auct. non Wall.*, Hook in B. Meg. 76. E. 4553. 1850.

Shrub large upto 3m tall. **Lamina** ovate to ovate-elliptic, 10 - 25 x 5 - 12cm, usually acuminate, base rounded, rarely sub-cordate, margin obscurely dentate, upper surface minutely, tuberculate, glabrous, lower surface stellate-hairy, mainly veins, **petiole** usually with tuft of hairs at top. **Inflorescence** drooping, rachis usually terete. **Calyx** ± tubular, stellate hairy; teeth triangular. **Petals** ovate-oblong, pink. **Stamens** upto 15mm long anthers with small lump on connective near base; short anther with spur on connective; **Style** curved at apex. **Capsules** ± ellipsoid.

- Flower* : July -October *Fruit*: January - May
Exsiccatus : Phusrey Simaney, **SR Lepcha & AP Das 31001**, 02. 10.2004.
Status : Common
Local distribution : Hatichery, Rigu 500-2000 m
General distribution : INDIA (Sikkim), BHUTAN, NEPAL CAMBODIA, LAOS, MYANMAR, VIETNAM.

Sarcopyramis Wallich

Sarcopyramis nepalensis Wall., Tent. Fl. Nepal 32. t. 23. 1824; C.B. Clarke in Hook.f., Fl. Brit. India 2: 541. 1879; Hara & Ohashi in Fl. E. Him. 222: 1966; Hara *et. al.* Enum. Fl. Pl. Nepal 2: 171. 1979; Clement in Grierson & Long Fl. Bhutan 2(1): 299. 1984. *Sardopyramis lanceolata* Wall. [Cat. 213. n. 6290, 1832, *nom. nud.*] ex Bennett, pl. Jav. Rar. 214. 1844. *Sarcopyramis grandiflora* Griff. Notul. 4: 678. 1854.

Herbs, erect, upto 35 cm tall, branched. Stems quadrangular, glabrous. **Petioles** 1 - 2.4 cm, narrowly winged; blade broadly ovate to ovate lanceolate, **lamina** 4.5 - 9.5 × 2 - 4.5 cm, blade, membranous, abaxially puberulous or glabrescent, adaxially sparsely strigose and with or without white spots, secondary veins 1 or 2 on each side of midvein, base truncate to cuneate, slightly decurrent, margin serrulate, apex acuminate. **Inflorescences** terminal, cymes, 1 - 3 -flowered, with 2 bracts at base; bracts sessile, foliaceous, ovate; pedicels quadrangular. **Calyx** obpyramidal, apex of calyx lobes truncate and with a membranous disk, disk margin fimbriate. **Petals** pink, obovate, ca. 5.5mm, oblique, apex truncate. **Stamens** equal; connective decurrent. Ovary with a membranous crown. **Capsules** cup-shaped, quadrangular, membranous.

<i>Flower</i>	: August - October	<i>Fruit</i> : September - January.
<i>Exsiccatus</i>	: Jorepokhri, SR Lepcha & AP. Das 29387, dated 30.09.2004.	
<i>Status</i>	: Fair	
<i>Local Distribution</i>	: Rachela below, Padamchen, Singhaney 1000-3000m.	
<i>General Distribution</i>	: NE-INDIA (Sikkim - Assam), BHUTAN, NEPAL, MALAYA, INDONESIA MYANMAR, PHILIPINES, THAILAND. CHINA	

Order: Cornales

NYSSACEAE Dumort.

Nyssa Linnaeus

Nyssa javanica (Blume) Wang. in Pfreich. 41: 15.1909; Wasscher in FM 4: 29. 1948; Clement in Grierson & Long, Fl. Bhutan 2(1): 333. 1991. *Agathisanthes javanica* Bl., Bijdr. 645. 1825. *Nyssa sessiliflora* Hook. f. & Thoms., Gen. Pl. 1: 952. 1967; C.B. Clarke in Hook.f., Fl. British India 2: 747. 1879.

Local Name: *Lho Sumbrang kung* (Lep), *Lekh Chilaunay* (Nep.).

Tree robust upto 25 m tall. **Leaves** alternate, simple; petioles 1 - 2.7 cm long; **lamina** 4 - 13 × 4 - 8 cm, oblong-elliptic, margin entire or denticulate, acute to shortly acuminate, base cuneate or rounded, sparsely hairy, pinnately veined. **Flower heads** 1-1.5 cm diam., sub-globose, capitate. Peduncles upto 2.5cm long. Male and female flowers alike in shape, axillary. **Calyx** about 0.2.5 cm, appressed hairy, 4 - 5 lobed; **Corolla** usually 5, 0.2 × 0.13 cm, almost oblong; stamens 10; style simple, often bifid; ovary unilocular; ovule solitary and pendulous. **Fruit** obovoid.

<i>Flower & Fruit</i>	: May - August.
<i>Exsiccatus</i>	: Lower Phusrey 1950 m, SR Lepcha & AP. Das 0302, dated 7.10.2004.
<i>Status</i>	: Less Frequent.
<i>Local Distribution</i>	: Mulkharka, Phusrey. 1400 - 2000 m.
<i>General Distribution</i>	: E. HIMALAYA; INDIA, NEPAL, BHUTAN, MALAYSIA, JAVA, SUMATRA, BORNEO.

CORNACEAE Dum.

Key to the Genera:

1. Shrub upto 5 m tall; drupe ovoid 2
+ Tree upto 15 m tall; drupe subglobose *Swida*
2. Leaf apposite; lamina elliptic oblong; Umbels not originated on the midvein .. *Aucuba*
+ Leaf alternate; lamina lanceolate; umbels originated at midvein *Helwingia*

Aucuba Thunberg

Aucuba himalaica Hook. f. et Thoms. ex Hook. f., Ju. Himal. Pl. T.12. 1955; C.B. Clarke in Fl. Brit. India 2: 747. 1879, Pfl.-reich IV-299, Hook. 41: 41. 1910; Hara in Fl. E. Him. 1: 232 & 644. 1966; Clement in Grierson & Long, Fl. Bhutan 2(1): 331. 1991.

Local Name: Kali Kaath (Nep.).

Shrub upto 4m tall, dichotomous branched **Leaves** opposite; petioles 1-2.3 cm long; lamina 10 – 20 x 2 - 6 cm, elliptic - oblong or oblong, long acuminate, base cuneate, margin serrate - denticulate, coriaceous, glabrous above, tomentose in lower surface in juvenile. **Male panicles** to 15 cm. **Male flowers** upto 0.6 cm. **Calyx** 4 – toothed, to 0.33 cm, ovate; stamens 4, subsessile. Female panicles to 5.2 cm. Female flowers upto 0.57 cm long. **Petals** to 0.40 cm, ovate; ovary unilocular; style short. Fruit ovoid, 1-seeded

Flower & Fruit : April – July

Exsiccata : Tungya 2150 m, *SR Lepcha & AP. Das 0302*, dated 08.09.2004.

Status : Common

Local Distribution : Rachel Middle, Tungya 2100-2650m.

General Distribution : EASTERN HIMALAYA; INDIA (Sikkim - Manipur).

Note : Endemic to NE India.

Helwingia Willdenow

Helwingia himalaica Hook.f. & Thoms., Fl. Brit. India 2: 726. 1879; Hara in Fl. E. Him. 1: 232, 645 & 662, t.49. 1966; 2: 92. 1971; 3: 88 & 393-413, t. 5a, b. 1975; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 191. 1979; Clement in Grierson & Long, Fl. Bhutan 2(1): 331. 1991.

Shrubs upto 2 m tall. Stem woody, branched, glabrous. **Leaves** alternate; petioles 0.5-2.6 cm long, glabrous; **lamina** 4.5-13 x 1.1-3.6 cm, lanceolate, bristly-serrate, acuminate, base cuneate, glabrous, mid-rib strong, lateral nerves arched, mostly 6 to 8 on either half. **Umbels** sessile, borne on middle of midvein on lamina. Pedicels 0.15-0.2 cm, slender, glabrous. **Flower** unisexual, minute, greenish; males many; **sepals** truncate; **petals** and **stamens** 3-5; ovary 3-4 celled; styles basally connate. **Fruits** ovoid, red, fleshy.

Flower : April - May *Fruit*: June - September.

Exsiccatus : Rachel below near NNP border 2700 m, *SR Lepcha & AP Das 400*, dated 13. 10. 2004.

Status : Very Common in semi-open places

Local Distribution : Mulkharka, Rachel below, 2250-2800 m.
General Distribution : HIMALAYAS; INDIA (Sikkim), (NEPAL-BHUTAN),
MEGHALAYA, MYANMAR, W. CHINA.

Note : It is an important ornamental plant.

Swida Opiz

Swida macrophylla (Wall.) Sojak in Nov. B.H.B. Univ. Carol. Prag. 1960: 10. 1960; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 193. 1997; Clement in Grierson & Long, Fl. Bhutan 2(1): 330. 1991.
Cornus macrophylla Wall. in Roxb., Fl. Indica 1: 433. 1820; Prodr. Fl. Nepal 141.1825; C.B. Clarke in Fl. Brit. India 2: 744. 1879.

Local Name: Patmero/Bangi Kath (Nep.).

Tree to 15 m tall. **Leaves** opposite; petiole 1 – 3.3cm; lamina 10 - 19 x 5.5 -11 cm, ovate to ovate-elliptic, acuminate, base truncate to rounded, whitish puberulent beneath, with hairs on both sides. **Inflorescence** erect, youngest branches in opposites. **Flowers** bisexual. **Calyx** teeth small, distinct, obscurely 4 toothed, teeth to 0.07 cm. **Petals** 4, upto 0.45 cm, usually oblong, spreading; **stamens** 4, equal to petals; anthers cordate with recurved tips; ovary 2-elled; style simple with capitate stigma. **Drupe**s subglobose, 2 seeded.

Flower & Fruit : May – July

Exsiccatus : Sokpa pokhri 1950m, *SR Lepcha & AP. Das 0301*, dated 17.09.2005

Status : Common

Local Distribution : Middle Rachel Chowk, Sokpa-pokhri 1800 – 2500 m.

General Distribution : AFGANISTAN, HIMALAYAS; INDIA (Kashmir-BHUTAN);
MEGHALAYA, MYANMAR, EAST TO CHINA, JAPAN.

Order: Santalales

SANTALACEAE R. Brown

Dufrenoya Chatin

Dufrenoya platyphylla (Sprengel) Stauffer in Viert., Nat. Ges. Zurich. 114: 70. 1969; Tebbs in Enum. Fl. Pl. Nepal 3: 192. 1982; Grierson & Long, Fl. Bhutan 1(1): 143. 1983. *Viscum platyphyllum* Sprengel, Syst. Veg. 4 (Curr. Post.): 47. 1827. *Dendrotrophe heterantha* (Wallich ex DC.) Henry *et* Roy in Bull. Bot. Surv. India 10: 276. 1969.

Local Name: Ainjeru (Nep.).

Shrub usually parasitic on tree upto 3 m tall. **Lamina** shape variable; usually obovate to orbicular, 3.5 – 7.5 x 2 – 4.5 cm, entire, obtuse, base abruptly attenuate, coriaceous, glabrous, nerves 7 - 9 from base, distinct beneath. **Inflorescence** with male flowers sessile in pedunculate scaly clusters; **perianth** with 5 - 6 triangular lobes. **Female flowers** in clusters of 3 - 10, scaly only at base and apex; perianth tube 5 - 6 lobed; ovary obovoid, inferior; fruiting pedicels upto 1cm. **Fruits** a small drupe, obovoid.

Flower & Fruit : April – July

Exsiccatae : Padamchen- Talkharkha 2240 m, *SR Lepcha & AP Das 31028*, dated

02.10.2004, Phusrey dara 2000m, , *SR.Lepcha AP Das 302*, dated
26.09.2003. Katusey dara 1950 m, *SR Lepcha & AP Das 310*, dated
26.09.2003.

- Status* : Less Frequent.
Local Distribution : Subaney, Singhaney Phusrey, Padamchen 1600-2250m.
General Distribution : HIMALAYAS; INDIA, (Kumaon-BHUTAN), Assam, MYANMAR.
Note : 1. Endemic to Himalaya.
2. A noted medicinal plant.

LORANTHACEAE A.L. Jussieu

Scurrula Linnaeus

Key to the Genera :

1. Shrubs parasitic upto 2 m tall; leaves alternate but often opposite near apex .. *Scurrula*
+ Herbs parasitic upto 1.5 m tall; leaves not prominent *Viscum*

Scurrula elata (Edgew.) Danser in Bull. Jard. Bot. Buitenz. Ser. 3(10): 350. 1929; Hara & Ohashi in FLE.Him 1: 64. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 191. 1982; Grierson & Long, Fl. Bhutan 1(1): 147. 1983. *Loranthus elatus* Edgew. in Trans. Linn. Soc. 20: 58. 1846:

Local Name: Aijeru (Nep.).

Shrubs parasitic upto 2.5 m tall. Juvenile buds and shoots stellate tomentose, brownish. **Leaves** alternate but often opposite near apex; **petioles** 1 - 2 cm; **lamina** broadly ovate, 3 - 11 x 1.2 - 5 cm, entire, acute, base rounded to cuneate, brownish stellate tomentose on both surfaces, glabrous both surface when mature; lateral nerves 4 - 6 pairs, mid-vein axil with short hairs. **Inflorescence** in axillary racemes; peduncle to 1.7 cm, brown; bracts to 0.22 cm, ovate. **Flowers** bisexual, upto 2.8 cm long, 6 - 10 in each cluster. **Sepals** to 0.23 cm, tube slightly truncate. **Petals** to 3.3 cm long, tubular, curved, reddish in basal part, apically green; anthers reddish; filament slender, black; stigmas swollen and globose. **Fruits** obovoid, narrowing at base.

- Flower & Fruit* : April - December
Exsiccatae : Dokala 3800 m, *SR Lepcha & AP. Das 31162*, dated 03.10.2004.
Dorhok 2300 m., *SR Lepcha & AP. Das 30292*, dated 07.08.2004.
Status : Common
Local Distribution : Rachel, Mulkharka. 2000 - 3900 m.
General Distribution : INDIA, NEPAL, BHUTAN, TIBET, CHINA.

Viscum L.

Viscum nepalense Spreng., Syst. Cur.-Post. 47. 1827; Ramamoorthy in FHD 311. 1976; Grierson & Long, Fl. Bhutan 1(1): 150. 1983; Fl. Meghalaya 2: 762. 1987. *V. atriculatum auct non.* N. Burm., 1768; Fl. Brit. India 5: 226. 1886

Local Name: Dah-sumthet (Lep.), Harchur (Nep.).

Herbs parasitic, leafless and cymosely branched upto 1.2m, pendent phylloclade. Stem oftenly jointed terete only towards base. Branches oftenly flattened, striate. **Leaves** absent or not prominent; nodes constricted; internodes variable in length and breadth, 2 - 3.5 x 0.3 - 0.8 cm, flattened, decussately oriented, tapering towards base. **Flowers** unisexual, clustered at nodes, minute and greenish; anthers white. **Fruits** globose, yellowish-green.

- Flower & Fruit* : July - September

- Exsiccatus* : Chandaney RF, - Padamchen 1900 m, SR Lepcha & AP Das 03014, dated 13. 10. 2004.
- Status* : Rare.
- Local Distribution* : Chandaney RF, - Padamchen, 1420 - 2180m.
- General Distribution* : HIMALAYAS, INDIA, MYANMAR, CHINA, FORMOSA.
- Note* : Use in traditional medicinal for the treatment of fracture.

Order: Celastrales

CELASTRACEAE R. Brown

Key to the Genera:

1. Leaf alternate; ovary free or partly immersed in the Disc 2
- + Leaf opposite; ovary immersed in the disc *Euonymus*
2. Erect shrub or tree; spinescent; flowers in axillary cymes; calyx deeply lobed; fruits 3 celled; 1 - 6 seeded *Maytenus*
- + Climbers or epiphytic shrub; non spinescent; flowers in axillary, terminal cymes or panicles; calyx cup shaped; fruits 2 -3 celled; 3 - 6 seeded *Celastrus*

Celastrus Linnaeus

Key to the species:

1. Plant climbing; leaf base rounded – cuneate *C. hookeri*.
- + Plant lianas or scandant; leaf base attenuate *C. paniculatus*

Celastrus hookeri Prain, in Journ. Asiat. Soc. Beng. 73: 197.1904.; Hra in Fl. E. Him. 1: 189; 1966; Long in Grierson & Long. Fl. Bhutan 2(1): 122. 1991.

Herbs climbing, deciduous, brachlet thily lenticellate,. **Leaves** broadly elliptic to suborbicular 9 - 13 x 6 – 10 cm, abruptly mucronate, base rounded – cuneate, margins crenate – serrate. **Flowers** few, in axillary and terminal cymes at the tip of new shoot. **Petals** shallowly toothed, filament glabrous. **Fruits** few, coriaceous; **seeds** ovoid – ellipsoid.

- Flower* : April - June. *Fruit*: July
- Exsiccatus* : Singhaney dara 2100 m, *SR Lepcha & AP. Das 0295*, dated 14.09.2005
- Status* : Common
- Local Distribution* : Dohrok, Subhaney. 2100 – 3050 m.
- General Distribution* : E. HIMALAYA; INDIA (Sikkim, Khasia, Manipur,) NEPAL, BHUTAN, CHINA, BURMA.

Celastrus paniculatus Willd., Sp. Pl. 1: 1125. 1797; Lawson in Fl. Brit. India 1: 617. 1875; Hara in Fl. E. Him. 1: 189. 1966; Hara *et al*, Enum. Fl. Pl. Nepal 2: 88. 1979; Long in Grierson & Long. Fl. Bhutan 2(1): 122. 123. 1991. subsp. *paniculatus*: FWB 1:419. 1997. *Celastrus dependens* Wall. (Cat. no. 4302. 1831, *nom.nud.*) in Roxb., Fl. Ind. ed. Carey, 2:389. 1824.

Local Name: *Bhainsay Lahara* (Nep.).

Shrubs, scandants. Branchlets terete, pubescent. Stem grooved, lenticellate. **Leaves** simple, alternate; petioles to 1 cm; **lamina** 3 – 11 x 1.8 – 4.5 cm, obovate to orbicular, crenate-serrulate, abruptly acuminate, base attenuate, glabrous, whitish green beneath. **Flowers** in paniced, cymes, terminal, pendulous; peduncles pubescent. Flowers whitish-green. **Sepals** 5, ovate, fimbriate, greenish. **Petals** 5-lobed, margin irregular, clawed, obovate; stamens 5; anthers yellow; filament greenish-white; stigma 3-lobed. **Capsule** globose; seeds arillate, ellipsoid.

Flower : April - June. *Fruit*: July - September
Exsiccatus : Rachela 2160 - 2700, **SR Lepcha & AP. Das** 0293, dated 13.09.2005.
Status : Common
Local Distribution : Mulkharka, Rachela below 1400 – 2700m.
General Distribution : HIMALAYAS; INDIA, SRI LANKA, MYANMAR, INDO-CHINA, MALAYSIA, CHINA, FORMOSA, AUSTRALIA.

Euonymus Linnaeus

Key to the species:

1. Erect shrubs or small trees *E. frigidus*
- + Climbers or epiphytes 2
2. Corolla crimson; capsule turbinate *E. viburnoides*
- + Corolla white; capsule globular or subglobose 3
3. Cymes 3 – 15 flowered; ovary smooth; capsule 2 -4 shallowly lobed *E. vagans*
- + Cymes 7 – 30 flowered; ovary warted; capsule unlobed *E. echinatus*

Euonymus echinatus Wall. in Roxb., Fl. Indica, ed. Carey, 2: 410. 1824; Lawson in Fl. Brit. India 1: 611. 1872; Hara *et al.*, Fl. E. Him. 1: 189. 1966; Hara in Enum. Fl. Pl. Nepal 2: 89. 1979; Long in Grierson & Long, Fl. Bhutan 2(1): 118. 1991.

Shrubs, climbers epiphytic on tree and rock-crevices with tufted adventitious roots. **Leaves** opposite; petioles to .5 cm; **lamina** 1.5 - 6 x 1.5 - 4 cm, ovate-lanceolate, serrate, acute, base rounded, glabrous, lateral nerves arching, prominent above. **Cymes** to 4.5 cm, usually terminal or axillary, 3 – 15 flowered; peduncles divided. **Flowers** 4-merous, dark red; sepal lobes to 0.13 cm. **Petals** 4, to 0.40 cm long, rounded, white, greenish or yellowish ; stamens inserted on fleshy disc; anthers 4. **Capsules** globular, echinate, armed of several minute spines.

Flower : April – June *Fruit*: August – September
Exsiccatus : Rachela middle **SR Lepcha & AP. Das** 03787, dated 08.10.2004.
Status : Common
Local Distribution : Rachela middle, Phede. 2700 – 3200 m.
General Distribution : E. HIMALAYA; INDIA (Sikkim, Darjeeling)
Note : Endemic to Eastern Himalaya.

Euonymus frigidus Wall. in Roxb., Fl. Indica, 2: 409. 1824; Hara in Fl. E. Him. 189. 1966; Lawson in Fl. Brit. India 1: 611. 1872; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 89. 1979; Long in Grierson & Long, *et al.*, Fl. Bhutan 2(1): 119. 1991; Singh *et al.*, Fl. India 5: 99. 2000

Tree small or ever green shrubs upto 4m. Buds terminal enlarged in winter and autumn. **Leaves** lamina 3.5 – 12 x 1.5 - 3cm, coriaceous, oblong elliptic to oblanceolate, acuminate, base cuneate, and margins serrulate, lateral veins smooth. petiole 4 - 10mm. **Flower** in cymes 2.5 – 4 cm axillary, **flowers** mostly 6 - 7, 4-merous, 4 – 5 mm diameter. **Calyx** lobed 0.7 mm. **Corolla**

brownish-crimson, broadly ovate or suborbicular 3-4 mm, unlobed; **anthers** sessile. **Capsules** subglobose, fleshy, 1 - 2cm before dehiscence, 4 lobed after dehiscence, red, 4-lobed, 2 - 3 cm in diam. seeds 4.

Flower : May - June. *Fruit* : August- December
Exsiccatus : Rachela 2970 m, **SR Lepcha & AP. Das 31062**, dated 08.10.2004.
Status : Common.
Local Distribution : Kyongnosla, 15 mile, Rachela . 3000 - 3010
General Distribution : E. HIMALAYA, INDIA (Darjeeling, Sikkim, Assam, Manipur)
MYANMAR, CHINA.

Note : An ornamental plant.

Euonymus vagans Wall. in Roxb., Fl. Ind. ed. Carey, 2: 412. 1824; Lawson in Fl. Brit. India 1: 611. 1872; Hara in Fl. E. Him. 1: 190. 1966; 2: 71. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 90. 1979; Long in Grierson & Long., Fl. Bhutan 2(1): 118. 1991.

Similar to *E. echinatus* but differing in variable shapes and sizes of the leaves. **Cymes** with 7 - 30-flowered. **Flowers** smaller, upto 0.9 cm across. **Capsules** subglobose, lobes 2 - 4, shallowly rounded .

Flower : May - June. *Fruit* : August- December
Exsiccatus : Rachela lower 2800, **SR Lepcha & AP Das 0290**, dated 17.09.2005
Status : Common.
Local Distribution : Hangey, Sokpa pokhri, 1800 - 2500 m
General Distribution : E. HIMALAYA, INDIA (Sikkim, Assam, Manipur) TIBET, CHINA.
Note : An ornamental plant.

Euonymus viburnoides Prain, JASB 73:194. 1904; Hara in Fl. E. Him. 1:190. 1960; Grierson & Long., Fl. Bhutan 2(1):118. 1991. *E. frigidus sensu* Fl. Brit. India 1:611. 1875, p.p, *non* Wallich.
Local Name: Haray Lahara (Nep.).

Shrubs epiphytic evergreen, lenticellate. Branchlets 4-angled. **Leaves**; petioles to 2 cm long; lamina 3 - 10 x 2.5 - 5.5 cm, ovate-lanceolate, acuminate, base cuneate or rounded, margins irregularly serrulate, nerves 7 pairs. **Cymes** to 10 cm, many flowered, axillary, divaricately branched. **Flowers** to 0.7cm across, 4-merous. **Calyx** lobes upto 0.20 cm, concave. **Petals** 0.22 - 0.5 cm, orbicular, crimson. **Capsules** turbinate, quadrangular.

Flower : May - June *Fruit*: July - September
Exsiccatus : Rachela below, 2300 m, **SR Lepcha & AP. Das 0291**, dated 17.09. 2005.
Status : Less common
Local Distribution : Kyongnosla, 15 mile, Rachela, Panglakha upto 3200 m.
General Distribution : E. HIMALAYA, INDIA (Sikkim, Darjeeling) CHINA.
Note : Endemic to Eastern Himalayas

Maytenus Molina

Maytenus rufa (Wall.) Hara, Journ. Jap. Bot. 40: 327. 1965; Hara in Fl. E. Him. 1: 190. 1966; 2: 72. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 2: 90. 1979; Long in Grierson & Long, Fl. Bhutan 2(1): 124. 1991. *Celastrus rufa* Wallich in Roxb., Fl. Ind. 2:397. 1824. *Gymnosporia rufa* (Wall.) Lawson in Fl. Brit. India 1: 620. 1875.

Shrubs upto 5 m tall. **Branches** slender, spinose. Spines upto 1.5 cm long, naked. **Leaves** lamina 3 - 11 x 15 - 4.5 cm, broadly lanceolate to elliptic lanceolate, serrate, acuminate, coriaceous, glabrous. **Cymes** 2 - 4.5 cm diam., axillary, pendulous. **Flowers** numerous, small; calyx teeth minute, triangular. **Petals** 0.13 - 0.4cm, suborbicular, creamy - white. **Capsules** turbinate.

Flower : April - June *Fruit:* July - September
Exsiccatus : Tungya, 2100 m, **SR Lepcha & AP. Das** 0294, dated 20.09.2005
Status : Less common
Local Distribution : Tungya, 1400 - 2400m.
General Distribution : HIMALAYAS; INDIA (Kumaon- Skim), NEPAL, BHUTAN,
Note : Endemic to Himalaya.

AQUIFOLIACEAE Bartling

Ilex L.

Key to the species:

1. Corolla 4-lobed; stamens 4 2
+ Corolla 5 - 7 lobed; stamens 5 - 8 *Ilex fragilis*
2. Leaves elliptic to obovate; corolla white *I. crenata*
+ Leaves lanceolate to narrowly oblong; corolla reddish pink *I. sikkimensis*

Ilex crenata Thunberg, Fl. Japan 78. 1784 var. *thomsonii* (Hook. f.) Loesener, Monogr. Aquifol. 1: 202, t. 4, f. 2C. 1901; Hara in Fl. E. Him. 1: 187. 1966; 2: 70. 1971; Andrews in Grierson & Long, Fl. Bhutan 2(1): 108. 1991; Hajra in Fl India 5: 52. 2000. *I. thomsonii* Hook.f., Fl. Brit. India 1: 602. 1875.

Trees with puberulous shoots. **Leaves**; petioles to 0.30 cm; elliptic to obovate, lamina 1.5 - 3 x 0.6 - 1.5 cm, crenate towards apex, acute, attenuate, glabrous, lower surface with dark glands, lateral nerves oftenly indistinct. **Flowers** 1 - 3 in axillary cymes, 4-merous. **Calyx** 4-lobed, glabrous, lobes sub-orbicular to broadly ovate. **Corolla** 4-lobed, white, sub-orbicular or broadly ovate; stamens 4, nearly as long as petals. **Fruit** to 0.8 cm across, glabrous, black, Fruit pedicels usually with hairs.

Flower : May - July. *Fruit:* August - November
Exsiccatus : NNP border, 2700 m, **SR Lepcha & AP. Das** 31297, dated 13.07.2008.
Status : Less Common.
Local Distribution : Rigu, Padamchen 2100 - 2800 m.
General Distribution : E. HIMALAYA; INDIA (Darjeeling-BHUTAN), MEGHALAYA.
Note : Endemic to Eastern Himalaya.

Ilex fragilis Hook. f. in Fl. Brit. India 1: 602 . 1875; Hara in Fl.E. Him. 1: 187 . 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 87. 1979; Andrews in Grierson & Long, Fl. Bhutan 2 (1): 106. 1991; Hajra in Fl India 5: 56. 2000
Local Name: Phalamkath (Nep.).

Trees branched, glabrous. **Leaves** alternate, uppermost paired ; petiole to 1.5 cm ; **lamina** 4 – 7.5 x 1.2 - 3.8 cm , ovate to elliptic-ovate, serrate, acuminate, rounded, glabrous, lowers surface pale green - yellowish, mid-vein deep and broad, lateral veins 6 - 9 pairs, rugose. **Flowers** or fascicles usually un-branched or axillary, monoecious; pedicels short to 0.30 cm, glabrous. **Calyx** glabrous, 5 - 7 lobed, rounded to ablong, ciliated. **Corolla** white, 5 - 7 lobed, occasionally more, larger than sepals, to 0.17 cm, spreading, ciliated; **stamens** 5 - 8, originate from corolla. **Drupe** red, glabrous.

Flower : May - June *Fruit:* September - February
Exsiccatus : Rachela below, 2800 m, *SR Lepcha & AP. Das* 31295, dated 13.07.2008
Status : Very Common.
Local Distribution : Rachela Middle, Neora Pathak, 2200 – 2600 m.
General Distribution : E. HIMALAYA; INDIA, (NEPAL-BHUTAN), ASSAM, MYANMAR, W.CHINA.

Ilex sikkimensis Kurz, Jour. Asiat. Soc. Beng. 44(2): 202. 1875; Hara in Fl. E. Him. 1:188. 1966
I. hookeri King in Jour. Asiat. Soc. Beng. 55(2): 266, t. 14. 1887; Monogr. Aquifol. 287. 1901; Andrews in Grierson & Long. Fl. Bhutan 2 (1): 109. 1991.
Local Name: Lise (Nep.).

Trees upto 9 m tall. **Leaves** ; **petioles** to 2 cm, pinkish red; **lamina** 4 – 12 x 1 - 3.5 cm, lanceolate to narrowly oblong, serrate, acute to acuminate, attenuate, coriaceous, greenish above, both sides glabrous, mid-rib channeled in lower surface, prominently depressed above. **Flowers** ; **male flowers** in axillary clusters; **females flowers** usually solitary, axillary. **Calyx** 4 – lobed, to 0.2 cm. **Corolla** 4-lobed , reddish pink; **Stamens** 4. **Drupe** to 0.8cm across, **Fruit** pedicel slightly elongated.

Flower : April – May *Fruit:* August – November
Exsiccatus : Rachela below at Jorpokhari, 2700 m, *SR Lepcha & AP. Das* 31298, dated 13.07.2008
Status : Common.
Local Distribution : Tinsimsna, Jorpokhari, 2500 – 3050 m.
General Distribution : E. HIMALAYA (NEPAL – BHUTAN).
Note : Endemic to Eastern Himalaya.

Order: Euphorbiales

BUXACEAE Dumort

Sarcococca Lindley

Sarcococca hookeriana Baillon, Monogr. Bux. 53. 1859; Hara in Fl. E. Him. 1: 185. 1966; Grierson & Long in Fl. Bhutan 2(1): 131. 1991. *S. pruniformis* var. *hookeriana* (Baillon) Hook.f., Fl. Brit. India 5: 267. 1887.

Local Name: Hue shing (Bhutia), Chile Kaath (Nep.).

Shrub 1.5 - 2m tall. Stem terete, branched. **Leaves** alternate; petiole 0.3 - 1.2; **lamina** 3.5 - 8 x 2.2 - 3 cm, narrowly elliptic-lanceolate, entire, acute or acuminate, cuneate, both surfaces glabrous, mid-rib faint and impressed above, nervules obscure. **Inflorescence** axillary racemes few to many flowered, short. **Bracts** ovate. **Flowers** fragrant. Tepals short upto 0.3 cm, imbricate, pinkish, or pale-yellow; **stamens** long, exerted, whitish; ovary globose.

Flower : April - August.

Exsiccatus : NNP boundary 2195 m, **SR Lepcha & AP. Das** 0263, dated 15.09. 2005.

Status : Rare

Local Distribution : PWS, 2100 -2300m.

General Distribution : E. HIMALAYA; INDIA (Sikkim, West Bengal, Assam, Arunachal Pradesh), NEPAL, BHUTAN, S. TIBET

Note : 1. Endemic to Eastern Himalaya.

2. Wood used to make walking sticks.

EUPHORBIACEAE A. Jussieu

Key to the Genera:

- 1. Herbs annual or perennial 2
- + Shrubs or trees *Euphorbia*
- 2. Plants dioecious 3
- + Plants monoecious *Glochidion*
- 3. Leaf palmately (5 - 13) veined and often peltate at base; Petals 8 - 10 *Ostodes*
- + Leaf pinnately veined and 3 veined at base; Petals absent *Macaranga*

Euphorbia Linnaeus

Key to the species:

- 1 Plant with creeping rhizomatous 2
- + Plant without rhizomatous 3
- 3 Stem foetid; styles united in lower third, recurved *E. sikkimensis*
- + Stem non foetid; style united in lower half, not recurved *E. longifolia*

- 3 Plant less than 1 m tall; young shoot crispate-pubescent *E. Himalayansis*
 + Plant more than 1 m tall; young shoot non crispate pubescent ... *E. luteo-viridis*

Euphorbia himalayansis (Klotzsch) Boissier in DC. Prodr. 15 (2): 113. 1862; Hook. f., Fl. Brit. India 5: 258. 1887; Hurusawa & Tanaka in Fl. E. Him. 182. 1966; Kitamura in Hara, Fl. Pl. Nepal 3: 195. 1982; Long in Grierson & Long., Fl. Bhutan 1(3): 765. 1987. *Tithymalus himalayansis* Klotzsch. Kurusawa & Ya. Tanaka in Fl. E. Him. 182. 1966.

Herb perennial, dark green bearing a woody roots stock to 70 cm tall. Juvenile shoots crisped-pubescent. **Leaves**; stems leaves oblong or oblong lanceolate lamina 2.5-4x0.5-0.8cm, obtuse or subobtuse, base rounded, glabrous, sessile,; exstipulate; uppermost leaves 6 - 10 in whorl. **Rays** to 4.5 cm densely crispate-pubescent; bracts enclosing cyathium, ovate acute. **Cyathia** campanulate with 5 brown semicircular glands; **ovary** smooth; **styles** connate simple recurved bearing small capitate stigma. **Capsules** globose-triangular.

- Flower* : June- *Fruit:* August
Exsiccatus : Sherathang 4300 m, *SR Lepcha & AP Das*, 103. dated 07.10. 2006
Status : Sparse.
Local Distribution : Sherathang 3000 - 4200m
General Distribution : E. HIMALAYA; INDIA, (NEPAL to BHUTAN).
 Note : Endemic to Eastern Himalaya

Euphorbia longifolia Baillon ex Boissier, in DC. Prodr.15(2): 78. 1862; D.Don; Prodr. Fl.Nepal 62. 1825; Hook. f. in Fl. Brit India 5:261.1887; Kitamura in Hara Enum.Pl.Nepal 1:195.1982; Long in Grierson & Long. Fl. Bhutan 1(3): 765. 1987

Herbs perennial with creeping rhizome up to 120 cm tall. **Stems** simple, juvenile stems rays glabrous or sparsely pilose. **Leaves**: stems leaves linear lanceolate, 4.5 - 13 x 1.5 - 2 cm, acute base cuneate, glabrous, subsessile or shortly petiolated to 3.5 mm. Rays up to 4.3 cm glabrous; bracts yellow ovate to 2.5cm. **Cyathia** campanulate to 4.5mm; **ovary** prominently bearing small blunt tip rounded up-growth (warted) ; **styles** to 3.3mm, united in lower half, bilobed. **Capsules** warted.

- Flower* : May - June *Fruit:* August
Exsiccatus : Changu 4000 m, *SR Lepcha & AP. Das 0102*, dated 16.09.2004
Status : Sparse.
Local Distribution : Kupup, Changu, 1880 - 4000 m
General Distribution : E. HIMALAYA
 Note : Endemic to Eastern Himalaya

Euphorbia luteo-viridis D.G. Long, in notes Roy. Bot. Gard. Edinberg 44 (1): 163. 1986; Long in Grierson & Long. Fl. Bhutan 1(3): 764. 1987

Herbs perennial with thick roots stock woody. **Leaves**: cauline leaves tuft slightly shorter lamina 14 - 35 (55) cm; leaves and inflorescence yellow-green rarely reddish-tinged; broad lamina 2 - 3.5 x 1 - 2.8cm, obtuse, sessile. **Rays** of umbels 4 - 5, crispate-pubescent, to 3.5cm; **bracts** to 1.8cm broad, suborbicular or broadly ovate; **styles** to 3 mm. **Capsules** not observed.

- Flower* : May *Fruit:* August

Exsiccatu : Changu 4000 m, **SR Lepcha & AP. Das** 2765, dated 07.10.2006
Status : Sparse.
Local Distribution : Gnathang, Changu 3400 – 4300 m
General Distribution : E. HIMALAYA; INDIA, (NEPAL – BHUTAN).
Note : Endemic to Eastern Himalaya.

Euphorbia sikkimensis Boissier in DC. Prodr.15: 2.113. 1862; Hook. f. in Fl. Brit. India . 5.(2): 1887; Hara *et al.* in Fl. Enum. Fl. Nepal 3: 196.1982; Long in Grierson & Long, Fl. Bhutan 1(3): 764. 1987. *Tithymala sikkimensis* (Boissier) Hurusawa & Tanaka in Fl. E. Him. 184(1966).
Herbs perennial with creeping rhizome. **Stem** glabrous and foetid upto 85 cm long. **Leaves**; stems leaves alternate, linear or lanceolate **lamina** 3.5 - 13 x 0.6 - 2cm acute, base cuneate, glabrous, subsessile or on petiole to 4.5mm exstipulate, uppermost leaves up to 18 in a whorl. **Rays** glabrous bearing 3 - 4 flowers ovate, acute orange or red; bract enclosing cyathium, devoid of any pigmentation. **Cyathia** campanulate with 4 - 5 semicircular glands at margin ovary smooth; **styles** united in lower third, recurved above. **Capsules** globose-trigonus.

Flower : May - June *Fruit*: September- October.
Exsiccatu : Kyongnosla 3400 m, **SR Lepcha & AP. Das** 2767, dated 18.10. 2005.
Status : Sparse.
Local Distribution : Phusrey, Kyongnosla 3000 – 3800 m
General Distribution : E. HIMALAYA
Note : Endemic to Eastern Himalaya.

Glochidion Forster

Glochidion acuminatum Mueller Argoviensis, in Linnaea 32: 68. 1863; Hook.f. in Fl. Brit. India 5: 323. 1887; Kitamura in Hara Enum. Fl. Pl. Nepal 3: 196. 1982; Long in Grierson & Long, Fl. Bhutan 1(3): 779. 1987.

Local Name: Lalikaath (Nep.).

Tree evergreen medium size 6 – 10 m tall, with pubescent drooping branchlets. **Leaves** alternate; lamina 4 – 13 x 2 – 4 cm, lanceolate, entire, acuminate pinnately veined, greenish above, pale and hoary pubescent beneath. **Flowers** in axillary dense fascicles. **Sepals** 6; unequal, obovate greenish. **Petals** 0; **male flowers** with 3 anthers; styles connate, columnar, column 4-5 lobed, lobes erect, short. **Fruits** globose, with persistent style.

Flower : April – June *Fruit*: August – December
Exsiccatu : Phusrey 2200 m, **SR Lepcha & AP Das**, 2770, dated 13.07.2003
Status : Frequent
Local Distribution : Phusrey, 160 – 2000 m
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, S.W. CHINA.
Note : Used as fodder for cattle. Table plates and cups are made by pinning up the leaves and used in festive occasions especially during puja offerings

Macaranga Petit-Thouars

Macaranga postulata King ex Hook. f., in Fl. Brit. India 5: 445. 1887; Hurusawa & Tanaka in Fl. E. Him. 1: 179. 1966; Kitamura in Hara E. Fl. Pl. Nepal 3: 197. 1987; Grierson & Long., Fl. Bhutan 1(3):805. 1987. *M. gnelinifolia* Hook. f., in Fl. Brit. India 5: 445. 1887.

Local Name: Malata (Nep.).

Tree upto 15 m tall, with rusty pubescent branches. **Leaves** alternate; stipules to 1 cm; petioles to 13 cm long; **lamina** 7 - 17 x 6 - 13 cm, broadly ovate, obscurely sinuate-dentate, acute to shortly acuminate, base shallowly cordate or truncete, veins palmately 5 - 7 at base, glabrous above, densely gland-dotted beneath., ovate. **Male panicles** to 5 cm; flowers 0.3 cm across; stamens 20. **Female panicles** to 10 cm; flowers shortly pedicellate. **Calyx** to 0.25 cm, 4-lobed; ovary bilobed, glandular; styles 2, recurved. **Capsules** brownish tomentose, with persistent styles.

Flower : October - November *Fruit:* December - February
Exsiccatu : Hangey 1900 m, *SR Lepcha & AP. Das* 2771, dated 13.07.2003
Status : Common
Local Distribution : Phusrey, Subaney 1500 - 2000 m
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN.
Note : Endemic to Eastern Himalaya.

Ostodes Blume

Ostodes paniculata Blume, Bijdr. 620. 1826; Hook.f. in Fl. Brit. India 5: 400. 1887; Man. Ind. Timb. 616. 1902; Fl. Asm. 4: 197. 1940; Fl. Meg. 2: 197. 1987; Long in Grierson & Long., Fl. Bhutan 1(3): 795. 1987.

Local Name: Palak kung (Lep.), Bepari (Nep.).

Trees upto 20 m tall, spreading. Bark brownish. **Petioles** long upto 20 cm; often crowded at branchlet ends, **lamina** 6 - 18 x 3 - 8 cm, ovate or ovate-elliptic, margin serrate distantly, acuminate, base rounded or rarely oblique, glabrous, dark green above, paler beneath, 3- nerved. **Panicles** hairy. **Flowers** to 1 cm diam., pinkish-white. **Sepals** 3, **Petals** 4 -5, shortly clawed; **stamens** many (more than 20); filaments free, basally hairy. **Capsules** subglobose.

Flower : March *Fruit:* August
Exsiccatu : Beusa 1900 m, *SR Lepcha & AP. Das* 1019, 15. 09. 2005.
Status : Less frequent
Local Distribution : Phusrey, 1600 - 2050 m
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, W. MALAYSIA, CHINA.

Order: Rhamnales

RHAMNACEAE A.L. Jussieu

Rhamnus Linnaeus

Key to the species:

1. Leaves elliptic-obovate; flowers fascicled; Corolla absent..... *R. purpureus*
+ Leaves oblong-elliptic; flowers paniced; Corolla 5..... *R. napalensis*

Rhamnus napalensis (Wall.) Laws. in Hook.f., Fl. Brit. India 1: 640. 1872, '*nipalensis*'. Grubvo in Fl. Syst. Pl. Vasc. 8: 299. 1949; Hara *et al.* Enum.Fl. Pl. Nepal 2: 91. 1979; Long & Rae in Grierson & Long, Fl. Bhutan 2(1): 143. 1991; Hajra & Singh *et al.*, in Fl. India 5: 188. 2000. *Ceanothus napalensis* Wall. in Roxb., Fl. Indica 2: 375 & 575. 1824; Cat. 150, n. 4263. 1831.

Local Name: Archal (Nep.).

Shrubs climbing up to 6 m tall. **Leaves** alternate or sub-opposite; **petiole** up to 1.8cm long; stipules small, caduceus; oblong - elliptic, lamina 5 - 15 x 3.7 - 7 cm, apiculate, base rounded, margins serrulate, lower surface glabrous except hair-tufts at vein axils; stipules minute and caduceus. **Inflorescence** simple or compound racemes, branched, terminal and axillary; peduncles slightly pubescent. **Flowers** many, greenish. **Calyx**-lobes 5, triangular. **Corolla** 5, spatulate; ovary rounded; styles trilobed. **Fruits** in drupes sub-globose, 2 - 3 seeded.

Flower & Fruit : July - October

Exsiccatus : Phusrey 2100 m, **SR Lepcha & AP. Das** 1353, dated 10.10.2004.

Status : Less common.

Local Distribution : Dorok, Ramitey dara (NNP border) 1520 - 2280 m.

General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, CHINA, MYANMAR, INDO-CHINA.

Note : Used in traditional medicines for the treatment of bone fracture.

Rhamnus purpureus Edgew. in Trans. Lin. Soc. 20: 44. 1846; Laws. in Fl. Brit. India 1: 639. 1872; Hara in Fl. E. Him. 198. 1966; 2: 77. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 91. 1971. Fasc. Fl. India 20: 57. 1990; Long & Rae in Grierson & Long, Fl. Bhutan 2(1): 144. 1991.

Shrubs or small trees, erect, unarmed. **Leaves** membranous, elliptic-obovate, serrate, base cuneate. **Flowers** 0.52 - 0.55cm across, 3 - 6 in axillary fascicles. **Calyx** lobes 0.33 - 0.6cm long. **Corolla** absent. **Fruits** in drupes 0.60 - 1cm diam, 3 or 4 lobed.

Flower & Fruit : July- October

Exsiccatus : Phusrey 2370m, **SR Lepcha & AP. Das** 1354, dated 10.10.2004.

Status : Sparse

Local Distribution : Dohrok, Singhaney upto 2650 m.

General Distribution : HIMALAYA; INDIA, NEPAL, BHUTAN, CHINA, MYANMAR, INDO-CHINA.

LEEACEAE (DC.) Dumort

Leea Linnaeus

Leea indica (N. L. Burman) Merr., Philipp. J. Sci. 14: 245. 1919. Long & Rae in Grierson & Long. Fl. Bhutan 2 (1): 164. 1991; Hajra *et al.* Fl. India 5: 337.2000. *Staphylea indica* N. L. Burman, Fl. Indica, 75. 1768;

Local Name: *Gelini* (Nep.)

Shrubs or small trees. **Stipules** broadly obovate, apex rounded, glabrous; **petioles** to 21 cm long, central petiole longer than laterals, to 4.5 cm, glabrous; **lamina** 23 - 4.5 × 1.8 - 3.8 cm, 2- or 3-pinnate, glabrous leaf axis glabrous; leaflets elliptic - elongate elliptic, or elliptic-lanceolate, base rounded, margin irregular - regular teeth, teeth sharp, apex acuminate; lateral veins 6 - 11 pairs, abaxial veinlets conspicuous. **Inflorescences** opposite to leaves, compound dichasial or umbelliform; peduncle 1 - 3 cm, with brown hairs. **Involucre** elliptic-lanceolate, apex acuminate, glabrous; **bracts** oval elliptic-lanceolate, apex shortly acute and acuminate; pedicel 1 - 2.5 mm, pubescent; buds, apex suborbicular. **Calyx** triangular, glabrous. **Corolla** elliptic, glabrous, white or greenish white. **Staminodial tube** to 1.3 mm. **Stamens** 5; filaments to 0.7 mm; anthers elliptic. **Ovary** globose; stigma expanded slightly. **Berries** 4 - 6-seeded.

Flower : April - July *Fruit:* August - December

Excisscatus : Dohrok 2300 m, *SR Lepcha, & AP. Das* 30263, dated 16.10.2004.

Status : Not common

Local Distribution : Phusrey, Mulkharka, 200 - 1200 m.

General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, SRI LANKA, THAILAND, CAMBODIA, INDONESIA, VIETNAM, LAOS, MALAYSIA, NEW GUINEA, PHILIPPINES, AUSTRALIA, PACIFIC ISLANDS

VITACEAE Juss.

Key to the Genera

1. Style with small discoid stigma, tendril branch swollen into a cup *Tetrastigma*
+ Style rarely with discoid stigma, tendril branch with swollen pads *Parthenocissus*

Parthenocissus Planchon

Parthenocissus semicordata (Roxb.) Planch. in DC., Monogr. Phan. 5: 451. 1887; Hara in Fl. E. Him. 200. 1966; 2: 79. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 2: 94. 1979; Long & Rae in Grierson & Long. Fl. Bhutan 2(1): 152. 1991.

Vitis semicordata Roxb., Fl. Indica. ed. Carey, 2: 841. 1824.

V. himalayana (Royle) Brandis var. *semicordata* (Roxb.) Lawson in Fl. Brit. India 1: 656. 1875.

Local Name: *Charcharey Lahara* (Nep.).

Climber shrubby branched, slender, glabrous. Stem quadrangular. **Leaves** ternately 3-foliolate; petioles 1.5 - 5 cm; leaflets asymmetric, **lamina** 4 - 6 × 3 - 4 cm, ovate-elliptic, distantly serrate, caudate, cuneate or semi-cordate, glabrous, pubescent along nerves. **Tendrils** upwardly branched, terminating into a disc-like pads. **Flowers** in terminal or leaf-opposed paniculate umbels. **Calyx**

salver-shaped. **Corolla** 5, to 0.7 cm; style truncate; stigma simple or bilobed. **Berries** globose; seeds, black.

Flower & Fruit : July- October

Exsiccatus : Phusrey upto 2000 m, **SR Lepcha & AP. Das 1351**, dated 11.10.2007.

Status : Common.

Local Distribution : Dohrok, Phusrey, Ramitey upto 2500 m.

General Distribution : E. HIMALAYA ; INDIA Khasia hills.

Note : 1. Endemic to Eastern Himalaya

2. Leaves become red before being shed. A good fodder.

Tetrastigma (Miquel) Planchon.

1. Stem reddish; leaves 3 foliate; petals pale green *T. serrulatum*

+ Stem rarely reddish; leaves 3 – 5 foliate; petals pinkish white *T. objectum*.

Tetrastigma serrulatum (Roxb.) Planchon in DC., Monogr. Phan. 5: 432. 1887; Hara in Fl. E. Him. 1: 201. 1966; 2: 80. 1971; 3: 82. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 2: 95. 1979; Long & Ray in Grierson & Long, Fl. Bhutna 2(1): 155. 1991;

Cissus serrulata Roxb., Fl. Ind. ed. Carey, 1: 432. 1820.

Vitis capreolata D. Don, Prodr. Fl. Nep. 188. 1825; Lawson in Fl. Brit. India 1: 659. 1875.

Local Name: Charchary lahara (Nep.).

Climbers or shrub. Stem reddish with bifid tendril. **Leaves** 5 – foliate; petiole 24.5 cm; triangular stipules, **lamina** 2.5 - 3.5cm acuminate, cuneate base, margin crenate with short shape teeth between crenations. **Flowers** pale green, pubescent, umbellately branch cymes, 2.5 - 5cm diam.; Peduncle red. **Calyx** small. **Petals** 2 mm, short style. **Berries** globose, red, black or purple in ripe. 2 seeded.

Flower : May - October.

Fruit: April - May

Excisscatus : Sano-Ramitey 2200m, **SR Lepcha & AP. Das 20250**, dated 8.10.2004.

Status : Common.

Local Distribution : Singhaney, Dohrok, Phusrey to 2400 m.

General Distribution : TEMPERATE HIMALAYAS; INDIA, (Kumaon-Darjeeling), CHINA.

Note : 1. Endemic to Himalaya

2. A common fodder plant.

Tetrastigma obtectum (Wallich ex Lawson) Planch. ex Franch. in Bull. S. Bot. Fr. 33: 458. 1886; Monogr. Phan. 5:434. 1887; Hara in Fl. E. Him. 3:81. 1975; Long & Ray in Grierson & Long Fl. Bhutan 2(1): 157. 1991.

Vitis obsecta Wallich ex Lawson in Fl. British India 1: 657. 1875.

Tetrastigma Myanmarnicum Momiyama, in Fl. E. Him. 2: 79. 1971, p.p. excl. basionym.

Climber slightly shrubby; pendent branches. Stem terete, woody. Tendril terete, branched. **Leaves**; petioles 1 - 1.5 cm long, pubescent. **Leaves** pedately 3 or 5 foliate; leaflets size variable 3 – 13 x 2 – 4 cm, obovate, acute, base cuneate, margin serrate, membranous, pubescent along veins beneath. Peduncle to 18 cm long. Cymes 24 cm across, compound-umbellate, pubescent.

Pedicels upto 40 cm. **Calyx** minute. **Petals** upto 0.5 cm, pinkish white; stigma lobes 4, flat. **Berries** globose, with 2 seeds.

Flower : May - October. *Fruit:* April - May
Excisscatus : Singhaney 2100m, **SR Lepcha & AP. Das** 03056 dated 19.07.2005..
Status : Common.
Local Distribution : Rachel Chowk, Singhaney, Phusrey to 2400 m.
General Distribution : TEMPERATE HIMALAYAS; INDIA (Kumaon-Darjeeling), CHINA.
Note : 1. Endemic to Himalaya
2. A common fodder plant.

Order: Linales

LINACEAE Gray

Anisadenia Wallich ex Meisner

Anisadenia saxatilis Wall. ex Meisn., Pl. Vas. Gen. Comment. 2: 96.1938; Hook.f., Fl. Brit. India 1: 412. 1872; Hara in Enum. Fl. Pl. Nepal 2: 73. 1979; Fasc. Fl. India 13: 3. 1983; Grierson & Long in Fl. Bhutan 1(3): 752. 1987. Sharma *et al.*, Fl. India 3: 573. 1993. *A. khasyana* Griff., Notul. 4: 534. 1854; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 73. 1989.

Herbs small perennial, epiphytic, 10 – 40cm tall. Stem usually unbranched, subglabrous. **Lamina** 2.5 - 7 x 0.6 – 2cm, arrangement variable, mainly alternate (lower ones), upper somewhat whorled towards top; elliptic-lanceolate, acute, base cuneate, pubescent beneath; **bracts** lanceolate, caducous. **Inflorescence** in terminal spike. **Calyx** 0.22 - 0.5cm, strongly nerved and glandular bristly. **Corolla** 0.60 - 0.85cm, obovate, pinkish. **Fruits** oblong.

Flower : June – September *Fruit:* August – November
Excisccatus : Dohrok 2300 m, **SR Lepcha & AP. Das** 30216, dated 06.10.2004.
Status : Rare.
Local Distribution : Padamchen, Kyongnosla 1800 – 3000 m.
General Distribution : HIMALAYAS; INDIA, (Kashmir -BHUTAN), Arunachal Pradesh, NAGALAND.
Note : Endemic to Eastern Himalaya

Order: Sapindales

STAPHYLEACEAE (DC.) Lindley

Turpinia Ventenat

Turpinia nepalensis Wallich *ex* Wight *et* Arnott, Prodr. 156. 1834; Ic. Pl. India Or. 3:t. 972. 1845; Hara in Fl.E.Him.1:191.1966; 2:72. 1971; Hara *et al.*Enum.Fl.Pl.Nepal 2: 99. 1979; Nam. Chang. Flr. Pl. 577. 1987; Long in Grierson & Long. Fl.Bhutan 2 (1): 129. 1991; Mat. Fl.

Arunachal Pradesh 1(2):332. 1996. *T. martabanica* Wallich, Cat. 150, n. 4278.1831, *nom. nud.* *T. pomifera auct. non DC.* : Hiern. in Fl. Brit. India 1: 698. 1875 p.p.

Local Name: Thali (Nep.).

Trees small upto 18m tall. **Leaves** opposite unevenly 1-pinnate, rachis swollen at nodes; petiolules short to 1.2cm long; stipules interpetiolar to 0.9 cm; **leaflets** lanceolate or elliptic, **lamina** 6.5 -13 x 3 - 5cm, acute, base cuneate, margin serrate, sparsely hairy above, nerves prominent beneath, lateral veins 6 - 9 on either sides. **Inflorescence** in axillary and terminal panicles, bisexual. **Sepals** and **petals** 3, sub-equal, scarcely ciliate; ovary superior and 3-celled; style 3; ovules 4 per cell. **Fruits** sub-globose, apically 3-ridged.

Flower & Fruit : September– October

Exsiccatus : Phusrey 2190 m, **SR Lepcha & AP. Das 1511**, dated 10.10.2008.

Status : Rare

Local Distribution : Phusrey, Dohrok, Hangey 1600 – 2380 m.

General Distribution : E.HIMALAYA; INDIA, NĒPAL, BHUTAN, MYANMAR, INDO-CHINA, CHINA, THAILAND

Note : Used as firewood.

ACERACEAE A. Jussieu

Acer Linnaeus

Key to the species

1. Leaf unlobed or rarely 2 lateral lobes *Acer hookeri*
+ Leaf 3- 5 – 7 lobed 2
2. Leaf trilobed *A. thomsonii*
+ Leaf 5 – 7 lobed 3
3. Lamina entire *A. coppadocium*
+ Lamina serrate..... 4
4. Samara erect, angle of divergent 90° or less 5
+ Samara slanting , the angle of divergent more than 90°..... 6
5. Lamina inciso- serrate, apex caudate *A. caudatum*
+ Lamina remotely serrate, apex acuminate..... *A. sterculaiaceum*
6. Leaf lobes deltoid, margin deeply serrate *A. pectinatum.*
+ Leaf lobes ovate, sub-entire or serrulate *A. campbellii*

Acer campbellii Hooker f. et Thomson ex Hiern in Fl. Brit. India 1: 696. 1875; Trs. N. Beng. 42. 1929; Hara & Ohashi in Fl.E.Him.1:191. 1966; Hara *et al.* Enum. Fl.Pl.Nepal 2: 98. 1979 ; Grierson & Long. Fl. Bhutan 2(1): 64. 1991. Pant in Singh *et al.*, Fl. India 5: 397:2000.

Trees 20 - 30m tall. **Leaves** palmately 5 - 7-lobed, lamina 10 - 12 × 12 - 15 cm, broader than long, both surfaces light green, shining, margin serrulate, base truncate-cordate, 5 - 7-nerved,

glabrous or at the axils and along the nerves beneath sparsely pilose; lobes ovate-caudate or lanceolate-caudate. **Flower** in dense corymbose, terminal, appearing with leaves 5 - 15 cm long, pentamerous, greenish-white. **Stamens** 8, somewhat included, reddish, filament short. **Disc** extra staminal. **Ovary** glabrescent. **Samaras** 1.7 - 3.0 cm long, slanting, the angle of divergent more than 90°, glabrous.

Flower : April *Fruit* : August
Exsiccatae : Rachela 2800 m, **SR Lepcha & AP. Das** 31058, Dated 03.10.2004
Bara- Ramitey 2500 m, **SR Lepcha & AP. Das** 31137, Dated
03.10.2004.
Status : Common
Local Distribution : Memenchu, 3560 m.
General Distribution : N INDIA (Sikkim), NEPAL, BHUTAN, MYANMAR, CHINA,
VIETNAM.
Note : Used as a fodder in Sikkim.

Acer cappadocicum Gleditsch, Schriften Ges. Naturf. Freunde Berlin 6: 116. 1785;
Hara in Fl.E.Him. 2: 93. 1971; Grierson & Long in Fl. Bhutan 2(1): 67. 1991; Pant in
Singh *et al* Fl. India 5: 397. 2000

Trees to 20 m tall. **Leaves** deciduous; **petiole** 7 - 12 cm, slender, glabrous; lamina 4 - 12 (-20) x 5 - 20 cm, abaxially pale green, adaxially dark green, usually longer than broad, adaxially glabrous, base rounded, 3 - 7-lobed, occasionally with leaves small, entire; middle lobe triangular-ovate, apex acuminate; lateral lobes obtuse or triangular-ovate. **Flowers** in corymbose inflorescence; yellowish green; pedicel 2 - 2.5 cm. **Sepals** 5; **petals** 5; **disc** glabrous.

Flower : April *Fruit*: August
Exsiccatus : Rachela, 2800 m, **SR Lepcha & AP. Das** 31119, dated 03.10.2004.
Status : Less Common
Local Distribution : Rachela, Panglakha, PWS, 1500-3000
General Distribution : INDIA (Kashmir, Sikkim, Assam), NEPAL, CHINA, BHUTAN,
PAKISTAN, SW ASIA, EUROPE (ITALY)].

Acer caudatum Wallich, Pl. Asiat. Rar. 2: 4. 1830 & 2: 28.t. 132. 1831; Hiern in Hook.f., Fl. Brit. India 1: 695. 1875; Hara in Fl. E. Him.(1):19. 1991. Grierson & Long, Fl. Bhutan 2(1): 67. 1991; Pant in Singh *et al.*, Fl. India 5: 399. 2000;

Trees or shrubs, upto 15 m tall. **Leaves** Petioles 5 - 10 cm long, pubescent, lamina 7.5-15 x 8-18 cm, under surface pubescent, 5-lobed, basal lobes small or often obscure; adult barbate in the axils of nerves below, base cordate, margin inciso-serrate, 5 - 7 nerved, apex long, linear, cuspidate-serrulate. **Flowers** in erect, terminal, racemes; villose, pentamerous, yellowish. **Stamens** 8, exserted. **Disc** large, extra staminal. **Ovaries** pubescent; styles elongated; stigmas short. **Samaras** ca 3 cm long, angle of divergent less than 90°.

Flower : March *Fruit*: October
Exsiccatus : Kyongnosla, **SR Lepcha & AP. Das** 31479, dated 27.07.2005.
Status : Less Common
Local Distribution : PWS, 1675 - 2130
General Distribution : INDIA (Sikkim), BHUTAN, CHINA, MYANMAR

Acer hookeri Miquel in Arch. Neerl. Sci. Nat. 2: 471. 1852; Hiern in Fl. Brit. India 1:694 1875; Trs. N. Beng. 41. 1929; Hara in Fl. E. Him 1:191. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 98. 1979; Grierson & Long., Fl. Bhutan 2 (1):64. 1991.

Local Name: Lal Kapasi (Nep.)

Trees upto 15 m tall. Branches green with whitish stripes later becomes reddish. **Leaves:** petioles to 4 cm long, reddish, sparsely hairy in lower basal part; **lamina** 5 - 13 x 3 - 7 cm, ovate, sharply serrate to bi-serrate, caudate-sub-cordate, acuminate, glabrous and green both sides or sparsely hairy on veins of old leaves beneath, basally 5-nerved. **Flowers** appears with leaves, racemes simple, to 12 cm, pendulous. **Flowers** actinomorphic, monoecious, greenish white and appear along with new leaves. **Sepals** 0.5 x 0.4 cm, almost oblong. **Petals** nearly equal to sepals but slightly broader, 0.33 x 0.17 cm, obovate; **stamens** 8, scarcely exerted. **Samara** sub horizontal, nuts rounded, winged divergent, to 1.5 x 0.4 cm.

Flower : April *Fruit:* August
Exsiccatus : Rachela trijunction 3000 m, **SR Lepcha & AP. Das** 31257, dated 13. 07. 2008.

Status : Less Common

Local Distribution : Rachela trijunction, 2200- 3000 m.

General Distribution : INDIA (Sikkim)

Note: 1. Endangered species of India (Nair & Shastri ,1987- 1988)

2. An ornamental plant.

Acer pectinatum Wallich, Pl. As. Rar. 2: 4. 1831; Hara *et al.* Enum. Fl. Pl. Nepal 2: 298. 1979; Hara *et al.* Fl. E. Him. 2: 73.1971; Grierson & Long, Fl. Bhutan 2 (1): 67. 1991. *A. caudatum* f. *pectinatum* (Wallich) Hiern in Fl. Brit. India 1: 695. 1875. *A. caudatum* auct. non Wallich: Hiern. in Fl. Brit. India 1: 695. 1875 p.p.

Local Name: Lekh Kapasi (Nep.).

Trees deciduous, upto 22 m tall. **Leaves** lamina 5 - 8 x 5.5 - 7.5 cm.; **petioles** purplish red, 2.5 x 6 cm, 3 - 5 lobed, leaf blade abaxially pale green, adaxially dark green, suborbicular, 3 - 5 lobed, abaxially pubescent, adaxially glabrous, primary veins 5, lateral veins 8 or 9 pairs, base cordate or deeply cordate, 3 - 5 lobed; middle lobe ovate, apex caudate-acuminate, lateral lobes triangular, margin serrate, apex caudate-acuminate or obtuse. **Pedicels** slender, glabrous. **Flowers** staminate. **Sepals** 5, purplish green, ca. 3.5mm. **Petals** 5. **Stamens** 8. **Fruits** yellowish ca. 5 x 4.5 mm; wings falcate, spreading obtusely.

Flower : April - June *Fruit* July - November
Exsiccatae : Rachela 2800 m, **SR Lepcha & AP Das** 31117, dated 27.10.2004.
Kyongnosla, 3500 m, **SR Lepcha & AP. Das** 32006, dated 27.10.2004.

Status : Rare

Local Distribution : Rachela, Kyongnosla, 2200 - 3500

General Distribution : NE INDIA, NEPAL, BHUTAN, NE MYANMAR, CHINA,

Acer sterculiaecium Wallich, Pl. As. Rar. 2: 3. t. 105. 1830; Hara in Fl. E. Him. (1):192.199; Grierson & Long. Fl. Bhutan 2.1:68.1991; Pant in Singh *et al.*, Fl. India 5: 408. 2000 ; *A. villosum* sensu Wallich *J.c.* 2: 4. 1831 (non Presl.); Hiern in Hook.f. Fl. Brit. India 1: 695. 1875.

Trees upto 15 m tall. **Leaves** ; **Petioles** densely villose, upto 13 cm long, canaliculated; **lamina** 12 - 20 x 13 - 22 cm, subcoriaceous, 3 - 5 lobed, basal lobes smaller, often obscure, both surfaces

dull green, upper glabrate; margin remotely serrate, base deeply cordate, 5 – 7 nerved, apex acuminate. **Flowers** racemose pubescent, appearing with or before leaves, lax, lateral collate, pendulous, pentamerous, greenish-yellow, bracts wooly. **Stamens** 5 - 8 (7 - 10), perigynous, exerted. **Ovaries** greenish-brown, prominent green disc present. **Samaras** 4-5 cm long, puberulent, brownish, angle of divergent 90°.

Flower : February *Fruit:* September
Exsiccatus : Ramitey 2000 m, **SR Lepcha & AP Das** 31109, Dated 03.10.2004.
Status : Less common
Local Distribution : Ramitey, PWS, 1675 – 2130
General Distribution : HIMALAYAS, INDIA (Sikkim), BHUTAN
Note : Endemic to Himalaya.

Acer thomsonii Miquel in Arch. Ne'erl. Sci. Nat. 2: 470. 1867; Hara in Fl. E. Him. 1: 193. 1966; 2: 73. 1971; Kitamura in Enum. Fl. Pl. Nepal 2: 98. 1979; Fasc. Fl. India 9: 18. 1982; Grierson & Long., Fl. Bhutan 2(1): 66. 1991. *A. villosum* Wallich var. *thomsonii* (Miquel) Hiern in Fl. Brit. India 1: 695. 1875.

Local Name: Melo Kapasi (Nep.).

Trees upto 30 m tall. **Leaves;** petioles to 15 cm long; lamina 7 - 22 x 6.5 - 15 cm, sub-coriaceous, trilobed, sub-orbicular, triangular, acuminate, base rounded or cordate, entire or obscurely serrate, glabrous in older. **Inflorescence** spicate racemose; to 23 cm long. **Sepals** upto 0.4 cm, oblong, white pubescent. **Petals** almost equal to sepals or slightly longer, yellowish. **Anther** exerted. **Samara** reddish brown, wings to 7cm.

Flower : October – December *Fruit:* January – August
Exsiccatus : Memenchu, 3800 m, **SR Lepcha & AP Das** 20299, dated 28. 10. 2004.
Status : Rare
Local Distribution : PWS, 1400 – 2400 m
General Distribution : HIMALAYAS; INDIA (Simla - Arunachal Pradesh), MANIPUR, MYANMAR.

ANACARDIACEAE Lindley

Key to the Genera:

1. Leaves simple..... 2
 + Leaves compound..... 3
2. Leaves opposite, petals 4, stamens 8..... *Dobinea*
 + Leaves alternate, petals 5, stamens 5..... *Semicarpus*
3. Flowers unisexual ; stamens 5 *Rhus*
 + Flowers bisexual; stamens 10 *Spondias*

Dobinea D. Don

Dobinea vulgaris D. Don, Prodr. Fl. Nep. 249. 1825; Hook.f. in Fl. Brit. India 1: 696. 1875; Hara in Fl. E. Him. 1: 186. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 100. 1979; Grierson in Grierson & Long, Fl. Bhutan 2(1): 62. 1991; Hajra *et al.*, Fl. India 5: 41. 2000.

Local Name: Sanglay (Nep.).

Shubs upto 5.5 m tall branched. **Leaves** opposite; petioles 2-3cm long; **lamina** 7 – 13 x 3 – 5.5 cm, elliptic-lanceolate, acuminate, dentate - serrate, thinly hairy beneath. **Inflorescence** in panicles upto 53 cm long, mostly terminal, pyramidal. **Flowers** unisexual, whitish, male to 0.18 cm; bracts upto 1.6 cm long, usually linear **stamens** 8, alternately short and long; female to 0.15 cm. **Petals** absent; **stamens** 8. **Fruits** orbicular – ob-cordate, 0.4 cm across, compressed, whitish.

Flower : August - October *Fruit:* October - November
Exsiccatus : On way to Panglakh from Premlakha, 1800 m, **SR Lepcha & AP Das**
31258, dated 13. 07. 2008
Status : Common
Local Distribution : Rigu, Between Padamchen – Lingtam, 1120-2200 m
General Distribution : HIMALAYAS; INDIA (Sikkim- Assam).NEPAL-BHUTAN,

Rhus Linnaeus.

Key to the species:

1. Leaf surface sparsely pubescent above, densely brown tomentose below ; panicles both pyramidal and terminal.; flowers greenish- white *Rhus semialata*
- + Leaf surface glabrous in both sides, glossy adaxially; panicles axillary; Flowers yellowish green *Rhus succedanea*

Rhus semialata Murray in Comm. Soc. Goetting 5: 27. t. 3. 1784; Hook.f. in Fl. Brit. India 2: 10. 1876; Grierson in Grierson & Long, Fl. Bhutan 2(1): 55. 1991. *R. javanica* L., Sp. Pl. 265. 1753; Kanai in Hara Fl. E.Him. 1: 186. 1966. *R. javanica* var. *roxburghii* (DC.) Rehder and Wilson in Sargent, Pl. Wilson. 2: 179. 1914

Local Name: Bhakimlo (Nep.).

Shrub to small tree, upto 12.5 m tall. **Branched**, lax. **Leaves** alternate, odd-pinnate; leaflets 3 - 6 pairs, **lamina** 3 - 13 x 2.4 – 7.2 cm, oblong-ovate or elliptic, margin crenate-dentate, acute, base rounded rarely truncate, upper surface sparsely pubescent, lower densely brown tomentose , rachis usually winged upwards. **Panicles** both pyramidal and terminal. Flowers yellow or greenish-white. **Calyx** very small with rounded lobes. **Petals** about oblong, deflexed; ovary to 0.17 cm, oblong, reduced to pistillode in male flowers. **Drupe** subglobose, to 0.6 cm across, reddish, hairy.

Flower & Fruit : August - January
Exsiccatus : Rachela below – NNP border 2230 m, **SR Lepcha & AP. Das** 31259,
Dated 13.07. 2008
Status : Common
Local Distribution : Rachela Chowk, Panglakh below, 1400 – 2250 m.
General Distribution : HIMALAYAS; INDIA, MYANMAR, THAILAND, CHINA,
FORMOSA, KOREA, JAPAN.

Note : Fruits edible.

Rhus succedanea L., Mant. Pl. 2: 221. 1771; Hook.f. Fl. Brit. India 2: 12. 1876; Hara in Fl. E. Him. 1:186. 1966; 3: 76. 1975; Grierson in Grierson & Long, Fl. Bhutan 2(1): 65. 1991; var. *acuminata* (DC.) Hook. f. in Fl. Brit. India 2: 12. 1876. *R. acuminata* DC., Prodr. 68. 1815.
Local Name: Rani Bhalayo (Nep.).

Shrub to small trees upto 10 m tall. **Leaves** imparipinnate; petioles to 0.8 cm long; leaflets 2 - 6 pairs, ovate or oblong, **lamina** 4.8 - 11.5 x 1 - 4.8 cm, entire, caudate-acuminate, cuneate, rounded or rarely oblique, both upper and lower surface glabrous, glossy adaxially, silvery white abaxially, mid-rib deeply impressed above, lateral veins 13 - 24 pairs. **Panicles** axillary, to 10 cm, slender. **Flowers** unisexual, yellowish green. **Sepals** short, 0.3 cm, glabrous. **Petals** larger than sepals, glabrous; stamens 5, reduced to staminodes in female flowers; **ovary** to 0.16 cm, ovoid, reduced to pistillode in male flowers. **Drupes** drooping, subglobose, to 0.6 cm, yellowish.

Flower : April – June *Fruit* : June – August.

Exsiccatu : Subaney Dara, 1800 m, *SR Lepcha & AP. Das* 31261, dated 13. 07. 2008

Status : Less Common.

Local Distribution : Subaney Dara, Rachel Chowk, 1200 – 2300 m.

General Distribution : HIMALAYA; INDIA, MYANMAR, THAILAND, INDO-CHINA, JAPAN.

Note : Sap causes irritating and itching blisters on skin (Rai & Das 2000).

Spondias L.

Spondias pinnata (L. f.) Kurz, Prelim. Rep. For. & Veg. Pegu Append. A. 44, App. B. 42. 1875; Hara *et al.* Enum. Fl. Pl. Nepal 2:102. 1979; Grierson in Grierson & Long, Fl. Bhutan 2 (1): 60. 1991. *Mangifera pinnata* L. f., Suppl. Pl. 156. 1781. *Spondias mangifera* Willd., Sp. Pl. 2: 751. 1799; Hook.f. in Fl. Brit. India 2:42. 1876.

Local Name: Amaroo (Nep.).

Trees to upto 38 m tall. **Branches** spreading, in old trees. **Leaves** alternate, odd-pinnate, to 35 cm; leaflets 2 - 6 pairs, oblong-elliptic, **lamina** 5.9 – 16 x 4 – 7 cm, acuminate, base rounded or cuneate, entire with a distinct intra-marginal vein, glabrous. **Panicles** axillary or terminal. **Flowers** ± sessile, bisexual, borne on inflorescence branches. **Calyx** 5-lobed, lobes to 0.07 cm. **Petals** 5, 0.22 - 0.5 x 0.2 - 0.20 cm, ovate - oblong, valvate ; stamens 10 ; ovary sub-globose; styles 4-5, free. **Drupe** ellipsoid, 4-5 celled, orange-yellow.

Flower & Fruit : March - June

Exsiccatu : Subaney – Panglakh 2700 m, *SR Lepcha & AP. Das* 31262, dated 15. 07. 2008.

Status : Less Frequent.

Local Distribution : Rachel Chowk, 1200 – 2300 m.

General Distribution : TROPICAL HIMALAYAS; INDIA, SRI LANKA, MALAYSIA.

Note : Fruits eaten. Shoot also yields a gum called “Chop” (Rai & Das, 2009).

Semecarpus L. f.

Semecarpus anacardium L. f., Suppl. Pl. 182. 1781; Hook. f. Fl. Brit. India 2: 30. 1876; Hara in Fl. E. Him 1:187. 1966; 3:77. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 2:102. 1979; Grierson in Grierson & Long. Fl. Bhutan 2(1):61. 1991.

Local Name: Kalo Bhalayo (Nep.).

Trees deciduous to 15 m tall. Juvenile shoot pale tomentose. **Leaves;** petioles to 5 cm long; simple, **lamina** 16 - 37 x 13 - 20 cm, oblong-obovate, cuneate, entire, subglabrous above, pubescent beneath, coriaceous. **Flowers** in panicles slightly shorter or equalling leaves. **Flowers** to 1cm across, subsessile, dioecious. **Calyx** obconic. **Petals** to 0.6 cm long, oblong, greenish white. **Drupe** up 3 cm long, oblong or ovoid.

Flower & Fruit : May - February

Exsiccatus : Subaney - Singhaney 1600m, *SR Lepcha & AP. Das* 208, dated 16.09. 2001.

Status : Less Frequent.

Local Distribution : Gangtok below, Rigu, 1200 - 1700 m.

General Distributions : HIMALAYAS; INDIA, (Sirmore-Sikkim), MYANMAR, MALAYSIA, N. AUSTRALIA.

Note : The species is of ethno-medicinal importance.

RUTACEAE A.L. Jussieu

Key to the Genera:

- 1. Leaves compound 2
- + Leaves simple *Skimmia*
- 2. Shrubs or tree with trifoliolate or pinate leaves 3
- + Herbs with bi- or triternate leaves *Boenninghausenia*
- 3. Leaves opposite, pinnate; trees evergreen; stamen 4 - 5 *Tetradium*
- + Leaves alternate; trifoliolate; shrubs often armed; stamens 4 - 8 *Zanthoxylum*

Boenninghausenia Reichenboch.

Boenninghausenia albiflora (Hook.) Reichenb. ex Meisn., Consp. 197. 1828; Hook. f. in Fl. Brit India 1: 486. 1875; Kanai in Fl. E. Him. 3: 75. 1972 Hara *et al.*, Enum. Fl. Pl. Nepal 2: 81. 1979; Grierson in Grierson & Long, Fl. Bhutan 2(1): 7. 1991; Hajra *et al.*, Fl. India 4: 263. 1997

Herbs or under-shrubs upto 1.5m tall. Branches usually slender, glabrous. **Stem** glabrous to pubescent. **Leaves** lamina bipinnate, 4.5 - 15 x 3.5; leaflets blades elliptic-obovate to broadly obovate suborbicular, entire, emarginate to rounded, cuneate, glabrous, pale green, nerves distinct. **Inflorescences** in terminal cymes, globose to ovoid to ellipsoid to oblong in bud. **Flowers** upto 65mm long. **Calyx** 1- 2mm persistent. **Corolla** elliptic to obovate to oblong 3.5 - 9 x 3.5mm, white or pink striped-stamen slightly longer then corolla. **Gynophore** elongating in fruit.

- Flower* : May. *Fruit:* November.
Exsiccatu : Talkharka 2200m, *SR Lepcha & AP. Das* 27745, dated 30.09.2004
Status : Not common.
Local distribution : Talkharka, Singhaney 1350-3050m.
General distribution : PAKISTAN, INDIA, NEPAL, BHUTAN, MYANMAR, THAILAND, INDONESIA, PHILIPPINES, JAPAN, LAOS, VIETNAM.
Note : Used in the treatment of lice and other related problems.

Skimmia Thunbery

Key to the species:

1. Shrubs or trees, upto 9m tall; leaf surface glabrous and glossy beneath;
 fruits ellipsoid, reddish *S. arborescens*
 + Shrubs upto 2m tall; leaf surface pale beneath; fruit sub-globose, black *S. laureola*

Skimmia arborescens Anders. ex Gamble in Journ. Linn. Soc. Bot. 43: 491. 1916; Kanai in Fl. E. Him. 170. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 82. 1979; Grierson Grierson & Long, Fl. Bhutan 2(1): 19. 1991; Hajra *et al.*, Fl. India 4: 393. 1997. *Limonia laureola sensu* Hook.f., in Fl. Brit. India 1:499.1875, p.p. non (DC.) Walpers.

Local Name: Limbuniphul, Choulaney (Nep.).

Shrubs or small evergreen trees upto 9 m tall. **Leaves** closely alternate, falsely whorled at branch ends; petioles 0.5 - 1.5cm; lamina 5.5 - 13 x 2.2 - 4.8 cm, elliptic - oblanceolate, entire, caudate-acuminate, cuneate, glabrous, glossy beneath, lateral veins 5 - 7 on each side. **Inflorescence** in short racemes to 3. 8 cm long, terminal. **Sepals** 0.2 - 0.13 cm. **Petals** 0.26 - 4 x 0.13 - 0.5 cm, creamy; stamens 0.2 - 0.8cm; anthers brown; filaments greenish-white; ovary 0.20cm long. **Fruits** ellipsoid, reddish.

- Flower* : April - May *Fruit:* November - March.
Exsiccatu : Mulkharka 2120 m, *SR Lepcha & AP. Das* 31114, dated 13.10.2004
Status : Common.
Local Distribution : Mulkharka, Hangey, 2100 - 2800 m.
General Distribution : INDIA, NEPAL, BHUTAN, W. CHINA, THAILAND.

Skimmia laureola (DC.) Walpers, Repert. 5: 405. 1842-1847; Grierson in Grierson & Long, Fl. Bhutan 2(1): 19. 1991; Hajra *et al.*, Fl. India 4: 394, 397. 1997. *S. melanocarpa* Rehder & Wilson in sory, pl. Wilson.2: 138. 1914. *Skimmia wallichii* Hook.f. & Thoms. ex Gamble in Journ. Linn. Soc. Bot. 43: 492. 1916,

Local Name: Jainberiphul (Nep.)

Shrubs small evergreen glabrous semi-prostrate, not exceeding 2m tall. **Leaves** simple or crowded on branches. alternate; petioles short 1.5cm; elliptic; oblanceolate - entire, acute or caudate, cuneate, glabrous, dark green above pale beneath, lamina 3 - 11 x 3 - 5cm, acute, base cuneate lateral nerves 6 - 8 pairs. **Flowers** in short terminal racemes, fragrant. **Sepals** -5 lobed. **Petals** 5 lobes upto 1.2mm long, greenish yellow, oblanceolate; **stamens** 5 equal or slightly or shorter to petals 2.5mm. **Ovary** ovoid. **Fruits** sub-globose to 8 mm in diam., black.

- Flower* : April. *Fruit:* May.
Exsiccatu : Ramitey dara - Rachelá 2890 m, *SR Lepcha & AP. Das* 31191, dated 05. 10.2004.
Status : Less common

Local distribution : Rachela, Premlakha 2895-3200m
General distribution : E. HIMALAYA (NEPAL-BHUTAN, Assam), MYANMAR, W. CHINA.

Tetradium Loureiro

Tetradium fraxinifolium (Hook.) Hartely in Gard. Bull. Singapore 34(1): 102. 1981; Grierson in Grierson & Long, Fl. Bhutan 2(1): 9. 1991; Hajra *et al.*, Fl. India 4: 370. 1997. *Philagonia fraxinifolia* Hook. in Ic. Pl. t. 710. 1875. *Evodia fraxinifolia* Hook.f. in Fl. Brit. India 1: 490. 1875.

Local Name: Khanakpa (Nep).

Tree upto 13m tall. **Leaves** ovate elliptic, acuminate, lamina 8 – 25 x 3.5 - 9cm base ± asymmetrically rounded, margin crenates, glabrous or sparsely pubescent on both surfaces, marginal oil glands layer then those scattered about lamina, leaflets 3 - 7pairs, ovate. **Inflorescence** 8 - 22cm, branches pubescent, flower 4 merous. **Calyx** 4, 1 - 2mm. **Corolla** greenish 3 - 6mm. **Stamens** slightly longer than corolla. **Ovary** glabrous or appressed pubescent; ovate 2-3per. **Fruit** 4 carpellate, connate, at base forming a 4 lobed follicle; 2 seeded per cell, subtrigonous.

Flower : May – November *Fruit:* July – November.
Exsiccatus : Dohrok 2200m, **SR Lepcha & AP. Das 30271**, Dated 06.10.2004.
Status : Common
Local Distribution : Dohrok, Phusrey, Rachela upto 3000 m
General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, THAILAND, VIETNAM
Note : Fruit used to make pickles and taken in acute dysentery.

Zanthoxylum Linnaeus

Key to the Species:

1. Perianth uni-seriate, petiole and leaf rachis usually wing 2
+ Perianth bi-seriate; petiole and rachis not winged *Z. oxyphyllum*
2. Leaf margins serrate; flowers in sub-umbellate panicles, rarely axillary ... *Z. acanthopodium*
+ Leaf margins crenate or entire; flowers axillary in short pedunculate ... *Z. armatum*

Zanthoxylum oxyphyllum Edgew. in Trans. Linn. Soc. 20: 42. 1846; Hook.f. in Fl. Brit. India 1: 494. 1875; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 83. 1979; Grierson in Grierson & Long, Fl. Bhutan 2(1): 15. 1991. *Zanthoxylum violaceum* Wall., cat 33,m1213.1829, nom. nud,p.p. *Fagara oxyphylla* (Edgew) Engl,pltfam.34: 118.1896 ; Hajra *et al.* Fl. India 4: 378-385. 1997

Local Name: Bhainsy timur (Nep).

Shrubs or small trees, twigs scrambling, prickles hooked. **Leaves** odd-pinnate; lamina 4 – 8 x 2 - 3cm, acute odd-pinnate leaflets 1 – 9 pairs ovate-lanceolate to oblong, acute or acuminate, base rounded or cuneate, margin glandular crenate and leaflets usually bearing spines beneath. **Inflorescence** in sub-umbellate panicles. Male flowers calyx 4 – lobed. **Corolla** 4, ovate-elliptic. Perianth biseriate. **Stamens** 4, pistillodes 1 or 2 female flowers; calyx and petals as in male flowers. **Staminodes** absent. **Carpel** 4, ovoid style cohering. **Follicles** upto 4, sub-globose, purplish red.

Flower : May – June *Fruit:* September – October

- Exsiccatus* : Ramitey dara 2300m, **SR Lepcha & AP. Das 31163**, dated 03.10.2004.
 Rachela 3010 m, **SR Lepcha & AP. Das 27716**, dated 30.09.2004.
- Status* : Sparse
- Local Distribution* : Ramitey dara, Subaney – Singhaney 1980 – 2900 m
- General Distribution* : HIMALAYAS; INDIA, (Garhwal-BHUTAN), Meghalaya, MYANMAR.

Zanthoxylum acanthopodium DC., Prodr. 1: 727. 1824; Hook.f. in Fl. Brit. India 1: 493. 1875; Trs. N. Bengal 29. 1929; Hara & Ohashi in Fl. E. Him. 171. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 83. 1979; Grierson in Grierson & Long, Fl. Bhutan 2(1): 13. 1991; Hajra *et al.*, Fl. India 4: 385. 1997

Local Name: Boke Timbur (Nep).

Shrub with prominent prickles, tomentose, ferruginous in young branchlets. **Leaves** usually imperipennate, upto 22cm; **leaflets** 3 - 9, lamina 3.8 - 6.5 x 1.4 - 3.5cm, lanceolate or ovate-lanceolate, serrate, shortly acuminate or acute, rounded, glabrous above, pubescent, veins distinct beneath, wings between leaflets upto 0.55 cm broad. **Inflorescence** axillary, small crowded, shortly pedunculate. **Perianth** uniseriate. **Calyx** leaves linear, ciliate; **stamens** brownish. **Fruits** sub-globose, red; seeds globular; follicle blackish.

- Flower* : October - February *Fruit:* December - June
- Exsiccatus* : Subaney Dara, **SR Lepcha & AP. Das 31029**, dated 02.10.2004.
- Status* : Less Common.
- Local Distribution* : Subhaney, Dohrok 2000 – 2600 m.
- General Distribution* : HIMALAYAS ; (Kumaon-BHUTAN), INDIA (Meghalaya) MYANMAR, THAILAND, INDO-CHINA, W. CHINA.

Note : Fruits chewed to cure indigestion and flatulence

Zanthoxylum armatum Candolle, Prodr. 1: 727. 1824; Hajra *et al.*, Fl. India 4: 379. 1997; Hara & Kanai, Fl. E. Him. 3: 76. 1975.

Shrubs, climbers, or trees upto 5 m tall. Branch-lets and leaflet with prickles. **Leaves** 3 – 9 foliolate; rachis glabrous or rust-colored pubescent, wings to 4.5 -6 mm on each side; **leaflet** subsessile, opposite, lanceolate, ovate, or elliptic, 2.5 - 13 × 1.5 – 3.8cm, base attenuate to broadly cuneate, margin crenate or entire and often revolute when dry, apex acute to acuminate. **Inflorescences** terminal on short lateral branchlets, rarely axillary, upto 30 flowers. **Perianth** in 2 irregular series or 1 series, with 6 - 8 ± undifferentiated tepals. **Male flowers:** stamens 4 - 6; anthers yellow prior to anthesis; connective apex with oil gland; carpels lacking. **Female flowers:** carpels 2 or 3, abaxially often with a conspicuous oil gland; styles recurved; staminodes ligulate. **Fruit** follicles usually purplish red, with some oil glands. Seed blackish brown.

- Flower* : April – May *Fruit:* August – October
- Exsiccatus* : Singhaney dara – Rachela 2800 m, **SR Lepcha & AP. Das 31027**, dated 07.10. 2004.
- Status* : Less Common.
- Local Distribution* : Singhaney, Rachela 2000 – 3100 m.
- General Distribution* : PAKISTAN, INDIA, NEPAL, BHUTAN, BANGLADESH, THAILAND, INDONESIA, JAPAN, KOREA, LAOS, MYANMAR, PHILIPPINES, VIETNAM.

Order: Geraniales

OXALIDACEAE R. Brown

Oxalis Linnaeus

Key to the species:

1. Leaflets ob-cordate – broadly cordate 2
+ Leaflets ob-triangular *O. latifolia*
2. Inflorescence with 1 flowered; corolla white; capsule ovoid *O. acetosella*
+ Inflorescence with 2 - 3 flowered; corolla yellow; capsule sub-cylindrical *O. corniculata*

Oxalis acetosella L., Sp. Pl. 43. 1753; Rec. Surv.Bot. India 6(8): 325-341, 1919; Journ. Fac. Sci. Univ. Tokyo Bot. 6: 81. 1952; Hajra *et al.*, Fl. India 4: 242. 1997; Hara in Fl. E. Him. 167. 1966. *O. leucolepis* Diels in Notes Bot. Gard, Edin. 5:223. 1912.

Herbs with rigid and creeping root-stock. **Leaves** petioled to 14cm long, pubescent; **lamina** of leaflets broadly obcordate, 1.5 – 3.5 x 1.2 – 4 cm, ternate, appressed pubescent beneath along margins; peduncles to 17 cm, slender, axillary. **Flowers** to 1.7 cm diam, 1-flowered, white. **Calyx** oblong, rounded. **Corollas** equal to calyx, spatulate-oblong, white; stamens 10, unequal and alternately placed; ovary to 0.4cm, glabrous. **Capsules** 0.42 x 0.38 - 0.8 cm, ovoid, ribbed.

Flower & Fruit : May– August

Exsiccatius : Below Dorok 1920m, *SR Lepcha & AP. Das 31277*, dated 13.09. 2008.

Status : Rare.

Local Distribution : NNP border, 1420 - 2180m.

General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, JAPAN, TAIWAN.

Oxalis corniculata L., Sp. Pl. 435. 1753; Hara in Fl. E. Him. 1:168. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 77. 1979; Long in Grierson & Long, Fl. Bhutan 1(3):742. 1987

Local Name: Chari-amilo (Nep.).

Herbs perennial, spreading upto 15 cm. **Leaves** palmate-trifoliolate, radicals leave, clustered; petiole to 4.5 cm, densely brownish hairy; palmate-trifoliolate, radicals, clustered; stipules adnate; **leaflets lamina** 0.5 – 1 x 0.6 - 1cm, entire-ciliate, broadly obcordate, emarginate, lobes rounded, base cuneate, both sides densely hairy, veins indistinct; peduncles axillary, usually 2-5 flowered, hairy. Pedicels upto 1.5cm long. **Flowers** 0.6 – 1.5cm across. **Calyx** linear-elliptic, persistent. **Corolla** yellow, larger than calyx, notched in the middle. **Capsules** subcylindric, pubescent, fruiting pedicel deflexed; seeds many.

Flower & Fruit : February – October

Exsiccatius : Phusrey above, 2430, *SR Lepcha & AP. Das 31278*, dated 13.09.2008.

Status : Common.

Local Distribution : Phusrey – Rachel middle. 2100 - 2800m.

General Distribution : COSMOPOLITAN

Note : Leaves are having potential medicinal values.

Oxalis latifolia Humboldt, Bonpland & Kunth., Nov. Gen. Sp. 5:184, t. 467. 1821; Hara in Fl. E. Him.168. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 77. 1979; Long in Grierson & Long, Fl. Bhutan 1(3): 743. 1987.

Herbs with bulbil scales many nerved. **Leaflets**, ob-triangular 2.5 – 5.5 x 3 – 3.5 cm, shallowly emarginated, eglandular and glabrous. **Inflorescence** umbels not compound. **Flowers** campanulate. Calyx with 2 hastate apical glands. **Corolla** red-pink.

Flower & Fruit : May – August
Exsiccatus : Dhorok below 1960m, *SR Lepcha & AP. Das* 31279, dated 13.09.2008.
Status : Frequent
Local Distribution : Phusrey 1060 – 2000 m.
General Distribution : Native of C. & S. AMERICA, Naturalized in ASIA & EUROPE.

GERANIACEAE A.L. Jussieu

Geranium Linnaeus

Key to the species

1. Inflorescence solitary cymes 1 or (2)-flowered 2
- + Inflorescence cymes in umbel-like aggregates 2 or (3)-flowered *G. polyanthes*
2. Herbs with 3-9 lobes, petals purplish, staminal filament dark red *G. donianum*
- + Herbs with 3-5 lobes, petals pale pink, staminal filament whitish *G. nepalensis*

Geranium donianum Sweet, Geran.4:sub t. 338. 1827; Hara in Fl.E.Him.3: 72.1975; Hara *et al.* Enum.Fl. Pl. Nepal 2: 76. 1979; Campbell & Long in Grierson & Long, Fl. Bhutan 1(3): 748. 1987; Hajra *et al.*, Fl. India (4): 68, 71,1997. *G. multiflorum* D. Don, Prodr. Fl. Nepal. 207. 1825. *G. collinum auct.non.bieb*:Edgew.& Hook.f.in Fl. Brit. India 1: 429. 1872.

Herbs perennial, erect upto 40cm tall. **Stem** much branches. **Leaves** opposite, stipules lanceolate; petiole to 0.7 mm; **lamina** 1.6 - 3.38 cm across, appressed nonglandular trichomes; segments 5, rhombic to obtriangular, 3 - 9 lobed in distal half. **Inflorescence** solitary, 2-flowered; bracteoles linear-lanceolate. **Calyx** 5.5 – 1.2mm, antrorse to patent nonglandular trichomes, inside almost glabrous. **Corolla** deep purplish, 1.8 - 2.5 cm, not reflexed, margin basally ciliate, apex emarginate. **Staminal** filaments dark red distally but paler at base, lanceolate, anthers reddish, 1.5 - 2.3 mm. **Nectaries** 5, hemispheric; stigma dark red. **Fruit** erect when immature; mericarps smooth, narrowed apex; Seeds small upto 2.4 mm.

Flower : July-August *Fruit*: August - September
Excisssatus : Kupup 3940 m, *S.R.Lepcha & A.P. Das* 31408, Dated 27.07.2005.
Status : Abundant.
Local Distribution : Serabthang, Bhimbase, Dokala. 3500 - 4500 m
General Distribution : HIMALAYAS - INDIA (Sikkim), BHUTAN, NEPAL, CHINA,
Note : Endemic to Himalaya.

Geranium nepalense Sweet, Geran. 1:t.12. 1820; Edgew. & Hook.f. in Fl. Brit. India 1: 430. 1872; Hara in Fl. E. Him.1: 167. 1966; 3: 74: 1975; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 76. 1975; Campbell & Long in Grierson & Long, Fl. Bhutan 1(3): 749. 1987. Hajra *et al.*, Fl. India (4): 76. 1997

Herbs, perennials slender. **Stem** upto 72 cm tall, trailing, or ascending. **Leaf** opposite; stipules lanceolate to subulate; **petiole** to 50 cm, pubescent, lamina deeply 3 - 5 lobed, lobes ovate-rhombic, toothed, hairy; **pedicels** pubescent, eglandular. **Inflorescence**, solitary cymes (1 or)2-flowered; peduncle upto 7.5cm; bracteoles linear-lanceolate. **Calyx** 3.2 - 5.5 mm, non glandular trichomes, whitish yellow. **Corolla** white, pale pink, or rarely deep pink, 4.3 - 5.8 mm, both surfaces with a few trichomes, apex rounded or slightly notched. **Staminal** filaments whitish, lanceolate, anthers 2 celled violet. **Nectaries** 5, hemispheric, glabrous. **Stigma** reddish. **Fruit** erect when immature; mericarps 1 transversal vein at apex, capsule to 13 mm including beak.

Flower : April – September *Fruit*: May – October
Exsiccatae : Dohrok 2200 m, **SR Lepcha & AP. Das 30282**, Dated 06.10.2004.
Panglakha 2990 m, , **SR Lepcha & AP. Das 20274**, Dated 28.10.2004.
Status : Abundant.
Local Distribution : Rachela, Padamchen, Kupup 2800 – 4000 m.
General Distribution : PAKISTAN, AFGHANISTAN, NE & S INDIA, NEPAL, BHUTAN, SRI LANKA, MYANMAR, THAILAND, INDONESIA, LAOS, N. VIETNAM.

Note : The whole plant is used for Chinese medicine.

Geranium polyanthes Edgew. & Hook.f. in Fl. Brit. India 1: 431.1874; Hara in Fl. E. Him. 167. 1966; 3: 75. 1975; Hara *et al.*, Enum. Fl. Pl. Nepal 2: 76.1979; Campbell & Long in Grierson & Long, Fl. Bhutan 1(3): 745.1987; Hajra *et al.* Fl. India (4): 78. 1997

Herbs perennials erect or decumbent upto 65 cm tall. **Leaves** alternate or opposite at inflorescence; stipules ovate; petiole subglabrous; **lamina** 2.3 – 4.9 cm, palmately cleft, pilose with ± appressed trichomes; segments 5 - 7, obtriangular, 3 - 9-lobed oblong or obovate lobes. **Inflorescence** cymes in dense umbel-like aggregates, usually 2(or 3)-flowered; peduncle absent; pedicel to 2.7cm, with trichomes; bracteoles lanceolate. **Calyx** to 7.5 mm. **Corolla** pinkish outside glabrous, inside basally with trichomes, margin basally ciliate, apex rounded or retuse. **Staminal** filaments pink or white, lanceolate; anthers yellow, to 1.3 mm. **Nectaries** 5, hemispheric, glabrous. **Stigma** pinkish. **Fruit** mericarps reticulate, without a basal callus.

Flower : July - August *Fruit*: August – October
Exsiccatae : Lampokhri 4350 m, **SR Lepcha & AP. Das 30931**, dated 27.07.2005.
Bhimbase 4290 m, **SR Lepcha & AP. Das 30981**, dated 27.07.2005.
Dokala 3850 m, **SR Lepcha & AP. Das 30994**, dated 28.07.2005.
Status : Abundant.
Local Distribution : Jalepla, Gnathang, Tamzay 2900 – 4000 m.
General Distribution : HIMALAYAS; (Kumaon to Sikkim).
Note : Endemic to Himalaya.

BALSAMINACEAE A. Richard

Impatiens Linnaeus

Key to the species:

1. Herbs more than 1 m tall 2.
- + Herbs less than 1 m tall 3

2. Capsules sub-cylindric – cylindric 4
- + Capsules clavate *I. drepanophora*

4. Herbs \geq 1 m tall; flowers few (2 -7 flowered) *I. cymbifera*
- + Herbs \leq 1 m tall; flowers numerous *I. pradhanii*

3. Capsules ellipsoid, fusiform, elongated 5
- + Capsules cylindric, linear 6

5. Capsule ellipsoid *I. bracteata*
- + Capsule fusiform or elongated 8

6. Flowers purplish pink with dark red stripe *I. pulchra*
- + Flowers orange red or golden yellow with purple nerves at throat... *I. porrecta*
- + Flowers pale to midium yellow *I. jurpia*

8. Flowers \geq 4 *I. decipiens*
- + Flowers \leq 4 *I. Spirifer*

10. Lateral veins 7 - 9 pairs, flowers pale purple to yellowish white ,.... 11
- + Lateral veins 4 - 7 pairs, flowers strictly yellow *I. Longipes*

11. Lamina 3.5 – 8 x 3.5 – 7 cm; flowers radiate *I. radiata*
- + Lamina 2.5 – 6 x 1 – 6 cm; Flowers never radiate *Iracemosa*

Impatiens bracteata Colebrook ex. Roxburgh in Roxburgh, Fl. India, ed. Carey & Wallich, 2: 459. 1824; Balakrishnan, Fl. Jowai 1: 111.1981; Grey-Wilson in Grierson & Long., Fl. Bhutan 2 (1): 103. 1991

I. fimbriata Hook., Exot. Fl. 2:t.146. 105; Hook. f., Fl. Brit. India 1: 461.1874.

Herbs annual upto 5 - 45m tall. **Stem** glabrous, few branched. **Leaves** opposite rarely sub-opposite alternate, elliptic lanceolate, lamina 3 – 13 x 1 – 3.4. Inflorescence a dense many-flowered raceme; flowers pink with a yellow throat: bracts closely overlapping, markly fimbriate to 2.5 cm. Lower sepal slightly boat shaped, constricted into a curved filiform spur to 2.5 cm. Dorsal petals slightly hooded, ovate or flattened, lateral united petals to 1.5 cm; upper lateral petals suborbicular ; lower obovate. **Capsules** fusiform.

Flower : June *Fruit:* September
Exsiccatus : Rachela below 2750 m, *SR Lepcha & AP. Das* 27725, dated 30.09.

2004.

- Status* : Less common
Local Distribution : Dorok- Phusrey, Rachela, Gangtok below, 1200 - 1500 m
General Distribution : E.HIMALAYA; INDIA, Meghalaya, Manipur. (NEPAL – BHUTAN)
Khasia, CHINA.

Note : A new distribution record for Sikkim.

Impatiens cymbifera Hook.f., Fl. Brit. India 1: 475. 1875; Grey-Wilson in Grierson & Long., Fl. Bhutan 2 (1): 102. 1991

Herbs annual upto 1.5 m tall. **Leaves** elliptic – ovate elliptic or lanceolate elliptic lamina 7.5 – 20 × 2.5 – 7 cm. **Inflorescence** 2 -7 flowered in raceme, sometime reduced to 1 flower on lateral shoot; flower purple, lilac to reddish purple; peduncle to 7.5 cm. **Sepal** lower one like boat shaped, to 1.3 cm, abruptly constricted into a curved filiform spur 0.7 – 1.1cm. **Dorsal petals** slightly hooded, ovate- cordate, to 1.2 cm, crested above; **lateral united** petals 2.3 cm, upper lateral petal suborbicular, lower lateral narrow lanceolate – oblong, obtuse. **Capsule** cylindrical

- Flower & Fruit* : July - November
Exsiccatu : On way to Panglakha 2700 m, **SR Lepcha & AP. Das** 20216, dated 08.10. 2004.
Status : Common
Local Distribution : Panglakha, Rachela 1900 – 3000 m.
General Distribution : E. HIMALAYAS; INDIA (Sikkim, Assam, Nagaland, Manipur, Meghalaya) NEPAL, MYANMAR INDO- CHINA.

Impatiens decipiens Hook.f. in Rec. Bot. Surv. India 4: 17. 1905; Grey-Wilson in Grierson & Long, Fl. Bhutan 2(1): 95. 1991,

Herbs perennial upto 55 cm tall. **Leaves** ovate to ovate- elliptic, lamina 2.3 – 13 x 4.5 – 6.2 cm, lateral veins pubescent in upper surface. **Flowers** in fascicles of 2 – 4, occasionally solitary, pink to purple. **Lower** sepal funnel shaped to 1.3 cm gradually tapering into a spur; spur to 3.3 cm, usually S- shaped filiform, sparsely pubescent. **Dorsal petal** slightly hooded; lateral united sepals shaped to 23 mm, upper lateral petals of each pair broadly oval, slightly emarginated, 0.6 – 1 x 0.5 – 0.7 cm.; lower lateral petals asymmetrically oval. 1 – 1.4 x 0.8 – 1.2 cm. **Capsules** cylindrical.

- Flower* : September *Fruit* : December
Exsiccatu : Pangolakha 3100 m, **SR Lepcha & AP. Das** 30255, dated 06.10.2004.
Status : Less common
Local Distribution : Mulkharka, Subaney, Talkharka, 1200 – 1600 m.
General Distribution : INDIA (Darjeeling – Sikkim), NEPAL, BHUTAN, TIBET, CHINA,
Note : Endemic to Eastern Himalaya

Impatiens drepanophora Hook.f. in Rec. Bot. Surv. India 4: 17 & 22. 1905; Grey-Wilson in Grierson & Long, Fl. Bhutan 2 (1): 97. 1991; Vivekananthan in Hajra *et al*, Fl. India 4: 1997.

Herbs annual robust, upto 100 cm tall. **Leaves** lamina 4.5 - 13 x 2.5 - 5 cm, alternate; leaf blade ovate - lanceolate, with 2 stipitate basal glands. lateral veins 7 - 8 pairs, base cuneate, apex acuminate. **Flowers** axillary or subterminal, racemose, 6 – 9 flowered; Pedicels short slender, bracteate at base; **bracts** usually caducous, green, ovate-lanceolate, glandular. Flowers yellow. Lateral **calyx** 2, falcate. Lower calyx constricted into an involute-incurved spur. Dorsal **corolla**

spurred, orange; lateral united corolla clawed; basal lobes red spotted, narrowly oblong; distal lobes oblong. **Capsules** clavate.

Flower : August *Fruit* : September
Exsiccatus : Rachela 2870 m, *SR Lepcha & AP. Das* 30228, dated 06.10.2004.
Status : Common
Local Distribution : Panglakha, Bhusuk, Rachela 2000 - 2900 m.
General Distribution : E. HIMALAYA; INDIA (Darjeeling - Sikkim,) NEPAL. BHUTAN, MYANMAR,
Note : Endemic to Eastern Himalaya.

Impatiens jurpia Buch.- Ham. ex Hook.f. & Thoms. in Journ. Linn. Soc. 4: 140. 1860; Hook.f. Fl. Brit. India 1: 471.1874; et in Rec. Bot. Surv. India 4: 14. 1905; Hara Fl. E. Him. 196. 1966 & 2: 75: 1971; Grey-Wilson in Grierson & Long. Fl. Bhutan 2 (1): 90. 1991; Hajra *et al.*, Fl. India 4: 161. 1997.

Herbs perennial - annual upto 60 cm tall. **Leaf** glabrous, oval \pm ovate, **lamina** 7 - 23 x 2 - 13 cm. **Flowers** 3 - 10 in racemes, pale - mid yellow, **Spurs** often reddish ; peduncle to 13 cm **Calyx** lower obliquely sulcate - abruptly constricted into a curve. **Corolla** dorsal cuculate, with a keel like crest, upto 6 mm in upper part, ; lateral united corolla to 35 mm. upper lateral corolla oval, emarginated; lower lateral corolla asymmetrically obovate. **Capsules** cylindric.

Flower : June - August
Exsiccatus : Pangolakha, 2800 m, *SR Lepcha & AP. Das*, 30933, dated 24.07.2005
Status : Common
Local Distribution : Phusrey, Bhusuk, 1200 - 1800 cm
General Distribution : E. HIMALAYA; INDIA (Sikkim, Darjeeling), BHUTAN
Note : Endemic to E. Himalaya.

Impatiens longipes Hook.f & Thoms. in J. Linn. Soc. 4: 151. 1960; Hook.f., in Fl. Brit. India 1: 473. 1875 et Rec. Bot. Surv. India 1: 473. 1875 et Rec. Bot. Surv. India 4: 21. 1905; Grey-Wilson in Grierson & Long. Fl. Bhutan 2(1): 98: 1991.

Herbs annual upto 90cm tall. **Leaves** lamina 4 - 8 x 3 - 4 cm, alternate; **Petioles** with 2 basal glands; leaf blade ovate-lanceolate, lateral veins 4-7 pairs, base cuneate, attenuate into petiole, margin crenate-serrate, apex long acuminate. **Flowers** axillary or subterminal, racemose, 3 - 6 (- 7) -flowered; peduncles spreading, bracts often caducous, yellow. **Calyx** small, 2, rarely 4, ovate-oblong, apex acuminate. **Lower calyx** infundibular, narrowed into a hooked. **Corolla** orbicular, apex mucronulate on dorsal side; united and without clawed at lateral; **Capsules** linear, seeds oblong-ovoid, rugose.

Flower : August *Fruit*: September
Exsiccatae : Rachela 3050 m *SR Lepcha & AP. Das* 31044, dated 02.10.2004; Pangolakha 2850, *SR Lepcha & AP. Das*, 29372, dated 30.09.2004.
Status : commom
Local Distribution : Rachela, Panglakha, Durpiney near NNP border ca. upto 4100 m.
General Distribution : E. HIMALAYA; INDIA (Darjeeling - Sikkim).
Note : Endemic to Sikkim & Darjeeling himalaya

Impatiens porrecta Hook.f. & Thoms. in J. Linn. Soc. 4: 138. 1860; Hook.f. in Rec. Bot. Surv. India 4: 33. 1905 ; Grey-Wilson in Grierson & Long. Fl. Bhutan 2 (1): 83. 1991.

Herbs upto 45 cm tall, tufted, diffuse. **Stems** slender, creeping at base, glandular hairy. **Leaves** lamina 3.5 - 7 × 2 - 4 cm, oblong obovate to elliptic oblong, obtuse, acute or acuminate, crenate serrate at margins, base cuneate, petioles 2.5 mm long, peduncles 1 - 2 flowered. **Flowers** orange red or golden yellow with purple nerves at throat; **bracts** setaceous, glands tipped, spur long, abruptly hooked. **Capsules** ellipsoid.

Flower : September *Fruit* : November
Exsiccatus : Dohrok 2300 m, **SR Lepcha & AP. Das** 30251, dated 06.10.2004.
Status : Common
Local Distribution : Lingtam, Rigu, Karponang, Dohrok upto 3000 m.
General Distribution : E. HIMALAYA; INDIA (Sikkim, Darjeeling)
Note : Endemic to Eastern Himalaya

Impatiens pradhanii Hara in Journ. Jap. Bot. 40: 99. 1965; Vivekananthan in Hajra *et al*, Fl. India 4: 125. 1997; Grey-Wilson in Grierson & Long, Fl. Bhutan 1(1): 103. 1991. *Impatiens bicornuta* Wallich in Roxb., Fl. Indica, ed. Carey & Wallich ii. 460. 1824.

Herbs annual, upto 1 m tall. **Leaves** alternate; petiole with globose glands at base; elliptic or elliptic-lanceolate, **lamina** 5.5 - 12 (-16) × 5 - 8cm both surfaces glabrous or sparsely pilose, setose at base, lateral veins 10 - 12 pairs, base cuneate, margin coarsely crenate, apex caudate-acuminate. **Inflorescences** crowded in leaf axils, racemose, many flowered; Pedicels fascicled or verticillate ; bracts ovate, with conspicuous aristate glands at apex. **Flowers** pale blue-purple, **Lateral calyx** 2, ovate, with aristate glands at apex. **Lower calyx** purple spotted, broadly sigmoid-curved constricted into a hooked or incurved spur; **Dorsal corolla** suborbicular ; lateral united petals not clawed, basal lobes ovate to suborbicular; distal lobes narrowly caudate, apex long tailed ; auricle inflexed, **Anthers** obtuse. **Capsule** subcylindric, shiny.

Flower : June *Fruit*: August
Exsiccatus : Mulkharkha - Ramitey dara 1800 m, **SR Lepcha & AP. Das**, 27798, dated 30.09.2004
Status : Less common
Local Distribution : Rigu, Subaney, Ramitey dara 2400 - 2800 m.
General Distribution : E. HIMALAYA; INDIA (Darjeeling - Sikkim).
Note : Endemic to Sikkim.

Impatiens pulchra Hook.f. & Thoms. in Journ. Linn. Soc. 4: 139. 1860; Hook.f., Fl. Brit. India 1: 459. 1874; Grey-Wilson in Grierson & Long., Fl. Bhutan. 2(1): 90. 1991; Vivekananthan in Hajra *et al*, Fl. India 4: 199. 1997;

Herbs upto 30 cm tall, erect, glabrous, Stems nodes sparsely branched. Petiole upto 13 mm, glabrous. **Leaf-lamina** 3 - 10 × 1.5 - 3 cm, oblong or lanceolate, elliptic - lanceolate, shortly attenuate into petiole at base, acuminate, crenate to crenate dentate along margin, dark green above, pale beneath, lateral nerves 8 -12 pairs. **Flowers** purplish pink with dark red streak, peduncles upto 2 flowered. Bracts lanceolate. **Lateral calyx** 2, acute to acuminate. Lip funnel shaped. Spur constricted, filiform, basal lobes elliptic oblong, distal lobes narrowly elliptic to semiovate, obtuse. **Capsules** ellipsoid.

Flower : June *Fruit*: October
Exsiccatus : Phusrey, 2306 m, **SR Lepcha & AP. Das** 20216, dated 08.10.2004.
Status : Common
Local Distribution : Phusrey, Premlakha, Beusa 1200 – 1800 m
General Distribution : E. HIMALAYAS; INDIA (Sikkim, Darjeeling, Assam, Arunachal Pradesh, Nagaland and Meghalaya), NEPAL, BHUTAN, MYANMAR.
 Note : Endemic to Eastern Himalaya

Impatiens racemosa DC., Prodr. 1: 688. 1824; Hook.f., Fl. Brit. India 1: 479. 1875; Grey-Wilson in Grierson & Long, Fl. Bhutan 2 (1): 97. 1991 ; Vivekananthan, Rathakrishnan, Swaminathan & Ghara in Hajra *et al.*, Fl. India 4: 1997.

Herbs annual upto 70cm tall. **Leaves** elliptic-lanceolate or elliptic-ovate, **lamina** 2.5 - 5- 8 x 1 – 6 cm, glabrous on both surfaces, setose between teeth, lateral veins 7 - 9 pairs, base cuneate, attenuate into petiole, margin crenate, apex acuminate. **Inflorescences** axillary or subterminal, racemose, 3 -10 flowered; peduncles subtending leaves. Pedicels slender, bracteate at base, lanceolate. **Flowers** yellow or pale yellow. Lateral calyx 2, red when dry with 1 gland at one side of upper margin. **Lower calyx** boat shaped, narrowed into an incurved, spur very short or absent. **Dorsal corolla** hooded, orbicular, lateral united corolla not clawed, 2-lobed; basal lobes ovate to orbicular ; distal lobes broadly dolabriform. **Auricles** rounded. **Anthers** obtuse. **Capsules** linear clavate, seeds many; brown, oblong.

Flower : June *Fruit*: August
Exsiccatus : Premlakha 2200 m, **SR Lepcha & AP. Das**, 27741, dated 30.09.2004
Status : Common
Local Distribution : Dorok, Premlakha, Durpiney, Bhusuk 1200 - 3000 m.
General Distribution : HIMALAYA; INDIA (Kashmir to Darjeeling, Sikkim), NEPAL. BHUTAN, CHINA.

Note : Endemic to Himalaya.

Impatiens radiata Hook.f., in Fl. Brit. India 1: 476. 1875 & in Rec. Bot. Surv. India 4: 15. 1905; Biswas, Pl. Darj. Sikkim 1: 210. 1966; Grey-Wilson in Grierson & Long Fl. Bhutan 2(1):96.1991 ; Vivekananthan, Rathakrishnan, Swaminathan & Ghara in Hajra *et al.*, Fl. India 4: 201. 1997.

Herbs annual upto 80 cm tall. **Leaves** lamina 3.5 – 6- 12 x 3.5 - 7cm, petiole bearing 2 globose basal glands; oblong-ovate or lanceolate, setose between teeth, lateral veins 7 - 9 pairs, margin crenate, apex acuminate. **Inflorescences** with many flowered, verticillate, radiate, many flowered per cycle. Pedicels slender, bracteate at base; bracts persistent, **Flowers** pale purple to yellowish white, small. **Lateral calyx** ovate-lanceolate, **Lower calyx** boat shaped , erect spur. **Dorsal corolla** hooded, suborbicular; lateral united corolla 2-lobed; basal lobes broadly ovate to suborbicular ; distal lobes oblong, apically 2-lobed. **Anthers** obtuse. **Capsule** linear; seeds obovoid, small,

Flower : August *Fruit*: September
Exsiccatae : Rachel 3030 m, **SR Lepcha & AP. Das** 31077, dated 02.10.2004; Jorpokhri, 2600 m , **SR Lepcha & AP. Das** 31095, dated 02.10.2004.
Status : Common
Local Distribution : Lingtam – Subaney dara, Premlakha below, Rachel 2100 - 3200 m.
General Distribution : E.HIMALAYA; INDIA, (NEPAL –NEFA) Khasia, CHINA.
 Note : Endemic to Eastern Himalaya

Impatiens spirifer Hook.f. & Thoms. in Journ. Linn. Soc., Bot.4: 135. 1860; Hook.f. Fl. Brit. India 1: 471. 1875 & in Rec. Bot. Surv. India 4: 17. 1905; Biswas, Pl. Darjeeling Sikkim Him.1: 208.1966; Grey-Wilson in Grierson & Long. Fl. Bhutan 1(2): 94. 1991.

Herbs erect upto 30 cm tall. **Stem** sparingly branched. **Leaves** alternate, upper sessile, subverticillate, lower petiolate, alternate, ovate to ovate lanceolate or ovate elliptic base attenuate, apex acuminate, shallowly crenate along margin, lateral nerves 4 – 8 pairs, stipule setose. **Flowers** one or two, peduncle, yellow, pedicels slender. Lateral calyx ovate, cordate, with 3.5 mm long appendages, slightly pubescent. **Lip** pale rose; spurs abruptly constricted, spirally coiled at apex. Purple spotted. **Wings** bilobed, 2.2 – 2.8 cm long, violet purple; basal lobe slightly smaller than distal ones, ovate to narrowly lanceolate, 1.2 – 1.5 x 0.6 - 0.8cm. **Capsules** elongate; seed globose, puberulous.

Flower : September *Fruit*: December
Exsiccatus : Pangolakha 2880 m, **SR Lepcha & AP. Das** 30255, dated 06.10.2004.
Status : Less common
Local Distribution : Talkharka, Lingtam, Panglakha, Kyongnosla, upto 3000 m,
General Distribution : E. HIMALAYA; INDIA, (E. NEPAL – BHUTAN) S. TIBET.
Note : Endemic to Eastern Himalaya

Order: Apiales

ARALIACEAE A. Jussieu

Key to the Genera:

- | | |
|--|----------------------|
| 1. Plant unarmed | 2 |
| + Plant armed | <i>Brassaiopsis</i> |
| 2. Scandent shrubs or tree | 3 |
| + Rhizomatous herb with unbranched stem | <i>Panax</i> |
| 3. Pedicel articulated at base of ovary | 4 |
| + Pedicel not articulated at base of ovary | 5 |
| 4. Leaflets margin entire | <i>Pentapanax</i> |
| + Leaflets margin serrate | <i>Aralia</i> |
| 5. Leaf simple | <i>Merriliopanax</i> |
| + Leaf compound | 6 |
| 6. Leaves mostly 3-foliolate | <i>Gamblea</i> |
| + Leaves digitate | <i>Schefflera</i> |

Aralia Linnaeus

Aralia cachemirica Decaisne in Jacq., Voy. Ind. 72, t. 81. 1844; C.B. Clarke in Fl. Brit. India 2: 722. 1879; Hara in Fl. E. Him. 1: 225. 1966; Grierson in Grierson & Long, Fl. Bhutan 2(1): 336. 1991. *Panax decompositum* Wallich ex DC., Prodr. 4:255. 1830; non *Araliade composita* Reinw. ex de Vries 18.6-57.

Shrubs to 2 – 3.5 m tall. **Stem** unarmed. **Leaves** pinnate, 30 - 65cm; leaflets **lamina** 4.5 – 14. 5 x 3.3 - 6.5 cm, ovate, acuminate, base cordate or rounded, margin serrate, glabrous or shortly pubescent, hairy. **Panicles** 32 - 44 cm, branched. **Bracts** 4 - 5 mm, subulate. **Umbels** 1.4 - 2.5 cm across. branches of panicles and pedicels pubescent, usually articulated at base of flower. **Flowers** creamy. **Calyx** minutely 5-toothed. **Petals** 5, imbricate. **Styles** 5, almost free. **Fruits** 0.5 -0.6 cm in diam. Sub-globose, 5-celled, dark purple; 5 seeded.

Flower & Fruit : July – August
Exsiccatus : Nathang – Panglakha, 3000 – 4000 m , *SR Lepcha & AP. Das* 39884, dated 30.07.2005
Status : Less common
Local Distribution : Neora-Sikkim Border, Mulkharka. 2400 – 2700 m.
General Distribution : AFGANISTAN AND TEMEPERATE HIMALAYAS; INDIA (Kashmir-Darjeeling), BHUTAN.

Brassaiopsis Decaisne et Planchon

Key to the species:

1. Leaves palmately 7 – 12 lobed; lobes segmented towards base, oblong *B. mitis*
+ Leaves deeply palmately to 11 lobed; lobes segments linear-lanceolate *B. hispida*

Brassaiopsis hispida Seemann, in Journ. Bot 2: 292. 1864; Grierson in Grierson & Long, Fl. Bhutan 2(1): 343. 1991.

Local Name: Phutta (Nep.).

Tree 4 – 5 m tall. **Stem** with prickle. **Leaves** deeply palmately upto 11 lobed; petiole to 40 cm , with prickles; suborbicular, **lamina** 25 x 60 cm, lobes divided 2 -3 at base, oblong, acute, margin prickly serrate, base cordate upper surface glabrous, lobes further segmented at base, oblong, acuminate . **Inflorescence** racemose to 45 cm, main axis with prickle in umbels. Peduncles upto 9 cm, in diam. **Flowers** in panicles upto 40 cm long; umbels to to 6 cm in diam.. **Calyx** teeth minute, rusty tomentose. **Petals** 5, stamen valvets **Fruits**, globose.

Flower : February - April
Exsiccatus : Phusrey , 2150 m, *SR Lepcha & AP. Das* 30262, ,dated 06.10.2004
Status : Frequent.
Local Distribution : Singhaney, Prem lakha below, 1000 – 2000 m.
General Distribution. : E. HIMALAYA;INDIA, NEPAL-BHUTAN.
Note : Endemic to Himalaya.

Brassaiopsis mitis C.B. Clarke in Fl. Brit. India 2:736. 1879; Hara in Fl. E. Him. 1: 226. 1966; 3: 86. 1975; Hara et al. Enum. Fl. Pl. Nepal 2: 191. 1979; Grierson in Grierson & Long, Fl. Bhutan 2(1): 343. 1991.

Local Name: Chuletro, Phootta (Nep.).

Trees, 3 – 6 m tall with spiny and few branches. **Leaves** palmately 7 – 12 lobed; petioles to 40 cm long, bristly pubescent, often prickly; suborbicular, **lamina** 15 – 50 cm across, incised into many lobes, lobes further segmented towards base, linear-lanceolate, acuminate, stellately pubescent undersurface. **Flowers** in panicles upto 52 cm long; umbels to 10 cm in diam., numerous. **Calyx** teeth minute, rusty tomentose. **Corolla** to 0.6cm, creamy white, glabrous. **Fruits**, globose.

Flower : May – July *Fruit*: August – October
Exsiccatu : Panglakha ridge, 2300 m, **SR Lepcha & AP. Das** 31289, dated 13. 07. 2008.
Status : Frequent.
Local Distribution : Panglakha ridge, Phusrey – Rigu, 1360 – 2380 m.
General Distribution : E. HIMALAYA; INDIA (NEPAL-BHUTAN).
Note : 1. Endemic to Himalaya.
2. Fodder plant

Gamblea Clarke

Gamblea ciliata C.B. Clarke in Fl. Brit. India 2: 740. 1879; Hara *et al* Enum.Fl. Pl. Nepal 2: 191. 1979; Grierson in Grierson & Long, Fl. Bhutan 2(1): 340. 1991.

Local Name: Kursimla (Nep.).

Trees medium sized to 12m tall, unarmed. **Leaves** ; petioles to 20 cm long, initially brownish tomentose; palmate, usually 3-foliolate, rarely 5-foliolate; leaflets **lamina** 5 - 25 x 5 – 15 cm, ovate or elliptic, entire, ciliate, acuminate, base cordate, sometimes cuneate, thinly hairy along veins on both sides. **Flowers** in panicles upto 22cm long; umbels to 10 cm across, usually 10-18 flowered. **Calyx** with minute teeth. **Corolla** to 0.40 cm, ovate, greenish slightly recurved. **Fruits**, subglobose-globose; seeds 3 - 5.

Flower : June – July *Fruit*: August – October
Exsiccatu : Below Premlakha 2600 m, **SR Lepcha & AP. Das** 20291, dated 28.10. 2004
Status : Less Frequent.
Local Distributions : Rigu- Lingtam, 2200 – 2650 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL-BHUTAN, MYANMAR, S. TIBET.

Merrilliopanax Linnaeus

Merrilliopanax alpinus (C.B. Clarke) C.B. Shang, Bull. Mus. Natl. Hist. Nat., B, Adansonia. 5: 293. 1983; Grierson & Long. Fl. Bhutan 2 (1):348. 1991. *Brassaiopsis alpina* C.B. Clarke in Fl. Brit. India 2: 736. 1879; Mizushima in Fl. E. Him. 226. 1966; Hara *et al*. Enum. Fl. Pl. Nepal 2: 191. 1979.

Local Name: Botey phutta (Nep.)

Trees upto 8 m tall. **Stem** unarmed, pale brownish, tomentose. **Leaves** : petiole to 22 cm long, ; broadly ovate or suborbicular, **lamina** 13 – 23 x 12 – 26 cm, 3 lobed, acuminate, base cordate, margin serrulate, upper and lower surface both pubescent, more pale brown in lower surface,

Panicle branched to 26 cm, pale brown. Umbels to 2.3 cm in diam. 7 – 15 flowered; pedicels to 6 mm. Petals greenish, ovoid to 2.5 mm. Stamens to 2.3 mm. **Inflorescence** a terminal panicles of umbels. **Flowers** small. **Calyx** teeth 5, minute. **Petals** 5. **Ovary** 2 celled; ovules 1 per cell; style 2 united at base. **Fruits** ellipsoid, to 4 x 4 mm.

- Flower* : May – September
Exsiccatus : Singhaney bans 2200 m, **SR Lepcha & AP. Das** 194, dated 13.08.2006.
Status : Frequent.
Local Distribution : South Rigu, Mulkharka towards WB, 1700 – 2800 m.
General Distribution. : E. HIMALAYA ; INDIA, NEPAL, BHUTAN.
Note : 1. Endemic to Himalaya.
2. The species is used as medicinal and an ornamental in China.

Panax Linnaeus

Panax pseudo-ginseng Wallich, Trans. Med. Phys. Soc. Calcut. 4: 117. 1829; Grierson in Grierson & Long. Fl. Bhutan 2(1): 340. 1991. *Aralia pseudo-ginseng* (Wallich) Clarke in Fl. Brit. India 2: 721. 1879. subsp. *himalaicus* Hara, Journ Jap. Bot. 45: 208, f. 2b. 11 c-e & 12 a. 1970; Hara in Fl. E. Him 2: 90. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 2: 192. 1979.

Local Name: Jarra Okhati, Paanch Pattay (Nep.).

Herbs perennial rhizomatous 55 cm tall. Rhizomes with nodular rings. **Stem** erect, unbranched. **Leaves** whorled at stem tip; petioles upto 6, to 6 - 13 cm long, red in maturity; leaflets 5, **lamina** to 11 -13 x 2.5 - 5 cm, ovate or lanceolate, acuminate, base cuneate or obliquely rounded, margin coarsely dentate-serrate, deeply incised, midvein and lateral veins red, hirsute on upper surface. **Peduncles** 13 cm long. **Flowers** in terminal umbellate. **Pedicel** slightly raised above the main axis, **Calyx** small, 5-toothed. **Corolla** 5, larger than calyx elliptic, acute and whitish; stamens 5; anthers ovoid; styles 2, connate at base; ovary 2-celled. **Fruits** numerous, subglobose, red on ripening; seeds 2-3.

Key to the varieties

1. Rhizome nodules closely arrange; leaf margin dentate- serrate *var. angustifolia*
+ Rhizome nodules widely arranged; leaf insiso-serrate *var. bipinnatifidus*

var. angustifolius (Burkil) Li in Sargentia 2: 118. 1942; Hara in Fl.E.Him. 1: 227. 1966; 2: 90. 1971; Hara *et al.* Enum.Fl. Pl. Nepal 2: 192. 1979; Grierson in Grierson & Long, Fl. Bhutan 2 (1): 341. 1991. f. *angustifolius*.

Herbs 15 - 25 cm tall, rhizomatous. **Rhizomes** nodules closely arrange rarely distantly, each nodule representing one year's growth. **Petioles** 2 - 6cm long; **leaflets** lamina 4 - 13 x 1.3 - 3 .4 cm, elliptic lanceolate or elliptic obovate, margin unlobed but dentato-serrate; acuminate, densely pilose throughout. **Pedicels** upto 0.70 cm long. **Seeds** not compressed.

- Flower & Fruit* : May – September.
Exsiccatus : Rachela below, 2600 m, **SR Lepcha & AP. Das** 0170, dated 23.06. 2008
Status : Very rare.
Local Distribution : Rachela , NNP border, 1800 – 2600 m.

General Distribution : E. HIMALAYA; INDIA, (NEPAL-BHUTAN), MEGHALAYA, THAILAND, W. CHINA.

Note : The rhizomatous nodules are believed to contain a 10 % of active principles of the drugs for vitality. The local people collect them for various folk medicines. (Das & Rai 2001)

var. bipinnatifidus (Seeman) Li in *Sargentia* 2: 118. 1942; Hara in *Fl. E. Him.* 1: 227. 1966; 2: 90. 1971; Hara *et al.* *Enum. Fl. Pl. Nepal* 2: 192. 1979; Grierson in *Grierson & Long, Fl. Bhutan* 2 (1): 341. 1991.

Herbs usually with weak and slender stem. **Nodules** of rhizome often with longer gaps of ca 3.5 cm in between. **Leaflets** 2.5 - 7 cm, pinnatisect; **pinnæ** alternately larger and smaller, incise-serrate again, larger lobes upto 0.65 cm broad.

Flower & Fruit : May - September

Exsiccatus : Kyongnosla, 3500 m, **SR Lepcha & AP. Das** 0170, dated 25.10. 2004.

Status : Very rare

Local Distribution : PWS only.

General Distribution : E. ASTERN HIMALAYA (SIKKIM, DARJEELING, ARUNACHAL PRADESH, BHUTAN, CENTRAL TO EASTERN NEPAL, NORTH BURMA AND SOUTHWESTERN CHINA), ASSAM.

Pentapanax Seemann

Pentapanax fragrans (D. Don) T.D. Ha in *Fl. Ser. Vietnam* Autoref. Diss.?? 1872; cf. Ha in *Novosti Sist. Vyssh. Rast.* 11: 227. 1974; Grierson in *Grierson & Long, Fl. Bhutan* 2(1): 338. 1991. *P. leschenaultii* (DC.) Seeman in *Journ. Bot.* 2: 296, cum fig. 1864; Hara in *Fl. E. Him.* 1: 227. 1966; 3: 87. 1975; Hara *et al.* *Enum. Fl. Pl. Nepal* 2: 192. 1979. *Hedera fragrans* D. Don, *Prodr. Fl. Nep.* 187. 1825. *Panax leschenaultii* DC., *Prodr.* 4: 254. 1830.

Local Name: Chinday (Nep.).

Shrubs to small trees, upto 10m tall. occasionally grows as an epiphyte. **Leaves** 12-30cm, pinnately 3 to 5, foliolate; **leaflets** 5 - 15 x 2 - 8 cm, ovate-elliptic, serrate, acuminate, base rounded or often cordate, glabrous above, pubescent along veins beneath. **Umbels** to 3cm across, globose; rachis upto 13 cm long, pubescent. **Bracts** lanceolate. **Flowers** bisexual, to 0.6cm in diam., pedicellate, greenish **Calyx** lobes minute, glabrous. **Corolla** ca 0.4cm long, deciduous; styles united. **Fruit**, oblong, ribbed.

Flower : April - July.

Fruit: August - December

Exsiccatus : Ramitey dara , 1800 - 2700 m, **SR Lepcha & AP. Das** 31141, dated 03. 10. 2004.

Status : Frequent.

Local Distribution : Rigu, Gangtok below, 1900 - 2500 m.

General Distribution : HIMALAYAS; INDIA, (Kumaon - BHUTAN), Meghalaya, MYANMAR, CHINA.

Note : Fruits and leaves are eaten as vegetable.

Schefflera Forster

Key to the species:

1. Trees to 12 m tall; nerves much impressed above *S. impressa*
+ Shrubby climber, rarely epiphytic; nerves not prominent above *S. venulosa*

Schefflera impressa (Clarke) Harms. in Engl., Pfl.-fam. 3(8): 38. 1894; Hara in Fl. E. Him. 1: 228. 1966; 3: 87. 1935; Hara *et al.* Enum. Fl. Pl. Nepal 2: 193. 1979; Grierson in Grierson & Long, Fl. Bhutan 2 (1): 345. 1991. *Heptapleurum impressum* Clarke, Fl. Brit. India 2: 728. 1879.
Local Name: Bhalu Chinday, Bhalu Phootta (Nep.).

Trees small unarmed to 12 m tall. Leaves digitate; petioles upto 35 cm long; leaflets 5 - 8; lamina 8 - 23 x 4 - 9 cm, elliptic-oblongate, entire, acuminate, base cuneate, glabrous above, stellate wooly beneath, nerves well impressed above. Panicles to 50 cm, branched, tomentose. Umbels upto 4 cm; petals to 0.5 cm, greenish white; styles upto 1.8 cm, connate. Fruits subglobose.

Flower : July - September *Fruit:* September - December
Exsiccatus : Subaney dara - Singhaney bans 1700 - 2300 m, *SR Lepcha & AP. Das* 31501, dated 15.07.2008
Status : Less common
Local Distribution : Rigu, Premlakha below, 1800 - 2500 m.
General Distribution : HIMALAYAS; INDIA, (Kumaon - BHUTAN), S.W. CHINA.
Note : Endemic to Himalaya.

Schefflera venulosa (Wight *et* Arnott) Harms in Engl., Pfl.-fam. III, 8: 39. 1894; Sargentia 2: 34. 1942; Hara in Fl. E. Him. 1: 228. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 193. 1979; *Heptapleurum venulosum* (Wight *et* Arnott) Seemen in Journ. Bot. 3: 80. 1865; *S. elliptica* Harms *sensu* Hand.-Mzt., Symb. Sin. 7: 691. 1933.
Local Name: Kursimla Lahara (Nep.); Kuntiong-rik (Lep.).

Shrubs climbing bearing thick adventitious roots, often epiphytic. Leaves digitately 5 - 7 foliate; petioles 8- 15cm long; petiolules 2 - 4cm; leaflets lamina 7 - 17 x 4 - 8 cm, elliptic-oblong, acuminate, glabrous. Panicles to 20 cm long, stellate pubescent. Umbels many flowered, upto 2cm long. Bracts ovate, caducous. Calyx truncate; petals 0.22 - 0.5 cm long, obovate-oblong, whitish. Fruits to 0.6 cm across, ellipsoid, prominently 5-ribbed, orange-crimson.

Flower : September - December *Fruit.* December - March
Exsiccatus : Singhaney bans 2000 m, *SR Lepcha & AP. Das* 31500, dated 15.07.2008.
Status : Frequent.
Local Distribution : Singhaney- Subhaney, Premlakha 700 - 2300 m.
General Distribution : HIMALAYAS; INDIA (Punjab - Sikkim), BHUTAN, Meghalaya, MYANMAR, S. AND W. CHINA, MALAYSIA.

APIACEAE A. Jussieu

Key to the Genera

- | | | |
|--|----|-------------------------|
| 1. Non-aromatic herbs | 2 | |
| + Aromatic herbs | | <i>Pleurospermopsis</i> |
| 2. Rhizomatous herb | 3 | |
| + Non-rhizomatous herb | 4 | |
| 3. Stylopodium rounded or domed | 5 | |
| + Stylopodium conical | | <i>Oenanthe</i> |
| 4. Umbels compound | 6 | |
| + Umbels simple | | <i>Hydrocotyle</i> |
| 5. Petals obovate, fruit oblong | | <i>Sinocarrum</i> |
| + Petals ovate-lanceolate, fruit ovate-subglobose | | <i>Acronema</i> |
| 6. Fruit ovoid-oblong or sub-globose | 7 | |
| + Fruit rectangular-ellipsoid or suborbicular | 8 | |
| 7. Calyx teeth present | 9 | |
| + Calyx teeth absent | | <i>Sanicula</i> |
| 8. Outermost petals often longer than inner ones | | <i>Heracleum</i> |
| + Outermost petals \pm equal to inner ones | | <i>Cortiella</i> |
| 9. Petioles usually winged | 12 | |
| + Petioles not winged | 10 | |
| 10. Fruits winged | 11 | |
| + Fruits unwinged | 12 | |
| 11. Stylopodium present | 13 | |
| + Stylopodium usually absent | | <i>Selinum</i> |
| 12. Stylopodium conical | | <i>Physospermopsis</i> |
| + Stylopodium domed | | <i>Pimpinella</i> |
| 13. Stylopodium conical-rounded | | <i>Pleurospermum</i> |
| + stylopodium domed | | <i>Cortia</i> |
| 14. Flowers usually white | | <i>Vicatia</i> |
| + Flowers yellow, sometimes tinged green or purple | | <i>Bupleurum</i> |

Acronema Edgeworth

- | | | |
|---|---|--------------------|
| 1. Plant non-rhizomatous; Bracts 1 fallings early | 2 | |
| + Plant rhizomatous; Bracts absent | | <i>A. nervosum</i> |

2. Corolla creamy-white; umbellules 3 - 6 rayed *A. hookeri*
 + Corolla purplish; umbellules 2 - 4 rayed *A. tenerum*

Acronema hookeri (Clarke) Wolff, in Eng. Pflanzenreich, Umbellif. Apioide.- Ammin.323.1923. Watson in Grierson & Long, Fl. Bhutan 2(2): 481. 1999. *Pimpinella hookeri* C.B. Clarke, in Hook.f. Fl. Brit. India 2: 686.1869.

Herbs perennial robust, branched upto 120 cm tall. **Leaves**; lower pinnate or ternate, or 2-ternate; leaflets ovate, to 2.5 x 1.5 cm, serrate to deeply lobed, glabrous, main vein minutely papillose; ultimate segments elliptic -ovate, obtuse - mucronate at the apex; fewer upper leaves, sheathing at base. **Flowers** umbels around in upper half of stem, in a lax group, 3 - 6 rays; rays to 16 mm, slender, bracts and bracteoles 0 -1, linear; umbellules 3 - 5 flowered. **Corolla** creamy-white rarely purplish at base, lanceolate. **Stylopodium** flat -domed shaped. **Fruits** ovoid to sub globose.

- Flower & Fruit* : July - August
Exsiccatae : Dohrok, 2200 m, *SR Lepcha & AP. Das* 31075, dated 06. 10. 2004; Kyongnosla 3500m, *SR Lepcha & AP. Das* 066, dated 13.09. 2004.
Status : Fair
Local Distribution : Kyongnosla, Padamchen, 800 - 3200 m.
General Distribution : INDIA, CHINA, BHUTAN, INDONESIA, JAPAN, NEPAL, MALAYSIA, MYANMAR, PAKISTAN, PHILIPPINES, SRI LANKA, VIETNAM; E AFRICA.
Note : The species has reputed medicinal value.

Acronema nervosum Wolff in Fedde, Report. 27: 315. 1930; Watson in Grierson & Long, Fl. Bhutan 2(2): 482. 1999.

Herbs small perennial, rhizomatous upto 40 cm tall. **Stem** slender, rhizomatous unbranched. **Leaves** with 1 - 2 in both basal and cauline, ternate or pinnate, 13 x 4 cm including the petiole; leaflets of basal leaves, **lamina** 0.4 - 2.8 x 0.3 - 1.5 cm, ovate - elliptic; ternately lobed, margin usually serrately toothed in upper half; sheathing base of upper leaves narrowed to 2 mm broad. **Umbels** solitary and terminal, 3 - 5 rayed, elongating in fruits; **bracts** absent. umbellules to 3.5 mm., 3 - 7 flowered; pedicels to 4 mm, glabrous; **bracteoles** 2 - 3, linear. **Petals** white - purplish, elliptic ovate, apex acuminate elongated, rarely papillose. **Stylopodium** dark purple - creamy, flattened; styles erect. **Fruits** ovoid - globose.

- Flower & Fruit* : July - August
Exsiccatus : Zuluk, 4000 m, *SR Lepcha & AP Das* 32845, dated 26.10 2004.
Status : Fair
Local Distribution : Memenchu, Kupup, Changu, 2800 - 4000 m.
General Distribution : HIMALAYALA; INDIA(Kumaon - BHUTAN).
Note : Endemic to Eastern Himalaya.

Acronema tenerum (DC.) Edgewarth in Trans. Linn. Soc. 20: 51. 1851.; Cannon in Enum. Fl. Pl. Nepal 2: 184. 1979. *Pimpinella tenerum* Benth. ex Hook.f. in Fl. Brit. India 2: 686. 1869. Var *dissecta* C.B. Clarke; Watson in Grierson & Long, Fl. Bhutan 2(2): 482. 1999.

Herbs perennial. **Stem** slender or erect. **Leaves** pinnate with 3 - 7 leaflets; petiole sheathing base, narrow;, to 1.3 mm broad; **lamina** 5 - 2 cm including petiole. upper leaves usually ternate;

leaflets ovate, entire to deeply ternately lobed, 4 – 13 x 5 – 11 mm acute, base truncate, margin serrate, papilose on margins and veins in upper surface; ultimate lobes ovate elliptic. **Umbels** 2 – 4 rayed, laxly branched, rays 5 – 13 mm; **bracts** 1, lanceolate-linear., fallings early. umbellules to 10 with to 4 flowered; pedicels to 6 mm, glabrous; **bracteoles** 3 – 5, ovate. **Corolla** purplish, narrowly lanceolate. acuminate to filiform. **Stylopodium** greenish cream, flat – domed shaped. styles spreading. **Fruits** narrowly ovoid.

Flower & Fruit : July – August
Exsiccatus : Nathang, 4000 m, **SR Lepcha & AP. Das** 31294, Dated, 08.10. 2008
Status : Fair
Local Distribution : Kyongnosla, Padamchen, 3200 – 4000 m.
General Distribution : HIMALAYAL; INDIA(Kumaon – BHUTAN), BURMA, CHINA,

Bupleurum L.

Key to the Species :

1. Plants more than 40cm tall, stem sparingly branched 2
- + Plants less than 40cm tall, stem solitary *B. longicaule*
2. Flower bracteole elliptic – ovate; umbellules 1- 4 flowered *B. dalhousianum*
- + Flower bracteole elliptic – sub-orbicular; umbellules 10 -15 flowered .. *B. candolii*

Bupleurum candolii Wallich (cat,17,n.552.) 1829, *nom. nud.*) ex DC. Prodr. 4: 131. 1830; C.B. Clarke in Fl. Brit. India 2: 674; Kanai in Hara Fl.E.Him.228.1966; Hara *et. al* Enum. Fl. Pl. Nepal 2:184.1979; Watson in Grierson & Long Fl. of Bhutan 2(2): 467. 1999.

Herbs perennial upto 1 m tall. **Stem** erect, much - branched. **Leaves**; lower leaves linear-lanceolate or long - elliptic, **lamina** 12 – 15 x 0.5 – 0.8 cm, 11 – 15-nerved, abaxially glaucous, apex rounded-obtuse, apiculate. **Upper** leaves long-obovate, base cuneate. **Umbels** to 4 cm across; bracts 3 – 5, ovate, unequal; rays 4 – 8, to 3 cm, unequal, slender; bracteoles 5, broadly elliptic or suborbicular, apex rounded, apiculate, greatly exceeding flowers; **umbellules** 10 – 15-flowered; pedicels short 0.5 – 1.5 mm. **Corolla** pale yellow or dark purple. **Stylopodium** low-conic, discoid, dark yellow or dark purple. **Fruit** oblong, brown.

Flower : July - August *Fruit*: September - October
Exsiccatus : Rachel - Panglakha, 2700 m, **SR Lepcha & AP. Das** 0193, dated 26.07.2006
Status : Less Common
Local Distribution : Kyongnosla, Karponang, Padamchen 1800 – 3200 m.
General Distribution : PAKISTAN, HIMALAYA; INDIA (Kashmir, Sikkim), NEPAL, BHUTAN, MYANMAR,.

Bupleurum dalhousianum (Clarke) Koso-Poljansky in Act. Hord. Etrop. 30: 165. 1915; Watson in Grierson & Long., Fl. Bhutan 2(2): 466. 1999.

Herbs perennial upto 40cm tall. Sparingly branched. **Leaves** membranous with reticulate veining in parallel; basal and lower leaves linear to ob-lanceolate, lamina 2.5 x 0.17 -0.6 cm, usually obtuse acute, long attenuate at base; middle leaves linear- lanceolate, acute, base rounded, semi-amplexicaul, **lamina** 2.5 – 5.5 x 0.4 – 1cm; upper leaves broadly lanceolate, lamina 1.5 – 3.5 x

0.5 – 1.2 cm rounded to cordate at base, amplexicaule. Flower in umbellules upto 10, rays rarely unequal, bract 2-3 unequal, bracteole 4- 5 , elliptic ovate, 3 – 5.5 x 2 – 3.5 mm , obtuse acuminate. Petals dull blue to dark purple. Stylopodium dark purple red. Fruit ovoid.

Flower : June Fruit : July
Exsiccata : Rachela, 3100 m, *SR Lepcha & AP. Das 31427*, dated 11.10.2004.
Premlakha – Panglakha, 2900 m, *SR Lepcha & AP. Das 0192*, dated 30.09.2004
Status : Fairly common
Local Distribution : Nathang, Kupup, Lampokhri, Changu, Kyongnosla 3050 – 4600 m .
General Distribution : INDIA, BHUTAN, MYANMAR, NEPAL, VIETNAM
Note : A reputed medicinal plant elsewhere.

Bupleurum longicaule Wallich (cat.17,n.557.1829.nom. nud.) Ex DC. Prodr. 4: 131.1830; C. B. Clarke in Fl. Brit. India 2: 667.1879; Hara *et. al* Enum. Fl. Pl. Nepal 2:185.1979; Watson in Grierson & Long Fl. Bhutan 2(2): 468. 1999. *Blupleurum rupestre* Edgew. in. Tr. Linn. S. 20: 52. 1846.

Herbs perennial upto 20 cm tall. Stems solitary, purplish-red, decumbent. Lower leaves lanceolate; basal leaves few sessile, base broad, clasping; linear; lamina 3 – 8 x 0.2 – 0.4 cm, 5 – 7 nerved, tapering into petiole.; upper leaves sessile; blade lanceolate or ovate, 1.5 – 5 x 0.3 – 0.8 cm, base rounded, clasping, apex acuminate, sometimes caudate. Flower few in umbels ; bracts 1 – 3, ovate, 5 – 18 x 4 – 8 mm, unequal; ray unequal; bracteoles, broadly ovate or obovate, tinged purple, slightly exceeding flowers, apex apiculate; umbellules, 16 – 24-flowered; pedicels short 1– 2 mm. Corolla dark purple. Stylopodium low-conic, dark purple. Fruit oblong-ovoid, brown.

Flower & Fruit : June – September
Exsiccata : Bhimbase, 4350 m, *SR Lepcha & AP. Das 0191*, dated 27.07.2006.
Status : Less common
Local Distribution : Changu, Memenchu, On way to Bhimbase, 3300 – 4600 m.
General Distribution : SIBERIA, PAKISTAN, HIMALAYA, BHUTAN, NE INDIA, NEPAL, MYANMAR.

Note : A reputed medicinal plant

Cortia DC.

Cortia depressa (D. Don) C. Norman in J.B.75: 96.1937; Kanai in Fl.E.Him.3: 87.1975; Hara *et al* Enum. Fl. Pl. Nepal 2: 185.1979; Watson in Grierson & Long., Fl. Bhutan 2(2): 494. 1999. *Athamanta depressa* D. Don, Prodr. Fl. Nepal 184. 1825. *Cortia lindleyi* DC.Prodr.4: 187.1830. *Cortia nepalensis* C.Norman in J.B. 67: 245. 1929.

Herbs of 10 – 20 cm tall. Leaves ; petioles pubescent; lamina 1 – 12 x 0.55 – 2.5cm, 1.5 – 2.5 - pinnatisect, pinnae 5 – 7 pairs; ultimate segments linear, 2.5 – 4.5 x 1 – 1.5 mm, margins entire, narrowly revolute. Bracts few, 2-pinnate, segments linear; rays numerous, 3.5 – 8 cm, unequal. pubescent; bracteoles 10 – 15, 2-pinnatisect, narrow-linear, longer than flowers; umbellules 25 – 30-flowered. Styles short 0.2 – 1.8 mm, little elongated in fruit. Fruit ovoid - oblong, 3.5 – 5 x 2.5 – 4 mm.

Flower : July-August *Fruit:* September – October

Exsiccata : Panglakha, 3000 m, **SR Lepcha & AP. Das**, 30842, dated 29.07.2005
Status : Less common
Local Distribution : Sherabthang, Lampokri, Changu 3000 – 4400 m.
General Distribution : HIMALAYA; INDIA Kumaon – BHUTAN, TIBET.
Note : Endemic to Eastern Himalaya.

Cortiella C. Norman.

Key to the species

1. Leaf lamina 3.5 – 11 x 1 – 3 cm; petals always white *C. hookeri*
+ Leaf lamina 6.5 – 13 x 3 – 5 cm; petals white, rarely tinge purple *C. cortiodes*

Cortiella hookeri (C.B. Clarke) C.Norman in Journ. Bot., Lond. 1937; Watson in Grierson & Long Fl. Bhutan 2 (2): 488. 1999. *Cortia hookeri* C.B. Clarke in Fl. Brit. India 2: 709. 1829; Cannon in Enum. Fl. Pl. Nepal 2: 186. 1979.

Herbs perennial upto 35 cm tall. **Leaf lamina** 3.5 – 11 x 1 – 3 cm. ultimate leaves segments 1.5 – 3.5 x 0.85mm. Peduncles crassicaul, upto 4.5mm. Inflorescence of umbel with 7 -many rays; rays 1- 5cm; umbellules usually upto 2cm across, pedicels upto 4.5mm. **Calyx** teeth linear-subulate, 0.4 - 1.3mm. **Corolla** white rarely purplish. **Fruits** purple tipped wings on dorsal ribs of mericarp often convuluted crowded, dark, vittae lines appear at the maturity.

Flower : June *Fruit.* : September
Exsiccatum : Nathang, 3950 m, **SR Lepcha & AP. Das** 052, dated 13.05.2003
Status : Less common
Local Distribution : Dongkyala, Nathang, Sherathang (3950 - 5000m)
General Distribution : HIMALAYA; INDIA, NEPAL - BHUTAN.
Note : 1. Endemic to Eastern Himalaya.
2. Matured seeds are eaten as spices.

Cortiella cortiodes (C. Norman) M.F. Watson in Edinburgh J. Bot., 53(1): 130. 1996 ; Watson in Grierson & Long Fl. Bhutan 2(2): 489. 1999. *Selinium cortiodes* C. Norman in Journ. Bot., Lond. 75: 95. 1937.

Herbs upto 27cm tall. **Leaves lamina** 6.5 -13 x 3 x 5 cm, ultimate leaf segment 2 – 12 x 0.65mm. **Umbel** with sessile on the crown of plat, rays many; lateral umbels rarely crassicaul upto 10 cm long, less rays , upto 3.5 cm, shorter than leaves, spreading; umbellule 2 cm across, bracteole usually tipped purple- black. **Calyx** teeth short upto 1,2mm long. **Petals** white, rarely tinge purple 1- 1. 3 x 0.4 – 0.55mm. **Fruits** 3 dorsal ribs prominent, some with reduced wings in the lower half.

Flower : June-July *Fruit.* : September – October
Exsiccatum : Donkyala, 3980 m, **SR Lepcha & AP. Das** 600, dated 13.05.2003
Status : Less common
Local Distribution : Jalepla, Dongkyala (4000 – 5300 m)
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN.
Note : Endemic to Eastern Himalaya.

Heracleum Linnaeus.

Key to the species:

- 1 Leaf gregarious; Umbel rays upto 6, calyx teeth subulate; fruits orbicular *H. nepalense*
+ Leaf not gregarious; Umbel rays more than 6, calyx teeth linear; fruits obovate *H. wallichii*

Heracleum nepalense D. Don, prodr. Fl. Nepal 185. 1825; C.B. Clarke in Fl. Brit. India 2: 714. 1879; Kanai in Fl. E. Him 229. 1966; Hara *et al*, Enum Fl. Pl. Nepal 2: 186. 1979. *Heracleum nepalense* var. *bivitata* C.B. Clarke in Fl. Brit. India 2: 714. 1879; Watson in Grierson & Long, Fl. Bhutan 2(2): 501. 1999.

Local Name: Samben (lep.) Chimping (Nep.)

Shrubs stout erect, upto 2 m tall. Stem solitary, pubescent. **Leaves**; basal leaves with long-petiolate; broad-ovate, lamina 20 – 45 × 20 – 35 cm, trifoliolate or 1 – 2-pinnate, pinnae 3 – 7 pairs; leaflets broadly ovate, lamina 9 – 20 × 5 – 12 cm, both surfaces finely pubescent, especially along veins, margins serrate. **Cauline leaves** similar to the basal, reduced upward, smaller, 3-lobed sessile on expanded sheaths. **Umbels** (11–) 15 – 30 cm wide; bracts 1 – 5, linear or absent; rays numerous unequal, extending in fruit; bracteoles linear, unequal, persistent; umbellate 8 – 30-flowered. **Calyx** teeth subulate. **Corolla** white, occasionally pinkish, radiant, 2-lobed. Young ovary densely hairy. Fruits obovoid.

Flower & Fruit. : June – September.

Exsiccatus : Rachela, 2800m, *SR Lepcha & AP. Das* 31070, dated 02.10.2004

Status : Common

Local Distribution : Karponang, Kyongnosla, Changu, Padamchen, Rachela, 2000 – 4000 m

General Distribution : INDIA (North East), NEPAL - BHUTAN, MYANMAR,

Note : 1. Endemic to Himalaya.

2. Dried seeds are used for flatulent.

Heracleum wallichii DC., prodr 4: 195. 1830; C.B. Clarke in Fl. Brit. India 2: 712. 1879; Kanai in Fl.E.Him. 229. 1966; Hara *et al* Enum. Fl. Pl. Nepal 2: 186. 1979; Watson in Grierson & Long Fl. of Bhutan 2(2): 501. 1999. *Heracleum diversifolia* Wall., cat18, n.574. 1829. *nom.nud.* *Heracleum sublineare* C.B. Clarke in Fl. Brit. India 2: 713. 1879.

Local Name: Samben (lep.) Chimping (Nep.)

Herbs, slender, perennial. **Stem** upto 60 cm tall, white-hirsute below nodes. **Leaves** ; upper leaves 3-partite or unipinnate; **leaflets** lamina 2 - 5.5 × 1.2 - 3 cm, lanceolate, serrate, acute-acuminate, base narrowly oblique, pilose above, glabrous beneath except nerves. **Umbel rays** 6 - 8, glabrous. **Bract** 1, small, linear, deciduous. **Bracteoles** linear and more prominent. **Pedicels** 0.5 - 1.5 cm. **Calyx** teeth linear; **petals** to 0.60 cm long, 2 - lobed, white, or pinkish. **Fruits** obovate, glabrous, brownish, broad lateral wings, ridged.

Flower : July- August *Fruit:* September- October.

Exsiccata : Memenchu, 3800 m, *SR Lepcha & AP. Das* 052, dated 13.05.2003

Status : Less common

Local Distribution : Kyongnosla, Baba Mandir, Changu, Padamchen (3000 – 4100 m)

General Distribution : E. HIMALAYA, (NEPAL – BHUTAN).

Note : 1. Endemic to Eastern Himalaya

2. Matured seeds eaten as spice.

Hydrocotyle L.

Key to the species

1. Lamina reniform; calyx white or purplish *H. himalaica*
+ Lamina cordate; calyx light green *H. nepalensis*

Hydrocotyle himalaica P.K.Mukharjee in Indian For 95: 470.t.1.1969; Hara *et. al* Enum. Fl. Pl. Nepal 2:186.1979.; Watson in Grierson & Long Fl. of Bhutan 2(2): 443. 1999. *Hydrocotyle Javanica* var. *podantha* C. B. Clark in Fl. Brit. India 2: 668. 1879. excl. Basionym.; *Hydrocotyle Javanica* auct.non. Molkenb; Hara in Fl. E.Him.230.1966

Herb decumbent upto 50 cm tall. **Leaf** blades orbicular or reniform, **lamina** (0.8-)1.5 – 3.5 (–6) × (1.2 –) 3 – 6(–8) cm, shallowly 5–7-lobed, lobes deltoid or rounded, both surfaces sparsely hirsute or covered with purplish verruciform hairs, obtusely crenate, apex obtuse-rounded, principal nerves 9. **Flowers** umbels with many-flowered, densely capitate in flower; peduncle 3–8 cm, usually as long as or longer than petioles; pedicels 1–2 mm in flower, 4–7 mm in fruit. **Calyx** white with yellow or purplish red glands. **Styles** spreading. **Fruit** brown to purplish red, cordate - globose.

- Flower* : June – July
Exsiccatus : Rachela, 2900 m, *SR Lepcha & AP. Das* 31002, dated 02.10.2004
Status : Less common
Local Distribution : Karponang, Gangtok, Penlangla, Rigu, Hathicherey upto 2200 m.
General Distribution : E. HIMALAYA; INDIA Meghalaya,(NEPAL-BHUTAN),

Hydrocotyle nepalensis Hooker, Exot. Fl. 1: t. 30. 1823; Hara *et. al* Fl. E. Him. 1: 229 & 643. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 186. 1979; Watson in Grierson & Long Fl. of Bhutan 2(2) ; 444: 1999. *H. polycephala* Wight & Arnt., Prodr. Fl. Ind. 1: 366. 1834. *H. javanica* auct. non Thunb.: Clarke in Fl. Brit. India 2: 667. 1879, p.p.

Herbs decumbent, comparatively larger stem. **Leaves**; petioles 1 – 6.5 cm long, thick, fleshy, light red when young; **lamina** 2 – 4.5 x 1.6 -7.2 cm ; palmately 6 - 7 lobed, usually serrate, broadly cordate, greenish and hairy above, light green beneath, veins greenish white to light red. **Peduncles** 1.7 - 2.7 cm long, aggregated. **Corolla** light-green; **stamens** upto 0.6 cm long.

- Flower* : May - July *Fruit* : July- December
Exsiccatae : Dohrok , 2300m, *SR lepcha & AP. Das* 30244, dated 06.10.2004;
Lungthung, 3900 m, *SR Lepcha & AP. Das* 32885, dated 27.10.2004
Status : Less Common.
Local Distribution : Gangtok, Hathicheray, Lingtam, (1900-2300m).
General Distribution : AFRICA, HIMALAYAS, BHUTAN, INDIA (Kashmir – Meghalaya), TIBET, KOREA, AUSTRALIA, HAWAII, MALYSIA. MYANMAR.

Note : The species has reputed medicinal value. Decoction of leaf is given in throat-pain and Also in pneumonia.

Oenanthe Linnaeus.

Key to the species

1. Plants diffused creeping; primary pinnae 5 – 7 pairs; fruit subglobose *O. thomsonii*
+ Plants weakly erect; segments upto 3 pairs; fruit ellipsoid *O. hookeri*

*Exsiccatu*s : Kupup – Bhimbase, 4100 m, **SR Lepcha & AP. Das** 31422, dated 27.07.2005.
Status : Rare
Local Distribution : Kupup, Bhimbase 3500 – 4500 m
General Distribution : INDIA, CHINA, BHUTAN, E NEPAL.

Pimpinella Linnaeus.

Key to the species :

1. Plants over 1 m tall; leaflets finely serrate; petals cream to purple cream, rarely white
 *P. diversifolia*
 + Plants less than 1 m ; leaflets bi-serrate ; petals white *P. tongloensis*

Pimpinella diversifolia DC., Prodr. 4: 122. 1830; C.B. Clarke in Fl. Brit. India 2: 688. 1879; Hara in Fl. E. Him. 1: 230. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2:188. 1979; Watson in Grierson & Long. Fl. Bhutan 2(2): 476. 1999.

Herbs perennial erect - slender with single stock root upto 1.2 m tall. **Stem** slender. **Leaves** trifoliolate or variable in shape and size, lower leaves pinnate with 2 pairs of lateral leaflets; leaflets lamina 2 - 5.5 x 1.5 – 4cm, ovate, apex acute to acuminate, base cordate to truncate, lower cauline often simple, ovate, upper ones usually pinnate; petioles long, scarcely hairy to glabrous; cauline leaves shallowly 3 - 5 lobed; leaflets variable, rounded or ovate, sometimes lobed or deeply dissected, finely serrate, often laciniate. **Peduncles** 6 - 16 rayed. Bract linear. **Flower** small, shortly pedicelled; **Petals** cream to purple cream and sometime emarginated white. **Fruits** ridged and blackish.

Flower : July - September *Fruit:* September. - November
*Exsiccatu*s : Rachela trijunction, 2900m, **SR Lepcha & AP. Das** 099, dated 13.10.2003.
Status : Common.
Local Distribution. : Karponang, Rachela trijunction, 2000 – 3500 m.
General Distribution : INDIA (West Bengal, Sikkim, Meghalaya) AFGANISTAN, CHINA, MYANMAR, JAPAN.

Pimpinella tongloensis P.K. Mukherjee in Bull. Bot. Surv. India 12 (1-4): 78. 1970 publ. 1972 ; Watson in Grierson & Long Fl. Bhutan 2(2): 476. 1999.

Herbs erect up to 70 cm tall. **Stem** often glabrous or rarely pubescent, ribbed. **Leaves** oftenly trifoliolate; petiole 1- 7cm, glabrous or with thin hairs; leaflets lamina 1.7 – 6.8 x 0.4 – 4.6 cm, triangular-ovate, apex acute, margin serrate (bi-serrate), base truncate - cordate, sometime obliquely cordate, usually glabrous but sometime strigose on the main veins above. **Umbels** to 12 - rayed; rays 8 – 19 mm, unequal; **bracts** lanceolate to 5mm, falling early; umbellules with 13 – 19 flowered; pedicels to 1.8 mm, unequal, bracteoles 1 - 3, linear-lanceolate, **Petals** ovate-acute, white. **Anthers** white to suffused purple. **Fruits** ovoid attenuate to the tip, smooth.

Flower : August-September
*Exsiccatu*s : Rachela below, 2900 m, **SR Lepcha & AP. Das** 29388, dated 16. 08. 2004.
Status : Not common
Local Distribution : Panglakha, Padamchen above, 2500 – 2800 m

General Distribution : E.HIMALAYA; INDIA (Sikkim). CHINA,

Note : 1. Endangered species of India (Nair & Shastri, 1977-78).

2. A new distribution record for Sikkim.

Pleurospermopsis C. Norman

Pleurospermopsis sikkimensis (C.B. Clarke) C. Norman in J.B.67: 200, t.2. 1938; Hara *et al* Enum. Fl. Pl. Nepal 2: 188. 1979; Watson in Grierson & Long., Fl. Bhutan 2(2): 460. 1999.

Pleurospermum sikkimensis C.B. Clarke in Fl. Brit. India 2: 702. 1879

Herbs or small shrub upto 60cm tall. Stem base ca. 1 cm thick. **Leaves**; petioles slender, 2.5 – 15 cm, sheath often purple spotted; **lamina** oblong in outline, 5 – 20 × 2 – 5 cm; **pinnae** 3 – 7 pairs, 9 – 18 × 7 – 20 mm, base rounded or truncate, apex acute, green adaxially, often tinged purple abaxially. **Flowers** in umbels 4 – 15 (–25) cm across; **bracts** green; rays stout, to 3 mm thick; **umbellules** 2 – 4 cm across; **bracteoles** numerous, 1 – 16 × 4 – 8 mm, 3-lobed, lobes toothed, acute; **pedicels** 1–3 mm. **Calyx** teeth purple-black, ca. 0.5 mm. **Fruits** green, apex blackened.

Flower & Fruit : January– September: October

Exsiccatae : Kupup, 4000 m, *SR Lepcha & AP. Das* 31070, dated 02.10.2004; Panglakha, 3000 m, *SR Lepcha & AP. Das* 30422, Dated 13. 10.2006

Status : Rare

Local Distribution : Changu, Donkyala, Jalepla, Nathang, 3000 – 4250 m.

General Distribution : HIMALAYA; INDIA, (NEPAL – BHUTAN) CHINA.

Pleurospermum Hoffman

Key to the species:

1. Plants non-aromatic; leaf pinnae 7 – 9 pairs; calyx teeth present *P. hookeri*
+ Plants aromatic; leaf pinnae 4 – 6 pairs; calyx teeth absent *P. pilosum*

Pleurospermum hookeri C.B. Clarke in Fl. Brit. India 2: 705. 1879; Hara *et. al* Enum. Fl. Pl. Nepal 2: 188.1979; Watson in Grierson & Long Fl. of Bhutan 2(2): 456. 1999.

Herbs perennial upto 50 cm tall. Stem slender, ribbed. **Leaves** mostly basal; basal and lower petioles 3 – 8 cm, sheaths narrowly oblong; triangular - ovate, 5 – 13 cm, 3 – 4-ternate-pinnate; **pinnae** 7 – 9 pairs, ovate-lanceolate, **lamina** 3 – 5 × 1.5 – 2.5 cm; ultimate segments linear, ca. 2 mm. **Flowers** in umbels 5 – 7 cm across; **peduncles** 6 – 12 cm; **bracts** 5 – 7, obovate - lanceolate or linear - lanceolate, 1.5 – 2.5 cm, margin membranous, broad, white or tinged brown, apex long-caudate or occasionally pinnatifid; rays sub equal, ribbed; **bracteoles** obovate – lanceolate, similar to bracts, **pedicels** numerous, flattened. **Calyx** teeth unequal, narrowly triangular. **Corolla** rounded, 1–1.2 mm, white. **Anthers** dark purple. **Fruit** ovoid.

Flower & fruit : August – October.

Exsiccata : Zuluk – Serabthang, 3900 m, *SR Lepcha & AP. Das* 003, dated 13.06.2006

Status : Less Common

Local Distribution : Baba Mandir, Kupup, Bhimbase, Donkyala, 3600 – 5000 m.

General Distribution : HIMALAYA; INDIA,(Kashmir – BHUTAN), CHINA.

Note : Endemic to Himalaya.

Pleurospermum pilosum C. B. Clarke ex H. Wolf in Fedde. Repert. 27: 117. 1929. Watson in Grierson & Long. Fl. Bhutan 2(2): 1999.

Herbs aromatic upto 35 cm tall. **Stem** purplish with leaf remains clothing at base. **Leaves**; petiolate (petiole winged at base to 4.5 mm, red); usually 2 -3 pinnately divided, **lamina** 8 - 25 x 3.5 - 10 cm (including petiole), 4 -6 pairs of leaflets divisions; ultimate segment ovate, pinnatisect, with whitish pubescent at veins beneath. **Umbel** 6 - 17 rays; bracts 1 -3, lanceolate. **Umbellules** 20 -30 flowered; **bracteoles** purplish green, ovate, acuminate. **Calyx** teeth absent. **Petals** white within, purple red or greenish on the reverser. Fruit oblong tinged purple.

Flower & Fruit : July - October.

Exsiccata : Baba-mandir - Kupup, 3900 m, **SR Lepcha & AP. Das**, dated 13.06.2006

Status : Less Common

Local Distribution : Baba Mandir, Kupup, Bhimbase, Donkyala, 3800 - 4500 m.

General Distribution : HIMALAYA; INDIA, BHUTAN.

Note : Endemic to Himalaya.

Sanicula L.

Sanicula elata Buch-Hamilton ex. D. Don. Prodr. Fl. Nep. 183. 1825; Kanai in Hara Fl. E. Him.: 231.1966; Hara in Fl. E. Him. 644.1966; Hara *et al* Enum. Fl. Pl. Nepal 12: 189.1979; Watson in Grierson & Long. Fl. Bhutan 2(2): 446. 1999. *Sanicula hermaphrodia* Buch.-Ham. ex. D. Don. Prodr. fl. 183. 1825; *Sanicula europace* var. *elata* (Buch.-Ham. ex. D. Don.) H. Wolff in Engl., Pl. Freich Iv-228 (Ht.31): 63.1913

Herbs 20 - 80cm tall. **Leaf**; basal leaves several; leaves blade broadly ovate-cordate or sub-pentagonal, **lamina** 3 - 7 x 4 - 10 cm, palmately 3 (- 5)-parted, irregularly serrate, teeth mucronate; shallowly 2-3-parted, base cuneate, apex acuminate; lateral segments oblique-ovate, often 2-parted. Cauline leaves short-petiolate; blade 3(- 5)-parted, upper leaves greatly reduced. **Flowers** in cymose branched, terminal branch often very short, lateral branches elongate; **bracts** 2, lanceolate; rays ca. 5 mm, unequal; **bracteoles** 7 - 10, linear; **umbellules** 4 - 8 flowered. **Petals** white, pale yellow or pale blue. **Fertile flowers** 3(or 4) per umbellule; calyx teeth shorter than bristles, persistent; styles 2-times longer than calyx teeth, recurved. **Fruit** ovoid-globose.

Flower : April - August

Exsiccatus : Dohrok 2200 m, **SR Lepcha & AP. Das** 30202, dated 06.10. 2004

Status : Fair

Local Distribution : Kyongnosla, Padamchen, 900 - 3200 m.

General Distribution : INDIA, CHINA, BHUTAN, INDONESIA, JAPAN, NEPAL, MALAYSIA, MYANMAR, PAKISTAN, PHILIPPINES, SRI LANKA, VIETNAM; E AFRICA.

Note : The species has reputed medicinal value.

Selinum L. (*nom. cons.*)

Key to the species

1. Leaf ultimate segments ovate to oblong Fruit oblong-ovoid ... *S. candollei*

+ Leaf ultimate segments linear, Fruits elliptic- circular *S. wallichianum*

Selinum candollei DC., Prodr. 4: 165. 1830; C. B. Clark in Fl. Brit. India 2: 700. 1879; Kanai in Fl. E. Him. 231. 1966; Hara *et al* Enum. Fl. Pl. Nepal 2: 189. 1979. ; Watson in Grierson & Long Fl. of Bhutan 2(2): 491. 1999. *Angelica candollei* Wall., cat. n, 582. 1829. *nom. nud peucedum wallichianum* DC., Prodr. 4: 181. 1830. *Selinum wallichianum* (DC.) Raizada & Saxena in India forester 92: 323. 1966. *Selinum temifolium* var. *filicifolium* (Edgew.) C.B. Clarke in Fl. Brit. India 2: 700. 1879.

Herbs or small shrubs upto 1.5 m tall. **Stem** erect, ribbed, branched above. **Leaves**; basal petioles 20 – 30 cm, wholly sheathing; sheaths inflated, 5 – 10 cm broad, purplish; leaf blade broadly ovate, **lamina** 20 – 25 × 15 – 20 cm, 3-pinnate; pinnae 4 – 5 pairs; ultimate segments linear, 2 – 5 × ca. 1 mm. **Umbels** 6 – 10 cm across (to 20 cm in fruit); bracts 4 – 8, linear, caducous; rays subequal, elongating in fruit; bracteoles 5 – 12, lanceolate, unequal, longer than umbellules, ascendant, entire or apex 2 – 3-lobed, margins white membranous; umbellules 20 – 25-flowered. **Calyx** teeth linear-lanceolate, 0.5–1 mm. longer than stylopodium. **Petals** white or pinkish, purplish-red when in bud. **Fruits** oblong-ovoid.

Flower : July-August *Fruit*: September
Exsiccatu : Rachela, 3000 m, *SR Lepcha & AP. Das* 31075, dated 02.10.2004.
Status : Less common
Local Distribution : Kyongnosla, Tamjay, Bombay hill (Changu) 3200 – 4000 m
General Distribution : HIMALAYAS; INDIA, (Kashmir – BHUTAN).
Note : Endemic to Eastern Himalaya.

Selinum wallichianum (DC.) Raizada & Saxena in India Forester, 92: 323. 1966; Watson in Grierson & Long, Fl. Bhutan 2(2): 490. 1999. *Selinum tenuifolium* Wallich. Cat. N. 579; ex DC: Prod. 4. 181. 1830.

Herbs perennial foetid, upto 1.2 m tall. **Stem** surrounded by the leaves remains at base. **Leaves** 3 pinnate; petiole to 23 cm long, narrowly sheathing at base; ultimate segments ovate to oblong, deeply pinnatifid, lobes acute, pubescent on veins beneath, acute; basal leaves pubescent, finely pubescent at rachis and veins in lower surface, narrow sheathing base. **Umbel** to 8.5 cm across, 15 - 25 rayed, white, papilose - puberulent; **bracteole** linear - lanceolate; occasionally forke, occasionally pinnatifid. **Calyx** teeth to 1.2 mm. **Petals** 1.5 mm, white, unequal; style to 0.7 mm. **Fruits** elliptic- circular, ribbed.

Flower : July - September
Exsiccatu : Rachela, 2950 m, *SR Lepcha & AP Das* 31075, dated 02.10.2004.
Status : Less common
Local Distribution : Kyongnosla, Tamjay, Bombay hill (Changu) 2000 – 4000 m
General Distribution : HIMALAYAS; INDIA, (KASHMIR-Bhutan), Meghalaya, TIBET.
Note : Endemic to Eastern Himalaya.

Sinocarum H. Wolff

Sinocarum minusum M.F. Watson in Edinburgh. J. Bot. 53(1): 140. 1996; Watson in Grierson & Long Fl. Bhutan 2(2): 471. 1999.

Herbs slender, diminutive, multi-stemmed perennial up to 1.3 m tall. **Leaves** basal and cauline, 1-2x ternate, to 4x1cm (including **petiole**); leaflets ovate, to 4 x 4mm, deeply ternately lobed to pinnatifid, segments 4-lobed at apex, ultimate segments oblong-elliptic acute; petiole to 3-6 cm long with broad sheathing base c 4x 3 mm. **Umbels** held just above the leaves, 5-14 mm across, 4 - 6- rayed. **Flower** 3 - 5mm across; pedicels 0.5 - 2 mm; bracteoles 0.4 - 3 mm; bracteoles 0 - 3, linear, to 1.5mm. **Calyx** teeth obsolete. **Petals** dark purple or white flushed purple, ovate, acute. **Stylopodium** domed, dark purple; styles reflexed. Fruits not observed.

Flower : June

Exsiccatus : Donkyala, 3800 m, **SR Lepcha & AP. Das** 770, dated 13.09.2007

Status : Common.

Local Distribution : KAS, PWS upto 4000 m,

General Distribution : Himalaya; INDIA; BHUTAN.

Note : A new distribution record for Sikkim

Vicatia DC..

Vicatia conifolia DC., Prodr. 4: 243.1830; C.B. Clarke in Fl. Brit. India 2: 671. 1871; Kanai in Fl. E. Him. 232. 1966; Hara *et. al* Enum. Fl. Pl. Nepal 2: 190. 1979. *Sison conifolium* Wallich, cat. 18, n.591.1829. *nom.nud.* *Chacrophyllum gracillimum* Klotzset, B. Reise. pr. waldem.149,t. 46. 1862.

Herbs perennial, erect. Stem single with short root stock upto 32 cm tall. **Leaves** ; **petiole** narrowly sheathing at base; leaves pinnatifid into linear acute ultimate segments 18 x 12 cm; lamina 2 - 3.5 x 0.3 - 0.8 mm. **Flowers** with compound umbel of 7 -10 rayed. Bracts 1 - 2, usually nearly similar to upper leaves, rays 0.5 -4cm; very unequal. **Bracteole** 1 - 4, 1.2 - 4.5mm; umbellules upto 2cm across., 8 - 9 flowered, **pedicels** elongated to 9mm in fruit. **Petals** obovate. Fruit ovoid - oblong.

Flower : July *Fruit* : August

Exsiccatus : Ramitey, 1900 m, **SR Lepcha & AP. Das** 27245, dated 10.10.2004

Status : Less common

Local Distribution : 17th mile, Changu, Sherabthang, (1800 - 3700 m)

General Distribution : HIMALAYAS; AFGHANISTAN, BALISTAN, INDIA (Kashmir), NEPAL.

Note: A new distribution record for Sikkim

Subclass: Asteridae

Order: Gentianales

GENTIANACEAE A. L. Jussieu

Key to the Genera:

- | | |
|--|------------------------|
| 1. Plants climbing | 2 |
| + Plants erect or procumbent | 3 |
| 2. Fruits berry-like | <i>Tripterospermum</i> |
| + Fruits capsular | <i>Gentiana</i> |
| 3. Corolla spurred | <i>Halenia</i> |
| + Corolla not spurred | 4 |
| 4. Petals with distinct nectarines | <i>Swertia</i> |
| + Petals without nectarines | <i>Gentiana</i> |

Gentiana Linnaeus

Key to the Species:

- | | |
|---|-----------------------|
| 1. Plant Less than 15 cm tall | 2 |
| + Plant more than 15 cm tall | 3 |
| 2. Leaf lamina ovate – orbicular; margin non-ciliolate | 4 |
| + Leaf lamina oblong – spatulate, margin ciliolate | <i>G. sikkimensis</i> |
| 4. Leaf margin cartilaginous; stigma lobes oblong | <i>G. micans</i> |
| + Leaf margin non-cartilaginous; stigma lobes suborbicular | <i>G. prolata</i> |
| 3. Leaf lamina oblong elliptic; corolla blue; capsule ovoid- ellipsoid..... | <i>G. elwesii</i> |
| + Leaf lamina ovate; corolla blue – purple ; capsule ellipsoid | <i>G. speciosa</i> |

Gentiana elwesii C.B. Clarke in Hook.f., Fl. Brit. India 4: 115. 1885; Hara *et al*, Fl. E. Him. 254. 1966; Chater in Hara *et al*, Enum. Fl. PL. Nepal 3: 92. 1982; Aitken in Grierson & Long, Fl. Bhutan 2(2): 644. 1999.

Herbs perennial up-to 20cm tall. **Stems** purple, erect. **Lamina** 1.5 - 2 x 4 – 7 mm, blade oblong-elliptic, apex obtuse; base narrowed, margin smooth. **Flowers** in clusters, sessile rarely with lower pedunculate. **Calyx** tube, narrowly obconic, membranous. **Lobes** lanceolate apex acute. **Corolla** blue to truncate, oblique. **Stamens** inserted at basal part of corolla tube, anther narrowly ellipsoid. **Capsule** ovoid ellipsoid. **Seeds** light brown.

Flower : September
Exsiccatus : Singhaney 2350 m, **SR Lepcha & AP. Das** 0257, dated 16.09.2007.
Status : Common
Local Distribution : Chhangu, KAS, Dokala. 2300 – 4400 m.
General Distribution : HIMALAYA; INDIA, NEPAL, BHUTAN, S.E. TIBET.

Gentiana micans C.B. Clarke in Hook.f., Fl. Brit. India 4: 112.1885; Chater in Hara *et al*, Enum.Fl. Pl. Nepal 3: 93. 1982; Aitken in Grierson & Long, Fl. Bhutan 2(2): 649. 1999. *G. argentea* C.B. Clarke in J. Linn. B. 14: 436. 1875.

Herbs, annuals upto 7cm tall. **Stems** radically branched from base. **Petiole** 0.3 - 1.7 mm ; lamina 3.5 - 5 × 1.5 - 4.5mm, leaf blade ovate to ovate-orbicular, margin cartilaginous, apex obtuse and mucronate; veins 1-3; Cauline leaves crowded, folded; lamina subulate, 0.6 - 0.9 cm × 1.5 - 2.5 mm, subleathery, apex acute, midvein prominent. **Flowers** few, actinomorphic, subsessile, greenish white. **Calyx** narrowly obconic, tube membranous; lobes subulate, as long as or longer than tube, apex acuminate, apiculate, midvein prominent. **Corolla** pale blue, tubular, tube 1.5 - 3cm; lobes ovate, margin entire, apex obtuse and mucronate; **Stamens** inserted at middle of corolla tube, equal; anthers linear, 1-1.2 mm. **Stigma** lobes broadly oblong. **Capsules** obovoid-ellipsoid.

Flower : March. *Fruit* : September
Exsiccatus : Bhimbase 4350 m, **SR Lepcha & AP Das** 30983, dated 24.07.2005.
Status : Frequent.
Local Distribution : Rachela, Mulkharka. 2000-2550m.
General Distribution : TEMPERATE AND SUBALPINE HIMALAYAS; AFGHANISTAN, INDIA, NEPAL, BHUTAN, CHINA.

Gentiana prolata I.B. Balfour, Trans. & Proc. Bot. Soc. Edinburgh. 27: 266. 1918; Hara in Fl. E. Him. 1: 255. 1966; Smith in Hara *et al*, Enum. Fl. Pl. Nepal 3. 93. 1982; Aitken in Gierson & Long, Fl. Bhutan 2(2): 641. 1999.

Herbs perennials upto 8 cm tall. **Leaf** triangular; stem leaves larger toward apex, petiole tube to 3.5 mm; leaf ovate to orbicular or upper leaves lanceolate to elliptic, lamina 2.5 - 5 (-13) × 2.5 - 4 mm, margin smooth, apex obtuse to rounded. **Flowers** terminal, solitary, sessile, pentamerous. **Calyx** tube tubular, to 9 mm; lobes erect, lanceolate to oblong, apex acute to obtuse. **Corolla** blue, with pale yellow-white base and dark blue stripes, streaks, and spots, tubular, lobes ovate to triangular, margin entire, apex obtuse; plicae broadly triangular to subtruncate; **stamens** inserted at middle of corolla tube; **filaments** to 8.5 mm; anthers narrowly ellipsoid ; stigma lobes suborbicular. **Capsules** ellipsoid.

Flower : August *Fruit*: March - November
Exsiccatus : Singaney 2500 m, **SR Lepcha & AP. Das** 0236, dated 16.09.2007.
Status : Frequent.
Local Distribution : Nathang, 15th mile Kyongnosla . 3400 - 4500 m.
General Distribution : E. HIMALAYA; INDIA (Sikkim, BHUTAN).
Note : Endemic to Eastern Himalaya

Gentiana sikkimensis C.B. Clarke in Hook.f., Fl. Brit. India. 4: 114. 1885; Smith in Hara *et al*, Enum. Fl. Pl. Nepal. 3: 93. 1982; Aitken in Gierson & Long, Fl. Bhutan 2(2): 645. 1999.

Herb, perennial 4 - 12 cm tall. **Petiole** slightly shorter than blade, broadened toward stem apex; **lamina** oblong to spatulate, 0.4 - 1.9 × 4 - 7.5 mm base narrowed, margin ciliolate, apex rounded; basal blade suborbicular, 5 -12 mm. **Inflorescences** 3 - 8 flowered. **Calyx** tube short upto 7.5 mm, lobes linear to linear-lanceolate, unequal, 1-veined, apex acute. **Corolla** blue, with dark blue streaks, tubular, 1.5 - 2.5 cm; lobes ovate, apex obtuse; plicae truncate; **stamens** inserted at middle of corolla tube; filaments 5 - 6 mm; **anthers** narrowly ellipsoid; stigma lobes oblong. **Capsules** ellipsoid, seeds ellipsoid to subglobose.

Flower : August *Fruit*: November.
Exsiccatus : Singaney ban 2450 m, **SR Lepcha & AP. Das** 0217, dated 16.09.2007.
Status : Frequent.
Local Distribution : Mulkharka. 3400 - 4500 m.

General Distribution : E. HIMALAYA; INDIA (NEPAL to BHUTAN), Assam, Manipur, S.TIBET, and N. BURMA

Gentiana speciosa (Wall.) Marquand in Kew Bull. 1931: 70. 1931; Hara in Fl. E. Him. 255, t. 4b. 1966; Chater in Hara *et al.*, Enum.Fl. Pl. Nepal 3: 93. 1982; *Crawfordia speciosa* Wall., Tent. Fl. Nep. 64, t. 48. 1826; Hook.f. in Fl. Brit. India 4: 6. 1885.

Herb upto 30 cm, with stems twining, terete, glabrous. **Petiole** to 6 mm; **lamina** ovate, 3.5 - 6.5 × 1.5 - (2-3) cm, base rounded, margin crenulate, apex acuminate, veins 3 - 5. **Inflorescences** 1-flowered or cymes. **Pedicel** 1- 5 cm; **bractlets** 1 pair, lanceolate, less than 8.5 × 2.5mm. **Calyx** campanulate; tube 1 - 1.5cm, apex with a transparent membrane, entire or less often split on 1 side; lobes triangular, 2.5 - 3 × 1.4 - 1.8 mm, apex acute. **Corolla** blue-purple to purple, campanulate, 3.5 - 4 cm; lobes broadly ovate-triangular, apex acute; plicae semiorbicular to truncate, oblique, margin crenulate. **Stamens** inserted at middle of corolla tube; filaments linear-subulate, **anthers** sagittate, **Nectaris** narrowly ovate. **Style** linear, ca. 6mm including linear stigma lobes. **Capsules** dark brown, ellipsoid, compressed.

Flower : August *Fruit*: November.
Exsiccatus : Nathang 3950 m, *SR Lepcha & AP Das* 0290, dated 27.10.2004.
Status : Frequent.
Local Distribution : Bhimbase, Dokala, 3400 - 4400 m.
General Distribution : E. HIMALAYA; INDIA, (NEPAL to BHUTAN) Assam, Manipur, S. TIBET and N. BURMA.

Swertia Linnaeus

Key to the species:

1. Nectaries on petals naked..... *S. bimaculata*
- + Nectaries on petals covered, forming a pocket like structure..... 2
2. Basal leaves 5 or 7 nerved at base..... 3
- + Basal leaves 3 nerved at base..... *S. dalatata*
3. Radical leaves long (upto 3cm), petioled, 7nerved..... *S. speciosa*
- + Flowers 4-merous..... 4
4. Flowers almost sessile..... *S. chirayita*
- + Flowers with 0.3-1cm long pedicels..... *S. hookeri*

Swertia bimaculata (Sieb. et Zucc.) Hook.f. & Thoms. ex C. B. Clarke in Journ. Linn. Soc. 14: 449. 1875; C.B. Clarke in Hook.f., Fl. Brit. India 4:123. 1885; Hara in Fl. E. Him 256. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 96. 1982; Aitken in Grierson & Long. Fl. Bhutan 2(2): 624.1996. *Ophelia bimaculata* Sieb. & Zucc. in Abh. Akad. Wiss. Munchen. 4 (3): 159. 1946.

Local Name: *Bhalay Chireto* (Nep.).

Herbs, annual, erect upto 1m tall. **Stem** hollow. **Leaves** opposite, cauline ones petiolate (upto 0.9cm), **lamina** 1.5 - 6.5 × 0.5 - 3.5 cm, broad elliptic-lanceolate, entire, acute, base rounded pointed, glabrous both sides, distinctly 3-nerved. **Inflorescence** both axillary and terminal clusters. **Flowers** tetra-pentamerous. **Sepals** 5, small and shorter than corollas, nearly elliptic; **Corolla** larger and longer upto 1.5cm, white, many nerved, apical portion spotted; **stamens** 4 - 5; filament long upto 0.7cm, **anthers** dorsifixed. **Seeds** reddish black, numerous.

Flower : August - October *Fruit*: October - March.
Exsiccatus : NNP boarder 2750 m, , **SR Lepcha & AP. Das** 31025, dated 02.10.2004.
Status : Abundant.
Local Distribution : Rachela, Panglakha. 1950 - 3000 m.
General Distribution : E. HIMALAYA, INDIA, MYANMAR, CHINA, JAPAN.

Swertia chirayita (Roxb. ex Fleming) Karsten, Deuts. Fl. 1025. 1880-83; C.B. Clarke in Hook.f., Fl. Brit. India 4: 124. 1885, ut *chirata*; Hara in Fl. E. Him. 1: 257. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 96. 1982; Aitken in Grierson & Long, Fl. Bhutan 2(2): 626. 1996. *Gentiana chirayita* Roxb. ex Fleming in As. Res. 11. 167. 1812. *Swertia tongluensis* Burkill in ASB n.s. 2: 319. 1906; 3: 33. 1907.

Local Name: *Rungken* (Lep.), *Chireto* (Nep.); *Chirata* (Beng.).

Herbs, perennial upto 55cm tall. Stem usually subterete. **Leaves** opposite, sessile or very shortly stalked (subsessile), **lamina** 3.8 - 8.5 x 1.3 - 4.2 cm, elliptic, entire, acute, base narrowed, basally 5-nerved, dark green. **Panicles** terminal as well as axillary, leafy, many flowered. **Flowers** sessile to very shortly pedicelled (pedicel 0.1cm), 4-merous, lurid bluish yellow; **calyx** lobed, segments lanceolate; **corolla** lobes, ovate, acuminate, variously tinged, 2-glands on each lobe; filaments free; anthers and stigma oblong. **Capsule** ovate.

Flower : September - November *Fruit*: November - February.
Exsiccatus : Singaney bans 2400m, **SR Lepchu & AP. Das** 216, dated 16.09.2004.
Status : Rare
Local Distribution : Rachela Peak, Tungsay RF. 2000 - 3100 m.
General Distribution : HIMALAYAS;INDIA, (Kashmir to BHUTAN) and Khasia
Note : 1. Endemic to Himalaya.
2. Species of a highly potential traditional medicine.

Swertia dilatata C.B. Clarke in Hook.f., Fl. Brit. India 4: 122. 1885; Hara in Fl. E. Him. 1: 257. 1966; Hara *et al.* Enum.Fl. Pl. Nepal 3: 97. 1982.

Herbs, annual, upto 50cm tall. Stem round, hollow. **Leaves** opposite, sessile or shortly petiolate, lamina 1.5 - 3.8 x 0.5 - 0.8 cm, lanceolate, acute -acuminate, base rounded or pointed, glabrous, triplinerved. **Flowers** in panicles, pentamerous; **sepals** broad, upto 1cm, elliptic-lanceolate, pointed acuminate, persistent; **petals** shorter than calyx, acute, base provided with a purplish band, pale membranous, greenish yellow, distinctly 5-nerved, mid nerve thick and prominent; glands horse-shoe shaped; scales hanging. **Capsules** round, green yellow, numerous.

Flower : September - November. *Fruit*: October - January
Exsiccatus : NNP boundary 2280m, **SR Lepcha & AP. Das** 0258, dated 16.9.2007.
Status : Common.
Local Distribution : Rachela , Jorpokhari. 2200-3050m.
General Distribution : E. HIMALAYA; INDIA, (NEPAL) Khasia.
Note : Endemic to Eastern Himalaya

Swertia hookeri C.B. Clarke in Hook.f., Fl. Brit. India 4: 127. 1885; Hara *et al.* Enum. Fl. Pl. Nepal 3: 97. 1982. Aitken in Grierson & Long. Fl. Bhutan 2(2): 629. 1999

Herbs, small, erect, upto 35 cm tall, rootstock perennial. Stem hollow. **Leaves** cauline; lamina 5 - 12 x 2.5 - 3.3 cm, spatulate-elliptic, basally connate, entire, narrowed at both ends, 5-nerved; radical leaves sessile, smaller than cauline, lamina ovate, terminal ones flushed with purple colour. **Cymes** axillary, densely flowered. Pedicels 0.5 - 1 cm. **Flowers** modding, bell-shaped, 4-merous, maroon, darkly veined. **Calyx**

upto 0.8cm, lobes ovate, acute, green. **Corolla-lobes** 1.5 x 0.6cm, obtuse, nerved with bluish lines; filaments linear; anthers oblong; style with very short stigma.

- Flower & Fruit* : September - December.
Exsiccatus : Thamay dara 2490m, *SR Lepcha & AP Das* 015, dated 13. 10. 2004.
Status : Common.
Local Distribution : Dorok, kyongnosla. 2100 - 2500 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, S.E. TIBET.
Note : Endemic to Eastern Himalaya

Swertia speciosa D. Don in London Edinberg Philos. Mag. J. Sci 8: 77. 1836; C.B. Clarke in Hook.f., Fl. Brit. India 4: 128. 1885; Hara et al, Enum. Fl. Pl. Nepal 3: 97. 1982; Aitken in Grierson & Long. Fl. Bhutan 2(2): 627. 1996. *S. perfoliata* Royle ex G. Don, Gen. Syst. 4:176. 1837.

Herbs, erect herbs upto 55 cm tall. Stem oftenly hollow. Radical leaves opposite, long petioled (upto 3.5 cm long), **lamina** 4.5 - 10 x 1.5 - 5.5 cm, entire, acute, base narrowed downwards, dark green, upto 7-nerved; cauline leaves elliptic, acute or acuminate, sometimes clasping the stem. **Cymes** paniculate. Pedicels long. **Flowers** pentamerous, 1.2 - 2.2cm diam.; calyx-lobes to 1.8cm long, elliptic, acute, serrate, overlapping basally. **Corolla-lobes** 5, spreading, 1.5 - 2.5 cm, elliptic, grey, each with fimbriae at base; **filaments** linear, flattened; **anthers** ovate.

- Flower* : July
Exsiccata : Neora phatak 2700 m, *SR Lepcha & AP. Das* 258, dated 16.09.2007.
Status : Common.
Local Distribution : Singaney bans, Padamchen, Kyongnosla 2100 - 2600 m.
General Distribution : EASTERN HIMALAYA; INDIA, (NEPAL - BHUTAN).
Note : Endemic to Eastern Himalaya.

Swertia ciliata (D. Don ex G. Don) B.L. Burtt, Notes Roy. Bot. Gard. Edinburgh. 26: 272. 1965. *Ophelia ciliata* D. Don ex G. Don, Gen. Hist. 4: 178. 1837; Smith in Enum. Fl. Pl. Nepal 3. 96.1982; Aitken in Grierson & Long. Fl. Bhutan 2(2): 623. 1999;

Herbs, annuals 20 - 55cm tall. Stems erect, sub-quadrangular, branched. **Lamina** 0.8 - 5.5 x 0.4 - 2.5 cm, sessile or short petiolate; leaf blade lanceolate to ovate-lanceolate, base obtuse, margin slightly revolute, apex acute, veins 3 - 5. **Inflorescences** panicles of cymes, many flowered, spreading. **Flowers** pentamerous; pedicel erect, upto 2cm, filiform. **Calyx** lobes reflexed at anthesis, lanceolate, 5.5 - 6.5 x 2 - 2.5 mm, margin and midvein dark purple, apex acuminate. **Corolla** dirty purple, with 2 purple spots above each nectary, 1 - 2cm in diam. Nectaries 1 per corolla lobe, horseshoe-shaped, naked; **filaments** dark purple, 3.5 - 5mm, basally much enlarged and connate; anthers blue-purple, ellipsoid; style slender; stigma lobes capitate. **Capsules** ovoid, Seeds pale yellow, subglobose.

- Flower* : July *Fruit*: September
Exsiccatus : Singaney bans 2350 m, *SR Lepcha & AP. Das* 0266, dated 16.09.2004.
Status : Frequent.
Local Distribution : Kupup Nathang, Bombay hills (KAS) 3600 - 3700m
General Distribution : AFGHANISTAN, HIMALAYA; INDIA, NEPAL, CHINA.

Halenia Borkhausen

Halenia elliptica D. Don in London Edinberg Philos. Mag. J. Sci. 8: 77. 1836; C.B. Clarke in Hook.f., Fl. Brit. India 4: 130. 1885; Hara & Ohashi in Fl. E. Him. 256. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 95. 1982; Aitken in Grierson & Long. Fl. Bhutan 2(2): 611.1999. *Swertia centrostemma* Wall., Cat. 154, n. 4385. 1831, *nom. nud.* *Swertia pelons* Griff., Itin 197.1848.

Herbs, annual. **Stem** with 4-angled. **Leaves** opposite, sessile to shortly stalked, **lamina** 0.6 - 2.3 x 2.7 - 1.5 cm, narrow-elliptic, entire, acute-subglobose, base slightly rounded. **Flowers** in branched terminal and axillary cymose panicle pale blue. **Calyx** 4-lobed, lobes lanceolate-ovate. **Corollas** upto 0.6cm across, deeply 4-lobed, 4 short blue spurs 0.5cm projecting backward and outward from the petal base. **Fruit** not recorded.

Flower : September - October
Exsiccatus : Panglakha 3040m, **SR Lepcha & AP. Das** 29398, dated 30.09.2004.
Status : Less Frequent.
Local Distribution : Rachel Peak, Memenchu, Changu, 2600-3100m.
General Distribution : ASIA; INDIA, NEPAL, BHUTAN, TIBET, CHINA, MYANMAR.

Tripterospermum Blume

Tripterospermum volubile (D. Don) Hara in Journ. Japan Bot. 40: 21. Jan. 1965; Hara & Ohashi in Fl. E. Him. 1: 258. t. 4c 1966; Hara *et al.*, Enum. Fl. Pl. Nepal. 3: 98. 1982; Aitken in Grierson & Long. Fl. Bhutan 2(2): 610.1999. *Gentiana volubilis* D. Don, Prodr. Fl. Nepal 126. 1825. *Crawfordia fasciculata* Wall., Tent. Fl. Nepal 63. t. 47. 1826; C.B. Clarke in Hook.f., Fl. Brit. India 4: 107. 1885.

Climber or twinners. **Leaves** often opposite; **lamina** 1.5 - 4 x 0.4 - 2.2 cm, ovate-lanceolate, denticulate, acute, base narrow rounded, glabrous both surfaces, 3-nerved. **Flower** axillary, short pedicellate, light pinkish; **sepals** toothed, teeth linear; **petals** campanulate, pinkish white. **Berry** ellipsoid, reddish, succulent,

Flower : June- September. *Fruit*: October - November
Exsiccatus : Rachel 2950 m, **SR Lepcha & AP. Das** 31051, dated 02.10.2004.
Status : Common.
Local Distribution : Rachel, Jorepokhri, Mulkharka, 2000 - 3010 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, TIBET, MYANMAR.

ASCLEPIADACEAE R. Brown

Key to the Genera:

1. Terrestrial climbers; leaves ovate, non-succulent 2
- + Epiphytic undershrubs; leaves linear, succulent, both sides densely hirsute *Hoya*
2. Leaves coracious; flower pale pink to dark purple; stigma dome-shaped .. *Treutlera*
- + Leaves non-coracious; flower yellow, greenish, purple; stigma depressed, bifid ... *Ceropegia*

Ceropegia Linnaeus

Key to the species:

1. Lamina ovate; cymes upto 12 flowered *C. pubescens*
+ Lamina linear lanceolate rarely ovate; cymes upto 4 flowered *C. longifolia*

Ceropegia longifolia Wallich, Pl. Asiat. Rar. 1: 56 t. 73. 1830; Hook.f., Fl. Brit. India 4: 69. 1883; Hara *et al.* Enum. Fl. Pl. Nepal 3: 85.1982; Fasc. Fl. Ind.16: 20.1984; Grierson & Long in Fl. Bhutan 2(2): 732. 1999.

Climbers or twinner, slender glabrous. **Leaves**; petioles to 0.90 cm long; **lamina** 9 - 20 x 2 - 4.5 cm, linear-lanceolate, rarely ovate lanceolate, base rounded, acuminate, entire. **Cymes** extra-axillary.; peduncles upto 5 cm long, 1-4 flowered hairy; pedicels to 1cm long. **Flowers** dark purple. **Sepals** to 4.6 cm, purple with curved tube and bulbous base, lobes ovate, bristly ciliate and blackish, corona 10-lobed, ciliate, horns linear, **follicles** upto 13 cm long; **seeds** oblong.

- Flower* : August - September *Fruit* : October - January
Exsiccatus : Rachela below 2600 m, *SR Lepcha & AP. Das* 31502, dated 16.07.2008
Status : Not common
Local Distribution : Rachela, Panglakha, PWS, NNP (WB), 2200 - 2600 m.
General Distribution : HIMALAYAS; INDIA (Simla-Sikkim, Assam) MYANMAR.
Note : Endemic to Himalaya.

Ceropegia pubescens Wallich, Pl. As. Rar. 2: 81, t. 187. 1831; Hook.f. in Fl. Brit. India 4: 73.1883. Hara in Fl. E.Him. 1: 260.1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 85.1982; Fasc. Fl. India. 16: 28. 1984; Grierson & Long in Fl. Bhutan 2(2): 729. 1999

Climbers, slender, glabrous, pubescent. **Leaves**; petioles to 5cm long; leaves **lamina** 6 - 12 x 4.5 - 6.5cm, ovate, acuminate, base rounded, glabrous or sometime sparsely pubescent. **Flowers** in cymes, to 12 flowered; peduncles upto 5.5 cm long; pedicels 2 - 3 cm. **Calyx** upto 0.6 cm long, linear. **Corolla** 3.5 - 4.5 cm long, subcylindric, with dilated throat, spotted greenish, lobes elliptic. Coronal processes minute or obsolete, ciliated. **Follicles** to 11cm long; **seeds** oblong.

- Flower* : August - September *Fruit*: October - January
Exsiccatae :Panglakha 3000 m, *SR Lepcha & AP. Das* 29392, dated 30.09.2004. Dohrok - Phusrey, 2300m, *SR Lepcha & AP. Das* 30207, dated 0610.2004.
Status : Less common.
Local Distribution : Panglakha, Phusrey, Hangey 1200 - 2000 m.
General Distribution : HIMALAYAS; INDIA, MYANMAR.

Hoya R. Brown

Key to the species:

1. Lamina linear, elliptic - suborbicula 2
+ Lamina ovate lanceolate *H. lanceolata*
2. Leaves petiolate; flowers not sweet scented; corona rounded oblong *H. linearis*.
+ Leaves sessile; flowers sweet scented; corona lobes ovate oblong *H. serpens*

Hoya linearis Wallich ex D. Don, Prodr. Fl. Nepal 130. 1825; Bot. Mag. t. 6682. 1883; Hook.f., in Fl. Brit. India 4: 53. 1883; Hara in Fl.E.Him.1: 261. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 87. 1982; Grierson & Long in Fl. Bhutan 2(2): 716. 1999. *Hoya linearis* var. *nepalensis* Hook. f. in Fl. Brit. India 4: 53. 1883.

Epiphytic, undershrubs. **Stem** usually 20 - 35cm, trailing, flaccid, densely hirsute. **Leaves** sessile; **lamina** 3.5 - 5 x 0.4 - 0.5cm, linear, narrowly terete, entire, acute, densely hirsute both surfaces, coarse, isobilateral, nerves not distinct. **Umbels** many flowered, terminal and sessile. **Flowers** ebracteate, white, fragrant. **Calyx** lobes small, hirsute, linear lanceolate. **Petals** broadly ovate; **corona** rounded oblong, spreading stellately.

Flower : September – October *Fruit*: December - April
Exsiccatus : Between Phusrey -Mulkharka, 2240 m **SR Lepcha & AP. Das** 27800, dated 30.07.2004
Status : Common.
Local Distribution : Mulkharka, Middle Rachel Chowk, 1700 – 2400 m.
General Distribution : HIMALAYAS, NEPAL INDIA (ARUNACHAL PRADESH, ASSAM, SIKKIM, MEGHALAYA, W. CHINA.

Hoya lanceolata Wallich ex D. Don, Prodr. Fl. Nep.130. 1825; Hook.f., Fl. Brit. India 4: 54. 1883; Hara in Fl. E. Him. 1: 261. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 87. 1982; Grierson & Long in Fl. Bhutan 2(2): 717. 1999.

Epiphytic, shrub, upto 90 cm tall with pendent branches. **Branchlets** pubescent. **Leaves**; petioles 0.18 - 0.29 cm long; **lamina** 2.5 – 6.5 x 0.7 – 3 cm, ovate-lanceolate, acuminate, base acute, glabrous, succulent. **Cymes** terminal and axillary, umbellate, 6-10 flowered. **Sepals** to 0.7 cm, oblong-lanceolate, pubescent. **Corolla** to 1.5 cm diam., whitish, centrally pinkish, tube upto 1.2 cm long, lobes spreading, coronal processes terete, spreading. **Follicles** to 15 cm, slender.

Flower : May - June *Fruit* : August - December
Exsiccatus : Phusrey forest barrack - Mulkharka, 1600 m, **SR Lepcha & AP. Das** 31504, dated 15.07. 2008
Status : Less common.
Local Distribution : Mulkharka, Middle Rachel, NNP, 1700 – 2400 m.
General Distribution : HIMALAYAS; INDIA (Kumaon – BHUTAN), Meghalaya, MYANMAR.

Note : Endemic to E.Himalaya.

Hoya serpens Hook. f., Fl. Brit. India 4:55. 1883; Hara in Fl. E, Him. 1: 261.1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 87.1982; Grierson & Long in Fl. Bhutan 2(2): 715. 1999.

Epiphyte, herbs, ramos to 1 m tall. **Stem** slender, creeping, rooting on the bark. **Leaves**; petioles to 0.30 cm long; **lamina** to 2 cm across, broadly elliptic to sub-orbicular, acute, base rounded, succulent, hairy both sides. **Umbels** axillary; peduncles to 45 cm, stout; pedicels to 2.3 cm long. **Flowers** white, sweetly scented. **Sepals** upto 0.45 cm, ovate. **Corolla** 1.5 – 2 cm across, dull white-brown, tomentose within, lobes ovate and obtuse; **corona lobes** ovate- oblong rarely ellipsoidal. **Follicles** not seen .

Flower : April - May *Fruit*: August - October
Exsiccatus : Mulkharka, 1700 m, **SR Lepcha & AP Das** 31503, dated 15.07. 2008
Status : Common.
Local Distribution : Mulkharka, Rigu, NNP, 1600 - 1800m.
General Distribution : E. HIMALAYAS; INDIA (Sikkim , Darjeeling), BHUTAN.
Note : Endemic to E. Himalaya.

E

Treutlera Hooker f.

Treutlera insignis Hook.f. in Hooker, Icon. Pl. t. 1425. 1883; Hook.f. Fl. Brit. India 4: 45. 1883; Hara in Fl. E. Him. 1: 262. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 88. 1982; Grierson & Long in Fl. Bhutan 2(2): 712. 1999.

Shrubs, twinning branched, with milky latex. Branches terete, glabrous, silvery white. **Leaves** placed in distantly; petiole to 4.5 cm; **lamina** 7 – 13 x 3- 4 cm, elliptic, entire, acuminate, base rounded to shallowly lobed inward medianly, glabrous both surfaces except in the nerves above, dark green and leathery above, paler to silvery white below, midrib broad below, lateral nerves 5-6 pairs. **Umbels** axillary; peduncles to 5 cm; bracts lanceolate. **Flowers** to 2.8 cm across, dark purples. **Sepals** ciliate, small. **Corolla** larger, nearly rotate, 5-lobed, lobes ovate. **Fruit** not collected.

Flower : August *Fruit*: September – December
Exsiccatus : Mid-Rachela 2300 m, **SR Lepcha & AP. Das** 31263, dated 13.07.2008.
Status : Common.
Local Distribution : Mulkharka - Phusrey, 2000 – 2400 m.
General Distribution : E. HIMALAYAS; INDIA (Sikkim, Darjeeling, Meghalaya), NEPAL, BHUTAN.
Note : Endemic to E. Himalaya.

Order: Solanales

SOLANACEAE A. Jussieu

Key to the Genera

1. Plants < 2 m tall; branches lenticellate; corolla campanulate, orange / yellow ... *Cestrum*
- + Plant > 2 m tall; branches setulose; Petals oblong, purplish white or light pink ... *Lycianthes*

Cestrum Linnaeus

Cestrum aurantiacum Lindley, Bot. Reg. 71. 1844; Hara in Fl. E. Him. 1:282. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3:108. 1982

Local Name: Malami Phul (Nep.).

Shrubs upto 4 m tall. Branches lenticellate. **Leaves** alternate; petioles to 3.5 cm long; lamina 5.2 -11. 8 x 2.5 – 6.5 cm, ovate-elliptic, entire acute, glabrous on both surfaces. **Inflorescence** in terminal and axillary cymes, branched, 1 - 5 flowered, terminal flowers fascicled; bracts to 1.2 cm, ovate lanceolate. **Corolla** tubular, orange yellow. **Calyx** tube green, 5-lobed, linear.. **Corolla**

to 2.4 cm long, bell shaped, orange yellow; stamens 5, epipetalous; ovary bi-locular; stigma usually notched. **Berries** globose, white, to 1.3 cm long.

- Flower* : July – August *Fruit*: August – September
Excisscaus : Premlakha 2700m, SR *Lepcha & AP. Das* 2345, dated 17.05.2003.
Status : Abundant.
Local Distribution : Premlakha 1500 – 2700 m
General Distribution : HIMALAYA; INDIA, (NEPAL – BHUTAN).
Note : A native of Central America; naturalized in the Himalayas. Cultivated elsewhere

Lycianthes (Dunal) Hassler

Lycianthes biflora (Loureiro) Bitter in Abh. Naturw. Ver. Bremen. 24:461. 1920. sub-sp. *macrodon* (Wallich ex Nees) Deb in Bot. Jour. Lin. Soc. 76: 293. 1978; Hara in Enum. Fl. Pl. Nepal 3: 109. 1982; *Solanum macrodon* Wallich ex Nees in Tr. Lin. Soc. 17: 43. 1834; C.B. Clarke in Fl. Brit. India 4: 232. 1885. *Lycianthes macrodon* (Wallich ex Nees) Bitter in Abh. Naturw. Ver. Bremen 24: 468. 1920.

Shrub upto 1.8 m tall with many brached. **Branches** usually setulose, nodes slightly jointed. **Lamina** elliptic, 5 – 13 x 3.6 – 6 cm, elliptic-lanceolate, entire or distantly toothed, acuminate, base narrowed to petiole, setulose both upper and lower surfaces. **Inflorescence** cymes with upto 2 – 6 flowered, oftenly sessile; pedicels to 2 cm. **Sepals** linear lanceolate. **Petals** to 1.4 cm, oblong, purplish white or light pink. **Berries** globose, red, seeds triangular.

- Flower* : July – September *Fruit*: August – December
Exciccatus : Below Phusrey 2100m, SR *Lepcha & AP. Das* 1500, dated 20.08. 2003.
Status : Abundant.
Local Distribution : Phusrey 1800 – 2250 m
General Distribution : Throughout tropical & subtropical ASIA, NEW GUINEA and HAWAII.

CONVOLVULACEAE A. Jussieu

Key to the Genera:

1. Corolla white, capsules one-seeded; fruiting sepals enlarged 3.5 cm *Porana*
+ Corolla pink or purple, capsules generally 4-seeded; fruiting sepals not enlarged ... *Ipomoea*

Ipomoea Linnaeus

Key to the species:

1. Flowers 1 – many; Sepals ovate elliptic *I. nil*
+ Flowers 1 – 5; Sepals oblong lanceolate *I. purpurea*

Ipomoea nil (L.) Roth, Cat. Bot. 1: 36. 1797, Ooststroom in Blumea 3: 499. 1940; Mill in Grierson & Long, Fl. Bhutan 2(2): 846. 1999. *Convolvulus nil* L., Sp. Pl. ed. 2. 1: 219. 1762.
Ipomoea hederacea auct, non Jacq.: C.B. Clarke in Fl. Brit. India 4: 199. 1883.

Twinner, rarely prostrate. **Stem** hirsute. **Petiole** 2.5 – 13 cm; broadly ovate to orbicular in outline, **lamina** 3.5 -13 x 4 – 15 cm, entire or 3 lobed, acute to acuminate, base cordate, appressed hairy on both surfaces; pedicel short 2 - 8 mm; bracts, linear. **Flowers** 1 – many. **Sepals** ovate elliptic at basal part, narrowed to long, linear lanceolate, with yellowish bristles, slightly hairy

above. **Corolla** infundibular, glabrous, whitish or lime blue, turning red to reddish-purple; **stamen** and style included. **Capsules** ovoid to globose, 3 celled or 3 valved; seeds black, pear shaped.

Flower : Almost round the year
Exsiccatus : Neora boundary 2700 m, , *SR Lepcha & AP. Das 30285*, dated 16.09.2007

Status : Common

Local Distribution : Gangtok, Bhusuk, Haticherey 1100 – 3100 m.

General Distribution : CIRCUMTROPICAL; INDIA, CHINA, MYANMAR, NEPAL, NEW GUINEA, PAKISTAN, SRI LANKA, THAILAND, AFGANISTAN, BALUCHISTAN, CHINA, JAVA, JAPAN; NATIVE OF S. AMERICA

Note : The seeds are used in local medicine in China.

Ipomoea purpurea Roth. Abh. 27. 1797; C.B. Clarke in Fl. Brit. India 4: 200. 1885; Mill in Grierson & Long, Fl. Bhutan 2(2): 848. 1999.

Twinner, annual, herbaceous. **Stem** with short appressed hairs. **Lamina** ovately to suborbicular, 2.5 - 13 x 2 - 14 cm, unlobed, rarely 3 lobed, acuminate, base deeply cordate. **Flowers** in axillary, 1 - 5 flowered in cymes; pedicels to 13 mm long. **Sepals** oblong lanceolate, acute, outer oblong, inner narrower and scarious margined. **Corolla** infundibular, glabrous, tube white or pink, limb white or red purple; mid petals distinctly reddish then others; **stamens** and style included. **Capsules** globose.

Flower : May - October

Exsiccatus : Padamchen, 2800 m, *SR Lepcha & AP. Das 0299*, dated 16.09.2007

Status : Common

Local Distribution : Padamchen, Subaney, Premlakha, Phusrey 1100-3100m.

General Distribution : CIRCUMTROPICAL

Note : Weeds or sometime cultivated as an ornamental.

Porana Burmann f.

Porana grandiflora Wall. in Roxb., Fl. Ind. ed. Carey 2: 41. 1824; C.B. Clarke in Fl. Brit. India 4: 221. 1885; Hara in Fl. E. Him. 1: 265. 1966; Hara in Enum. Fl. Pl. Nepal 3: 108. 1982; Mill in Grierson & Long, Fl. Bhutan 2(2): 855. 1999. *Ipomoea cuspidata* D. Don. Prodr. 98. 1825; Clarke in Fl. Brit. India 4: 215. 1883. *Dinetopsis grandiflora* (Wall.) Roberty in Candollea 14: 27. 1952.

Twinner slender, thinly pubescent. **Stem** reddish, pubescent, **Petioles** upto cm long. **Lamina** 7.5 - 13 x 6.5 - 15cm, broadly ovate, entire, acuminate, deeply cordate. **Racemes** usually 4- 12 flowered, 5 - 7.8 cm long, pubescent; **peduncles** 5 -11 cm, few to many flowered; **bracts** small 0.2 - 0.35 cm, linear; pedicels upto 1 cm long. **Calyx** linear-lanceolate, acuminate, hairy. **Corolla** usually infundibular, mauve, scented, tube 2.2 cm, linear, with limb 3 -5 cm long. **Capsules** subglobose, with persistent enlarged sepals.

Flower : August - October . **Fruit**: October - January

Exsiccatus : Talkharka, 2120m, *SR Lepcha & AP. Das 0300*, dated 05.06.2005.

Status : Common.

Local Distribution : Middle Rachel, 1820 - 2400 m.

General Distribution : E. HIMALAYAS; INDIA,(NEPAL- Sikkim).

Note : Endemic to Eastern Himalaya.

CUSCUTACEAE Dumitriu

Cuscuta Linnaeus

Cuscuta reflexa Roxb., Pl. Cor. 2:3, t. 104. 1798; in Fl. Indica 1: 446. 1820; ed. 2, 1: 466. 1832; C.B. Clarke in Fl. Brit. India 4: 225. 1883; Hara in Fl. E. Him. 263. 1966; Hara et al. Enum. Fl. PL. Nepal 3: 105. 1982; Mill in Grierson & Long, Fl. Bhutan 2(2): 863; 1999; *Cuscuta verrucosa* Sweet, Br. Flow. G. Ser. 1., 1: t. 6. 1823. *Cuscuta grandiflora* Wall. [Cat. 35, n. 1318. 1829, *nom. nud.*]

Twiner, parasitic. **Stem** reddish or yellowish brown, profusely branched. **Flowers** in short lax racemes of upto 12 flowers. **Bracts** leaves like. **Calyx** lobes 5, ovate – obtuse, 0.9 x 3 mm, shorter than corolla tube, margin scarious. **Corolla** creamy white, with scented, lobe obtuse 1.5 x 0.5 mm. **Stamens** 5; filament linear; anther basifixed; stigma 2 unequal. **Capsules** globose conical.

Subsp. *reflexa*.

Large flowers, corolla 1/3 of the tube

<i>Flower</i>	: February	<i>Fruit:</i>	October
<i>Exsiccatus</i>	: Singaney 2650m, SR Lepcha & AP. Das 1011 , Dated 16.09.2007		
<i>Status</i>	: Common		
<i>Local Distribution</i>	: 1200 – 2700 m.		
<i>General Distribution</i>	: AFGANISTAN, BALUCHISTAN, INDIA, NEPAL, BHUTAN, SRI LANKA, W. CHINA and MALAYSIA (JAVA)		

Note : Stem is medicinal.

Order: Lamiales

BORAGINACEAE A. Jussieu

Key to the Genera:

- | | |
|---|--------------------|
| 1. Leaf with whitish hair on both surface; flowers in racemes | <i>Cynoglossum</i> |
| + Leaf glabrous except mid veins; flowers axillary | <i>Hackelia</i> |

Cynoglossum Linnaeus

Key to the species:

- | | |
|---|-------------------------|
| 1. Plants more than 1 m tall | 2 |
| + Plants less than 1 m tall | <i>C. glochiadiacum</i> |
| 2. Corolla deep blue with limb throat scale blueish - white | <i>C. wallichii</i> |
| + Corolla white with limb throat scale blue | <i>C. lanceolatum</i> |

Cynoglossum glochidiatum Wallich ex Benth. in Royle, III. Bot. Him. 306. 1836; C.B. Clarke in Fl. Brit. India 4: 156 1993; Hara & Ohashi in Fl. E. Him. 1: 266. 1966; Hara et al. Enum. Fl. Pl.

Nepal 3: 100. 1982; Grierson & Long. Fl. Bhutan 2(2): 167. 1999. *C. wallichii* G. Don, Gen. Hist. 4: 354. 1832; C.B. Clarke in Fl. Brit. India 4: 157. 1883. *C. denticulatum* DC., Prodr. 10: 105. 1846; C.B. Clarke in Fl. Brit. India 4: 157. 1883.

Herbs upto 45cm tall. Branches ascending. **Stem** hispid with hairs rising from tubercles. **Leaves lamina** 3 – 6.5 x 0.5 - 2.5cm, alternate, sessile, lanceolate, acute, base attenuate, 3-nerved, hairy on both surfaces, hairs whitish, dense and almost erect. **Flowers** in elongated racemes, purple. **Calyx** lobed ovate to obtuse. **Nutlets** ovate, margined.

Flower : July - November *Fruit*: August- December.
Exsiccatus : Sano-Ramitey, 2250 m, **SR.Lepcha & AP. Das 31133**, dated 03.10.2004.
Status : Common
Local Distribution : Changu, Rongchu, Padamchen, Rongchu 1500 – 2300 m:
General Distribution : AFGHANISTAN, TURKESTAN, INDIA, TIBET, WEST CHINA C. ASIA.

Cynoglossum lanceolatum Forsskal, Fl. Aegypt. Arab. 41.1775; C.B. Clarke in Fl. Brit. India 4: 156. 1853; Grierson & Long. Fl. Bhutan 2(2): 907. 1999

Local Name:Khirpatey (Nep.)

Herbs annual or biennial, perennial hispid. Stems erect, to 125 cm, much branched. **Leaves**; petiole to 23 cm, basal leaves absent in Flower; subacute – acute; base shortly attenuate; upper surface grays strigose- hispid on veins. **Inflorescent** intricately branches, ultimate branched slightly divaricated on fruits. **Calyx** lobes to 1.3 mm, ovate, obtuse, strigose,. **Corolla** white to 2.3 mm long; limb to 3.4 mm in diam. throat scale blue, slightly crecent. **Nutlets** to 2.2 mm, ovate orbicular, emarginated.

Flower : Throughout the years
Exsiccatus : Phusrey – Singahney 2450 m, **SR Lepcha & AP. Das 0261**, dated 15.09.2005
Status : Common
Local Distribution : 1200 – 3600 m.
General Distribution : AFRICA, ARABIA, AFGHANISTAN, INDIA, BURMA, THAI, INDO-CHINA, MALAYSIA, AND CHINA.

Cynoglossum wallichii G. Don, Gen. Hist. 4: 354. 1832; C.B. Clarke in Fl. Brit. India 4: 157. 1883; Grierson & Long., Fl. Bhutan 2(2): 909. 1999.

Herbs biennial, robust. Stems to 80 cm., hispid with spreading hair. **Leaves**; radical leaves absent during flowering; lower cauline leaves elliptic **lamina** 40 – 80 x 20 – 24 mm, middle leaves sessile and de-current, oblong elliptic, lamina 50 – 110 x 17 – 23 mm, upper leaves sessile, ovate, apex acute, acuminate, margin entire, both upper and lower surface sparsely short hispid; mid rib brownish, lateral veins indistinct, margins in upper leaf with setules, **Inflorescent** with branches of 7 – 12 flowered. **Calyx** velvety blackish or dark purplish, lobes broadly ovate – suborbicular, uptuse or rounded. **Corolla** deep blue, to 4.5 mm long, limb throat scale bluish white, hairy. **Nutlets** to 3 mm, ovate elliptic marginate.

Flower : May *Fruit*: October
Exsiccatus : Sano-Ramitey 2220 - 2300m, **SR.Lepcha & AP. Das 0260**, dated 15.09.2005.

Status : Common
Local Distribution : Kyongnosla, Karponang, 1800 – 2900 m.
General Distribution : AFGHANISTAN, TURKESTAN, INDIA, TIBET, E. ASSAM, WEST CHINA

Hackelia Opiz

Key to the species:

1. Plants upto 70 cm tall; corolla funnel shaped; fruits pyramidal..... *H. uncinata*
 + Plants more than 70 cm tall; corolla not funnel shaped; fruit ovoid..... *H. bhutanica*

Hackelia bhutanica R.R. Mill in Edinburgh J. Bot., 53(1): 117. 1996; Grierson & Long. Fl. Bhutan 2(2): 902. 1999.

Herbs perennial, upto 70 cm tall. Stems erect, pilose. **Leaves** both cauline and radical; petioles upto 20 cm long; cauline leaves, petiolate; **lamina** 23 – 90 x 13 – 65 mm, acuminate, shortly pilose above, sparsely hairy to 1.2 mm, glabrous except on veins beneath. **Flowers** in axillary, few flowered, terminal cymes subtended by a bracts (leaves like); pedicels filiform, upto 14mm long. **Calyx** partite, to 1.4 mm, lobes lanceolate, acute, with white hirsute on veins. **Corolla** white; tube 1 – 1.8 mm, pilose at base, limb to 5.6 diam. **Nutlets** small grayish. ovoid.

Flower : May - July *Fruit* : August - November
Exsiccatu : Below Jorpokhari, 2750 m, **SR Lepcha & AP. Das** 30887, dated 30.07.2005.

Status : Less Common.
Local Distribution : Kyongnosla, Padamchen, Subaney, 1880 – 3000 m.
General Distribution : E. HIMALAYA; India, NEPAL, BHUTAN.
 Note : Endemic to Himalaya

Hackelia uncinata (Royle ex Benth) C.E.C. Fischer, Kew Bull. 298. 1939: 336. 1939. var. *brachytuba* (Diels) Hara in Fl. E. Him. 1:267. 1966; Hara in Enum. Fl. Pl. Nepal 3: 101. 1982; Grierson & Long. Fl. Bhutan 2(2): 902. 1999. *Cynoglossum uncinatum* Benth in Royle, Illustr. Bot. Himal. 1: 305. 1836. *Paracaryum brachytubum* Diels in NRBGE 5: 168. 1912. *Hackelia brachytuba* (Diels) Johnson in JAA 18: 25. 1937.

Herbs upto 5 m tall. Stems hairy. **Leaves** usually both cauline and radical; petioles upto 11 cm long; cauline leaves 4.2 - 7.3 x 2.5 - 4.5 cm, elliptic, acuminate, base obtuse; radical leaves oftenly larger than cauline, ovate, cordate, 4 - 6 nerved from base. **Inflorescence** in racemose to 13 cm, furcated; pedicels upto 1.3cm long. **Flowers** blue. **Sepals** to 0.6 cm, oblong-ovate, acute, glabrous, much elongated in fruit. **Corolla** funnel shaped, lobes upto 0.4 cm, rounded, overlapping. **Fruits** in small nutlets to 1 cm, pyramidal

Flower : June – August *Fruit*: August – November
Exsiccatu : Padamchen – Premlakha, 2200 m, **SR Lepcha & AP. Das** 0261, dated 16.09.2005.

Status : Less Common.
Local Distribution : Padamchen, Kyongnosla, 2280 – 3000 m.
General Distribution : HIMALAYAS; INDIA, NEPAL-BHUTAN, MEGHALAYA, S. TIBET, W. CHINA.

Note : Endemic to Himalaya

LAMIACEAE Lindley (*alt. nom.*)
LABIATAE A.L. Jussieu (*nom. cons.*)

Key to the Genera:

- | | |
|---|----------------------|
| 1. Plant with stellate hairs on leaves and stems | 2 |
| + Plant with simple hairs | 3 |
| 2. Bracts and calyx teeth spinose with strongly hooked | <i>Notochaete</i> |
| + Bracts and calyx teeth without hook tip | 4 |
| 4. Calyx 5 mm or less at anthesis | <i>Isodon</i> |
| + Calyx 5 mm or more at anthesis | 5 |
| 5. Flowers in dense terminal spike | 6 |
| + Flowers in whorls or axillary not forming a dense spike | <i>Phlomis</i> |
| 6. Calyx sub bilabiate; stamens 4; nutlets cuneate | <i>Leucosceptrum</i> |
| + Calyx bilabiate; stamens 2; nutlets trigonous | <i>Salvia</i> |
| 3. Fruit calyx tubular..... | 7 |
| + Fruit calyx bilipped and not tubular..... | 9 |
| 7. Herbs ascending or procumbent sometime erect | 8 |
| + Herbs erect | <i>Melissa</i> |
| 8. Flowers in axillary verticillaster; corolla-tube exceeding calyx | <i>Clinopodium</i> |
| + Flowers in unbranched spike; corolla-tube not exceeding calyx | <i>Prunella</i> |
| 9. Plants prostrate or decumbent | <i>Ajuga</i> |
| + Plants erect, stout | 10 |
| 10. Corolla white or pink; inflorescence compact | <i>Elsholtzia</i> |
| + Corolla lavender-blue; inflorescence generally lax | <i>Siphocranion</i> |

Ajuga Linnaeus

Key to the species:

- | | |
|--|-----------------------|
| 1. Herbs aromatic; flowers in spike ; corolla light purple, turning to white | <i>A. macrosperma</i> |
| + Herbs non- aromatic; flowers in lax whorls; corolla lilac, violet | <i>A. lobata</i> |

Ajuga lobata D. Don, Prodr. Fl. Nep. 108. 1825; Hook.f. in Fl. Brit. India 4: 702. 1885; Lab. Ind. 224. 1940; Murata in Hara Fl. E. Him. 271. 1966; 2: 113. 1971; 3: 92. 1975; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 149. 1982; Clement in Grierson & Long, Fl. Bhutan 2(2): 944. 1999.

Herbs perennial, prostrate and aromatic. Stem flexuous, \pm procumbent, deep brown and softly hairy. **Leaves**; petioles to 6.5 cm, white pubescent; **lamina** 4.5 - 11 x 3 - 5.5 cm, broadly oblong, margins hairy and sinuate-lobed, base slightly cordate, white hairy above, deep brown and hairy along nerves beneath; bracts oblong, dentate. **Flowers** in whorls lax, axillary, lilac, violet. **Calyx** 5-lobed, teeth lanceolate, thinly hairy. **Corolla** tube 2 cm, slender, straight, deeply 2-lipped, upper lip short, violet, limbs reticulate with dark violet lines; stamens 4, exerted, ascending; ovary with sub-equal lobes; **Fruit** calyx tubular.

Flower & Fruit : April - August

- Exsiccatu*s : Below Rachel 2790 m, **SR Lepcha & AP. Das** 32918, dated 28.10.2004.
Status : Less Common
Local Distribution : Gangtok – Karponang, Neora patak, Chitray. 2700 – 3000 m
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, MYANMAR, S.W. CHINA.

Ajuga macrosperma Wall. ex Benth. in Wallich, Pl. Asiat. Rar. 1: 58. 1830; Clement in Grierson & Long, Fl. Bhutan 2(2): 944. 1999. var. *breviflora* Hook. f. in Fl. Brit. India 4: 704. 1885; Mukherjee, Lab. Ind. 220. 1940; Murata in Hara Fl. E. Him. 271. 1966; 2: 113. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 3: 149. 1982.

Herbs perennial and prostrate. Branches slender, decumbent, villous. **Lamina** ovate oblong, 5 – 13 x 2 – 4.8 cm including petioles; sinuate-crenate and hairy, base subcordate, thickly white hairy above, sparsely hairy along nerves to almost glabrous below. **Spike** terminal, whorls interrupted; **bracts** ovate. **Calyx** obconic, to 0.30 cm, teeth short and obtuse. **Corolla** inflated at base, to 0.65 cm, 2-lipped, upper lip nearly erect, light purple to white during maturity; stamens 4, exerted; ovaries shortly 4-lobed. **Nutlets** deeply pitted; Fruit calyx tubular.

- Flower* : May – July *Fruit*: June – September
*Exsiccatu*s : Dohrok 2300, **SR Lepcha & AP. Das** 32926, dated 28. 10.2004.
Status : Frequent
Local Distribution : Gangtok, Phusrey, Deorali dara. 2150 – 3050 m.
General Distribution : E. HIMALAYA; INDIA, (NEPAL-Arunachal Pradesh).
Note : Endemic to Eastern Himalaya

Phlomis Linnaeus

Phlomis macrophylla Wall. [Cat. 57.n.2065.1829; *nom. nud.*] ex Benth. in Wallich., Pl. Asiat. Par. 1: 62. 1830; Hook. f. in Fl. Brit. India 4: 692. 1885; Aurata in Hara Fl. E. Him. 3: 94. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 3: 16. 1982; Clement in Grierson & Long, Fl. of Bhutan 2(2): 958. 1999.

Herbs, stout upto 15 cm tall. **Stem** erect, hairy. **Leaves** ovate; petioles 6 – 10 cm long, verticillasters, lamina 9 – 16 x 5. 5 – 13 cm, acuminate, base cordate – truncate, margin coarsely serrate, villous above. **Calyx** to 15 mm, pubescent or red on white marked, tube obliquely at base; upper lip plane brown villous. **Corolla** pink sparsely stellate hair beneath. bracts linear – lanceolate, hairs. **Nutlets** oblong – obovate, truncate apically.

- Flower* : July – August
*Exsiccatu*s : Panglaxha ridge 2990 m, **SR Lepcha & AP. Das** 31060, dated 8.10.2004
Status : Common
Local Distribution : Rachel, Bara Ramitey Dara. 2500 – 2900 m
General Distribution : HIMALAYA; INDIA, (Punjab – BHUTAN)
Note : Endemic to Himalaya

Clinopodium Linnaeus

Clinopodium umbrosum (M.-Bieb) C. Koch in Linnaea 21: 673, 1848; Murata in Hara Fl. E. Him. 272. 1966; 2: 114. 1971; 3: 92. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 3: 150. 1982. Clement in Grierson & Long, Fl. Bhutan 2(2): 977. 1999. *Melissa umbrossa* M.- Bieb., Fl. Taur. Cauc. 2:

63. 1808; *Calmintha umbrosa* (M.-Bieb.) Fisch. & Mey., Ind. Sem. Hort. Petrop. 6:6. 1840; Hook.f., Fl. Brit. India 4: 650. 1885; Lab. Ind. 98. 1940.

Herbs, annual, procumbent, slender upto 40 cm tall. Stem 4-ribbed, hairy. **Leaves**; petioles upto 0.8 cm; **lamina** 1 - 2.5cm, ovate, dentate, subacute, rounded, both-sides pubescent. Verticillaster dense, globose, densely pubescent. **Flowers** upto 0.50 long. **Calyx** 13 nerved, bilipped, upper teeth triangular. **Corolla** light purple to pinkish-white, tube straight, bilipped, upper lip erect, throat villous; stamens included; style lobed, lobes equal. **Nutlets** minute, subglobose.

Flower : June - September *Fruit*: August - October
Exsiccatus : Rachela 2880 m, *SR Lepcha & AP. Das* 27732, dated 30.09.2004.
Status : Abundant
Local Distribution : Lower Rachela Chowk, Rachela Middle. 1500 - 2700 m.
General Distribution : HIMALAYAS; IRAN, AFGANISTAN, PAKISTAN, INDIA, NEPAL, BHUTAN, TIBET, CHINA, MYANMAR.

Elsholtzia Willdenow

Key to the species:

1. Leaves elliptic lanceolate 2
+ Leaves ovate 3
2. Spikes panicled-secund; Flowers sessile *E. blanda*
+ Spike fascicled; Flowers shortly pedicelled *E. fruticosa*
3. Bracts nearly semi-circular; Nutlets obovoid *E. strobilifera*
+ Bracts broadly ovate; Nutlets oblong *E. ciliata*

Elsholtzia blanda (Benth.) Benth., Lab. Gen. Sp. 162. 1833; Dyer in Hook.f., Fl. Brit. India 4: 643. 1885; Mukherjee, Lab. Ind. 89. 1940; Murata in Hara Fl. E. Him. 1: 273. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3:152. 1982; Clement in Grierson & Long. Fl. Bhutan 2(2): 979. 1999.
Aphanochilus blandus Benth. in Wallich, Pl. As. Rar. 1: 29. 1830.

Shrubs or undershrubs, slender, strongly aromatic upto 120cm tall. Branch pubescent. **Petioles** to 1.5 cm long; **lamina** elliptic-lanceolate, 2.5 - 5.5 x 1.5 - 3.5 cm, serrate, acuminate, base narrowed, puberulous above, gland-dotted beneath. **Spikes** terminal and an short lateral branches, 5 - 13cm long, panicled, secund; **bracts** subulate. **Flowers** sessile. **Calyx** 0.22 - 0.25cm, urceolate, glandular-pubescent, lobes lanceolate; pubescent, white, tube oblique. **Corolla** white. **Nutlets** minute ellipsoid.

Flower : September - November *Fruit*: November - February.
Exsiccatus : Dohrak 2350 m, *SR Lepcha & AP. Das* 30281, dated 6.10.2004.
Status : Frequent.
Local Distribution : Singhaney Dara, Lower Padamchen 1600 - 2200 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, MALAYSIA.

Elsholtzia fruticosa (D. Don.) Rehder in Pl. Wilson. 3: 381. 1916; Murata in Hara Fl. E. Him. 1: 274. 1966; 3: 93. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 3: 153. 1982; Clement in Grierson & Long, Fl. Bhutan 2(2): 981. 1999. *Perilla fruticosa* D. Don, Prodr. Fl. Nepal 115. 1825. *E.*

polystachya Benth., Lab. Gen. Sp. 161. 1833; Hook. f. in Fl. Brit. India 4: 645. 1885. *Cyclostegia strobilifera* Benth. In Wallich, Pl. Asia. Rar. 1: 30. 1830, excl. *syn.*

Shrubs or undershrubs, highly aromatic. Branches obscurely 4-ridged. **Leaves** sub-sessile-shortly petioled; **lamina** elliptic-lanceolate, 3.5 - 8 x 1.5 - 2.5cm, serrate, acute to shortly acuminate, base cuneate-acute, glandular and finely haired both sides. **Spikes** long, fascicled, terminal, slender; **bracts** small, linear subulate and puberulous. **Flowers** tiny, shortly pedicelled. **Calyx** ribbed and 5-6 toothed, teeth short and sharply triangular, pubescent. **Corolla** tubular, notched, twice the length of sepals, densely hairy, white, strongly fragrant; **stamens** 4, exerted, filament long, base thickened and hairy; style exerted, bifid. **Nutlets** narrow with persistent calyx, often shiny.

Flower : September - November *Fruit*: November - January
Exsiccatus : Bhimbase 4320 m, *SR Lepcha & AP. Das 30943*, dated 24.07.2004.
Status : Common.
Local Distribution : Rachel Chowk, 2100 - 2550 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, TIBET, CHINA.

Elsholtzia strobilifera (Benth.) Benth., Lab. Gen. Sp. 163. 1833; Hook. f., in Fl. Brit. India 4: 645. 1885; Mukherjee, Lab. Ind. 92. 1940; Murata in Hara Fl. E. Him. 274. 1966; 3: 93. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 3: 153. 1982; Clement in Grierson & Long, Fl. Bhutan 2(2): 983. 1999. *Cyclostegia strobilifera* Benth. in Wallich, Pl. Asia. Rar. 1:30. 1830, excl. *syn.*

Herbs, annual upto 30cm tall. Branches white-hairy. **Petioles** to 0.7cm long, hairy; **lamina** ovate, 1- 3.5 x 0.5 - 1.5 cm, serrate, obtuse-acute, base cuneate to rounded, white hairy along nerves on both surfaces. **Spikes** short 1.5 -2.8cm, cylindric, compact, pubescent, peduncled; **bracts** large, nearly semi-circular, longer than sepals, membranous, ciliate and nerved. **Flowers** minute. **Calyx** narrowly tubular, 5-toothed, teeth lanceolate, hyaline. **Corolla**-tube slender, longer than calyx, pinkish, glabrous, lobes narrowly, spreading; stamens and styles long, exerted, brown. **Nutlets** oblong, not shiny, light brown.

Flower : August - November *Fruit*: October - January
Exsiccatus : Panglakhha 3000 m, *SR Lepcha & AP. Das 31090*, dated 2.10.2004.
Status : Common
Local Distribution : Rachela trijunction, Tungsay. 2000 - 3100m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, TIBET.

Elsholtzia ciliata (Thumb.) Hylander in Bot. Not. 1941: 129. 1941; Murata in Hara Fl. E. Him. 273.1996. Grierson & Long. Fl. Bhutan 2(2): 982. 1999. *Sideritis ciliata* Thumb., Fl. Zap. 245. 1784. *Elsholtzia cristata* Willd. In Rohmer & Usterr, Mag., Bot. 4- 2 : 5, t. 1. 1790; Hook. f., Fl. Brit. India 4: 645. 1885.

Herbs erect upto 110 cm tall. Stem quadrangular. **Petiole** to 4.3 cm; **lamina** ovate, 1.3 - 7.5 x 1.2 - 4.3 cm, acute or shortly acuminate, base cuneate, margin crenate serrate, pubescent to pilose with sessile gland beneath,. **Spikes** second, **bracts** broadly ovate, apiculate 3 - 5 x 4. 5 mm, ciliate. **Calyx** ca 2.2 mm, teeth triangular, Fruit calyx to 5.5 mm. **Corolla** purple to pale pink to 5 mm; **stamens** slightly exerted. **Nutlets** obovoid.

Flower : September - November *Fruit*: November - January
Exsiccatus : Bhimbase 4280m, *SR Lepcha & AP Das 30943*, dated 24.07.2004.

- Status* : Common.
Local Distribution : Rachela Chowk, 2100-2550 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, CHINA, TIBET, MYANMAR.

Notochaete Bentham

Notochaete hamosa Benth., in Wallich, Pl. Asiat. Rar. 1: 63. 1830; Hook.f. in Fl. Brit. India 4: 694. 1885; Mukherjee, Lab. Ind. 202. 1940; Murata in Hara Fl. E. Him. 279. 1966; 2: 116. 1971; 3: 94. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 3: 159. 1982; Clement in Grierson & Long. Fl. Bhutan 2(2): 955. 1999.

Herbs, perennial erect upto 70cm tall. Stem nearly quadrangular and stout. **Leaves**; petioles long, 1.5 -6cm, pubescent; **lamina** 3.5 -13 x 2 - 7cm, broadly ovate, toothed, acuminate, sub-cordate, white hairy above, nerves pubescent below. **Verticillaster** axillary, upto 3.5cm in diam., many flowered, spiny; **bracts** many, slender. **Calyx** tube 2 - 5cm, 5-toothed, teeth spinous and hooked, villous. **Corolla** white, as long as calyx spines, upper lip concave and erect, lower 3-lobed; stamens 4, anther-cells divaricate; style lobed, minute and nearly equal. **Nutlets** oblong, narrow.

- Flower* : July – September *Fruit*: September. - November
Exsiccatus : Dohrok 2300 m, *SR Lepcha & AP. Das 31268*, dated 13.09.2008.
Status : Common. 1900 – 2600 m.
Local Distribution : Changu lake, Kyongnosla, Padamchen.
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR.

Siphocranion Kudo

Siphocranion macranthum (Hook.f.) C.Y. Wu, Acta Phytotax. Sin. 8: 56. 1959; Clement in Grierson & Long, Fl. Bhutan 2(2): 999. 1999. *Plectranthus macranthus* Hook.f., Fl. Brit. India 4: 616. 1885.

Herbs with 70 cm tall. Stem tomentose, glabrescent below. **Leaves** ovate – elliptic ; petiole to 4 cm long; lamina 4 – 9 x 2.5 – 4.5 cm, base cuneate , rounded, apex acute – acuminate, margin serrate, tomentose on veins on either sides. **Flowers** 7 – 18 cm, in whorls – 2 flowered ; pedicels to 4.5 mm . bracts ovate – acuminate. **Calyx** puberulant, sessile gland, upper lip (subulate teeth) ; lower shorter than upper. **Corolla** pink – purple, upto 4.5 cm ; tube straight to 2 cm, upper lobe obtuse; lower sub-equal. **Stamens** inserted in throat, Nutlets globose upto 2.

- Flower* : August – October
Exsiccatus : Ramitey dara 2550 m, *SR Lepcha & AP. Das 31193*, dated 05.10.2004.
Status : Frequent.
Local Distribution : Racheal, Singhaney, Padamchen. 2500 – 3200 m
General Distribution : INDIA, BHUTAN, CHINA, MYANMAR, VIETNAM

Note : A medicinal herb

Prunella Linnaeus

Prunella vulgaris L., Sp. Pl. ed. 1: 600. 1753; Hook.f. in Fl. Brit. India 4: 670. 1885; Mukherjee, Lab. Ind. 14. 148. 1940; Murata in Hara Fl. E. Him. 1: 281. 1966; 2: 117. 1971; 3: 95. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 3: 162. 1982; Clement in Grierson & Long. Fl. Bhutan 2(2): 995. 1999.

Herbs, perennial, small, hairy upto 25cm tall. Stem erect, brown hairy. Root-stock creeping. **Lower leaves** to 1.8 cm long including petiole; upper leaves sessile; **lamina** 1.3 – 2.5 x 0.5 – 1.5cm, much variable, ovate or oblong, entire to dentate ciliate, rounded-acute, round to even notched/lobed, densely hispid above, nerves prominent below. **Spike** compact, cylindric. Bracts ovate-cordate, ciliate. **Flowers** deep purple. **Calyx** reticulate, toothed, teeth variable. **Corolla** small, purple, bilipped, lower lip spreading and upper one erect; **stamens** 4, exerted; filament 2-fid; anther cells diverging; ovary 4-lobed; style lobes subulate. **Nutlets** oblong.

Flower : June - September. Fruit: August - October
Exsiccatus : Rachela 2990 m, **SR Lepcha & AP Das** 31047, dated 02.10.2004.
Status : Common
Local Distribution : Panglakha, Padamchen. 1600-2600m.
General Distribution : ALL OVER EUROPE AND TEMPERATE ASIA.

Leucosceptrum Smith

Leucosceptrum canum Smith, Exot. Bot. 2: 113. 1806; Hook.f., Fl. Brit. India 4: 699. 1885; Murata in Hara, Fl. E. Him. 278. 1966; Clement in Grierson & Long. Fl. Bhutan 2(2): 948. 1999. *Clerodendrum leucosceptrum* D. Don, Prodr. 103. 1825. *Comanthosphace nepalensis* Kitamura & Murata; et. Phytotax. Geobot. 15: 109.1954.

Local name: Cheong (Lep.), Gurpis (Nep.)

Tree upto 7 m tall. Branches densely gray or puberulent or subglabrous. **Petiole** upto 4 cm, densely yellowish tomentose; lamina elliptic - lanceolate, 9 – 18 x 3.5 - 10 cm, densely gray or yellowish tomentose, adaxially glabrescent or puberulent on midrib, base cuneate, margin serrate or rarely crenate, apex acuminate. **Flowers** in spikes 9 -13 cm, usually densely stellate-tomentose. 6 - to many flowered, bracts acute, margin entire or irregularly crenate. Pedicel ca. 1.5 mm. **Calyx** upto 8 mm, densely yellowish stellate-tomentose, glabrous inside. **Corolla** 7 - 10 mm, stellate-tomentose outside. **Nutlets** smooth, with sparse ± transparent above.

Flower : November - March, *Fruit*: March - May.
Exsiccatus : Rachela 2500 m, **SR Lepcha & AP. Das** 31201, dated 13.07. 2008.
Status : Common
Local Distribution : Panglakha, Singhaney. 1500 – 2700 m
General Distribution : ALL OVER EUROPE AND TEMPERATE ASIA. INDIA , NEPAL, BHUTAN, MYANMAR, LAOS, VIETNAM

Isodon (Bentham) Spach

Key to the species:

1. Herbs slender, procumbent 2
- + Herbs erect *I. lophanthoides*
2. Leaves base subcordate; corolla lip lower straight *I. rugosa*.
- + Leaves base slightly truncate; corolla lip lower deflexed *I. repens*

Isodon rugosa (Hand. -Mazz.) Hara in J.Jap.Bot., 60(8): 236.1985; (Bentham) Codd.; Clement in Grierson & Long. Fl. Bhutan 2(2): 997. 1999. *Rabdosia rugosa* (Wallich ex Benth.) Hara in Journ. Japan Bot. 47:199. 1972; Hara et al. Enum. Fl. Pl. Nepal 3:161. 1982; *Plectranthus rugosus* Wallich ex Benth., Pl. As. Rar. 2:17. 1831; Hook.f. in Fl. Brit. India 4:620. 1885; Lab.

India 47. 1940. *Isodon plectranthoides* Schrad. in Benth., Lab. Gen. Sp. 43. 1832; Acta. Phyt. Geobot. 24.82. 1969.

Herbs slender upto 1.3 m tall. Stem pubescent, woody below. **Petiole** to 0.45 cm ; **lamina** ovate, 2 – 4 x 1.3 -1.7 cm, crenate, obtuse to subacute, base subcordate, rugose above, white tomentose beneath. **Flowers** in cymes terminal and axillary paniced. **Fruit** calyx to 0.5 cm, shortly bilipped, teeth subequal, acute and pubescent. **Calyx** bilabiate, campanulate, white, teeth 5, subequal, broadly triangular, **Fruit** calyx tubular. **Corolla** to 0.70 cm, white with purplish spots, upper lip to 2 mm, lower straight. . **Nutlets** oblong.

Flower : August- October *Fruit*: October - December.
Exsiccatus : Singhaney Dara 2300m, *SR Lepcha & AP. Das 31264*, dated 13.07.2004.
Status : Abundant in open places.
Local Distribution : Dohrok, Lower Padamchen. 1900 – 2450 m.
General Distribution : AFGANISTAN, PAKISTAN, INDIA, NEPAL, BHUTAN, CHINA.

Isodon repens (Wall.) Murata, Acta Phyl. Geobot. 22: 21. 1966; in Fl. E. Him. 276. 1966; Clement in Grierson & Long, Fl. Bhutan 2(2): 992. 1999. *Rabdosia repens* (Wall. ex Benth.) Hara in Journ. Jap. Bot., 47: 199. 1972

Herbs perennial, procumbent. Stem ascending, to 30 cm, unbranched. **Leaves** ovate orbicular; petiole upto 3 cm long; **lamina** 3 – 5 x 3.2 – 4.5 cm, pilose , puberulant, base slightly truncate, apex subacute , rarely rounded, margin crenate, villous hairs – puberulant on both sides. **Flowers** in terminal cymes, paniculate to 16 mm; 5 – 7 flowered. **Calyx** bilabiate, campanulate to 1. 8 mm, puberulent teeth triangular; upper lip shorter than lower. **Corolla** white with purple marked, mauve to dark blue, upper lip recurved, lower deflexed; **Nutlets** oblong – ovoid, brown.

Flower : September – October
Exsiccatus : Salami RF 3300 m, *SR Lepcha & AP. Das 31265*, dated 13, 07. 2008
Status : Frequent.
Local Distribution : Kaphyokla. 2000 – 3500 m
General Distribution : E. HIMALAYA; INDIA, (NEPAL – BHUTAN).
Note : Endemic to Eastern Himalaya.

Isodon lophanthoides (Hamlet.ex D. Don) Hara in J.Jap. Bot., 60(8): 235.1935; Clement in Grierson & Long, Fl. Bhutan 2(2): 995. 1999. *Rabdosia lophanthoides* (Buch.-Ham. ex D. Don) Hara in Journ. Japan Bot. 47:197. 1972; Hara in Fl. E. Him. 3:95. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 3: 162. 1982. *Hyssopus lophanthoides* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal 110. 1825; Fl. Brit. India 4: 618, 625. 1885. *Plectranthus striatus* Benth. in Pl. As. Rar. 2:17. 1831; Hook.f. in Fl. Brit. India 4: 618. 1885.

Herbs pubescent, erect upto 45 cm tall, unbranched or rarely branched. **Petiole** of upper leaves sessile, lower leaves to 3 cm, usually clasping; broadly ovate, **lamina** 3.5 - 8 x 4 - 6 cm, crenate, acuminate, base cuneate, thinly villous. **Flowers** in panicles axillary and terminal, with slender branches. **Calyx** to 0.30 cm, oftenly 5-toothed, 2-lipped, lobes obtuse, hispid. **Corolla** to 0.8 cm, white and pink striped, tube subcylindric; stamens 4, long exerted. **Nutlets** oblong.

Flower : September - November *Fruit*: October - January
Exsiccatus : Gumsay 2240m, *SR Lepcha & AP. Das 32919*, dated 28.10.2004.
Status : Less Common.

Local Distribution : Phusrey, Dohrok. 1600-2550m.

General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.

Isodon coetsa (Buch.-Ham.) Kudo, Lab. Sino-Jap. 131. 1929; Hara & Ohashi in Fl. E. Him. 275. 1966; Clement in Grierson & Long, 2(2): 998. 1999. *P. coetsa* Buch.-Ham. ex D. Don, Prodr. 117. 1825; Hook.f. in Fl. Brit. India 4: 619. 1885. *Plectranthus comenthoides* Benth. in Pl. As. Rar. 2: 17. 1830; Hook.f. in Fl. Brit. India 4: 620. 1885.

Herbs or undershrubs, aromatic. Stem quadrangular. **Leaves** opposite; petioles upto 2 cm; **lamina** 1.5 – 3.5 x 1-5cm, ovate or ovate-lanceolate, margin crenate or dentate, acute or acuminate, membranous, thinly pubescent, nerves prominent and bright white beneath. **Flowers** in paniculate cymes, lavender-blue; calyx 5-toothed hispid; corolla bilipped, recurved, tube exerted; **stamens** 4, didynamous; ovaries 4 loculed; **styles** slender, bifid. **Fruits** ovoid or orbicular ; **Fruit** calyx enlarged bilabiate with acute teeth.

Flower : August – October *Fruit* September - December

Exsiccatus : Chandaney RF 2000 m, *SR Lepcha & AP. Das 31267*, dated 13.09. 2008.

Status : Frequent.

Local Distribution : Subaney. 1700 – 2200 m.

General Distribution : INDIA, NEPAL, BHUTAN, SRI LANKA, N. MYANMAR, W. CHINA.

Melissa Linnaeus

Melissa axillaris (Benth.) Bakhuizem, f., in Backer & Back, f., fl. Jav. 2: 629. 1965; Murata in Fl. E. Him. 2: 115. 1971; 3: 93. 1975; Hara *et al.* Enum. El. Pl. Nepal 3: 157. 1982. Clement in Grierson & Long, Fl. Bhutan 2(2): 975. 1999. *M. parviflora* Benth. in Wallich, Cat. 9, n. 2125. 1829. *nom. nud.* Jpl. As. Rar. 1: 65. 1830.

Herbs perennials. Stem to 120 cm, puberulent. **Lamina** ovate – narrowly ovate ; petiole to 25 mm; usually purplish, 1 - 6 x 0.5 – 3.5 cm, acute, base truncate- crenate, margins crenate, puberulant above, glabrous beneath. **Flowers** few – numerous, verticillasters in leaf axils. **Calyx** hairy on mid veins, teeth; **Fruit** calyx to 9 mm. **Corolla** white to pale yellow with purple marked; tube straight, to 9 mm. **Nutlets** 2 mm.

Flower : June - September

Exsiccatus : Panglakha 3050 m, *SR Lepcha & AP. Das 32920*, dated 28.10. 2004.

Status : Not common

Local Distribution : Singhaney dara, 1200 – 3500 m.

General Distribution : E. HIMALAYA (NEPAL – BHUTAN), Assam, S. CHINA, Formosa, JAVA.

Salvia Linnaeus

Salvia campanulata Wall. ex Benth. In Wallich, Pl. Asiat. Rar. 1: 67. 1831; Clement in Grierson & Long., Fl. Bhutan 2(2): 972. 1999.

Herbs perennial, glandular. **Stems** erect upto 80 cm tall with spreading glandular hairs above, tomentose or glabrescent below. **Petiole** to 20 cm long, **lamina** of basal ovate to ovate oblong, 11 – 22 x 6 13 cm, acute to obtuse, base cordate, serrate to crenate, upper surface pubescent; lower

surface tomentose with numerous sessile glands. Inflorescence branched; bract ovate - acuminate. Verticillasters distant, 2 - 6 flowered. Calyx campanulate to 17 mm long, dull red purple on upper lip, glandular hairy on fruit. Corolla yellow, with brownish or purple marking on upper lip. Nutlets obovoid.

Flower : June - September
Exsiccatus : Changu 4000 m, *SR Lepcha & AP. Das 31271*, dated 28.10. 2008.
Status : Less common
Local Distribution : KAS, PWS. 1200 - 3500 m.
General Distribution : E.HIMALAYA; INDIA, (NEPAL - BHUTAN)
Note : Endemic to the Eastern Himalaya

Order: Plantaginales

PLANTAGINACEAE A.L. Jussieu

Plantago Linnaeus

Key to the species:

1. Leaf oblong or oblong ovate; flowers sessile; petals longer than sepals *P. erosa*
+ Leaf elliptic to elliptic lanceolate; flowers subsessile; corolla equals to calyx .. *P. depressa*

Plantago depressa Willd., Enum. Pl. Hort. Berol, Suppl. 8. 1813. Patzak & Rech.f. in Rech. f., Fl. Iran. 15: 7. 1965; Hartmann, Bot. Jb. 85: 351. 1966; Springate in Grierson & Long, Fl. Bhutan 2(3): 1343. 2001.

Herbs annual- perennial, stemless, up to 13 cm tall. **Leaves** few to many in rosettes, erect to decumbent; petiole to 2.2 cm, base broadly dilated.; Leaf **lamina** 4.5 - 6.5 x 1.8 - 3 cm, dentate, elliptic to elliptic-lanceolate, sparsely irregularly denticulate, teeth obtuse, villose - sparsely hairy, 5-7 nerved. **Flowering** head to 15 cm, upto late anthesis, **Spikes** nearly equalling the peduncle, narrow, dense; **Flower** sub sessile; bract suborbicular, ovate or elliptic, to 2.5 mm., bracts shorter than the calyx, concave. **Sepals** 2 mm long, slightly concave, obovate, elliptic to broad elliptic. **Corolla** tube equal to the calyx, lobes small, elliptic to ovate, obtuse to truncate-obtuse. **Anthers** exerted. **Capsule** conically attenuated. **Seeds** 5, purplish brown, compressed.

Flower : July - October
Exsiccatae : Panglakha 3000m, *SR Lepcha & AP. Das 27773*, dated 30.09.2004; Dorok 2300m, *SR Lepcha & AP. Das 20229*, dated 28.10.2004.
Status : Abundant
Local Distribution : Rachela, Kyongnosla upto 3300 m.
General Distribution : EAST URAL, SIBARIA, AMUR, RUSSIA, AFGHANISTAN, INDIA, NEPAL, BHUTAN, SRI LANKA, TIBET, CHINA, MANCHURIA, MONGOLIA, JAPAN.

Plantago erosa Wall. in Roxb., Fl. Indica 1: 423. 1820; Hara in Fl. E. Him. 306. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 166. 1982; Grierson & Long, Fl. Bhutan 2(3): 1342. 2001. *P. major auct. non. L.*: Hook. f. in Fl. Brit. India 4: 705. 1885 p.p; Springate in Grierson & Long, 2(3): 1342. 2001

Herbs small. Root-stock, perennial. **Leaves** radical, exstipulate; petiole 1.8 – 4.5cm long, glabrous or sparsely pubescent; **lamina** 2.5 – 5.5 x 1.5 – 3.2cm, oblong or oblong-ovate, entire to repand or irregular-dentate, acute or obtuse, base cuneate or rounded glabrous above, pubescent to glabrous beneath, 3 - 5 nerved, nerves pubescent beneath. **Spikes** axillary. Peduncles long upto 18cm, slender, sparsely hairy. **Flowers** small, sessile, densely crowded on spike, white;. **Sepals** 4, basally connate, glabrous, medianly black thick-lined, persistent. **Petals** longer than sepals, salver-shaped, scarious, filament short, capillary and persistent. **Capsule** few seeded; seeds small, cylindric.

Flower : April - July *Fruit:* June - October.
Exsiccatae : *Kupup, SR Lepcha & AP. Das 31426, 27.07.05*
Premlakha SR Lepcha & AP. Das 32936, 31.07.2005.
Status : Abundant
Local Distribution : Mulkharka, Rachel Middle, Neora-Sikkim Border, 1400 – 2900 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, SRI LANKA, MYANMAR, TIBET, CHINA..

Order: Scrophulariales

Buddlejaceae Wilhelamina

Buddleja Linnaeus

Key to the species:

1. Plant \geq 3 m tall 2
 + Plant more than 5 m tall *B. asiatica* .
 2. Leaves crenulate dentate, Capsule oblong and acute *B. macrostachya*
 + Leaves lanceolate or oblanceolate, Capsule broadly ellipsoid *B. colvilei*

Buddleja asiatica Lour., Fl. Cochinch. 72. 1790; C.B. Clarke in Fl. Brit. India 4: 82. 1883; Yamajaki in Fl. E. Him. 1: 253.1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 89. 1982; Rae in Grierson & Long. Fl. of Bhutan 2(3): 1081. 2001

Shrubs upto 5.5m tall. **Leaves** narrowly lanceolate , lamina 5.5 – 13 x 2 – 5 cm, acuminate base cuneate; margins minutely dentate, stellate pubescent or tomentose beneath, glabrous to stellate pubescent above; petiole short 2-8mm. **Inflorescence** terminal and axillary in dense panicles upto 22cm long, not fragrant. **Calyx** 2-4mm, stelletate pubescent lobes triangular. **Corolla** stelletate pubescent outside, lobes orbicular, white, or violet. **Capsules** ovoid, compressed.

Flower : September – December *Fruit:* December – April.
Exsiccatu : Rachel 2950 m, *SR Lepcha & AP. Das 31063, dated 02.10.2004.*
Status : Less common.
Local Distribution : Rachel, Panglakha 1900 – 2550 m.
General Distribution : E.HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, VIETNAM.

Buddleja colvilei Hook.f. & Thoms. in Hook.f, Illstr. Him. Pl. t. 18. 1855; C.B. Clarke in Fl. Brit. India 4: 81. 1883; Yamajaki in Fl. E. Him. 253. 1966; 2: 106. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 3: 89. 1982; Rae in Grierson & Long, Fl. Bhutan 2(3): 1080. 2001

Shrubs to small tree upto 3m tall. **Leaves**; petiole short 0.6mm; elliptic lanceolate to oblanceolate, **lamina** 5 -18 x 2 – 6cm , acuminate, base attenuate , margins shallowly serrate, glandular and sparsely to densely stallate hairs beneath. **Inflorescence** in cymose, terminal, axillary, flower mostly 3. **Calyx** upto 6mm, glandular, subglarous to densely tomentose. **Corolla** tubular campanulate, red wine coloured, glandular and sparsely hairy outside. Ovary stellate tomentose. **Capsule** broadly ellipsoid.

Flower : September – December *Fruit:* December – April
Exsiccatu : Bara Ramitey 2650 m, *SR Lepcha & AP. Das 31157*, dated 04.10.2004
Status : Less common.
Local Distribution : Rachela Chowk, Panglakha 1900-2550m.
General Distribution : E.HIMALAYA, INDIA (Assam), MYANMAR, VIETNAM, CHINA.

Buddleja macrostachya Bentham [ex Wallich, cat. 218,n. 6407. 1832, *nom.nud*],. Scroph. Ind. 42. 1935; C.B. Clarke in Fl. Brit. India 4: 81. 1883; Har *et al.* Enum. Fl. Pl. Nepal 3: 89. 1982. Grierson & Long, Fl. Bhutan 2(3): 1081. 2001. *B. griffithii* (C.B. Clarke) Marquand in Kew Bull. 1930: 194. 1930; Yamajaki in Hara Fl. E. Him. 2: 106. 1971.

Local Name: Bhimsen Paati (Nep.)

Shrubs upto 3m tall. **Leaves** opposite; stipules much developed and eared uniting the opposite leaves; petioles upto 0.5cm; **lamina** 13 - 27 x 2.5 - 4.5cm, crenulate-dentate, acuminate, base attenuate, rusty wooly beneath, mid rib very thick, veins prominent below. **Spikes** both terminal and axillary, 2.5 – 18 cm, elongate sub-panicled. **Flowers** rusty-white, villous; **Calyx** campanulate, 4-lobed, teeth lanceolate, acute; **Corolla** 4-merous, silvery white tinged with pinkish tube; **stamens** 4; **anthers** ovate to oblong, subsessile; **ovaries** 2-chambered with clavate and linear style; ovules numerous. **Capsules** oblong and acute, seeds elongated.

Flower : September – December *Fruit:* December – April
Exsiccatu : Rachela below 2750 m, *SR Lepcha & AP. Das 31187*, dated 05.10.2004
Status : Less common.
Local Distribution : Rachela Chowk, Singhaney 1900 – 2550 m.
General Distribution : E. HIMALAYA, INDIA (Assam, Sikkim), MYANMAR, VIETNAM, CHINA.

OLEACEAE Hoffmann & Link

Key to the Genera:

1. Climbing shrubs.....*Jasminum*
- + Shrubs to small trees.....2
2. Leaves imperipinnate; pedicels 0.4-0.65cm..... *Fraxinus*
- + Leaves simple; pedicels upto 0.25cm.....*Ligustrum*

Fraxinus Linnaeus

Fraxinus floribunda Wall. in Roxb., Fl. Indica ed. Carey 1: 150. 1820; C.B. Clarke in Hook.f., Fl. Brit. India 3: 605. 1882; Hara in Fl. E. Him. 251. 1966; 2: 105. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 79. 1982; Watson in Grierson & Long, Fl. Bhutan 2(2): 594. 1991.

Local Name: Lankuri (Nep.).

Trees deciduous upto 22 m tall. **Leaves** opposite, rachis 13 - 19cm, lateral leaflets 7 - 13. **Lamina** 7 - 15 x 3.5 - 7.5 cm, oblong elliptic, shallowly serrate, caudate - acuminate, base cuneate, glabrous above, pubescent beneath, membranous, nerves pillose beneath. **Inflorescence** terminal panicle, compound, subfascicle on branches, emerging before new leaves. **Flowers** bisexual. **Sepals** to 0.20cm, with triangular teeth, **Corolla** 4, linear-oblong, concave; stamens 2; stigma long. **Samara** oblanceolate, with fruiting enlarged calyx and emarginate wings upto 1.60cm.

Flower & Fruit : May - December.

Exsiccatus : Lower Phusrey 2250 m, **SR Lepcha & AP. Das** 31273, dated 13.07.2008.

Status : Common.

Local Distribution : Phusrey below, Subaney, 1700 - 2160 m.

General Distribution : HIMALAYAS; INDIA,(Kashmir- BHUTAN) Khasia, THAI, INDO-CHINA, and W. CHINA

Note : Use in traditional medicines.

Jasminum Linnaeus

Jasminum dispersum Wall. in Roxb., Fl. Indica ed. Carey, 1: 99. 1820; C.B. Clarke in Hook.f., Fl. Brit. India 3: 602.1882; Hara in Fl. E. Him. 251. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 80. 1982; Watson in Grierson & Long, Fl. Bhutan 2(2): 591. 1991.

Local Name: Harhey Lahara, Charpatay Lahara (Nep.).

Shrubs, climbing. Stem woody, terete. **Leaves** opposite 3 - foliate; petioles short to 0.20cm.; lateral leaflets smaller, 2.5 - 5 x 0.6 - 3 cm, terminal leaflet generally large, 4 - 8 x 1 - 3.5 cm, ovate-lanceolate, entire, acute-acuminate, base obliquely rounded to obscurely lobed inwards, glabrous, slightly coriaceous, 3-nerved, from base, reticulate. **Inflorescence** axillary, terminal cymes 5 - 15 flowered. Pedicels minutely coarse hairy. **Flowers** bracteate. **Calyx** tube greenish, with 5 triangular teeth. **Corolla** infundibuliform, white-pinkish, vertically lined, lobes 6, 0.5-0.6cm long, elliptic with a sharp mucro, spreading with indistinct vertical lines; stamens included; anthers 2-celled. **Fruits** long-cylindric.

Flower & Fruit : May. - March

Exsiccatus : Singhaney 2220 m, **SR Lepcha & AP. Das** 31574, dated 13.07.2008.

Status : Rare.

Local Distribution : Mulkharka, Singhaney 15090 - 2500 m.

General Distribution : HIMALAYAS; INDIA,(Kashmir - NEFA) Khasia, Manipur, THAI, W. CHINA.

Ligustrum Linnaeus

Ligustrum lucidum Buch.-Ham. ex Wall., Cat. n.2816. Aiton f., Hort. Kewed. 2(1): 19. 1810; Hara *et al.*, Fl. E. Him. 1: 252. 1966. *Ligustrum nepalense* Hooker in Bot. Mag. t. 2921. 1829; Fl.

Brit. India 3: 617. 1882. *Olea clavata* G. Don, Gen. Hist. 4: 49. 1938; Hara *et al*, Enum. Fl. Pl. Nepal 3: 81. 1982

Shrub to small tree. Branches lenticellate. **Leaves** opposite; petiole to 0.6cm long, glabrous; lamina 3 – 6.5 x 1.5 – 3 cm, ovate-lanceolate, entire, acute, base unequal-cuneate, both surfaces glabrous, coriaceous, glossy above, nerves slightly impressed above, prominent beneath, lateral nerves 7-9 pairs, irregular. **Inflorescence** terminal panicles branched, densely rusty villous. **Bract** lanceolate; pedicel very short to 0.20cm, villous. **Bracteoles** 0.3cm, linear, pubescent. Floral buds scattered or clustered. **Calyx** very short, 0.1cm, indistinctly 4-toothed. **Corollas** slightly longer than calyxes, upto 0.10cm, white-light red, glabrous; **stamens** 2, included.

Flower & Fruit : May– July
Exsiccatus : Dohrok 2380m, SR Lepcha & AP. Das 31275, dated 13.07.2008.
Status : Rare.
Local Distribution : Dohrok 1300 – 2300m
General Distribution : NATIVES OF CHINA.
 Note : Planted for ornamental value.

SCROPHULARIACEAE A. Jussieu

Key to the Genera

- | | |
|--|----------------------|
| 1. Plants rhizomatous hemi-parasitic | 2 |
| + Plants non rhizomatous | 3 |
| 2. Leaves strictly basal, non-pinnatifid | <i>Pedicularis</i> |
| + Leaves non basal, pinnatifid | 4 |
| 4. Calyx cylindrical | <i>Neopicrorhiza</i> |
| + Calyx oblong, ovate or suborbicular | <i>Scrophularia</i> |
| 3. Plants perennial | 5 |
| + Plants annual | <i>Calceolaria</i> |
| + Flower many | 6 |
| 5 Flower solitary | <i>Mimulus</i> |
| 6. Stamens 4 | 7 |
| + Stamens 2 | 8 |
| 7. Sepals 2; corolla blue or pinkish; tube rotate; scarcely zygomorphic | <i>Veronica</i> |
| + Sepals 4 -5; corolla blue, purple, or white; tube curved; zygomorphic | <i>Lagotis</i> |
| 8. Plants procumbent- decumbent – erect; leaves mainly crowded at the base .. | <i>Mazus</i> |
| + Plants slender and creeping; leaves dimorphic | <i>Hemiphragma</i> |

Calceolaria Linnaeus

Calceolaria gracilis Kunth in Humb. Bonpl. & Kunth, Nov. Gen. Sp. 2:339. 1818; Hara *et al.* Enum.Fl. Pl. Nepal 3:113. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1104. 2001. *C. mexicana* Benth in DC., Prodr. 10:205. 1846; Hara & Ohashi, Fl.E.Him. 285. 1966.

Herbs, annual, pubescent upto 35cm tall. Stem usually spongy. **Leaves** opposite; lamina 2 - 5.5 x 1.5 - 2.8cm, coarsely toothed or pinnately lobed, upper lobe ovate-lanceolate, acute, incisedentate, pubescent above, glabrous beneath. Pedicels upto 2.5cm long. **Flowers** axillary solitary. **Calyx** lobes to 0.5cm long, lanceolate, pubescent. **Corolla** to 1.5cm long, obovate-orbicular, deep yellowish, tube slender, with concave lower lip; stamens 2, included. **Capsules** subglobose.

Flower : June- October. *Fruit*: September - December
Exsiccatus : Rachela below, **SR Lepcha & AP. Das** 31096, dated 02.10.2004.
Status : Less Common.
Local Distribution : Bara-Ramitey, Dohrok, Phusrey 1900 - 2600 m.
General Distribution : NATIVE OF MEXICO, NATURALISED IN INDIA, MALAYSIA etc.

Hemiphragma Wallich

Hemiphragma heterophyllum Wallich in Trans. Linn. Soc.13: 612 (*ut heterophyllum*) 1822; Hook. f. in Fl. Brit. India 4: 289.1885; Yamazaki in Hara, Fl. E. Him. 286. 1966; Hara *et al.* Enum.Fl. Pl. Nepal 3: 114.1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1129. 2001

Local Name: Mala Phul (Nep.).

Herbs perennial, prostrate covering, stone and ground. **Leaves** on main stems with petiole 2 - 5 (- 10) m or sometime sessile, orbicular, cordate or reniform, base truncate, subcordate or cuneate, margin serrately 2 - 7 toothed, obtuse to acuminate, veins inconspicuous, crowded, needle like sometime linear-lanceolate upwards. **Flowers** subsessile or short pedicelled. **Calyx** lobes narrowly triangular-lanceolate, 3-5 mm, subequal. **Corolla** white or rose; tube short campanulate, lobe 5, orbicular to oblong, subequal. **Filaments** filiform, adnate to corolla tube; anther, locule apically confluent. **Capsule** red, ovoid to globose. **Seeds** pale yellow brown avoid.

Flower : March - July *Fruit*: July - October
Exsiccatus : Rachela, **SR Lepcha & AP. Das** 27738, Dated 30.09.2004.
Status : Common
Local distribution : Jorpokhari, Chitray Bunglow, Rachela Peak, 1800 - 3500 m
General distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, TAIWAN, PHILLIPINES.

Note : Roots used as medicinal. Fruits edible.

Lagotis Gaertx.

Lagotis kunawurensis (Royle ex Benth) Ruprecht in Mem. Acad. Sci. St. Pet. Ser. 7, 14:64.1869; Yamazaki in Fl. E. Him. 286. 1966; 3:98.1975; Hara *et al.*, Enum. Fl.Pl. Nepal 3:114. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1145. 2001. *Gymnandra Kunawerensis* Royle ex Benth., Scroph, India 47. 1835. *Lagotis glauca* var. *Kunawerensis* (Royle ex Benth.) Hook. f. in Fl. Brit. India 4:560.1885. *Lagotis kunawerensis* var. *Sikkimensis* (Hook.f.) Yamazaki in Fl. E. Him. 286. 1966.

Herbs, perennial, sheathes rosette. **Leaves** several, erect; **petioles** to 15 cm, elliptic to narrowly oblong; **lamina** 5 – 20 x 2 – 8 cm, obtuse or sub-acute, base attenuate or cuneate, margin crenate, rarely entire. **Scapes** to 32 cm. **Scape leaves** sessile, ovate, crenate – sub entire. **Flower** oblong ovate, narrowly oblong dense spike; bracts rhombic to elliptic, variably dentate-entire. **Calyx** to 4 – 8 x 3 – 6 mm, shortly mucronate lobes. **Corolla** blue or pale blue – violet, turning white, upper lip 3 – 5 x 1.8 – 4.2 mm, obtuse, entire, occasionally 3 notch; lower lip 2 linear, strongly recurved segment. **Stigma**, unequal branches. **Ovary** to 1.8 mm.

Flower : June – August *Fruit*: September
Exsiccatus : Kupup 4200m, **SR Lepcha & AP. Das 2324**, dated 15.08.2005.
Status : Less Common.
Local Distribution : Kupup, Padamchen KAS, 2700 – 4200 m.
General Distribution : HIMALAYAS; BALTIKISTAN, INDIA, BHUTAN, S. TIBET.

Mazus Loureiro

Key to the species

1. Plant with prominent rootstock; calyx tubular *M. dentatus*
 + Plant with small runners; calyx triangular..... *M. surculosus*

Mazus dentatus Wallich ex Bentham, Scroph. Ind. 27. 1835; Hook.f. in Fl. Brit. India 4: 260. 1885; Yamazaki in Fl. E. Him. 288. 1966; 2: 119. 1971; Hara in Enum. Fl. Pl. Nepal 3: 117. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1101. 2001.

Herbs, perennial with prominent rootstock. **Stem** upto 22 cm. **Leaf**: petioles to 5.3 cm long; lamina broadly ovate or oblong-elliptic, 3-9.5 x 2-6 cm, sinuate or waxy, deep purple beneath. **Flowers** to 8cm long, very few flowered in racemes; pedicels to 1.2 cm long; bracts setaceous. **Calyx** to 0.7 cm, tubular, lobes to 0.23 cm, acute. **Corolla** upto 2.3 cm long, funnel-shaped, oftenly drooping, purple to white, lower lip 3-lobed, spreading. **Capsules** globose, with sub-erect persistent calyx.

Flower : April - June *Fruit* : June - September
Exsiccatus : Rachela below, 2850 m, **SR Lepcha & AP. Das 32311**, dated 13.09. 2005.
Status : Less Common.
Local Distribution : Rachela Middle, Padamchen, Subaney 2100 – 2800 m.
General Distribution : HIMALAYAS; INDIA, (Kumaon-Arunachal Pradesh), Meghalaya.
Note : Endemic to Himalaya

Mazus surculosus D. Don, Prodr. Fl. Nep. 87. 1825, *ut surculosa*; Hook.f., in Fl. Brit. India 4: 260. 1885; Yamazaki in Fl. E. Him. 288. 1966; Hara in Enum. Fl. Pl. Nepal 3: 118. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1101. 2001.

Herbs perennial, small runners. **Leaves** usually in lax rosette, radical leaves larger, opposite; **lamina** 12 - 3 x 0.8 - 1.5 cm, obovate-spathulate or sub-pinnatifid, crenate, base narrowed to petioles, surfaces pubescent; pedicels bracteate. **Flowers** to 6 cm long. **Calyx** lobes triangular, sub-erect. **Corolla** bluish white or pinkish violet, 2 - lipped, upper lip dark and shortly two-lobed, lower of 3-rounded lobes.

Flower : May - July *Fruit* : July - September
Exsiccatus : Bombay hill, below Changu, 3500 m, **SR Lepcha & AP. Das 2327**, dated 23.08.2006.

- Status* : Common.
Local Distribution : Mulkharka Pokhari, Below, Changu, 1500 – 2750 m.
General Distribution : E.HIMALAYAS; INDIA, (Kashmir-BHUTAN), Assam, TIBET, W. CHINA.
 Note : Endemic to Himalaya

Mimulus Linnaeus

Mimulus nepalensis Bentham, Scroph. Ind. 29. 1835; Yamazaki in Fl. E. Him. 289. 1966; 2: 119. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 118. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1099. 2001. *M. assamicus* Griffith in Linnaea 12: 199. 1836. *M. tenellus* Bunge *sensu* Handel-Mazzetti, Symb. Sin. 7: 832. 1936, p.p. var. *nepalensis*.

Herbs prostrate very small 4 – 13 cm. **Leaves** opposite; petioles to 0.50cm; **lamina** 0.6 - 2.4 x. 05 -1.8 cm, ovate, coarsely serrate, acute, base slightly rounded, glabrous or sparsely hairy, nerves not prominent above. **Pedicels** to 3 cm, slender, axillary, adpressed hairy. **Flowers** in solitary. **Calyx** 0.7 - 1.4cm, truncate, tubular, 5-angled, with 5 short unequal lobes, sparsely pubescent. **Corolla** longer than calyx, yellow, upper lip erect, 2-lobed, palate 2-lobed, slightly swollen; anther cells divergent. **Capsules** included with inflated sepals

- Flower* : May - September *Fruit* : July - October
Exsiccatus : Phusrey below 2200 m, **SR Lepcha & AP. Das** 2323, dated 15. 07. 2006.
Status : Common.
Local Distribution : Dhorok Phusrey 1300 – 2700 m.
General Distribution : E. HIMALAYA; INDIA, (NEPAL-BHUTAN), Assam, W. and C. CHINA.

Neopicrorhiza D.Y. Hong

Neopicrorhiza scrophulariiflora (Pennell) D.Y. Hong, Opera Bot. 75: 56. 1984; Grierson & Long, Fl. Bhutan 2(3): 1131. 2001. *Picrorhiza scrophulariiflora* Pennell in Manogr. Acad. Nat. Sci. Philad. S: 65, t. 6B. 1943; Yamasaki in Fl. E. Him. 290. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 126. 1982. *Vernica lindleyana* Wallich, Cat. 13 & 23, n. 404. 1829. *nom.nud. Picrorhiza kurrooa auct. non.* Royle; Hook.f. in Fl. Brit. India 4: 290. 1885.

Herbs perennials upto 12 cm tall. **Leaves** spatulate to ovate, black when dry 3 - 6cm, base tapering, margin serrate or rarely double serrate; scape brown glandular hairy. **Flowers** in spike 1-2 cm. **Pedicel** upto 30mm long. **Calyx** to 1 cm in fruit; lobes lanceolate to obovate-oblong, upper lobe sublinear, brown glandular hairy. **Corolla** dark purple, pubescent outside; lower lip ca 1/2 as long as upper 3 lobe, lateral lobes with 2 or 3 small teeth ; upper lip \pm hooked. **Filaments** glabrous. **Ovary** 1 - 1.2 mm long, style 5 - 6 x as long as ovary. **Capsules** narrowly avoid.

- Flower* : July – September
Exsiccatus : Kupup 3950 m, , **SR Lepchu & AP. Das** 0119, Dated 13.06.2006.
Status : Rare & Threatened
Local Distribution : Baba- Mandir, Kupup Gnathang, Dokala 3500 – 4800 m
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, MYANMAR, W. CHINA.
 Notes : The rhizomes in traditional medicine.

Pedicularis Linnaeus

Key to the species

- 1. Herbs annual 2
- + Herbs perennial 3
- 2. Plants less than 30 cm tall; flowers axillary; corollas yellows *P. longiflora*
- + Plants more than 30 cm tall; flowers centrifugal; corollas red roses ... *P. megalantha*
- 3. Leaf segments more than 20 pairs 4
- + Leaf segments less than 20 pairs 5
- 4. Corolla purple-rose; galea with red-brown pubescent *P. pantlingii*
- + Corolla blackish purple; galeae with purple-red hairs *P. trichoglossa*
- 5. Leaves opposite *P. flexuosa*.
- + Leave alternate 6
- 6. Flowers axillary 7
- + Flowers laxly racemose *P. furfuraceae*.
- 7. Stems erect; Capsule oblong, apiculate; Corolla pink or purple..... *P. microcalyx*
- + Stems \pm erect; Capsule lanceolate ellipsoid; Corolla core red *P. siphonantha*

Pedicularis flexuosa Hook.f. in Fl. Brit. India 4: 308. 1884; Yamazaki in Fl. E. Him. 2: 120. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 123. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1189. 2001. *Pedicularis armatoides* Yamazaki in J. Japan Bot. 45: 147, f.5, 6, 1970.

Herbs perennial, upto 40 cm tall. **Stems** usually flexuous striate apically. **Leaves** opposite; **petiole** pubescent; **lamina** ovate-oblong, 5 x 2.5 cm; segments 8 - 14 pairs, oblong, pinnatisect, dentate, teeth callose. **Flowers** in lax terminal, interrupted basally; bracts leafy (leaflike). **Calyx** cylindric - campanulate, villous, lobes 5, unequal, posterior one entire, serrate. **Corolla** tube pilose; falcate, beak bent downward, straight; lower lip ovate-rounded. Filaments of pubescent to glabrous. **Capsules** oblong-lanceolate, apex acute; **seeds** blackish ellipsoid.

Flower	: June-August	Fruit	: July-September
Exsiccatus	: Kupup, SR Lepcha & AP. Das 31409 , Dated 27.07.2005		
Status	: Not common		
Local Distribution	: Kupup, Sherabthang 3000 - 3900 m		
General Distribution	: HIMALAYAS; INDIA, (NEPAL -BHUTAN), CHINA		

Pedicularis furfuraceae Wallich [Cat. 13, n. 412.1829, *nom. nud.*] ex Bentham, Scroph. India 54. 1835; Hook f. in Fl. Brit. India 4: 316. 1885; Yamazaki in Fl. E. Him. 2: 120. 1977; Hara *et al.*, Enum Fl. Pl. Nepal 3: 123. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1207. 2001.

Herbs perennial, upto 45 cm tall. **Stem** branched at base; braches widely spaced, pubescent. **Leaves** alternate, few; petiole slender, pubescent; **lamina** oblong-ovate to ovate, upper surface sparsely pubescent and densely white scurfy, pubescent or subglabrous in lower surface; pinnatifid; segments 4 - 6 pairs, ovate to lanceolate, dentate. **Flowers** in lazly racemose; bracts leaflike, longer than flowers. Pedicel subglabrous. **Calyx** oblique ovate, membranous, dense white pubescent; lobes 5. **Corolla** purplish, tube glabrous, expanded epically; lower lip longer than galea, middle lobe oblong apex emarginate. Filament pubescent, glabrous. **Capsules** lanceolate; seeds ovoid.

Flower	: June - July	Fruit:	July - August
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ExsiccatUS : Panglakha 2760 m, **SR Lepcha & AP. Das** 27753, dated 30.08.2004.
Status : Less common
Local Distribution : Panglakha 2700 – 4100 m.
General Distribution : E. HIMALAYA; INDIA, Assam, Darjeeling (NEPAL to BHUTAN)
 CHINA.
 Note : Endemic to E. Himalaya.

Pedicularis longiflora Rudolph in Mem. Acad. Sci. St. -pet. 4:345,t.2.1811; Hara *et al.* Enum. Fl. Pl. Nepal 3:123.1982; Grierson & Long, Fl. Bhutan 2(3): 1228. 2001; *Var tubiformis* (Klotzsch) Tsoong in Acta Phyt. Sin. 3:278.318 Jan. 1955; Yamazaki in Fl. E. Him. 3:100.1975. *Pedicularis tubiformis* Klotzsch, B. Reise Pr. Waldem. 106, t. 57.1862. *Pedicularis longiflora* subsp. *Tubiformis* (Klotzsch) Pennell in Monogr. Acad. Nat. sci. Philad. 5:150. 1943. *Pedicularis tubiflora* auct. non Hook. f. in Fl. Brit. India, 4: 315. 1885.

Herbs, annual upto 18 cm tall. **Stems** usually short, glabrescent. **Leaves** basal leaves in a rosette sparsely long ciliate; **lamina** lanceolate to narrowly oblong, glabrous on both surface, bipinnatifid to pinnatifid; segment 5 - 9 pairs, margin double dentate. **Flowers** in axillary; pedicel short. **Calyx** tubular, lobes 2 or 3. **Corolla** yellow, small, lower lip with a narrow maroon stripe; tube pubescent; filament densely pubescent. **Capsules** lanceolate seeds narrowly ovoid.

Flower : June – September *Fruit*: August – October
Exsiccatus : Bhimbase, **SR Lepcha & AP. Das** 31406, dated 27.07.2005.
Status : Not common
Local Distribution : Bhimbase, Dokala 2500 – 4100 m
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, CHINA.

Pedicularis megalantha D. Don, Prodr. Fl. Nepal 94. 1825; Hook. f. in Fl. Brit. India 4: 312. 1885; Yamazaki in Fl. E. Him. 2: 120. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 124.1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1223. 2001. *Pedicularis megalantha* var. *typical* Prain in Ann. Bot. Gard. Calc. 3: 118. 1890. pp.

Herbs annual upto 50 cm tall. **Stems** glabrescent. **Leaves** basal usually withering early; **lamina** linear oblong, 5-7 x 2-3.5 cm, upper surface sparsely white scurfy, lower surface sparsely pubescent; pinnatifid; segments 7 - 12 pairs, triangular lanceolate to oblong ovate, sinuate dentate. **Flowers** centrifugal, to more than 30 cm, bracts leaflike. **Calyx** oblong, pubescent; lobes 5, unequal. **Corolla** usually red rose; tube as long as calyx, beak circular; leaves lip enveloping galea, ciliate; anterior filament pair pubescent. **Capsules** ovoid. Lanceolate.

Flower : June – August *Fruit*: July – September
Exsiccatus : Kupup 4100 m, **SR Lepcha & AP. Das** 146, dated 13.05.2008.
Status : Common
Local Distribution : Kupup, Gnathang 3100 – 4300 m.
General Distribution : PAKISTAN, INDIA, NEPAL, BHUTAN, S.E. TIBET.

Pedicularis microcalyx Hook.f. in Fl. Brit. India 4: 315. 1885; Hara *et al.*, in Enum. Fl. Pl. Nepal 3: 124. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1212. 2001

Herbs perennial, root spreading, fusiform. **Stems** to 30 cm, erect, simple or branched from base, glabrous below, pubescent above. **Leaves** radical, caulines absent or reduced, 2 -3 in upper half of stem, alternate, petiolate; **lamina** lanceolate, oblong, 8 – 50 x 5 – 13 mm, pinnatifid with 5 – 10 pairs of ovate oblong, acute, bi-serrate. **Flowers** a loose head, several alternate, axillary flowers; pedicels to 7 mm, puberulent. **Calyx** campanulate, to 7 mm, 5 sub equal lobes. **Corolla** bright pink or purple, to 22 mm, tube straight, with lines of hairs; **galea** decurved near middle;

anther deep purple, gradually narrowed to tapering straight beaked; lateral lobe reniform, to 7 mm wide, margin entire, pilose; **stamens** inserted in middle; filaments glabrous; anther upturn at base. **Capsules** oblong, apiculate.

Flower : June – August
Exsiccatus : Kyonglasha 3500 m, *SR Lepcha & AP. Das 31461*, dated 13.08.2006.
Status : Common
Local Distribution : Changu, Kyonglasha 3200 – 4300 m.
General Distribution : E. HIMALAYAS; INDIA, (E. NEPAL – BHUTAN) S. TIBET.
Note : Endemic to Himalaya.

Pedicularis pantlingii Prain in J. Asiat. Soc. Beng. 58 (2): 273. 1889; Yamakazi in F. E. Him. 285. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 123. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1210. 2001. *P. furfuracea* Wallich var. *integrifolia* Hook.f. in Fl. Brit. India 4: 316. 1885.

Herbs perennial upto 50 cm tall. **Stems** usually 2-5, sometimes to 8. Branches pubescent, base with petioles remnants from preceding years. **Lamina** 16 x 1-2.6 cm, clustered at base; petiole upto 8 cm; lanceolate-linear, pinnatisect; segments 20 - 40 pairs, lanceolate, double dentate. **Flowers** racemose, usually interrupted; bracts linear shorter than flowers. **Calyx** cylindrical-oblong, cleft more deep; lobes 5, ±entire. **Corolla** purple-rose, galea densely red-brown pubescent abaxially and at margin; beak ca 4mm; lower lip densely red-brown ciliate; filament glabrous. **Capsules** long ovoid.

Flower : July – September. *Fruit*: August – October
Exsiccatus : Dokala, *SR Lepcha & AP. Das 31427*, dated 27.07.2005.
Status : Frequent
Local Distribution : Rachel Peak, Chowk, Tinsimana, 2400 – 3100 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, W. CHINA.

Pedicularis siphonantha D. Don, Prodr. Fl. Nepal 95.1825.; Hook.f. in Fl. Brit. India 4: 313. 1885; Yamazaki in Fl. E. Him. 3: 102. 1975; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 125. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1223. 2001. *Pedicularis hookeriana auct. non Wallich ex Bentham*: Yamazaki in Fl. E. Him. 3: 220. 1975.

Herbs perennial, 40 cm tall. **Roots** usually cylindrical. **Stems** single, ±erect. **Leaves** alternate, mostly radical except on well develop stem; petiole winged, glabrescent or sparsely long pubescent; basal leaves and on stem; **lamina** 1- 6 x 0.7 – 1.5 cm, leaf lanceolate –oblong to oblong, rarely elliptic, upper surface long pubescent; lower surface sparsely pubescent, pinnatisect; segments 6 - 15 pairs, ovate or triangular, pinnatifid. **Flowers** solitary axillary, dense; bracts leaflike, glabrescent, or ciliate. **Calyx** pubescent; tube to 1/3 cleft interiorly; lobes 2, (or 3 or 5). **Corolla** core red; finely pubescent; galea strongly twisted apically; beak semicircular or slightly s. shaped slender, lower lip, lobes 2. **Capsules** lanceolate ellipsoid.

Flower : May – July *Fruit*: September
Exsiccatus : Gnathang 3890 m, *SR Lepcha & AP. Das 30857*, dated, 29.07.2005.
Status : Common
Local Distribution : Gnathang 3000 – 4000 m.
General Distribution : E. HIMALA; INDIA, (C. NEPAL –BHUTAN).
Note : Endemic to Himalaya.

Pedicularis trichoglossa Hook.f. in Fl. Brit. India. 4: 310. 1885; Hara *et al.*, Enum Fl. Pl. Nepal 3: 125. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1198. 2001

Herbs perennial, upto 60 cm tall. Stems striate and hairy. **Leaves** sessile, linear lanceolate, pinnatifid to pinnapartite; segments upto 25 pairs, lamina 3 - 6cm x 4 - 12 mm,. **Flowers** in racemose, upto 18 cm; axis usually densely pubescent, bracts linear. Pedicel to 3 mm, pubescent. **Calyx** densely blackish purple villous, 5-lobbed. **Corolla** blackish purple; tube basally bent; galae apically pubescent, with purple-red hairs; beak slender, incurved. **Capsule** broadly ovoid, slightly exceeding calyx.

Flower : July – August *Fruit*: August – September.
Exsiccatus : Bhimbase 4350 m, **SR Lepcha & AP. Das 31471**, dated 27.07.2005.
Status : Less common
Local Distribution : Lampokhri, Bhimbase, Dokala 3000 – 5200 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, TIBET, CHINA

Scrophularia Linnaeus

Key to the species

1. Herbs < 1 m tall; lamina acuminate; calyx lobes elliptic, acute *S. elaitor*
 + Herbs > 1 m tall; lamina acute; calyx lobes rounded *S. urticaefolia*

Scrophularia elaitor Bentham, Scroph. Ind. 18. 1835; Hook.f. in Fl. Brit. India 4: 255. 1885; Yamazaki in Fl. E. Him. 290. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 126. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1092. 2001

Herbs, annual, glabrous upto 1.5 m tall. Stem usually stout, 4-winged. Leaves: petioles upto 8.0 cm long; lamina 8 – 22 x 4 – 7.5 cm, ovate-lanceolate, margin coarsely dentate, acuminate, subcordate nerves distinct beneath. **Flowers** in branched cymes, spreading. **Peduncles** 3 – 6 cm long. Bracts linear. **Calyx** lobes elliptic, subacute. **Corolla** to 0.6.5cm, green. **Stamens** upto 0.7cm, exerted. Styles equal to stamens, much exerted. **Capsules** ovoid.

Flower : July – August *Fruit*: September – October
Exsiccatus : Rachel, **SR Lepcha & AP. Das 31066**, dated 02.10.2004.
Status : Less Common.
Local Distribution : Todhay, Mulkharka, 1900 – 2700 m.
General Distribution : HIMALAYAS; BHUTAN, (Kumaon-BHUTAN), Assam, Meghalaya.
 Note : Endemic to Himalaya.

Scrophularia urticaefolia Wallich ex Bentham, Scroph. Ind. 18. 1935; Prodr. 10: 306. 1846; Hook.f. in Fl. Brit. India 4: 254. 1885; Lloydia 16: 168. 1953; Yamazaki in Fl. E. Him. 291. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 127. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1091. 2001.

English Name: Figwort

Herbs annual erect to 60 cm tall. Stem thinly pubescent, slender and quadrangular. Cauline leaves leaves opposite, sessile to shortly petioled (upto 0.4 cm); lamina 3 - 5 x 2 - 4 cm, ovate, coarsely dentate, acute, cordate, much smaller in inflorescence, glabrous, pale beneath. **Flowers** many in lax, leafy terminal branched cymes. **Calyx** lobes rounded. **Corolla** to 0.8 cm, bilipped, upper 2 lobes longer than the lower anterior ones; **stamens** 4, included; **staminode** 1, obovate and scaly. **Capsules** beaked.

Flower : July – August *Fruit*: September – October
Exsiccatus : Dohrok 2350 m, **SR Lepcha & AP. Das 2700**, dated 16.06.2006.
Status : Less Common.
Local Distribution : Phusrey, Dohrok, PWS 1900 – 2400 m.

General Distribution : E. Himalaya; INDIA, (NEPAL – Sikkim) W. CHINA..

Note : Endemic to Eastern Himalaya.

Veronica Linnaeus

Veronica cana Wallich ex Benth, Scroph. Ind. 45. 1835; Hook.f., in Fl. Brit India 4: 295. 1884; Yamazaki in Fl. E. Him. 294. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 129. 1982; Mill in Grierson & Long, Fl. Bhutan 2(3): 1136. 2001.

Herbs erect, hairy 5 – 8 cm tall. **Stem** unbranched. **Leaves** ; petioles upto 0.38 cm long; leaf lamina 0.7 - 1.4 x 0.4 - 1.3cm, ovate, margin toothed, with rounded teeth, acute, base rounded, pale green beneath, nerves not much prominent. **Flowers** in spikes usually terminal, 3cm long. **Flowers** upto 0.8 cm across, pale blue. **Calyx** linear-oblong. **Corolla** 4-lobed, lobes unequal and spreading, upper being larger; **stamens** 2. **Capsules** to 0.80 cm diam., notched and laterally 2-winged, wings being triangular.

Flower : June – August *Fruit*: July – December

Exsiccatus : Bhimbase 4300 m, *SR Lepcha & AP. Das 30918*, dated 24.07.2005.

Status : Common

Local Distribution : Jorpokhari, 2100-2800m.

General Distribution : HIMALAYAS; INDIA, (Kashmir-BHUTAN)

Note : Endemic to Himalaya.

GESNERIACEAE Dumort

Key to the Genera:

1. Corolla funnel shaped, Stamen 2 2
- + Corolla tubular ventricose, cylindrical; Stamen 2 or 4 3
2. Ovary stipitate *Didymocarpus*
- + Ovary linear *Chirita*
3. Seed rugose or papillate or hairy near helium; Disc cupular 4
- + Seed appendages at both end; Disc cupular or annular *Loxostigma*
4. Undershrubs usually epiphytic or lithophytic; leaves opposite *Aeschynanthus*
- + Herbs annual or perennial; leaves alternate *Rhynchoglossum*

Didymocarpus Wallich

Key to the species:

1. Leaves ovate, rarely suborbicular 2
- + Leaves ovate or elliptic 3
2. Calyx triangular; capsule with stipitate *D. pulcher*
- + Calyx campanulate and rounded; capsule without stipe *D. albicalyx*
3. Leaves lamina 3 – 4.5 x 1 – 3 cm; ovary disc cupular *D. aromaticus*
- + Leaves lamina 6 - 13 x 4 – 10 cm; ovary disc oblique *D. podocarpus*

Didymocarpus pulcher C.B. Clarke in DC., Monogr. Phan. 5: 79. 1883; in Hook.f., Fl. Brit. India 4: 348. 1884; Hara in Fl. E. Him. 3: 105. 1975; Hara *et al.*, Enum Fl. Pl. Nepal 3: 135. 1982; Hilliard in Grierson & Long, Fl. Bhutan 2(3): 1314. 2001.

Herbs rarely shrubs, perennial, upto 28 cm tall. **Leaves** usually with the whorl of 3 – 4 eaves rarely 2 ; **petiole** to 5.5cm; leaves lamina 2 – 9 x 2 – 6.5 cm, blade ovate to broadly ovate, herbaceous, adaxially sparsely oppressed puberulent, with yellow glandular, abaxially puberulent along veins, base oblique, cuneate to cordate, crenate to serrate, apex acute. **Flowers** in cymes 7 – 9; bract broadly ovate. **Calyx** slightly zygomorphic, 5 lobed nearly equal, triangular, glabrous, acute or sub-acute, margin entire. **Corolla** glandular pubescent, purple, rarely glabrous; tube cylindrical; **filament** glabrous; **anthers** puberulent; **staminode** 3.; pistil glabrous; ovary small. **Capsule** stipitate, often falcate.

Flower : July – August

Exsiccatus : Panglakha 2950 m, **SR Lepcha & AP Das** 27776, dated 30.09.2004.

Status : Common

Local Distribution : Dohrok, Premlakha, Hangay, Singhaney upto 1200-2700 m.

General Distribution : E. HIMALAYA; INDIA, (NEPAL – BHUTAN).

Note : Endemic to Eastern Himalaya

Didymocarpus albicalyx Clarke in DC., Monog. Phaner. 5: 78. 1883; Hara in Fl. E. Him. 1: 298. 1966; 2: 122. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 3: 134. 1982; Hilliard in Grierson & Long, Fl. Bhutan 2(3): 1312. 2001. *D. villosa* DC. *sensu* Clarke Comm. & Cyrt. Beng. 89, t. 59. 1874. *D. leucocalyx* Clarke in Hook.f., Fl. Brit. India 4: 348. 1885.

Herbs upto 35 cm tall. **Leaves** ovate, rarely suborbicular, unequal in size; 1- 3 pairs less leaves above, lowermost internodes elongating, **lamina**, 3 – 22 x 3 – 13 cm, apex acute to obtuse, base cordate to rounded, rarely oblique, margin doubly serrate, acute hairs above, acute hairs on veins beneath. **Flowers** usually many in spreading cymes; bracts ovate to suborbicular, pubescent, quickly deciduous. **Calyx** pale, rarely purplish,, purplish below, glabrous, campanulate, lobe rounded. **Corolla** glabrous shade of purple, limb oblique, lobes rounded,. Anthere bearded. **Capsule** without stipe.

Flower : June – September

Exsiccatus : Dohrok 2200 m, **SR Lepcha & AP. Das** 1070, dated 15.10. 2004.

Status : Common

Local Distribution : Singhaney, Subhaney, Premlakha. 1600 - 2800 m.

General Distribution : E. HIMALAYA, INDIA, (NEPAL to BHUTAN).

Note : Endemic to Eastern Himalaya.

Didymocarpus aromaticus Wall. ex D. Don, Prodr. Fl. Nep. 123. 1825, *ut aromatica*; Hara in Fl. E. Him. 3: 104. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 3: 134. 1982; Hilliard in Grierson & Long Fl. Bhutan 2(3): 1314. 2001. *E. subalternatus* Wall. ex R. Br. in Bennett, Pl. Jav. Ror. 118. 1840; Fl. Brit. India 4: 347. 1885.

Local Name: Kumkumpaati (Nep.).

Herbs, erect. **Stem** unbranched, hairy. **Leaves** 4, epically to 13 cm; petioles unequal, upto 0.7cm, pale hairy; **lamina** 3 – 4.5 x 1 – 3 cm, ovate or elliptic, crenately serrate but unequal, acute, base narrowly cuneate, light red below, dense golden wooly and coarse above, distinct beneath, impressed above. **Flowers** shorter than leaves, in terminal, in two distinct lower and upper rings/layers, shorter ones to 21cm, longer ones to 6 cm. **Flowers** purple-green. **Calyx** upto 0.5 cm, campanulate, deeply 5 – lobed. **Corolla** to 1.3 cm long, purplish green; ovary disc copular. **Capsules** sessile or with stipe, often curved.

Flower : June – August *Fruit*: August - December

Exsiccatus : Ramitey Dara 2600 m, **SR Lepcha & AP. Das** 31149, dated 03.10. 2004.

Status : Common.

Local Distribution : Rachel Middle, 1700 – 2400 m.
General Distribution : HIMALAYA; INDIA, (Kumaon to BHUTAN)
Note : 1. Endemic to Himalaya.
2. Traditional used as incense religious offerings.

Didymocarpus podocarpus Clarke in DC., Monogr. Phaner. 5: 76. 1883, ut *podocarpa*; C.B. Clarke in Hook.f., Fl. Brit. India 4: 347. 1885; Hara in Fl. E. Him. 1: 298. 1966; 2: 122. 1971; Hara *et al.*, Enum. Fl. Pl. Nepal 3: 134. 1982; Hilliard in Grierson & Long Fl. Bhutan 2(3): 1314. 2001.

Herbs, pubescent, upto 20cm tall. **Leaves** 4 all apical, opposite; petioles to 2 cm; **lamina** ovate-elliptic, 6 - 13 x 4 – 10 cm, crenate, obtuse acute, sparsely hairy above, glabrous in lower, except nerves; peduncles to 6cm long; bracts to 0.5 cm. **Flowers** many in spreading cymes. **Calyx** to 0.8cm, campanulate, purple, lobes obtuse. **Corolla** to 2.3 cm long, mostly purplish, and minutely hairy; ovary disc oblique. **Capsule** stipitate, falcate, to 1 cm long stalk.

Flower : July – October *Fruit*: October – March
Exsiccatus : Tungsay RF 2700 m, *SR Lepcha & AP. Das 31149*, dated 03.10. 2004.
Status : Common.
Local Distribution : Ramitey, NNP Border. 1900 – 3500 m.
General Distribution : E. HIMALAYA; INDIA, (NEPAL to BHUTAN).
Note : Endemic to Eastern Himalaya.

Chirita Buchanon-Hamilton ex D. Don

Key to the species:

1. Leaves elliptic to broadly elliptic; calyx lanceolate.....*C. urticifolia*
+ Leaves ovate; calyx triangular-acuminate..... *C. microphylla*

Chirita urticifolia Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. 90. 1825; C.B. Clarke in Hook.f., Fl. Brit. India 4: 359. 1885; Hilliard in Grierson & Long, Fl. Bhutan 2(3): 1320. 2001; Hara in Fl. E. Him. 2: 298. 1966.

Herbs, perennials upto 80 cm tall. **Leaves** opposite: **petiole** to 5.5 mm, **lamina** 3 - 13 x 3 – 5 cm, elliptic to broadly elliptic, rarely ovate or obovate, puberulent, e-glandular, prominent veins above, base oblique, broadly cuneate to rounded, margin dentate to serrate, apex acute to abruptly acuminate; lateral veins 5 - 10. **Flowers** 1- 2, in cymes; peduncle, puberulent to puberulent; bracts 2, free, lanceolate to ovate, apex acute. **Pedicel** puberulent or pilose. **Calyx** 4cm, 5- lobed; lobes unequal, lanceolate, margin entire. **Corolla** purple to pink, outside puberulent to pilose, inside glabrous; tube narrowly funnel-form; anthers fused by entire; **staminodes** 2; **stigma** deeply 2-lobed. **Capsules** c 9 cm long.

Flower : July – September *Fruit* : September – October
Exsiccatus : Jorepokhri 2650 m, , *SR Lepcha & AP. Das 31010*, dated 02.10.2004.
Singaney bans 2300 m, *SR Lepcha & AP. Das 276*, dated 16.09.2007.
Status : Less Common.
Local Distribution : Premlakhal, Hangey 1500 – 2650 m.
General Distribution : E. HIMALAYA INDIA, (NEPAL – BHUTAN).
Note : Endemic to Eastern Himalaya.

Chirita macrophylla Wall., PAR 1: 56, T. 72. 1830; C.B. Clarke in Hook.f., Fl. Brit. India 4: 358. 1885; Wood in NRBGE 33: 167. 1954; Hara *et al.*, Enum. Fl. Pl. Nep. 3: 133. 1982; Hilliard in Grierson & Long Fl. Bhutan 2(3): 1318. 2001.

Herbs, perennials with small rhizome. Stem upto 28 cm. **Leaves** 1 -2 radical; petioles upto 23 cm long; **lamina** ovate 4 – 16 x 2.5 – 13 cm, acute, base rounded or cordate, rarely oblique, margin serrate, hairy above, hair on veins on veins beneath; cauline leaves smaller. **Inflorescence** terminal with few flowered. **Calyx** divided, tubes upto 16 mm long, triangular-acuminate, glabrous. **Corolla** puberulous, tube cylindric, curved, inflated above, tube white or yellowish, lobes yellow, throat orange vein red, tube glandular on apex; **ovary** puberulous; style puberulous.

Flower : May – August

Exsiccatu : Rachela below 2800 m, **SR Lepcha & AP. Das 31173**, dated 08.09.2004

Status : Sparse Less common

Local Distribution : Dorok, Hangey, Beusa 1500– 2600 m.

General Distribution : E. HIMALAYA INDIA, (NEPAL – BHUTAN).

Note : Endemic to Eastern Himalaya.

Loxostigma Clarke

Loxostigma griffithii (Wight) Clarke in DC., *Monogr. Phaner.* 5: 60. 1883; C.B. Clarke in Hook.f., *Fl. Brit. India* 4: 344. 1885; Hara & Ohashi in *Fl. E. Him* 1: 299, t. 5a. 1966; Hara *et al.*, *Enum. Fl. Pl. Nepal* 3: 135. 1982; Hilliard in Grierson & Long, *Fl. Bhutan* 2(3): 1305. 2001. *Didymocarpus griffithii* Wight, *Ill. Ind. Bot.* 2: 182, t. 153. 1850. *Dichrotrichum griffithii* Clarke, *Com. & Cyrt. Beng.* 79, t. 51.1874.

Shrubs, small upto 1m tall. Stem herbaceous, pubescent. **Leaves** in unequal pairs; **petioles** upto 5cm long; **leaves** lamina 5..3 – 10 x 3 - 5.5cm, elliptic, subfalcate, finely serrate, acuminate, base unequal, pubescent. Flowers in cymes with many flowered; peduncles upto 8cm long. **Bracts** 0.60 - 0.4cm. **Calyx** oblong, acute, denticulate; corolla tubular, inflated above the base, pale yellow, 5-lobed; **stamens** 4, included; **anthers** in pairs; **ovary** shortly stalked. **Capsules** linear; seeds pendulous.

Flower : September – November *Fruit*: December – March

Exsiccatu : Dohrok 2300 m, , **SR Lepcha & AP. Das 27776**, dated 30.09.2004.

Status : Sparse / Less Common.

Local Distribution : Rachela trijunction, upto 3000m.

General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, CHINA,

Aeschynanthus Jack

Aeschynanthus hookeri C.B. Clarke in A. & C. DC., *Monogr. Phan.* 5: 21. 1883; Hara in *Fl. Him.* 297. 1966; Hara *et al* in *Enum. Fl. Pl. Nepal* 3: 133. 1982; Hilliard in Grierson & Long, *Fl. Bhutan* 2(3): 1302. 2001.

Herbs, epiphytes with glabrous stems upto 40 cm tall. **Leaves** opposite; petiole 2.- 3cm; leaf blade narrowly elliptic to oblong, **lamina** 5.5 x 3.5cm, leathery, glabrous, adaxially smooth or wrinkled, abaxially not punctate, base broadly cuneate, margin entire, apex acuminate; lateral veins indistinct. **Flowers** in pseudoterminal cymes, 4 - 10-flowered; peduncle absent; bracts persistent, **Calyx** red or purple, 5-lobed ; lobes ovate to broadly triangular, outside glabrous. **Corolla** scarlet to orange-scarlet, outside puberulent, inside glabrous ; **lips** nearly equal ; **stamens** exserted; anthers coherent in pairs at apex, **staminode** ca. 1.3 mm. **ovary** glabrous. **Capsule** ca. 25cm. Seeds with 2 hair like appendages at opposite end.

- Flower & Fruit* : May – October
Exsiccatus : Phusrey 2150 m, **SR Lepcha & AP Das** 30232, dated 06.10.2004.
Status : Rare
Local Distribution : Dohrok, Phusrey 1200 – 2100 m.
General Distribution : INDIA, NEPAL, BHUTAN, CHINA, MYANMAR

Rhynchoglossum Blume

Rhynchoglossum obliquum Blume, Bijdr. 471. 1826; C.B. Clarke in Hook.f., Fl. Brit. India 4: 367. 1885; Hara & Ohashi in Fl. E. Him. 1: 299. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 135. 1982; Hilliard in Grierson & Long, Fl. Bhutan 2(3): 1328. 2001. *Wulfenia obliqua* Wall., Tent. Fl. Nepal 5, t. 35. 1826. *R. obliquum* var. *parviflora* Clarke in DC., Monogr. Phaner. 5: 162. 1883; C.B. Clarke in Hook.f., Fl. Brit. India 4: 367. 1884.

Herbs, annuals. **Stems** upto 80 cm long, sparsely puberulent. **Petiole** upto 2.5 cm; oblique, 1 side elliptic, other side ovate, 3.5 - 13 x 2.5 - 7 cm, glabrous above, rarely puberulent, glabrous beneath, base oblique, cuneate to cordate on smaller side, cordate on other, margin entire to undulate, apex acute - acuminate. **Flowers** in cymes with 10 - 30-flowered, appressed puberulent; peduncle glabrous. **Calyx** tinged blue, 2.5 x 4 mm; lobes 1.3 - 3.5 mm. **Corolla** pale to dark purple or violet blue, 6.5 - 13 mm, puberulent near mouth; tube upto 2.5 mm; 3-lobed to undivided. **Stamens** 2; staminodes 2, ca. 0.6 mm. **Pistil** glabrous. **Capsules** ovoid ellipsoidal to 5 mm.

- Flower & Fruit* : August – November
Exsiccatae : Dohrok 2300 m, **SR Lepchu & AP. Das** 30256, dated 06.10. 2004.
 Singhaney 2200 m, **SR Lepchu & AP. Das** 20281, 28. 10. 2004.
Status : Common.
Local Distribution : Deorali dara (NNP border), Singhaney, 1400 – 2000 m.
General Distribution : INDIA, NEPAL, BHUTAN, SRILANKA, MYANMAR, CHINA, MALAYSIA, THAILAND, VIETNAM, CAMBODIA, INDONESIA, PHILIPPINES

ACANTHACEAE A. Jussieu

Key to the Genera :

1. Plant climbers *Thunbergia*
 + Plants non climbers 2
 2. Leaves margins entire *Asystasia*
 + Leaves margins tooth, crenate 3
 3. Herbs much branched; Capsule clayate *Hypoestis*
 + Shrubs, undershrubs, moderately branched; capsule oblong *Strobilanthes*

Asystasia Blume

Asystasia macrocarpa Nees in Wallich, Pl. As. Rar. 3: 89. 1832; C.B. Clarke in Fl. Brit. India 4: 495. 1885; Yamajaki in Fl. E. Him. 1: 300. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 139. 1982; Grierson & Long, Fl. Bhutan 2(3): 1282. 2001.

Undershrubs, usually decumbent upto 1.5 m high, erect. Stem pubescent, with swollen nodes. **Leaves**; petioles to 0.8 cm long; lamina 8 – 13 x 3.5 – 6 cm, lanceolate, acuminate, entire, cuneate at base, margin undulate, dark green, slightly puberulous mainly on vein below. **Recemes** upto 12 cm long, solitary, terminal. Rachis pilose, **flowers** in opposite pairs, ; pedicels upto 0.4.5 cm long. Bracts linear to 0.4 cm long. **Sepals** 0.3 - 0.70 cm, lanceolate, pubescent. **Corolla** upto 4 cm, tubular, pink-white; stamens 4. **Capsules** cylindric, usually 2-seeded.

Flower : February – May *Fruit*: June - July
Exsiccatus : Mulkharka – Phusrey upto 2100 m, **SR Lepcha & AP. Das** 31252, dated 13. 07. 2008.
Status : Rare
Local Distribution : Neora Border, Premlakha, 1600 – 2 350 m
General Distribution : SUB-TROPICAL HIMALAYAS; INDIA, (NEPAL-BHUTAN).
Note : 1. Endemic to Himalaya
 2. Flowers ornamental.

Hypoestis Soland ex R. Br.

Hypoestis triflora Roemer et Schultes, Syst. Veg. 1: 141. 1817; Prodr. 11: 506. 1847; C.B. Clarke in Fl. Brit. India 4 : 557. 1885; Hara in Fl. E. Him. 2:123. 1971; Hara et al. Enum. Fl. Pl. Nepal 3:141. 1982. *Justica triflora* Forssk., Fl. Aegypt.- Arab. 4.1775. *H. wallichii* Nees in Wallich, Pl. As. Rar. 3:114. 1831. *Dicliptera roxburghiana* auct. non Nees: Yamazaki in Fl. E. Him. 1: 301. 1966.

Herbs decumbent or semi-erect upto 30 cm tall. **Stem** usually ribbed, pubescent. **Leaves**; petioles to 3 cm long; lamina 5.5 - 9 x 3 - 4 cm, ovate, acute, obscurely rounded at base, margin crenate, pubescent on both surfaces. **Flowers** in capitellate cymes, 1-5 flowered; **bracts** 2, to 0.3 cm, opposite, ovate – oblanceolate, foliaceous. **Bracteoles** 2, to 0.8 cm long, lineae lanceolate. **Sepals** to 1 cm, lanceolate, greenish white. **Corolla** tube to 1.5 cm long, pinkish to white, bilipped, lower lip trilobed and recurved, red-spotted within; stamens 2. **Capsules** clavate-ellipsoid with few hairs on tip; **seeds** 4.

Flower : September *Fruit*: November
Exsiccatus : Rachela - Panglakha, m, **SR. Lepcha & AP.Das** 31255, Dated 13. 07. 2008.
Status : Common
Local Distribution : Jorepokhri, Premlakha – Panglakha 1400 – 2400 m.
General Distribution : W. ASIA, HIMALAYAS; INDIA, (NEPAL-BHUTAN), W. CHINA.

Strobilanthes Blume

Key to the Species:

- | | |
|---|-----------------------|
| 1. Flowers in axillary; corolla blue, pink | 2. |
| + Flowers in capitate; corolla pale lilac | <i>S. achinata</i> |
| 2. Spikes divaricate; bracteoles obovate – oblong | <i>S. divaricatus</i> |
| + Spike non divaricate; bracteoles linear- oblong | <i>S. wallichii</i> |

Strobilanthes echinata Nees in Wallich, Pl. As. Rar. 3: 85. 1832; Grierson & Long. Fl. Bhutan 2(3). 1262. Basionym: *Goldfussia echinata* (Nees) Haridasan et R.R. Rao, Comb. Nov.; Fl. Meg. 2: 663. 1987.

Undershrub or cabrous shrubs. **Leaves**; petioles to 2.5 cm long, lamina 3 – 13 x 1.5 – 3 cm, lanceolate, elliptic-lanceolate, coarsely dentate, long acuminate, base cuneate, coriaceous, thinly haired above, undersurface villous, lateral nerves 6 - 8 pairs, sub-parallel, villous. **Spikes** capitate, peduncled, hairy; **bracts** to 2.5 cm long, ovate, and pectinate; bracteoles small. **Flowers** to 4.5 cm long, purplish-white. **Sepals** segmented, scarious. **Corolla** infundibular, pale lilac, nearly glabrous. **Capsules** to 1.5 cm long.

Flower : May *Fruit*: October
Exsiccatus : Mulkharka – Phusrey 1950 m, **SR. Lepcha & AP. Das**, 31254, dated 13. 07. 2008.
Status : Common
Local Distribution : Phusrey, Subaney, PWS, 2100 – 2400 m.
General Distribution : E. HIMALAYA; INDIA (Sikkim - Meghalaya),
BHUTAN

Note : Endemic to E. Himalaya

Strobilanthes divaricatus (Nees) T. Anders in Journ. Linn. Soc. 9: 478. 1867; C.B. Clarke in Fl. Brit. India 4: 468. 1884; Yamajaki in Fl. E. Him. 1: 305. 1966; Grierson & Long. Fl. Bhutan 2(3): 1273. 2001. *Diflugossa divaricata* (Nees) Bremek. in Verh. Ned. Akad. Wetens. Sect. 2, 41(1): 246. 1944; Hara et al. Enum. Fl. Pl. Nepal 3: 140. 1982. *Goldfussia divaricata* Nees in Wallich, Pl. As. Rar. 3: 89. 1832

Shrubs upto 1.3 m tall. **Leaves**; petioles to 1 cm ; lamina 7 - 13 x 2.5 - 4.5 cm, lanceolate, serrulate, acuminate, minutely setulose, nerves pinnate, 7-pairs. **Spikes** axillary, lax, divaricate; **upper flowers** alternate; **bracts** to 0.8 cm, ovate, caducous; **bracteoles** slightly smaller than bracts, obovate - oblong, caducous. **Calyx** to 3 cm long, unequal, lobes narrow-lanceolate, long-caudate. **Corolla** to 4.2 cm long, tubular, slightly curved, purplish; filament hairy. **Capsules** glabrate; seeds 4.

Flower : August – October *Fruit*: October – December
Exsiccatus : Phusrey, 2050 m, **SR. Lepcha & AP. Das**, 31251, dated 13.07. 2008
Status : Frequent
Local Distribution : Mulkharka, Karponang, Gangtok, 1600 – 2300 m.
General Distribution : E. HIMALYA; INDIA (Meghalaya), NEPAL-BHUTAN, CHINA.
Note : Endemic to E. Himalaya

Strobilanthes wallichii Nees in Wallich, Pl. As. Rar. 3: 87. 1832; C.B. Clarke in Fl. Brit. India 4: 471. 1884; Yamajaki in Fl. E. Him. 1: 305. 1966. Grierson & Long. Fl. Bhutan 2(3): 1271. 2001. *Strobilanthes alatus* Nees in DC. Prodr. 11. 194. 1847 non Blume 1825-26. *Pteracanthus alatus* (Wallich ex Nees) Bremek in Verh. Nederl. Akad. Wet. 41. 199. 1944; Hara et al. Enum. Fl. Pl. Nepal 3:143. 1982. *Ruellia alata* Wallich, Pl. As. Rar. 1: 26, t. 31. 1830. *Goldfussia thomsonii* Hk. in Bot. Mag. t. 5119. 1859.

Herbs perennial upto 1m tall. Stem erect, glabrous or rarely pilose. **Leaves**; petioles to 2 cm ; lamina 1.5 - 13 x 1 - 5.5 cm, unequal, ovate elliptic. Acute, base rounded - attenuate, shortly decurrent, serrate - coarsely crenate, glabrous or pilose. **Flowers** in opposite pairs in axils of leaf-like bracts forming axillary spike. **Flowers** reduced to solitary, in axillary of leaves on main stem. ; **bracts** persistent ; **bracteoles** linear - oblong. **Calyx** to 2 cm long, lobes linear, subacute, unequal. **Corolla** to 15 cm long, blue, glabrous, tube inflated above. **Capsules** glabrous.

Flower : June - July *Fruit*: September - October
Exsiccatus : Below Rachela, 2900 m, **SR. Lepcha & AP. Das**, 31253, dated 13. 07. 2008.
Status : Frequent
Local Distribution : Rachela, Panglakha, NNP border, 2800 - 3800 m.
General Distribution : INDIA (Sikkim, Darjeeling, Meghalaya), CHINA.
Note : Endemic to E. Himalaya

Thunbergia Retzius (*nom. cons.*)

Key to the species

1. Flowers in fascicle raceme, orange red; leaf entire or remotely toothed *T. coccinea*
 + Flowers in solitary axillary, creamy white; leaf dentate *T. lutea*

Thunbergia coccinea Wallich, Tent. Fl. Nepal 49: 58.t. 37. 1824; C.B. Clarke in Fl. Brit. India 4: 393, 1884; Man. India Timb. 518. 1902; Indian Trees 497. 1906; Yamazaki in Fl. E. Him. (1) 305, 1966; Grierson & Long. Fl. Bhutan 2(3): 1246. 2001.

Climber with profuse and pendent branches. **Leaves**; petiolate, petioles upto 5 cm long; lamina 5 - 17 x 2 - 7 cm, ovate-elliptic or ovate-lanceolate, margin entire or remotely toothed, acuminate, base truncate or shallow cordate, glabrous, membranous, 3 - 5 nerved. **Flowers** in fascicled at the pendent racemes, 3-4 cm long, orange red. **Corolla** lobes reflexed. **Capsules** upto 5 cm long.

Flower : September - November *Fruit*: December - February
Exsiccatus : Mulkharka 1950 m, **SR. Lepcha & AP. Das**, 27715, dated 30.09.2004
Status : Rare
Local Distribution : Mulkharka 1800 - 2150 m
General Distribution : SUBTROPICAL TO TEMPERATE HIMALAYAS; INDIA (Sikkim), CHINA, INDO-CHINA
Note : Flowers ornamental.

Thunbergia lutea T. Anderson in Journ. Lin. Soc. Bot. 9: 448. 1867; C.B. Clarke in Fl. Brit. India 4: 392. 1884; Yamajaki in Fl. E. Him. 1:305. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3: 144. 1982.

Shrubby twiner, dextrose perennial. Stem slender, glabrous. **Leaves**; petioles 1to 3 cm long; ovate lanceolate, lamina 4 - 8 x 3 - 4.5 cm, acuminate, base cuneate, margin dentate, ciliate, hairy above. Bracteoles broadly ovate. **Flowers** solitary and axillary. **Calyx** 0.3 - 0.6 cm,

crenulate. **Corolla** 2.5 – 3 cm, creamy white, with oblique limbs; **stamens** 4; staminode rudimentary; filaments glandular at apex; style sparsely hairy on the upper. **Capsules** 2 – 3.5 cm, globose, beaked above.

- Flower* : August - September *Fruit* : October - December
Exsiccata : Mulkharka – NNP Boarder, 1800m, **SR. Lepcha & AP. Das**, 27720, dated 30.09.2004
Status : Less frequent
Local Distribution : Mulkharka, 1800 – 2150 m
General Distribution : E. HIMALAYA (Sikkim, Darjeeling,) NEPAL.
Note : Endemic to E. Himalaya

LENTIBULARIACEAE L.C. Richard

Utricularia Linnaeus

Utricularia striatula Smith in Ress, Cyclop. 37, n. 17. 1818; Hara in Fl. E. Him. 300. 1966; Taylor in Hara *et al.* Enum. Fl. Pl.Nepal 3: 133. 1982; Noltie in Grierson & Long, Fl. Bhutan 2(3): 1338. 2001. *U. orbiculata* Wall. ex DC., Prodr. 8: 18. 1844; C.B. Clarke in Hook.f., Fl. Brit. India 4: 334. 1885.

Herbs delicate, minute, annual, grows on moist tree bark and rocks. **Leaves** bladder small, orbicular to elliptic, **lamina** 0.5 - 0.6 x 0.35 - 0.4 mm across, orbicular. Basal leaves much dissected and with bladder. **Scape** 4.5 - 12cm, erect, very slender. Inflorescence in racemes 1-5 flowered. Pedicels 0.3 - 0.45 mm. Calyx lobes 0.13 - 0.3 mm. **Corolla** 0.22 - 0.42 mm, ligulate with lower lip, lower lip 5-lobed, lobes sub-equal, obtuse, white-pink. **Spur** to 0.5 mm, linear; stamens included. **Capsules** globose, with ovoid and glochidiate seeds.

- Flower & Fruit* : July – December
Exsiccatus : Dorok 2280 m, **SR Lepcha & AP. Das** 32927, dated 28. 07. 2005.
Status : Less frequent
Local Distribution : Hangey, Beusa, Premlakha. 1855 – 2150 m.
General Distribution : AFRICA, PAKISTAN, INDIA, MYANMAR, CHINA, MALAYSIA , NEW GUINEA.

Order: Campanulales

CAMPANULACEAE A. Jussieu

Key to the Genera:

1. Plant tuberous with foetid smell *Codonopsis*
+ Plant non- tuberous without foetid smell 2
2. Calyx tube adnate to ovary *Campanula*
+ Calyx tube adnate to ovary *Cyananthus*

Campanula Linnaeus

Campanula argyrotricha Wallich (Cat. No. 7138) ex DC. Prodr. 7: 473. 1839; Grierson & Long. Fl. Bhutan 2(3): 1379. 2001.

Herbs villous, with woody base. **Stem** decumbent, branched upto 35 cm with spreading hairs. **Leaves** sessile or shortly petiolate, elliptic to ovate, lamina 3.5 – 18 x 3 – 13 mm, sub-entire or slightly serrulate – crenulate, tomentose with long villous hairs, whitish beneath. **Flowers** solitary at tips of branches; flower very small ca 2.5 mm. **Calyx** lobes narrowly triangular to 6 mm, as long as corolla. **Corolla** tubular –campanulate, blue to violet; lobes ovate oblong. **Ovate** to 1.5 mm. capsule broadly obovate.

Flower : May *Fruit*: October
Exsiccatus : Serabthang 4200 m, **SR Lepcha & AP. Das** 0270, dated 19.09.2007.
Status : Common
Local Distribution : Kyongnosla, Changu, Serathang 3500 – 4500 m
General Distribution : INDIA (Sikkim, Darjeeling), BHUTAN.

Codonopsis Wallich

Key to the species:

1. Leaf margins entire-subentire 2
+ Leaf margins obscurely dentate, serrate – crenate, sinuate 3.
2. Stems ascending; leaf surface glabrescent above glaucescent below *C. foetens*
+ Stems decumbent to suberect; leaf surface pubescent in both sides *C. dicentrifolia*
3. Stem ascending; leaf base rounded or cuneate; *C. subsimplex*
+ Stem twining; leaf base deeply cordate; 4
4. Calyx lobes triangular –acuminate; sordid yellow with purple veins *C. inflatus*
+ Calyx lobes oblong; corolla pale; corolla greenish with apex reddish *C. affinis*

Codonopsis affinis Hook.f. & Thomson in Journ. Lin. Soc. 2: 12. 1857; C.B. Clarke in Fl. Brit. India 3: 431. 1881; Hara in Fl. E. Him. 1: 326. 1966; Hara *et al.* Enum Fl. Pl. Nepal 3: 50. 1982; Grierson & Long., Fl. Bhutan 2(3): 1387. 2001.

Local Name: *Syal ko Moot* (Nep.).

Twinner perennial with strongly foetid smell. **Stem** usually soft. **Leaves**; petioles 1.3 - 2.3 cm long; ovate, sub-entire, acute, base cordate, villous beneath, thinly pilose above, lamina 5.5-9.5 x 3-5cm. Peduncles 4 – 6.5cm. **Flowers** solitary, axillary, foetid. **Calyx** 0.6 -1.5 cm, oblong, distant, pilose. **Corolla** 1.4 - 1.6cm, greenish or purplish, lobes triangular, mouth upto 1.5 cm across. **Stamens** 5, free; stigma usually trilobed. **Capsules** hemispherical, beak upto 2-3mm long; seeds ellipsoid.

Flower : August – October. *Fruit*: September – November.
Exsiccatus : Middle Rachela, 2420 m, **SR Lepcha & AP. Das** 0313, dated 23.4.1995.
Status : Less common.
Local Distribution : Padamchen, Rachela, above Phusrey, 900 – 2500 m.
General Distribution : E. HIMALAYA (West Bengal, Sikkim), NEPAL, BHUTAN.
Note : 1. Endemic to eastern Himalaya.
2. Poisonous to human being.

Codonopsis dicentrifolia (C.B. Clarke) W.W. Smith in Rec. Bot. Surv. India 4: 388. 1913; Hara in Fl. E. Him. 3: 109.1975; Hara *et al.* Enum. Fl. Pl. Nepal 3: 51. 1982; Grierson & Long, Fl. Bhutan 2(3): 1385. 2001.

Herbs perennial often with tuber root. **Stem** decumbent to sub erect, 25- 70cm, glabrous, branched. **Leaves** usually ovate, **lamina** 1.5 – 4 x 0.6 – 3cm, usually glabrescent above, glaucous below, margin entire, some what sinuate. **Peduncle** upto 8 cm long. **Flowers** solitary, axillary. **Calyx** 13 – 17 mm lobes linear oblong 6-11mm. **Corolla** campanulate, 19 – 27 mm, blue, lobes ovate. **Fruits** obconical with short beak upto 10 mm long.

Flower : July – October
Exsiccatus : Nathang 3850 m, *SR Lepcha & AP. Das* 31073, dated 27.07.2005
Status : Common.
Local Distribution : Dongkyala, Kupup, Bhimbase, 3800 – 4200 m.
General Distribution : INDIA (Sikkim, Darjeeling), BHUTAN, NEPAL
Note : Endemic to Eastern Himalaya.

Codonopsis foetens Hook.f. & Thoms in Journ. Linn. Soc. 2: 16. 1858; C.B.Clarke in Fl. Brit. India 3: 433.1882; Grierson & Long., Fl. Bhutan 2(3): 1385. 2001.

Herbs with stem ascending upto 45 cm tall. **Stem** glabrescent with lateral braches near base. **Leaves**; petiole to 3 mm long; ovate, **lamina** 0.7 – 1.3 x 0.5 – 0.9 cm, grayish green, base truncate – ovate, pubescent in both sides, margin subentire; **peduncle** to 13 cm long. **Calyx** lobe oblong elliptic, margin slightly sinuate. **Corolla** campanulate or slightly globose, mauve or blue, lobes ovate, tip hooded. **Fruits** hemispherical to obconical.

Flower : July *Fruit:* September -
Exsiccatus : Premlakha – Panglakha 2750 m, *SR Lepcha & AP Das* 0266, dated 17.10.2004.
Status : Less common
Local Distribution : Singhaney, Rongchu (KAS), (2800 -4800 m).
General Distribution : E. HIMALAYA; INDIA (Sikkim), BHUTAN.
Note : Endemic to Eastern Himalaya.

Codonopsis inflata Hook.f. & Thomson in Journ. Linn. Soc. 2: 18. 1858; Hara *et al* in Enum. Fl. Pl. Nepal 3: 51. 1982; Grierson & Long., Fl. Bhutan 2(3): 1387. 2001.

Twinnners perennial with twinning stem of 5.5m. **Leaves** ovate, deeply cordate at base, lamina 4.8- 13 x 1.9 – 6.8cm, upper surface, sparsely pubescent and glabrous, lower surface glabrescent and glaucous, margin obscurely dentate; **petiole** upto 78mm; **Peduncle** upto 8cm. **Calyx** 13 – 18mm, lobes triangular acuminate. **Corolla** broadly tabular, campanulate, pale – sordid yellow with purple veins, lobes triangular. **Fruits** suglobose, purple black, glaucous.

Flower : June – August
Exsiccata : Gnathang 3800m, *SR Lepcha & AP. Das* 30295, dated 27.07.2005
Status : Common.
Local Distribution : Kyongnosla, Zuluk, Thamjay 3000 – 4100 m.
General Distribution : INDIA (Sikkim, Darjeeling), NEPAL, BHUTAN
Note : Endemic to Eastern Himalaya.

Codonopsis subsimplex Hook.f. & Thoms in Journ. Linn. Soc. 2: 16. 1858; C.B. Clarke in Fl. Brit. India 3: 432. 1882; Grierson & Long., Fl. Bhutan 2(3): 1386. 2001.

Herbs with stem ascending upto 60 cm tall. Stem trailing at upper part, glabrescent. **Leaves** ovate- ovate acuminate; petiole to 3 mm long; ovate, **lamina** 1.5 – 8 x 1- 6 cm, base slightly unequal, cuneate to rounded, both upper and lower surface pilose but slightly glaucous below, margin shallowly serrate or crenate; peduncle to 20 cm long. **Calyx** lobe ovate to ovate-oblong, glaucous. **Corolla** campanulate - globose, white or cream with purple markings inside; lobes ovate. **Fruits** hemispherical with beaked

Flower : July *Fruit:* September -
Exsiccatus : Baba Mandir- Kupup 3850 m, **SR Lepcha & AP Das** 0267, dated 20.09. 2005.
Status : Less common.
Local Distribution : Nathang, Dongkyala 3350 - 4100 m.
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN
Note : Endemic to Eastern Himalya

Cyananthus Wallich

Key o the species:

1. Corolla yellow *C. spathulifolius*
+ Corolla blue – violet 2
2. Stem decumbent; corolla funnel shaped; capsule ovate- acuminate *C. lobatus*
+ Stem procumbent, prostrate; Corolla campanulate; capsule ovate 3
3. Plants with woody rootstock; leaf lamina oblong – elliptic at base *C. pedunculatus*
+ Plants with fleshy rootstock; leaf elliptic spatulate *C. incanus*

Cyananthus incanus Hook. f. & Thoms. in Journ. Linn. Soc. Bot. 2: 20. 1858; C.B. Clarke in Fl. Brit. India 3: 434. 1881; Hara in Fl. E. Him. 2: 129. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 3: 58. 1982. *Cyananthus leicalyx* (Franch.) Cowen in New Fl. Silv. 10: 187. 1938. *Cyananthus incanus* var. *albicalyx* Franch. in J. de B. 1: 279. 1887.

Herbs perennial. Rootstock fleshy. Stem prostrate to 18 cm.. **Leaves** sessile to shortly petiolate; lamceolate, elliptic or spatulate lamina 3 – 7 x 1.5 – 3 mm, margin entire, often recurved, appressed hairy above, white tomentose beneath. **Pedicels** to 4.5 mm long, yellowish brown hairs. **Calyx** tubular to 10 mm, glabrous, or densely white or yellowish brown villous outside; lobes narrowly triangular, usually hairy inside. **Corolla** tubular to 22 mm long, deep blue to violet, rarely white, throat villous; lobes oblong. **Capsules** ovate.

Flower : July *Fruit:* September
Exsiccatus : Bhimbase 4300 m, **SR Lepcha & AP. Das** 0268, dated 13.09.2005.
Status : Common
Local Distribution : Kupup, Nathang, 3000 – 4500 m
General Distribution : E. Himalaya; INDIA, (NEPAL – BHUTAN), S. TIBET, and W.CHINA
Note : Endemic to Eastern Himalaya.

Cyananthus lobatus Wall. (Cat. 40, n. 1829, *nom.nud.*). ex Benth. in Royle, Illustr. Bot. Him. t. 69, f. 1835; C.B. Clarke in Fl. Brit. India 3: 433.1881; Hara *et al.* Enum. Fl. Pl. Nepal 3: 52. 1982.

Herbs perennial, decumbent. Stem upto 50 cm , sub glabrous to pilose. **Leaves** cuneate spatulate, **lamina** 9 - 30 x 7 - 22mm, usually with 3 lobes at apex, or rarely subsidiary lobe, sub glabrous or oppressed pilose above, pilose to lanate or rarely glabrous below. **Pedicel** upto 30mm long, densely brownish black villous. **Calyx** broadly tubular, lobes triangular densely brownish - black villous. **Corolla** broadly funnel shaped, blue, rarely white; lobes broadly obovate. **Capsule** ovate-acuminate.

Flower : June. *Fruit:* September
Exsiccatus : Rachela below, 2420 m, **SR Lepcha & AP. Das 30829**, dated 23. 4.1995.
Status : Common.
Local Distribution : Padamchen, Rachela, above Phusrey, 900 - 2500 m.
General Distribution : HIMALAYA; INDIA,(Punjab to BHUTAN), TAR., W. CHINA
Note : Endemic to Himalaya

Cyananthus pedunculatus C.B. Clarke in Fl. Brit. India 2: 434. 1881; Grierson & Long, Fl. Bhutan 2(3): 1389. 2001.

Herbs perennial. Rootstock woody. Stem procumbent, unbranched to 26 cm.. **Leaves** sessile to oblong, rarely elliptic towards base, lamina 4 - 17 x 1.5 - 6 mm , margin entire, pubescent on both surface. **Pedicels** to 15 mm long, spreading brown black hairs, **Calyx** tubular to 13 mm, villous brown black; lobes narrowly triangular to 5.5 mm. **Corolla** campanulate, to 40 mm, violet - blue, lobes obovate. **Capsule** ovate, nearly equal to calyx..

Flower : July *Fruit:* September
Exsiccatus : Baba Mandir - Memenchu lake 3850 m, **SR Lepcha & AP. Das 0269** , Dated 13. 10. 2004
Status : Common
Local Distribution : Kyongnosla , Changu, Serathang 3500 - 4500 m
General Distribution : E.HIMALAYA; INDIA (Sikkim), BHUTAN.
Note : Endemic to Eastern Himalaya

Cyananthus spathulifolius Nannfeldt in Acta. Hort. Gothoburg.v. 30. 1930; Grierson & Long., Fl. Bhutan 2(3): 1390. 2001.

Herbs perennial. Stems prostrate to procumbent upto 18cm long. **Leaves** sub-rhomboid-spathulate, **lamina** 5 -13 x 3 - 7.5mm, usually villous to pilose on both sides, rarely glabrescent above, margin entire to crenulate near apex. **Pedicel** upto 20mm long, hairy. **Calyx** tubular - globose, 5 -9mm long, glabrescent with few white or yellow brown villous hairs on outside; lobes narrowly triangular, villous on outside. **Corolla** tubular campanulate, yellow , throat densely villous; lobes obovate oblong. **Capsules** ovate.

Flower : January *Fruit:* September
Exsiccatus : Gnathang - Zeluk 3850 m, **SR Lepcha & AP. Das 32842**, dated 26.10.2004.
Status : Less Frequent.

Local Distribution : Kyongnosla, Changu, Tamzey , Gnathang 3000 – 4000 m.
General Distribution : EASTERN HIMALAYAS; INDIA (Sikkim), BHUTAN
Note : Endemic to E.Himalaya.

Order: Rubiales

RUBIACEAE A.L. Jussieu

Key to the Genera:

1. Annual or perennial herbs	2
+ Perennial tree or shrub	3
2. Stem erect	<i>Ophiorrhiza</i>
+ Prostrate, scrambling, scandant or climbing	4
3. Stamens at top of tube	5
+ Stamens inserted below throat of corolla	8
4. Leaves opposite	<i>Neanotis</i>
+ Leaves in whorls of whorls of 4-8	6
5. Flower scented	<i>Hymenodictyon</i>
+ Flower not scented	9
6. Calyx adnate to ovary	<i>Rubia</i>
+ Calyx tube absent above hypanthium	<i>Galium</i>
8. Corolla lobe incurved, fruit ellipsoid	<i>Neohynopogon</i>
+ Corolla lobe recurved or spreading, fruit globose or oblong	<i>Psychotria</i>
9. Corolla tube cylindric	<i>Mussaenda</i>
+ Corolla tube ± infundibular	<i>Lasianthus</i>

Hymenodictyon Wallich

Hymenodictyon flaccidum Wall. in Roxb., Fl. Indica ed. Carey, 2: 152. 1824; Hook. f. in Fl. Brit. India 3: 36. 1882; Hara in Fl. E. Him. 310. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 203. 1979; Springate & Wright in Grierson & Long Fl. Bhutan 2(2): 747. 1999.

Shrubs epiphytes much branched. Branches pendulous. **Leaves**; stipules broadly ovate, serrate, glandular; petioles to 10 cm long; **lamina** 7 – 16 x 5 – 11 cm, obovate-elliptic, entire, slightly acuminate, base narrowed into the petiole, pubescent in lower surface. **Flowers** in racemose to 27 cm, many flowered. **Bracts** ovate. **Flowers** subsessile, white. **Calyx** to 0.5cm. **Corolla** to 0.5cm, white; style exerted. **Capsules** reflexed; seeds usually winged.

Flower : June - August *Fruit*: November - February
Exsiccatus : Above Dohrok 2390 m, **SR Lepcha & AP. Das** 31284, dated 13.09.2008.
Status : Rare
Local Distribution : Dokrok, Phusrey upto 2390 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, W. CHINA.

Galium Linnaeus

Key to the species:

1. Leaves more than 5 in whorls 2
- + Leaves less than 5 in whorl *G. elegans*
2. Lamina elliptic-lanceolate; veins obscure beneath *G. Acutum*
- + Lamina linear or narrowly linear-obovate; veins strong beneath *G. asperifolium*

Galium acutum Edgew. in Trans. Linn. Soc. 20: 61.1846; Hook.f. in Fl. Brit. India 3: 208. 1882; Hara & Ohashi in Fl. E. Him. 308. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 200. 1979; Mill in Grierson & Long, Fl. Bhutan 2(2): 831. 1999. *G. himalayense* Koltzsch in Bot. Erg. Reis. Pr. Waldem. 88, t. 73. 1862.

Herbs, small decumbent, with short internodes. **Leaves** usually 5 - 6 in each whorl, sessile; **lamina** 0.5 - 1.5 x 0.4 - 0.4 cm, elliptic-lanceolate, entire and slightly recurved, acute, base narrow pointed, mid nerve strong beneath, veins obscure. **Peduncle** shorter than leaves. **Calyx** tube small. **Corolla** 4-lobed, segment 0.3 - 0.13 cm, lanceolate, acuminate. **Stamens** 4; filaments short; **stigma** 2, capitate. **Fruits** small, black.

Flower : July - October *Fruit*: September - December
Exsiccatae : Bhimbase 4300 m, *SR Lepcha & AP. Das 31476*, dated 28.07.2005;
Kyonglasha 3600 m, *SR Lepcha & AP. Das 32813*, dated 25.10.2004;
Nathang - Panglakha 2800 m, *SR Lepcha & AP. Das 32964*, dated
28.07.2005.

Status : Common
Local Distribution : Jorpokhari, Bhimbase, Rachela trijunction upto 4300 m.
General Distribution : HIMALAYAS; INDIA, (Kunawar - Sikkim) BHUTAN
Note : Endemic to Himalaya

Galium asperifolium Wall. ex Roxb., Fl. Indica 1: 391. 1820; Hara & Ohashi in Fl. E. Him 308. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 201. 1979; Mill in Grierson & Long, Fl. Bhutan 2(2): 834. 1999. *G. mollugo* L. *sensu* Hook.f. in Fl. Brit. India 3: 207. 1882. var *sikkimense* (Gandoger) Cufodontis in Oesterr. B. Zeits. 89: 241. 1940. *G. sikkimense* Gandoger in Bull. Soc. Fran. 66: 307. 1920.

Herbs, perennial, scandent. **Stem** shortly branched, filiform. **Leaves** in whorls of 4 - 6, sessile to minutely stalked; **lamina** 0.5 - 1.2 x 0.13 - 0.5 cm, linear or narrowly linear-obovate, entire, acute or obtuse, glabrous to slightly scabrid both surfaces, mid-vein strong beneath. Flower in axillary and terminal cymes, many flowered, divaricately branched. **Pedicels** recurved in fruits. **Corolla** white, minute and lobed with ovate segments. **Fruits** small, black coloured.

Flower : July - September *Fruit*: October - December
Exsiccatae : Nathang- Panglakha 2900 m, *SR Lepcha & AP. Das 30912*, dated
27.10.2004; Rachela 2950 m, *SR Lepcha & AP. Das 27735*, dated
30.09.2004.
Status : Common
Local Distribution : Rachela, Panglakha 1900 - 2700 m,
General Distribution : AFGHANISTAN, HIMALAYA (East to BHUTAN) INDIA (Khasia,),
SRI LANKA, N. BURMA, THAI, W.CHINA.

Galium elegans Wall. ex Roxb., Fl. IndiCa 1: 382. 1820; Hara & Ohashi in Fl. E. Him. 308. 1966; Mill in Grierson & Long, Fl. Bhutan 2(2): 828. 1999. *G. rotundifolium* L. sensu Fl. Brit. India 3: 204. 1881.

Herbs, small, trailing diffused. **Stem** usually unbranched, white pubescent. **Leaves** in whorl of 3 - 4, sessile or sub sessile to 0.13 cm; **lamina** 1 - 1.4 x 0.4 -1.5 cm, ovate to almost rounded, entire, acute or mucronate, base broad rounded or narrow, hirsute and scabrid both sides, basally 3 -nerved, convergent, pubescent. **Flower** in cymes slightly longer than leaves and with divaricate branching. **Corolla** white, small. **Fruits** adpressed hooked hairs.

Flower : June – August *Fruit*: July – December
Exsiccatae : Panglakha –Rachela 2780 m, **SR Lepcha & AP. Das 31093**, dated 02.10. 2004. Zeluk 3600 m, **SR Lepcha & AP. Das 27093**, dated 08.09.2004.
Status : Not common
Local Distribution : Middle Rachela, Panglakha 2100-2850 m.
General Distribution : HIMALAYA; INDIA, (Kashmir to Sikkim) Khasia, Manipur, THAI, N.BURMA, W.CHINA and FORMOSA.

Lasianthus Jack

Lasianthus sikkimensis Hook.f. in Fl. Brit. India 3: 180. 1882; Springgate in Grierson & Long, Fl. Bhutan 2(2): 808.1999.

Shrubs, evergreen, brownish tomentose. **Lamina** narrowly oblong rarely lanceolate, 13 – 23 x 2 – 4 cm, acuminate or caudate, acute at base, glabrous above, sparsely hairy below. Lateral veins 8 - 9 pairs. **Flowers** sessile or with upto 3 subsessile. Bracts subulate, villous. **Calyx** tube upto 1.5 mm, glabrous, ovate, acuminate. **Corolla** tube upto 4 mm. **Fruits** subglobose.

Flower : July – August
Exsiccatas : Phusrey 2250 m, **SR Lepcha & AP. Das 30298**, dated 07.10.2004.
Status : Abundant
Local Distribution : Middle Rachela , Phusrey upto 2500 m.
General Distribution : EASTERN HIMALAYAS; INDIA.
Note : Endemic to Eastern Himalaya

Mussaenda Linnaeus

Key to the species:

1. Leaf hairy on both surface; calyx linear-subulate; corolla lobes triangular ... *M. treutleri*
+ Leaf densely pilose in lower surface only ; calyx filiform; corolla lobes ovate ...*M. roxburghii*

Mussaenda macrophylla Wallich in Roxb., Fl. Ind. 2:228. 1824; Hook.f. in Fl. Brit. India 3:89. 1880; Hara *et al.* Enum. Fl. Pl. Nepal 2: 205. 1979; *M. hispida* D. Don, Prodr. Fl. Nepal 139. 1825.

Local Name: Dhobini Phul, Shitalu (Nep.).

Shrubs erect or sub-scandent upto 4 m tall. Branches straggling. **Leaves**; petioles upto 4cm long; lamina 6 - 16 x 2.5 - 9 cm, elliptic or oblong-lanceolate, entire, acuminate, base cuneate,

pubescent beneath, lateral nerves 7 - 10 pairs, subparallel. **Stipules** ovate, bifid, recurved. **Inflorescence** cymes trichotomous. **Bracts** foliaceous, laciniate. **Flowers** upto 4 cm long. **Calyx** 5-lobed, lobes foliaceous, petaloid, ovate;. **Corolla** tube to 3 cm long, orange yellow, hirsute, throat villous with 5 orbicular lobes; **stamens** 5; **stigmas** 2, linear. **Berries** globose.

Flower & Fruit : May – October.
Exsiccatus : Phurey below 1800 m, **SR Lepcha & AP. Das 30276**, dated 07.10.2004.
Status : Less Frequent.
Local Distribution : Dohrok, Phusrey, Beusa 1600 – 1800 m.
General Distribution : HIMALAYAS; INDIA (NEPAL-BHUTAN), ASSAM, MYANMAR, W. CHINA.
Note : Endemic to Eastern Himalaya

Mussaenda treutleri Stapf in Bot. Mag. 135:t. 8254. 1909; Hara in Fl. E. Him. 312. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 205. 1979; Wood in Grierson & Long, Fl. Bhutan 2(2): 783. 1999. *frondosa* L. var. *grandiflora* Hook. f., Fl. Brit.India 3: 90. 1882.

Local Name: Dhobini Kaath (Nep.).

Shrubs upto 3m tall. **Petioles** upto 35 cm long; **lamina** 9 - 16 x 5.5 - 9.5 cm, elliptic-ovate, entire, acute, base cuneate, hairy on both sides. **Stipules** bifid. **Flowers** in terminal corymbs oftenly at the axils of uppermost leaf, many flowered. **Calyx** teeth 0.45 – 2.5 cm, herbaceous, linear-subulate, herbaceous, enlarged segment 10 - 13 x 5 – 7 cm, bright white. **Corolla** upto 4 cm, orange yellow, pubescent within, lobes triangular. **Berries** globose, glabrescent.

Flower : May – July
Exsiccatus : Beusa 1960 m, **SR Lepcha & AP. Das 31283**, dated 13.09.2008.
Status : Frequent.
Local Distribution : Beusa, Hangey, Dohrok 1200 – 2300 m.
General Distribution : HIMALAYAS; INDIA,(Kumaon – BHUTAN) and Khasia.
Note : Endemic to Eastern Himalaya.

Neanotis W.H. Lewis

Key to the species :

1. Leaf puberulant, paler beneath; Corolla white *N. gracilis*
+ Leaf both surfaces pubescent; Corolla bluish-purple to white *N. wightiana*

Neanotis gracilis (Hook.f.) W.H. Lewis in Ann. Miss. Bot. Gard. 53: 38. 1966; Hara & Ohashi in Fl. E. Him. 313. 1966; Hara *et al.* Enum. Fl. Pl. Nepal Enum. Fl. Pl. Nepal 2: 205. 1979; Mill in Grierson & Long, Fl. Bhutan 2(2): 768. 1991. *Hedyotis wightiana* Wall. *ex* Wight *et* Arnt., Prodr. Fl.India Or. 410. 1834.. *Anotis wightiana* Wall. *ex* Hook. f., Fl. Brit. India 3 : 65. 1882.

Herbs, perennial, diffused. **Branches** prostrate, rooting at nodes. **Leaves** opposite, lamina 1.5 – 3.5 x 1.5 – 2.5 cm, lanceolate or ovate lanceolate, base cuneate, acuminate, membranous, thinly hairy yellow puberulant, paler beneath. **Flower** upto 7.5cm long, axillary and terminal, dichotomously forked. **Heads** 0.45 - 0.50cm across. **Flowers** clustered. **Calyx** 0.30 - 0.5cm, lobes lanceolate. **Corolla** slightly longer than sepals, tube broader, with obtuse lobes, white, glabrous. **Capsule** laterally compressed.

Flower : July – December *fruit:* October – January
Exsiccatus : Ramitey bara 2480m, **SR Lepcha & AP. Das 31026**, dated 13.09.2008.
Status : Abundant

Local Distribution : Middle Rachela, 1600 – 2250 m.
General Distribution : E.HIMALAYA ; INDIA(Sikkim , Khasia), NEPAL.
Note : Endemic to Eastern Himalaya.

Neanotis wightiana (Wallich ex Wight et Arnt.) W. H. Lewis in Ann. Miss. Bot. Gard. 53:40. 1966; Hara & Ohashi in Fl. E. Him. 1:313. 1966; Hara et al. Enum. Fl. Pl. Nepal 2:205. 1979;
Hedyotis wightiana Wallich ex Wight et Arnt., Prodr. Fl. Ind. Or. 410. 1834.
Anotis wightiana Wallich ex Hook. f., Fl. Brit. India 3: 65. 1880.

Herbs perennial diffused, upto 45 cm tall, tomentose. **Branches** prostrate or decumbent. **Leaves** sessile to subsessile; **lamina** 3.5 - 7 x 2 – 2.5 cm, ovate, entire, acute, both surfaces pubescent. Stipules deeply toothed. **Cymes** terminal and axillary, capitate, involucrate. **Flower** heads to 1.5 cm across, capitate, few flowered. **Flowers** minute, white. **Calyx** 0.3 - 0.5 cm, lobes subulate. **Corolla** longer than sepals, 0.2 - 0.4cm, bluish-purple to white. **Capsule** orbicular, seeds rugose.

Flower : May – September *fruit:* August - October
Exsiccatus : Panglakha ridge, 2440m, **SR Lepcha & AP, Das 03055**, dated 15. 07. 2005.
Status : Abundant
Local Distribution : Panglakha, Middle Rachela , 1600 – 2250 m.
General Distribution : HIMALAYAS; (NEPAL- BHUTAN) INDIA Sikkim, MYANMAR.

Neohymenopogon Bennet

Neohymenopogon parasiticus (Wallich) Benn. in IF 107: 436. 1981; Yamazaki in Fl. E. Him. 310. 1966; Long in Grierson & Long, Fl. Bhutan 2(2): 746. 1999; *Hymenopogon parasiticus* Wall. in Roxb., Fl. Indica 2: 157. 1824; Hook.f. in Fl. Brit. India 3: 34. 1882; Hara et al., Enum. Fl. Pl. Nepal 2: 203. 1979

Local Name: Lekh Biri (Nep.).

Shrubs, deciduous, epiphytic. Stipules persistent. **Leaf** ; stipules persistent; **lamina** 5.5 - 25 x 2.5 -13 cm, oblanceolate, entire, ciliate, acute-acuminate, cuneate, both sides thinly hairy, lateral nerves 16 - 17 pairs, pubescent. **Bracts** narrow-oblanceolate, stalked, white, pinnately veined, petaloid, thinly pubescent. **Pedicel** long, short-hairy. **Flowers** in trichotomous cymes. **Calyx-**lobes upto 1.3 cm, linear. **Corolla** tube long, slender, lobes 5, spreading, hairy. **Capsules** 1.5 - 1.5cm, turbinate-cylindrical, with persistent sepals; seeds numerous.

Flower : June – August *Fruit:* October – January
Exsiccatae : Panglakha 2600 m, **SR Lepcha & AP. Das 31151**, dated 13.07. 2004.
 Rachela 2700 m, **SR Lepcha & AP. Das 27778** dated 30.09.2004.
Status : Less common
Local Distribution : Middle Rachela , Panglakha 2100-2800 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, CHINA, MYANMAR

Ophiorrhiza Linnaeus

Key to the species:

- 1. Leaf lamina ovate-lanceolate; Corolla creamy-white *O. rugosa*
- + Leaf lamina ovate- elliptic; Corolla pink – yellow 2

Psychotria Linnaeus

Psychotria erratica Hook.f., Fl. Br. Ind. 3: 168. 1880; Yamazaki in Fl. E. Him. 315.1966; Wood in Grierson & Long, Fl. Bhutan 2(2): 808. 1999. *Psychotria erratica* var. *pedunculata* Hook.f., Fl. Brit. India 3: 169. 1882.

Shrubs, 1- 2 m tall. Stem usually glabrous. **Leaves** opposite pair, oblong- lanceolate, or narrowly oblong – elliptic, **lamina** 5 – 15 x 2 – 5 cm, shortly acuminate, base attenuate, entire, glabrous on lower surface, scurvy on veins; stipules narrowly ovate. **Flowers** in terminal, subsessile, few flowered puberulous. Bracteole scale link. **Calyx** teeth triangular, acute. **Corolla** greenish white, lobes ovate. **Fruits** oblong.

Flower : May – July
Exsiccatus : Dohrok 2320 m, **SR Lepcha & AP. Das** 30287, dated 07.10.2004.
Status : Abundant
Local Distribution : Middle Rachele, 1500 – 2200 m.
General Distribution : E.HIMALAYA; INDIA (Assam, Meghalaya), NEPAL, BHUTAN.
Note : Endemic to Himalaya.

Rubia Linnaeus

Key to the species

1. Plant reddish tinged through out, Corolla tips incurved *R. manjith*
+ Plant greenish through out, Corolla tips subulate *R. wallichianum*

Rubia manjith Roxb. ex Flem. in Asia Res. 11: 177. 1810; Hara & Ohashi in Fl. E. Him. 315. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 207. 1979; Long in Grierson & Long, Fl. Bhutan 2(2): 821. 1991. *R. cordifolia* L. *sensu* Hook. f., Fl. Brit. India 3: 202. 1882, p.p.

Local Name: *Vyem* (Lep.) *Majito* (Nep.).

Climber, perennial, herbaceous. **Stem** quadrangular, slender. **Leaves** usually 4 in a whorl (includes leafy 2-stipules); petioles unequal, 0.8 - 6.5 cm, lower spiny; lamina variable, ovate lamina 2.5 - 6.5 x 1.5 - 2.5 cm, entire, long-pointed, base cordate, scabrid, rusty when young, basal nerves 3 - 5, convergent. **Flowers** in axillary panicles. **Bracts** small, leafy. **Pedicel**, 0.5 - 0.30cm. **Flowers** head 0.30 - 0.5cm in diam., 5-merous. **Corolla** rust-coloured, lobes lanceolate, tips incurved. **Berries** globular, black purple.

Flower : July - September *Fruit*: September - March
Exsiccatae : Phusrey 2150 m, **SR Lepcha & AP. Das** 31007, dated 13.09.2008;
Nathang 3890 m, **SR Lepcha & AP. Das** 30896, dated
29.07.2005; Hangey 1960 m, **SR Lepcha & AP. Das** 20262, dated
28.10.2004; Dohrok 2300 m, **SR Lepcha & AP. Das** 30215, dated
06.10. 2004.
Status : Abundant.
Local Distribution : Phusrey, Nathang, Rachele trijunction 2000 – 3900 m.
General Distribution : HIMALAYAS; INDIA (Simla, Khasia) NEPAL, BHUTAN,

- Note* : 1. Endemic to Himalaya.
2. The red dyes obtained from fruits & root is used in colouring the dresses (Lepchas)

Rubia wallichianum Roxburge ex Flem. in Asia Res. 11: 177. 1810; Hara & Ohashi in Fl. E. Him. 315. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 207. 1979; Long in Grierson & Long Fl. Bhutan 2(2): 824. 1999. *R. cordifolia* L. *sensu* Hk. f., Fl. Brit. India 3: 202. 1882, p.p.

Local Name: Vyem (Lep.), Majito (Nep.).

Climber, perennial, green herbaceous. **Stem** prickly with hook prickles. **Leaves** lanceolate to ovate, variable in size; lower leaves cordate at base. **Flowers** in axillary panicles, large, rarely small, yellow or reddish. **Corolla** lobes upto 3 mm, subulate apex.

Flower : April – September

Exsiccata : Sokpa pokhri 2000m, *SR Lepcha & AP. Das* 27775, dated 30.09.2004.

Status : Abundant.

Local Distribution : Beusa, Hangey, 1600 – 2200 m.

General Distribution : HIMALAYAS; INDIA (Simla, Khasia) NEPAL, BHUTAN,

Note : Endemic to Eastern Himalaya.

Order: Dipsacales

CAPRIFOLIACEAE A. Jussieu

Key to the Genera:

- 1. Flowers in umbels- corymbs or panicles *Viburnum*
- + Flowers in spikes 2
- 2. Flowers axillary or terminal; regulars; seeds numerous. *Leycesteria*
- + Flowers axillary; regular or irregulars; seeds 2 *Lonicera*

Leycesteria Wallich

Key to the species :

- 1. Stem hollow 2
- + Stem solid *L. stipulata*
- 2. Calyx unequal; corolla white – pink *L. formosa*
- + Calyx equal; corolla greenish white – cream, pale yellow 3
- 3. Stipules present; calyx lobes unequal *L. glaucophylla*
- + Stipules absent; calyx lobes equal *L. gracilis*

Leycesteria formosa Wall. in Roxb., Fl. India ed. Carey 2: 181. 1824; C.B. Clarke in Fl. Brit. India 3: 16. 1880; Hara & Ohashi in Fl. E. Him. 1: 317. 1966; 2: 124. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 2: 195. 1979; King in Grierson & Long. Fl. Bhutan 2(3): 1355. 2001

Local Name: Dhongray (Nep.)

Shrub, small upto 3 m. **Stems** hollow. **Leaves** opposite, distichous; petioles 0.5 – 2.5 cm, broadly ovate-lanceolate, lamina 2.5 - 8 x 1 - 4cm, entire to dentate-serrate, acute-acuminate, base rounded, glabrous, whitish beneath. **Spikes** small, pubescent; **bracts** cordate, leafy, purplish

brown. **Calyx** 5-lobed, brown, persistent. **Corolla** funnel-shaped, purplish-yellow; **stamens** 5; ovary brown; style slender, glabrous; ovules many. **Berries** subglobose red.

Flower : May – June. *Fruit*: September. - November.
Exsiccatu : Sano-Ramitey 2230 m, *SR Lepcha & AP. Das 31143*, dated 04.09.2004, Thamey dara 2600 m, *SR Lepcha & AP. Das 31143*, dated 04.09.2004.

Status : Common.

Local Distribution : Kyonglasha, Ramitey, Rachela below, 1900 - 2400 m.

General Distribution : HIMALAYAS; INDIA (Kashmir, Meghalaya, Sikkim, Khasia Hills) BHUTAN S.E. TIBET, N. MYANMAR, CHINA

Note : Endemic to Himalaya

Leycesteria glaucophylla (Hook.f. & Thoms.) Clarke in Fl. Brit. India 3:16: 1880 p.p.; Hara in Fl. E. Him. 317. 1966; 2: 124. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 2: 195. 1979; King in Grierson & Long. Fl. Bhutan 2(3): 1355. 2001. *Leycesteria glaucophylla* Hook. f. & Thoms. in Journ. Linn. Soc. Bot. 2: 165. 1858. *Leycesteria belliana* W.W. Smith in Tr. & Proc. Bot. Soc. Edinb. 24: 173, t. 13. 1911.

Shrub with flexuous branches. **Stem** hollow. **Leaves**; petiole to 0.5cm long; lanceolate; stipules semicircular, **lamina** 4.5 - 13 x 1.5 - 4 cm, entire to sinuate toothed, acuminate, base almost rounded, glabrous, whitish below, veins more prominent below, mid-vein sparsely hairy beneath. **Spike** axillary, drooping few flowered, 3 cm long; **bracts** shorter, ovate-subulate, brown. **Flowers** 1cm long; pedicellate. **Calyx** unequally 5-lobed, 0.3 cm long; persistent. **Corolla** infundibuliform extending upto 1.4 cm, limb 5-merous, white; **stamens** 5, inserted on the corolla-throat; ovary brown; style slender; ovules many, arranged in 2 rows in each chamber. **Berry** to 12, dark red; seeds numerous, ellipsoidal.

Flower : September – December *Fruit*: February – June
Exsiccatae : Panglakha 3040 m, *SR Lepcha & AP. Das 27793*, Dated 30.09.2004.
; Padamchen – Panglakha 2500 m, *SR Lepcha & AP. Das 32878*, dated 27.10.2004.

Status : Common.

Local Distribution : Middle Rachela, Padamchen, Panglakha, 2490 – 3040 m.

General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR, W. CHINA.

Note : Endemic to Eastern Himalaya

Leycesteria gracilis (Kurz)Airy Shaw in Hook., Icon. Pl. Ser. 5. 2:t. 3166. 1932; Hara in Fl. E. Him. 1: 317. 1966; 2:124. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 2: 195. 1979; King in Grierson & Long. Fl. Bhutan 2(3): 1355. 2001. *Lonicera gracilis* Kurz in Journ. Asia. Soc. Beng. 39 (2): 77. 1870. *Leycesteria glaucophylla* Hook. f. *sensu* Fl. Brit. India 3: 16. 1880, p.p.

Local Name: Dhongray (Nep.).

Shrub with flexuous branches. **Stem** hollow. **Leaves** opposite; petiole upto 0.5 cm long; lamina 4 -13 x 1.5 - 4 cm, lanceolate, entire to sinuate toothed, acuminate, base rounded, glabrous, whitish below, veins distinct below, mid-vein hairy below. **Spike** axillary, drooping few flowered; bracts shorter, ovate-subulate, brown. **Flowers** 1.3 cm long. **Calyx** unequally 5-lobed, to 0.4 cm long.

Corolla infundibuliform, limb 5-merous, white; **stamens** 5, inserted on the corolla-throat; **ovary** brown; **styles** slender; ovules many, arranged in 2 rows per chamber. **Berries** 6-12, dark red; seeds, ellipsoidal and shining.

Flower : September - December *Fruit*: February - June
Exsiccatus : Rachela - Jorepokhri 2400 - 3000, **SR Lepcha & AP Das** 20297, dated 17.07. 2005.
Status : Common.
Local Distribution : Middle Rachela, trijunction 2490 - 3040 m.
General Distribution : E.IMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR, W. CHINA.

Leycesteria stipulata (Hook.f. et Thoms.) Fritsch in Engl. Pfl.-fam. 4. 4: 169. 1891; Hara in Fl. E. Him. 1: 318. 1966; 2: 125. 1971; King in Grierson & Long, Fl. Bhutan 2(3): 1355. 2001.
Lonicera stipulata Hook. f. & Thoms. in Journ. Lin. Soc. 2: 165. 1858. *Pentaptyxis stipulata* (Hook. f. & Thoms.) Hook. f., Fl. Brit. India 3: 17. 1880.

Shrubs erect upto 3 cm tall. **Branch** flexuous or semiscandant with solid stem. **Leaves** opposite, distichous; stipules leafy, orbicular; petiole to 0.2 cm; **lamina** 3 - 8 x 1 - 4 cm, ovate-lanceolate, coriaceous, sinuate-toothed, caudate-acuminate, base rounded, coriaceous, glossy and glabrous above, densely wooly below, veins deeply impressed below; peduncle upto 1 cm long, wooly; bracts and bracteoles green, very stout. **Flowers** clustered in axillary spikes, wooly, white. **Calyx** 5-cleft, hairy, persistent. **Petals** upto 2.2 cm, funnel shaped, limb 5-lobed, white, hairy; **stamens** 5, ovary 5 celled; style slender; stigma capitate. **Berries** with seeds many, ellipsoid.

Flower : April - May *Fruit*: June - September
Exsiccatus : Rachela below, 2700 m, **SR Lepcha & AP. Das** 20298, dated 17.07.2005.
Status : Very Common.
Local Distribution : Rachila below & trijunction 2100 - 2700 m.
General Distribution : E.IMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.

Lonicera Linnaeus

Key to the species:

- 1. Branchlets pith hollow; leaf acute - mucronate 2
- + Branchlets pith solid; leaf acuminate *L. angustifolia*
- 2. Corolla creamy white; berries violet- black *L. acuminata*
- + Corolla yellow ; berries black *L. macrantha*

Lonicera acuminata Wall. ex Roxb., Fl. Ind. ed. Carey, 2: 176. 1824; Hook. f., in Fl. Brit. India 3: 10. 1880; Hara & Ohashi in Fl. E. Him 1: 318.1966; Hara et al. Enum. Fl. Pl. Nepal 2: 195. 1979; Meyer in Grierson & Long. Fl. Bhutan 2(3): 1353. 2001

Shrub climbing. Stem golden yellow, densely pilose. **Branchlet** pith hollow. **Leaves**; petiole short upto 0.6cm, yellowish, hairy; cordate-oblong, **lamina** 1.5 - 6 x 1- 2.5 cm, entire, acuminate, coriaceous, brown and pilose on both sides, mid-rib thick and densely pilose, yellowish brown. **Inflorescence** terminal and axillary, few flowered; peduncles short ca 1 cm long. **Flowers** to 1.5cm long. **Calyx-tube** to 5 cm long, ovoid, glabrate, persistent, limbs 5, short, hairy. **Corolla** yellow, tubular, lobes hirsute in bud; **stamens** 5, inserted. **Berries** globose, violet-black.

Flower : June - July *Fruit*: August - December.
Exsiccatus : Panglakha 3020m, **SR Lepcha & AP. Das** 27771, dated 30.09.2004.
Status : Common
Local Distribution : Rachela Middle, Kyongnosla, 1900 - 2900 m.
General Distribution : E. HIMALAYAS; NEPAL, BHUTAN, MYANMAR, MALAYSIA, S. CHINA.

Lonicera angustifolia Hayata, Ic. Pl. Formos. 2:75. 1912; C.B. Clarke in Fl. Brit. India 3: 13. 1880; Meyer in Grierson & Long, Fl. Bhutan 2(3): 1347 .2001.

Shrub up to 5 m tall. **Branchlets** brown to black, pith solid. **Leaves** oblong to lanceolate; **petioles** upto 4.6cm, glabrous, leaving persistent leaf scar, lamina 1.3 - 5 x 0.4 -2 cm. acute to mucronulate, base attenuate, upper surface glabrous, lower surface pilose or rarely glabrous, silvery, rarely sparsely glandular ciliate; peduncle 1- 2.8 cm; **bracts** linear to lanceolate, 3.5 - 6.5 mm.; bracteolate usually connate. **Flowers** actinomorphic. **Corolla** white, greenish, pale pink, tube 7 -11 mm, glabrous; stamens usually shorter than tube. **Fruits** red, connate.

Flower : May - August
Exsiccatus : Rachela below, 2700 m, **SR Lepcha & AP. Das** 31156, dated 13. 09.2008
Status : Common
Local Distribution : 2200 - 3960 m Rachela, Panglakha upto 2950 m.
General Distribution : HIMALAYAS; INDIA (Kashmir - BHUTAN).
Note : Endemic to Himalaya

Lonicera macranthus (D. Don.) Spreng., Syst. Veg. 4(2): 82. 1827; Hara in Fl. E. Him. 318. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 196: 1979; Meyer in Grierson & Long Fl. Bhutan 2(3): 1354 .2001. *Lonicera macranthum* (D. Don) DC., Prodr. 4: 333. 1880; C.B. Clarke in Fl. Brit. India 3: 10. 1880. *Caprifolium macranthum* D. Don, Prodr. Fl. Nep. 140. 1825.

Shrub scandent, up to 5 m tall. Branches pendulous; **branchlet**, pith hollow. **Leaves** oblong to oblong-lanceolate; petioles upto 5.5 mm, villous hairs; **lamina** 4 - 8 x 2.8 - 4 cm. acuminate, base subcordate to truncate, glabrous in upper surface, pilose hairs on midrib; peduncle to 13 mm, villous, bract linear, bractlets free, ovate, ciliate. **Flowers** zygomorphic. **Calyx** lobes to 4.5 mm, ciliate. **Corolla** creamy white, tube glandular hairy, to 6.5 mm. **Fruits** black.

Flower : June - July
Exsiccata : Rachela 3000 m, **SR Lepcha & AP. Das** 31193, dated 13.09.2008.
Status : Common
Local Distribution : Rachila Middle, Panglakha, Beusa 1700 - 3000 m.
General Distribution : HIMALAYAS; NEPAL, INDIA (Sikkim, Darjeeling, Assam) BURMA BHUTAN,, MALAYSIA, CHINA.

Viburnum Linnaeus

Key to the species:

1. Drupe ellipsoid 2
 + Drupe oblong *V. mullaha*

2. Leaves base obtuse; corolla white to creamy; drupe red *V. erubescens*
 + Leaves base cuneate; corolla white to rose-pink; drupe black *V. nervosum*

Viburnum erubescens Wallich ex DC., Prodr. 4:329. 1830; C. B. Clarke in Fl. Brit. India 3: 7. 1882; Hara & Ohashi in Fl. E. Him. 1:230. 1966; Hara et al. Enum. Fl. Pl. Nepal 2: 198. 1979. var. *erubescens*; King in Grierson & Long. Fl. Bhutan 2(3): 1356. 2001.

Local Name: Asaray (Nep.).

Shrubs deciduous upto 4 m tall. **Leaves** opposite; petioles upto 0.9 cm; **lamina** 3 - 15 x 1.5 - 7 cm, ovate-elliptic, toothed, acute, base obtuse, lower surface fading, upper greenish, nerves beneath pilose. **Flowers** cymes paniced; panicles long, drooping, terminal and on short leafy lateral branchlets. Flowers 1.2 cm long. **Calyx** teeth short, oblong, pubescent. **Corolla** tube slender with rounded spreading lobes upto 0.8 cm, white to creamy, glabrous; stamens 5, inserted within the corolla tube; anthers dark purple; ovary 2 - 3 celled; ovules 1 in each chamber; style short. **Drupe** ellipsoid, red, crowned.

Flower : April - May *Fruit*: June - September
Exsiccatus : Ramitey dara 2395m, *SR Lepcha & AP. Das* 31142, dated 03.10.2004.

Status : Common.

Local Distribution : Ramitey, Dohrok, Premlakha 2000 - 2600 m.

General Distribution : HIMALAYAS INDIA, (Kumaon, Sikkim, Darjeeling, Arunachal Pradesh), MEGHALAYA, MYANMAR, S. TIBET, W. & C. CHINA.

Note : Fruits edible.

Viburnum nervosum D. Don, Prodr. Fl. Nepal 141. 1825; Hara in Fl. E. Him. 3: 107. 1975; Hara et al. Enum. Fl. Pl. Nepal 2: 199. 1975; King in Grierson & Long. Fl. Bhutan 2(3): 1358. 2001.

Viburnum cordifolium Wall. [Cat. 15, n. 462. 1829, nom. nud.] ex DC., Prodr. 4: 327. 1830.

Viburnum grandiflorum Wall. ex DC., Prodr. 4:329. 1830. Hara in Ham & Williams, Enum. Fl. Pl. Nep. 2: 198. 1979.

Shrubs, deciduous, upto 3 m tall. Branches with stiff winter buds protected by scales. **Leaves** elliptic, oblong, lamina 4.5 - 10 x 2.2 - 5.5cm, acute, sharply toothed, cuneate at the base, slightly hairy on the nerves. lateral nerves 7 - 10 pairs, prominent, closely parallel, undivided. **Flowers** in terminal sessile corymbs. **Bracts** hairy. **Calyx** tube glabrous; lobes short, ciliate. **Corolla** long-tubular, 12 - 14 mm lobes rounded, spreading, white to rose-pink. **Stamens** in two series, 2 attached near the mouth of corolla tube, 3 lower down, anthers included; **stigma** subsessile, 3 -lobed. **Drupe** ellipsoid, compressed, blackish; seed grooved on one side.

Flower : April - September
Exsiccatus : Dohrok 2200m, *SR Lepcha & AP. Das* 31049, dated 02.04.2004

Status : Common

Local Distribution : Dohrok, Phusrey, Subaney, 2600 - 3500 m.

General Distribution : HIMALAYA; INDIA (Kumaun, Sikkim, Assam) BHUTAN, TIBET, N. BURMA, W. CHINA.

Viburnum mullaha Buch.-Ham. ex D. Don., Prodr. Fl. Nepal 141. 1825; Hara in Fl. E. Him. 3: 320: 1966; Hara et al. Enum. Fl. Pl. Nepal 2: 198. 1979; King in Grierson & Long. Fl. Bhutan 2(3); 1357. 2001. *Viburnum stellulatum* var. *glabrescens* C.B. Clarke in Fl. Brit. India 3: 4. 1882.

Shrub upto 3 m tall. Branches with stellate pubescence. **Leaves** ovate or ovate-lanceolate, long acuminate, serrate, glabrous above, pubescent on the nerves beneath, membranous, lateral nerves

5 - 6 pairs, conspicuous, narrowly sharpen as teeth, undivided, only the lowest pair. **Flowers** small c. 3.5mm long, in terminal with long-stalked. **Inflorescence** umbellate corymbs. **Bracts** 3 - 4 mm long, linear, pubescent, caducous. **Calyx** pubescent. **Corolla** rotate, tube shorter than lobes, c. 1.5mm long, lobes spreading, pubescent. **Drupe** oblong, slightly compressed; 2 seeded, grooved.

Flower & Fruit : June – July
Exsiccata : Sano-Ramitey 2200 m, **SR Lepcha & AP. Das 31152**, dated 02.10.2007.
Status : Common
Local Distribution : Rachel, Panglakha, Kyongnosla, 2500 – 4000m.
General Distribution : HIMALAYA; INDIA (Punjab - Sikkim), BHUTAN, NEPAL.
Note : Endemic to Himalaya

VALERIANACEAE Batsch.

Key to the Genera

1. Plant more than 40 cm tall ; Leaves both cauline & radical; Petals white *Valeriana*
+ Plant upto 30 cm tall; Leaves basal ; Corolla tube pink – purple *Nardostachys*.

Nardostachys DC.

Nardostachys grandiflora (D.Don) DC., Prodr. 4: 624. 1830; Hara in Fl. E. Him. 3: 107. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 2: 209. 1979; Clement in Grierson & Long, Fl. Bhutan 2(3): 1364. 2001. *Valeriana jatamansi auct. non Jones*, D. Don in Lamb., 111. Gen. Cinchona 180, t. 1821. *Fedia grandiflora* Wall. Cat. 32, n. 1187, *nom. nud.* *Nardostyachys jatamansi* DC., Prodr. 4: 624. 1830. p.p. excl. basionym et syn; c. *Nardostachys gracilis* Kitam. in Acta. Phyt. Geobot. 15: 134. 1954; Grierson & Long, Fl. Bhutan 2(3): 1366. 2001

Herbs, perennial, rhizomatous, glabrous upto 30 cm tall. **Rhizomes** to 13 cm long, aromatic, covered with leaf remains at base. **Leaves** simple, rosette at base; basal leaves linear to spatulate; **lamina** 2.5 – 25 x 2.6 – 2.3 cm, glabrous or pilose on mid veins, margin entire; Cauline leaves ovate – ovate or oblong, margin entire or occasionally serrulate. **Flowers** in bracteate capitates heads; flowering stems erect, rarely branched above. Flowers head to 2.5 cm in diam. **Calyx** 5 lobed, 2 – 3.1 mm. **Corolla** 5-lobed unequal at base, pink-purple, tubular campanulate, lobes to 4.5 mm, obtuse; stamens 4; ovary tri-locular **Fruits** obovate, 1.5 x 2.8 mm.

Flower : June – September
Exsiccatae : Chhangu 4000 m, **SR Lepcha & AP. Das 047**, dated 13.10.2003; Baba Mandir 4000 m, **SR Lepcha & AP. Das 122**, dated 14.10.2003.,
Status : Rare & Threatened
Local Distribution : Baba Mandir, Changu, 3600 - 4500m.
General Distribution : Himalaya INDIA (Sikkim), BHUTAN
Note : 1. Endemic to Himalaya.
2. Roots used as medicinel by local people

Valeriana Linnaeus

Valeriana hardwickii Wallich in Roxb., Fl. India 1: 166. 1820; Hara & Ohashi, Fl. E. Him. 320. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 2: 209. 1979; Clement in Grierson & Long Fl. Bhutan 2(3): 1366. 2001. *Valeriana elata* D. Don, Prodr. Fl. Nepal 159. 1825. *Valeriana repens* Wallich, Cat. 14, n. 434. 1829. *nom. nud.* *Valeriana acuminata* Royle, Ill. Bot. Him. 241. 1835. *nom. nud.*

Herbs perennial, rhizomatous upto 70 cm tall. Rhizome woody to 5 mm. **Leaves** petiolules hairy, lateral ones to 0.4cm, terminal ones to 0.4-5cm; radical leaves with long petioles, pinnate with upto 5.5cm long petioles pubescent; cauline leaves few, opposite, upper ovate with pairs; leaflets 3, lateral ones smaller, terminal one larger (1.4 – 3.5 x 0.9 -1.9cm), ovate-lanceolate, obscure-serrate, acuminate, base cuneate. **Flowers** 0.3 - 0.40 cm long; bracts linear, glabrous; bracteoles short. Pedicels 0.3cm long. Flowering stems 5 – 39 cm long. **Calyx** to 0.4 mm, sepal pappose. **Petals** white. **Fruits** dorsally ribbed and hairy; fruiting pedicels somewhat elongated.

Flower : June - October. *Fruit*: August - December.
Exsiccatae : Baba Mandir, 4000 m, *SR Lepcha & AP. Das 31016*, dated 13.10.2006
Kupup 4300 m, *SR Lepcha & AP. Das 31472*, dated 27.07.2005
Status : Rare
Local Distribution : Jorpokhari, Hattidara, Rachel, 1900 – 3050 m
General Distribution : HIMALAYAS; INDIA (Kashmir-BHUTAN), Meghalaya, Myanmar, East to CHINA, JAVA
Note: Roots medicinal.

DIPSACEACEAE Juss.

Key to the genera:

1. Corolla 5 lobed ; stigma capitate *Triplostegia*
+ Corolla 4 lobed; stigma elliptic – oblique *Dipsacus*

Dipsacus Linnaeus

Key to the species:

1. Involucral bracts lanceolate; corolla tubular..... *D. inermis*
+ Involucral bracts ovate oblong; corolla tubular but expanded into campanulate... *D. atratus*

Dipsacus atratus Hook.f. & Thoms. ex Clarke in Hook.f., Fl. Brit.India.3: 218. 1881; Yamazaki in Fl. E.Him. 1: 321. 1996; Clement in Grierson & Long.Fl. Bhutan 2(3): 1370. 2001

Herbs, perennial upto 3 m tall. **Leaves** mostly basal and pinatifid; lamina 8 - 16cm x 2.5 - 6cm, middle and upper cauline leaves entire, sparsely pubescent. **Flowering** heads few, subglobose **Involucral** bracts ovate oblong to 4 – 11 x 3.5 – 6.3 mm; bracteoles lanceolate to 8.5 mm; involucl, toothed at apex. **Calyx** obtusely lobed, upto 1.3 mm. **Corolla** usually tubular in lower portion but slightly expanded into campanulate, lobes unequal, blue black – tinge purple.

Flower & Fruit : August – September
Exsiccatus : Bhimbase 4100 m, *SR Lepcha & AP. Das 3044*, dated 12. 10. 2004.
Status : Common
Local Distribution : Changu, kyongnosla , 3500 - 3900m.
General Distribution : INDIA, (Sikkim), BHUTAN, CHINA,

Dipsacus inermis Wall. in Roxb., Fl. India 1: 367. 1870. [Wall., Cat, 19, n. 427. 1829. *nom.nud.*]; Hara *et al.* Enum. Fl. Pl. Nepal 2: 210 1979. *Dipsacus strictus* D. Don, Prodr. F. Nepal 160. 1825., *nom. illegit.* C.B. Clarke in Hook.f., Fl. Brit. India 3: 217. 1881. var. *mitis* (D. Don) Y. Nasir in Fl. W. Pakistan 94: 10. 1975; Yamazaki in Fl. E. Him. (1): 321. 1966; Clement in Grierson & Long Fl. Bhutan 2(3): 1370. 2001. *Dipsacus inermis* Wall. var. b. Wall. in Roxb., Fl. India 1: 367. 1820. *Dipsacus mitis* D. Don, Prodr. Fl. Nepal 161. 1825. *Cephalaria cachmerica* Decne. in Jocquem., *very* 4 (Bot.) 86; t. 94. 1835.

Herbs, perennial upto 3 m tall. **Stem** glabrescent or with prickles. **Leaves** lamina 8 - 16cm x 2.5 - 6cm, middle and upper cauline leaves usually entire, sparsely pubescent. **Flowering** heads few, sub-globose 2.2 - 4.3 cm broad. **Involucral** bracts lanceolate, leafy than the receptacular ones. Receptacular bracts linear. **Flowers** cream-white, all alike, larger than the receptacular bracts.

Calyx substipitate, 4-lobed. **Corolla** tube lobes obtuse..

Flower : August. *Fruit*: September
Exsiccatus : Nathang 4100 m, **SR Lepcha & AP Das** 30849, dated 29.04.2005.
Status : Common
Local Distribution : Changu, Kyongnosla , 1400-4100m.
General Distribution : INDIA, CHINA, BHUTAN, AFGHANISTAN, MYANMAR, TIBET

Triplostegia Wallich *ex* DC.

Triplostegia glandulifera Wallich [Cat. 14, n. 436. 1836, *nom. nud.*] *ex* DC., Prodr. 4: 642. 1830; Clarke in Hook.f., Fl. Brit. India 3: 215. 1881; Yamazaki in Fl. E. Him. 321. 1966; Hara in Fl. E. Him. 3: 108. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 2: 210-211. 1979; Clement in Grierson & Long, Fl. Bhutan 2(3): 1369. 200. *Triplostegia glandulosa* DC., Mem. Fam. Valerian. 20, t. 5. 1832.

Herbs, perennial, erect. **Leaves** mostly grouped in basal, oblong to obovate, lamina 1.7 - 9.2 x 0.9 x 3.5 cm, occasionally pinnatifid, with 1 - 2 pairs leaves, margin serrate, pilose on main veins only beneath, base attenuate- petiolate. **Flowers** few on branched heads; bracts inclosing base of flowers, linear, apex mucronate, hook in fruit. **Corolla** obconical, to 3.2 mm, white, lobes tips tinged to purple, tube to 2.2 mm.

Flower & Fruit : August - September.
Exsiccata : Nathang 4000 m, **SR Lepcha & AP. Das** 1004, dated 10.10.2004
Status : Common
Local Distribution : Changu, Kyongnosla , 2000 - 3900 m.
General Distribution : HIMALAYA; INDIA (Gharwal - BHUTAN), W. & C. CHINA, and Formosa

Order: Asterales

ASTERACEAE Link (*nom. alt.*) COMPOSITAE (*nom. cons.*)

Key to the Genera:

1. Pappus absent or reduced	12
+ Pappus present	2
2. Pappus capillary, sometimes bristled	3
+ Pappus bristled or retrorsely barbed awned or much reduced	6
3. Involucre less than equal to 2 – seriate	4
+ Involucre 2- several seriate	5
4. Achenes cylindrical or linear	19
+ Achenes oblong-elliptic or obovoid	10
5. Achenes obovoid-ellipsoides	26
+ Achenes oblong.....	17
6. Phyllaries less than equal to 3- seriate	8
+ Phyllaries 3-several seriate	7
7. Stylè branch rounded or flattened	<i>Ainslea</i>
+ Style branch subacut or obtuse	13
8. Annual herb	18
+ Perennial herb	11
9. Flower unisexual	<i>Anaphalis</i>
+ Flower bisexual	<i>Saussurea</i>
10. Rhizomatous or stoloniferous or fleshy rootstock	14
+ Non – rhizomatous	15
11. Leaves opposite or basal rosette	16
+ Leaves alternate	<i>Gynura</i>
12. Leaf lyrately. pinnatifid or pinnatisect, palmately divided	22
+ Leaf entire or sub entire, denticulate, alternate	23
13. Flower unisexual	<i>Anaphalis</i>
+ Flower bisexual	<i>Erigeron</i>
14. Style branches linear	<i>Sorosaris</i>
+ Style branches oblong, truncate	<i>Tanacetum</i>

15. Receptacles domed or \pm conical	20
+ Receptacles flat or concave	<i>Artemesia</i>
16. Leaves opposite, toothed	<i>Eupatorium</i>
+ Leaves rosette, entire – dentate	<i>Cremanthodium</i>
17. Corolla pink or mauve	<i>Laggera</i>
+ Corolla yellow , sometimes purple	21
18. Leaves oblanceolate, deltoid	24
+ Leaves partly tripinnatifid	<i>Bidens</i>
19. Rhizomatous herb	<i>Tusilago</i>
+ Non-rhizomatous herb	<i>Synotis</i>
20. Style branches with short lanceolate appendages	<i>Myriactis</i>
+ Style branches obtuse	<i>Acmella</i>
21. Style branches linear, obtuse or flattened	25
+ Style branches truncate	<i>Ligularia</i>
22. Leaves spiny at margins	<i>Cirsium</i>
+ Leaves unarmed	<i>Senecio</i>
23. Leaves alternate	<i>Carpesium</i>
+ Leaves opposite	<i>Adenostemma</i>
24. Achene obconic – cylindrical	<i>Cacalia</i>
+ Achene oblong	<i>Gnaphalium</i>
25. Leaves finely tooothed	<i>Duhaldea</i>
+ Leaves coarsely tooothed	<i>Aster</i>
26. Leaves with distinct petiole	27
+ Leaves without distinct petiole, auriculate at base	<i>Sonchus</i>
27. Style branches short rounded	<i>Ainslea</i>
+ Style branches linear	<i>Lactuca</i>

Acmella Richard

Acmella paniculata (Wallich ex DC.) Jansen Syst. Acmella (Asterac.-Heliantheae) (Syst. Bot. monog.8): 67. 1985; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1605. 2001. *Spillanthes paniculata* DC. in Wight, Contr. Bot. Ind. 19. 1834; Prodr. 5: 625. 1836; Hara *et al.* Fl. E. Him. 2: 141. 1971; Chater & Kitamura in Enum. Fl. Pl. Nepal 3: 45. 1982; Hajra in Hajra *et al.* Fl. India 12: 409. 1995. Kumar & Singh, Astera. Sikkim 171. 2001. *S. pseudo-acmella* Murr., Syst. ed. 13: 610. 1774, non L. *S. acmella* var. *calva* (DC.) Clarke, Comp. India 138. 1876; Hook.f., in Fl.Brit.India 3: 307. 1881.

Local Name: Muuknok (Lep.) Kalijhar (Nep.).

Herbs annual, erect or decumbent, upto 40cm tall. **Leaves** lamina .3.5 - 7 x 1.8 -3 cm, acute or subobtusate, attenuate at base, subentire or serrate, subglabrous or sparsely pubescent on both surface. **Flowers** capitula discoid, to 10mm diam. rather many interterminal, corymbose panicles; **Involucres** bracts 2 – serrate with phyllaries in each whorls. **Palea** to 4 mm; **Corollas** 4 and 5 lobes in same head. **Achenes** with pale strongly ciliate border. **Pappus** bristle not exceeding cilia.

Flower : July – September *Fruit:* August - November
Exsiccatus : Lingtam – Padamchen 1500 m, *SR lepcha & AP. Das* 0224, dated 19.09.2004.
Status : Common in low altitude
Local Distribution : 500- 1800m.
General Distribution : E. HIMALAYA INDIA (Darjeeling, Sikkim, Assam), NEPAL, SRI LANKA, CHINA, MYANMAR, INDONESIA, MALAYSIA

Adenostemma Forster

Adenostemma lavenia (L.) O. Kuntze, Rev. Gen. Pl. 1:304. 1891; Hara in Fl. E. Him. 1: 329. 1966; Chater in Hara Enum. Fl. Pl.Nepal 3: 9. 1982; Hajra in Hajra *et al.* Fl.India 12: 346. 1995; Grierson & Springate in Grierson & Long Fl.Bhutan 2(3): 1626. 2001. Kumar & Singh, Astera. Skim 20. 2001. *A. lavenia* var *elatum* (D.Don.) Hochreutiner in Candollea 5: 298. 1934. *A. latifolium* D. Don, Prodr. 181, 1825.

Herbs erect slender upto 35 cm tall. Stem usually glabrous or glandular pubescent, unbranched. Petiole upto 1.5cm long. **Leaves** lamina 2.5 -6 x 1.7 – 4.5cm, opposite; broadly ovate or cordate, serrate, acute, base obtuse to subcordate or shallow-cordate, glabrous or thinly pubescent, 3-nerved. **Inflorescence** in lax panicles or corymbs. **Involucral** upto 6mm diam. in flower; bracts campanulate, oblong, obtuse, rarely acute, scabrid. **Phyllaries** 3 -3.5 x – 1.5 – 2mm, face and margin usually more hairy. **Corolla** lobes white or pink all densely pubescent Inflorescence in diam., in lax panicles or corymbs. **Pappus** hairs 3-5, clavate. **Achenes** warted, glandular.

Flower : August – November *Fruit* : September – December
Exsiccatus : Rachela below 2800 m, *SR Lepcha & AP. Das* 27790, dated 30.09.2004.
Status : Less common
Local Distribution : Rachela, KAS, 1850 – 2500 m.
General Distribution : PANTROPIC

Ainsliaea DC.

Key to the species:

1. Leaf base rounded; petiole winged; Flowers heads discoid..... *A. latifolia*
- + Leaf base cordate; petiole not winged; Flowers heads cylindrical..... *A. aptera*

Ainsliaea aptera DC., Prodr. 7: 14. 1838; C.B. Clarke, comp. Ind. 247. 1876; Hook.f., Fl. Brit. India 3: 388. 1881; Kitamura in Fl. E. Him. 1: 330. 1966; 2: 131. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 3: 9. 1982; Hajra in Hajra *et al.* Fl.India 13: 165. 1995; Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1418. 2001. Kumar & Singh, Astera. Sikkim 22. 2001.

Herbs, perennial erect upto 42 cm tall. **Stem** usually leafless in spring, stout. **Leaves** ; petioles upto 2 cm; ovate or orbicular, **lamina** 2.7 – 4.5 x 1.5 - 4cm, sinuate toothed, acute, base cordate, glabrous, nerves distinct above. Spikes usually slender, stout, red-brown. **Flower** heads 1- 2 cm long, cylindrical, sub-sessile. **Disc-florets** white or pinkish. **Involucral bracts** lanceolate, thin, glabrous, inner larger than outer. **Pappus** feathery, brown. **Achenes** ribbed, usually hairy.

Flower : March - May *Fruit:* October - December
Exsiccatu : Rachela 2990 m, **SR Lepcha & AP. Das** 31131, dated 03.10.2004
Status : Not common.
Local Distribution : Kyongnosla, 1900 – 3400 m.
General Distribution : TEMPERATE HIMALAYAS.
Note : Endemic to Himalaya.

Ainsliaea latifolia (D. Don) Schulz-Bip., Pollichia 18-19: 169. 1861; Brittonia 4: 182. 1941; Kitamura in Fl. E. Him.1: 330. 1966; 2: 132.1971; 2: 110. 1975; Chater in. Hara Enum. Fl. Pl. Nepal 3: 10. 1982; Hajra in Hajra *et al.*India 13: 167. 1995; Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1425.2001; Kumar & Singh, Astera. Sikkim 22. 2001. *Liatris latifolia* D. Don, Prodr.Fl. Nep. 169. 1825. *Ainsliaea pteropoda* DC, Prodr. 7: 14. 1838; Hook.f.in Fl.Brit.India 3: 388. 1881.

Herbs, perennial, erect upto 60 cm tall. **Stem** usually slender. **Leaves** mainly radical,; petioles upto 5.5 cm long, broadly winged, wings narrowed towards base; broadly ovate **lamina** 3 – 4.5 x 1.5 – 3.5 cm, finely toothed, acute, base rounded, pubescent both sides (white tomentose beneath in young stage), dark green, mid-vein thick and prominent; **cauline leaves** few, sessile, small, linear oblong or oblanceolate, toothed, pubescent. Flower spikes glabrous. **Flowers** heads upto 1.5 cm long, inner involucral bracts usually longer than outer, lanceolate, **Florets** 1- 4, white or tinged with pink. **Pappus** feathery, pale brown. **Achenes** ribbed.

Flower : April - June *Fruit:* July - November
Exsiccatu : Kyongnosla 3500 m, **SR Lepcha & AP. Das** 182, dated 23.07.2007.
Status : Common.
Local Distribution : Middle Rachela. 1800 – 3500 m,
General Distribution : INDIA , BHUTAN, MEGHALAYA, MANIPUR, MYANMAR, THAILAND, CHINA, TAIWAN, AND PHILIPPINES

Anaphalis DC.

Key to the species:

- 1. Herbs non-rhizomatous 2
- + Herbs rhizomatous 8

- 2. Herbs perennial 3
- + Herbs annual..... *A. margaritacea*

3. Involucral bracts 3 - 6 seriate. *A. royleana*
 + Involcre bracts many seriate..... 5
5. Leaf base cordate or recurved..... 6
 + Leaf base sub - semi aplexicaulis..... 7
6. Involucral bracts 3 - 4 seriate..... *A. contorta*
 + Involucral bracts 5 - 6 seriate..... *A. virgata*
7. Herbs less than 50 cm tall; Involucral bracts ovate-linear oblong..... *A. wightiana*
 + Herbs more than 50cm tall; Involucral bracts ovate-elliptic..... *A. griffithii*
8. Lower leaves usually petiolate; leaf 1 or 3 veined *A. triplinervis var.intermedia*
 + Lowers leaves often sessile; leaf 1 veined *A. triplinervis var. monocephala*

Anaphalis contorta (D. Don) Hook.f. in Fl. Brit. India 3: 284.1881; Kitam in Hara Fl. E. Him. 331. 1966; in Fl. E. Him. 2: 132. 1971; 3: 110. 1975 ; Hara *et al.* Enum. Fl. Pl. 3: 10. 1982; Hajra in Hajra *et al.* Fl. India 13: 59. 1995; Grierson & Springate in Grierson & Long Fl. Bhutan 2 (3): 1518.2001; Kumar & Singh, *Astera*. Sikkim 26. 2001. Var. **contorta**. *Antennaria contorta* D. Don in B. Reg. 7: t.605. 1821. *Gnaphalium contortum* Buch-Ham.ex. Spreng., Syst. Veg.3: 479. 1826. *Anaphalis hondae* Kitamura in Act. Phytotax. Geobot. 15: 78. 1953; BBSI 15: 206. 1976.
Local Name: Bukki Phool (Nep.).

Herbs, perennial, hairy. **Leaves** sessile, numerous and usually overlapping, **lamina** 2 - 3 x 1.5 - 2.5 cm, upper linear to narrow lanceolate, base cordate and densely clustered, margins usually inrolled, acute-blunt, green above, white tomentose on both surface, more dense lower, 1-nerved, nerve thick and prominent beneath. **Flowers** heads small 0.45 cm in diam., grouped in terminal compact corymbose clusters upto 2 cm in diam. **Involucral bracts** 0.3 - 0.3.5 cm, ovate, erect, blunt, papery and shining whit, 5 - 6 seriate. **Disc florets** whitish-yellow. **Achene** papillose,

- Flower* : August - January *Fruit:* November - March
Exsiccatae : Kupup - Bhimbase 4300 m, **SR Lepcha & AP. Das** 31416, dated 27.07.2005. Kyongnosla, 3100 m, **SR Lepcha & AP. Das** 32820, dated 25.10.2004. Zeluk 3900 m, **SR Lepcha & AP. Das** 32855, dated 26.10.2004.
Status : Common.
Local Distribution : Middle Rachila, Bhimbase, Zeluk, 1600 - 4350 m.
General Distribution : AFGHANISTAN, Temperate HIMALAYAS; INDIA CHINA,

Anaphalis griffithii Hook. f. in Fl. Brit. India 3: 280. 1881; Hajra in Hajra *et al.*, Fl. India 13: 61. 1995; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1519. 2001; Kumar & Singh, *Astera*. Sikkim 28. 2001.

Herbs perennial, erect, or ascending to 60 cm tall. **Stem** slender subbranched. **Leaves** lamina 2 - 3.4 x 0.3 - 0.5mm, linear-lanceolate, acute or apiculate at apex, semi-amplexicaul at base, margin entire or flat. Upper surface sparsely hairy, lower surface wooly, 1 nerved. **Flowers** in terminal corymb. **Peduncle** upto 4mm long, densely ferigenous tomentose. **Involucral bracts** 3 - 4 seriate, glistening white, ovate to elliptic-ovate. **Ray florets** with filiform. **Corolla**, obscurely toothed. **Disc florets** 5 toothed. **Achenes** oblong, hairy. **Pappus** hairs white, slender.

Flower & Fruit : October – February
Exsiccatus : Kyongnosla 3200 m, **SR Lepcha & AP. Das** 288, dated 23.06.2006.
Status : Not common
Local Distribution : PWS, 750 – 2340 m.
General Distribution : EASTERN HIMALAYA; INDIA NEPAL, S.W. CHINA.
Note : Endemic to Eastern Himalaya.

Anaphalis margaritacea (L.) Benth. & Hook. f., Gen. Pl. 2: 303. 1873; Kitam in Hara, Fl. E. Him. 1: 331. 1966; 2: 132. 1971; Hara *et al.* Enum. Fl. Pl. Nepal 3: 10. 1982; Hajra in Hajra *et al.* Fl. India 13: 68. 1995; Grierson & Springate in Grierson & Long Fl. Bhutan 2 (3): 1517. 2001; Kumar & Singh, Astera. Sikkim 29. 2001. *Gnaphalium margaritaceum* L., Sp. Pl. 850. 1753. *Anaphalis cinnamomea* C.B. Clarke, Comp. India 103. 1876; Fl. Brit. India 3: 281. 1881. *A. timmua* D. Don, Prodr. 174. 1825; Fl. Jow. 1: 276. 1981.

Herbs, annual, erect, leafy, unbranched, upto 50 cm tall, wooly-haired. **Leaves** sessile; **lamina** 4 - 9 x 1 - 1.5 cm, lanceolate, entire, acute, base simple and narrow, glabrous to thinly hairy and bright green above, reddish or grey wooly beneath, 3 - 4 nerved. **Flower** heads 0.6 cm across, subglobose, grouped in dense domed clusters. **Involucral bracts** usually small, elliptic-ovate, blunt, erect in flower.

Flower : August – November *Fruit*: September – December
Exsiccatae : Dongkyala, 3900 m, **SR Lepcha & AP. Das** 31024, dated 07.10.2004.
 Rachela 3100 m, **SR Lepcha & AP. Das** 31159, dated 03.09.2003.
 Bombay Hill (KAS) 3500m, **SR Lepcha & AP. Das** dated 27.09.2004.
Status : Abundant.
Local Distribution : Rachila Chowk, Donkyala, Rachela 2100 – 2750 m.
General Distribution : INDIA, BHUTAN, THAILAND, CHINA, JAPAN, N. AMERICA.

Anaphalis royleana DC., Prodr. 6: 272. 1838; Hook.f., Fl. Brit. India 3: 287. 1881; Hajra *et al.* Fl. India 13: 70.1995; Grierson & Springate in Grierson & Long., Fl. Bhutan 2(3): 1519. 2001; Kumar & Singh, Astera. Sikkim 29. 2001.

Herbs perennial, erect or decumbent, 20 – 55cm tall. **Leaves** lamina 3 -5 x 0.3 – 0.7cm , linear oblong, acute at apex , usually, with a brownish mucro, margin entire or recurved, densely grayish white and wooly beneath, 1 nerved. **Flower** head terminal corymbs, white. Peduncle buff colour and wooly. **Involucral bracts** many seriate, outer ovate white, inner elliptic oblong, greenish. **Disc florets** papillose and hairy., 5 toothed . **Achenes** papillose; **pappus** hairs white.

Flower : July – October *Fruit*: September – December
Exsiccatus : Panglakhha 2750 m, **SR Lepcha & AP. Das** 086, dated 23.07.2006.
Status : Very Common.
Local Distribution : Kyongnosla, Neola, Panglakhha 3000-5000m.
General Distribution : HIMALAYAS (Jammu to Sikkim)
Note : Endemic to Himalaya.

Anaphalis triplinervis C.B. Clarke Benth. ex. Hance in Journ. Bot 16: 12. 1878; Hajra *et al.* Fl. India 13: 77.1995; Grierson & Springate in Grierson & Long Fl. Bhutan 2 (3): 1522. 2001; Kumar & Singh, Astera. Sikkim 32. 2001.

Herbs erect rhizomatous upto 50 cm tall. **Stem** flexuous, white hairy. **Leaves** variable; stem often sessile to shortly stalked; petiole to 1.5cm, **lamina** 1.5 – 3.5 x 1 -1.8 cm, basal leaves 3 - 5 veins, elliptic – linear, oblong or lanceolate, or lowest obovate, spatulate, obovate to elliptic, apex acute, margin entire, blunt or acute, base narrow cuneate, green above, paler and woolly beneath, 3-nerved. **Flower**; capitula 9- 70 per inflorescence. Flowers heads 1.5 cm across, solitary, **Involucral bracts** 0.5 cm, glistening white, scarious, many seriate, ovate or aeliptic-lanceolate; acute or obtuse, brownish at base. **Ray florets** female, filiform. **Corolla** to 3 mm, long, distinctly 4 toothed. **Disc florets** bisexual, to 3,3 mm long, 5 toothed, yellowish-white.. **Style** bifid. **Achenes** blong. **Pappus** hairs white, bristly.

Var. var.intermedia DC., Prodr. 6: 270. 1838; Chater in Enum.Fl.Pl. Nepal 3: 11. 1982; Hajra *et al.* Fl. India 13: 77.1995. Kumar & Singh, Astera. Sikkim 32. 2001. *Anaphalis nubigena* DC., Prodr. 6: 270. 1838; Hook.f. in Fl. Brit. India 3: 279. 1881p.p. *A. cuneifolia* (DC.) Hook.f., in Fl. Brit. Inida 3: 280, 1881.

Herbs upto 65 cm tall; **Leaf** 1 or 3 veined; **inflorescence** with (1)7 – 15 capitular

Flower : June – July **Fruit**: September - October
Exsiccatae : Kupup 3900m, **SR Lepcha & AP. Das** 30840, dated 29.07.2005.
 Bhimbase – Dongkyala 4200 m, **SR Lepcha & AP. Das** 31405, dated 23.07.2005.
Status : Common.
Local Distribution : Zeluk, Rachila Middle. 2300 – 4000 m.
General Distribution : HIMALAYAS; INDIA (Kashmir – BHUTAN).
Note : Endemic to Himalaya.

Var. monocephala (DC.) Airy Shaw in Bot. Mag. 158: t. 9396. 1935; Chater in Enum.Fl. Pl. Nepal 3: 11. 1982; Hajra *et al.* Fl. India 13: 79.1995. Kumar & Singh, Astera. Sikkim 32. 2001. *A. monocephala* DC., Prodr. 6: 272. 1838. *A. nubigena* DC., Prodr. 6: 272. 1838; Hook. f., in Fl. Brit. India 3: 279. 1881.p.p.

Herbs to 20 cm tall; **Leaf** usually with 1 veined; **Capitulala** usually solitary or rarely 2 -4

Flower : June – July **Fruit**: September – October
Exsiccatae : Kyongnosla 3500 m, **SR Lepcha & AP. Das** 32807, dated 25.10.2004.
 On way to Panglakha 2890 m, **SR Lepcha & AP. Das** 130, dated 25.08. 2006.
Status : Common.
Local Distribution : Kyongnosla, Panglakha, 2800 – 4300 m.
General Distribution : HIMALAYA; INDIA, NEPAL, BHUTAN,
Note : Endemic to Himalaya.

Anaphalis virgata Thomson ex C.B. Clarke, Comp. Ind. 107. 1876 ; Hajra *et al.* Fl. India 13: 79. 1995; Hajra in Hajra *et al.* Fl. India 12: 79. 1995. Kumar & Singh, Astera. Sikkim 34. 2001. *A. stolicical* C.B. Clarke, Comp. Ind. 108. 1876 .Hook.f. Fl.Brit. India 3: 283. 1889.

Herbs perennial, erect branched to 50cm tall. **Stem** slender. **Leaves** lamina 0.8 - 4 x 0.3 – 0.6cm, narrowly lanceolate, linear oblong, recurved at base, acute at apex, rarely mucro, margin flat or

recurred, upper surface hairy dull green, under surface ashy white, 1 nerved. **Flowers** in terminal corymb with heads. Peduncle upto 3 cm, wooly. **Involucral bracts** 3 - 4 serriate, outer ovate-oblong; inner linear. **Ray florets** with filiform. **Corolla**, obscurely toothed. Style bifid. **Disc florets** pale yellow. **Corolla** 5 toothed. **Achenes** brown, oblong. **Pappus** hairs silky white.

Flower & Fruit : July – September
Exsiccatus : Bhimbase 4200m, **SR Lepcha & AP. Das** 31416, dated 27.07.2005.
Status : Rare
Local Distribution : Bhimbase, Donkyala PWS, 1400 – 4150 m.
General Distribution : W. – E. HIMALAYAS, INDIA, PAKISTAN, BHUTAN, TIBET, CHINA.

Anaphalis wightiana (DC.) DC., Prodr. 6: 273. 1838; Hook.f., in Fl. British India 3: 286. 1881; Hajra in Hajra *et al.* Fl. India 13: 81.1995.

Herbs perennial, erect branched to 65cm tall. **Stem** grooved. **Leaves** lamina 2 - 5 x 0.6 – 0.9cm, linear lanceolate, sub-amplexicaul, obtuse-acute at apex, margin recurved, upper surface pilosa scabrous, lower grey white, wooly, 1 nerved, sessile. **Flowers** head with dense corymbs clusters, peduncle short, c 0.8mm, long tomentose. **Involucral bracts** 3 - 4 serriate, outer ovate white, inner with short limb and inner linear oblong, brown. **Ray florets** with filiform, corolla, minutely 4 toothed. **Corolla** in disc florets 5 lobes. **Achenes** terete or papillose. **Pappus** hairs white.

Flower & Fruit : June
Exsiccatus : Kyongnosla 3400 m, **SR Lepcha & AP. Das** 32830, dated 25.07.2004.
Status : Rare
Local Distribution : Kyongnosla, Changu 750- 2340m.
General Distribution : INDIA Western Ghats, Tamil Nadu, Karnataka, Kerala, Sikkim.
Note : 1. Endemic to India.
 2. A new record for Sikkim and Eastern India.

Artemisia Linnaeus

Key to the species:

- 1. Plant upto 1.5 m tall; not strongly aromatic 2
- + Plant more than 1.5 m tall; strongly aromatic *Artemisia indica*
- 2. Capitula in on short lax racemes; phyllaries sparsely pubescent *A. thellungiana*
- + Capitula in distant broad panicles; phyllaries scarious *A. dubia*.

Artemisia dubia Wallich ex Besser in Nouv. Memb. S. Imp. Nat. Mos. 3: 39. 1834; Hara in Fl. E. Him. 1: 332. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 3:12. 1982; Hajra in Hajra *et al.* Fl. India 12: 19. 1995; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1563. 2001.
lavandulaefolia DC., Prodr. 110. 1838, p.p.

Local Name: Tuknil (Lep) Titepaati (Nep.).

Herbs or undershrubs, perennial, aromatic upto 1.5 m tall. Root-stock woody. **Stem** usually paniculately branched, pale green, ribbed; branches shorter.; **lamina** to 7.5cm, sessile, pinnatisect, irregularly serrate, acute, pale underside. **Flowers**; capitula 0.30 - 0.45cm across, nodding, borne

on lax racemes, reddish brown. **Involucre**; phyllaris scarious. **Receptacle** naked; uter florets female. **Corolla** yellowish green.

Flower : August - October *Fruit*: October- January
Exsiccatus : Premlakha – Panglakha 2800 m, **SR Lepcha & AP. Das** 28.07.2005.
Status : Common
Local Distribution : Premlakha, Kyongnosla, 1400 – 2300 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, CHINA.

Artemisia indica Willdenow, Sp. Pl. 3: 1846. 1803; Hara in Fl.E.Him 1: 332. 1966; 2: 133. 1971; Kitamura in Hara *et al.* Enum.Fl. Pl. Nepal 3: 12. 1982; Hajra in Hajra *et al.* Fl.India 12: 27. 1995; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1561.2001 Kumar & Singh, Astera. Sikkim 36. 2001. *A. grata* Wallich *ex* Bess. in Nouv. Mem. Soc. Nat. Mosc. 3: 57. 1834. *A. vulgaris auct. non.* L., Hook.f. in Fl. Brit. India 3: 325. 1881. p.p.

Local Name: Tukuil (Lep.), Titepaati (Nep.).

Shrubs, aromatic, bushy upto 2m tall. **Stem** leafy, whitish hairy or rarely glabrescent. **Leaves** alternate, sessile, highly aromatic, **lamina** 3 – 6.5 x 1.30 - 3.5 cm, ovate, lobed, lacinate or deeply pinnatisect, segments linear-lanceolate, acute, pubescent above, cottony white beneath; terminal leaves comparatively smaller, entire or 3-lobed. **Flowers** heads 0.25 - 0.35cm diam., ovoid or subglobose, arranged in long pyramidal panicles. **Involucral bracts** ovate, ovate-oblong, villous, margins scarious. **Anther** base obtuse, entire. **Achenes** oblong.

Flower : August - December *Fruit*: October – February
Exsiccatus : On way Nathang – Panglakha 4300 m, **SR Lepcha & AP. Das** 32973, dated 28.07.2005.
Status : Common
Local Distribution : 700-2250m.
General Distribution : SUBTROPICAL-TEMPERATE REGIONS OF INDIA, MYANMAR, THAILAND, CHINA, JAPAN.

Note : Traditionally used as medicine in hills of Sikkim and Darjeeling, antiseptic, also used as mosquito and insect repellent.

Artemisia thellungiana Pampamu in Nuovo Giorn. Bot. Ital. n.s. 33: 457. 1926: Razi in Rec. Bot. Surv. Ind.185. 1959; Grierson & Springate in Grierson & Long Fl, Bhutan 2(3): 1562. 200; Kumar & Singh, Astera. Sikkim 38. 2001. *A. vulgaris sensu*, Fl. Brit. India, p.p. non.

Local Name: Tukuil (Lep.) Titepaati (Nep.).

Herbs, perennial upto 1.5m. **Stem** often puberulous. **Leaves**; mid cauline leaves 1 -2 pinnatisect, ovate –elliptic, **lamina** 15 – 13 x 8 - 9 cm, 3 pairs of primary segments rarely pair of basal stipuliform lobes., subglandular, sparsely pubescent, tomentose below, ultimate segments subentire. **Flowers**; capitula in distant, broad panicles. **Involucral bracts** to 3 mm. **phyllaries** ovate – obovate, subglabrous, or sparsely arrenous, often purplish. **Achenes** oblong.

Flower & Fruit : August – September
Exsiccatus : Way to panglakha from Premlakha 2600 m, **SR Lepcha & AP. Das** 161, dated 23. 07. 2006.

- Status* : Common.
Local Distribution : Premlakha, Panglakha, 2800 – 3350 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, TIBET, CHINA.

Aster Linnaeus

Key to the species:

1. Herbs less than 30 cm tall 2
 + Herbs more than 30 cm tall 3
2. Herbs (Rhizomatous); Pappus white *A. himalaicus*
 +. Herbs (Non- rhizomatous); Pappus brownish *A. albescens*
3. Herbs with villous hairs; Leaves margin entire *A. strachiyi*
 + Herbs with glandular hairs; Leaves margin ciliate *A. flaccidus*

Aster albescens (DC.) Koehne, Hand.-Mazz. in Acta Hort. Goteb. 12: 1938; Kumar & Singh, *Astera*. Sikkim 42. 2001. *Amphirhapis albescens* DC., Prodr. N5: 343. 1836. *Microglossa albescens* (DC.) Benth. ex C.B. Clarke, Comp. Ind. 59. 1876. *Aster cabulicus* Lindl. in Bot. reg. 62. 1843; Grierson & Springate in Grierson & Long., Fl. Bhutan 2 (3): 1533. 2001;

Shrubs perennials erect. Stem to 2.5 m, sparsely pubescent with gland. **Leaves** sessile or shortly petiolate; ovate lanceolate, **lamina** 2 – 11 x 0.6 – 3cm; acute or acuminate, cuneate at base, entire or finely serrate, sparsely pubescent in lower surface or rarely bearing of few glands. **Capitula** numerous, in terminal corymbs; **involucral bracts** to 6mm in diam. phyllaries upto 20 linear lanceolate, green or purplish at tip; pubescent or tomentose towards base. **Flower** 12 – 30. **Corolla** tube to 3 mm. **Achene** sparsely pubescent. **Pappus** brownish, to 4mm.

- Flower* : May – October
Exsiccatus : Padamchen – Zuluk, 2900 m, *SR Lepcha & AP. Das* 070, dated 21.08. 2005.
Status : Common.
Local Distribution : Kyongnosla – Changu, 1900 – 3400 m
General Distribution : E. HIMALAYA; INDIA, TIBET, CHINA

Aster flaccidus Bung, in Mem. Acad. Sci. st.-pet .2: 599. 1835; Kitam in Fl. E. Him. 3: 112. 1975; Hara *et al.* Enum. Fl. Pl. Nepal, 3: 14. 1982. 1995; Hajra in Hajra *et al.* Fl. India 12: 86. 1995; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1537. 2001; Kumar & Singh, *Astera*. Sikkim 43. 2001. *Aster heterochaeta* C.B. Clarke, Comp. India 44. 1876; Hook .f. in Fl. Brit. India 3: 250. 1881, p.p.; Hajra in Hajra *et al.* Fl. India 12: 96. 1995. *A. tibeticus* Hook.f. in Fl. Brit. India 3: 251. 1881.

Herbs, perennials glandular hairy upto 15 cm tall. **Leaves** basal spatulate or obovate, **lamina** 2 – 5 x 0.5 – 2 cm; acute or obtuse, attenuate at base, ciliate at margins. **Flower** head solitary; **involucral bracts** 2 – seriate, linear lanceolate. **Ray florets** many tubes ca 2 – 5 mm long. Ligule oftenly blue or mauve. **Disk florets** yellow. **Stylar** appendages lanceolate. **Achenes** brownish, 2 ribbed; **pappus** outer white.

Flower : May – October
Exsiccatus : Kupup – Bhimbase 4800m, *SR Lepcha & AP. Das* 183, dated 27.07.2005.
Status : Common.
Local Distribution : PWS, Lampokhri, 4200 – 4900 m
General Distribution : SIBERIA.HIMALAYAS; INDIA, MONGOLIA, CHINA

Aster himalaicus C.B. Clarke, Comp.India 43. 1876; Hook.f. in Fl.Brit. India 3: 250.1881; Kitam in Fl.E. Him. 3: 112.1975; Hara *et al.* Enum. Fl. Pl. Nepal 3: 14.1982; Hajra in Hajra *et al.* Fl. India 12: 90. 1995; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1535. 2001; Kumar & Singh, Astera. Sikkim 44. 2001.

Herbs perennials, rhizomatous, upto 45cm tall. **Leaf** cauline sessil, lanceolate, rarely oblanceolate to broadly elliptic, oblong, lamina 2 x 0.5 – 3cm, acute, or obtuse, mucronates, entire. **Flower** heads head solitary; **involucral bracts** purplish tinged, **Ray Florets** many, tube, short upto 2.5mm long ; ligule purplish blue. **Disk florets** yellow or purplish. Style appendages broadly triangular. **Achene** brownish, obovate. **Pappus** white.

Flower : July. *Fruit:* October
Exsiccatae : Padamchen – Zuluk, 2500 – 3500 m, *SR Lepcha & AP. Das*, 32830, Dated 27.10.2004; Changu – Serabthang, 4000 – 4200 m, *SR Lepcha & AP Das* 096, dated 30.08.2005.
Status : Common.
Local Distribution : Kyongnosla, KAS, 3500 – 5200 m
General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, TIBET, CHINA.

Aster strachiyi Hook.f. in Fl.Brit. India 3: 250.1881; Kitam in Fl. E. Him.3: 112.1975; Hara *et al.* Enum.Fl.Pl. Nepal 3: 15.1982; Hajra in Hajra *et al.* Fl. India 12: 96. 1995; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1536. 2001; Kumar & Singh, Astera. Sikkim 46. 2001.

Herbs villous upto 25 cm tall. **Leaves** alternate or roset, sessile or attenuate to a short petiole; elliptic, spathulate , oblong or obovate , lamina 2 - 3 x 0.8 – 2 cm, obtuse or acute at apex, attenuate at base , entire **Flower** head solitary; **involucral bracts** purplish tinged, 2- seriate, ciliate at base, lanceolate. **Ray florets** many 30-40; ligule blue or mauve. **Disc florets** yellow, tubes 2.5 mm long. Style appendages lanceolate. **AcheneS** obovate, densely, white pubescent. **Pappus** white of purplish.

Flower : July *Fruit:* September
Exsiccatus : Nathang 4300m, *SR Lepcha & AP. Das* 185, dated 21.07.2005.
Status : Common.
Local Distribution : Padamchen, PWS, Bhimbase 900 – 4700 m
General Distribution : INDIA (Kullu – Sikkim) BHUTAN, NEPAL.
Note : Endemic to Himalaya.

Bidens L.

Bidens pilosa L., Sp. Pl. ed. 1. 832. 1753; Hook.f., in Fl. Brit. India 3:309. 1881; Hara in Fl.E.Him. 1: 333. 1966; Hara *et al.* Enum.Fl.Pl.Nepal 3: 15. 1982; Hajra in Hajra *et al.* FI 12:372. 1995; Grierson & Springate in Grierson & Long., Fl. Bhutan 2(3). 1609. 2001; Kumar & Singh, Astera. Sikkim 50. 2001.

Local Name: Kuro (Nep.)

Herbs, erect upto 65cm tall. **Stem** glabrous. **Leaves** opposite; petiole upto 2.6cm; lamina much variable, 3-lobed, 1-2 pinnatisect or undivided; leaflets ovate **lamina** 2.5 – 4.5 x 1.5 – 2cm, toothed, acute, narrow cuneate, pilose above, nerves distinct. **Peduncles** long upto 7.5cm, stout. **Involucral bracts** with scarious margin. **Flowers** heads 0.7 - 1.6 cm across, elongating in fruits. **Ray-florets** ligulate, white. **Achenes** 1 – 2 cm, linear, black. **Pappus** unequal of barbed bristles.

Flower : June - January *Fruit*: September - March
Exsiccatae : Jorepokri (between Panglakha & Rachela) 2600 m, **SR Lepcha & AP. Das** 27762, dated 30.09.2009; Mulkharkha (W.B. border) 1990 m, **SR Lepcha & AP. Das** 330, dated 20.08.2005.
Status : Common.
Local Distribution : Rachela Chowk, Padamchen; upto 2500 m.
General Distribution : PANTROPIC, ALSO EXTENDING TO TEMPERATE REGIONS.

Cacalia L.

Key to the species:

1. Plant with flexuose stem; petiole not winged; Capitula drooping in axillary and terminal racemoses; Achenes obsconic; bract broadly oblong; Achenes obsconic
..... *C. chinopodifolius*
- + Plant without flexuous stem; petiole winged; Capitula discoid; bract linear oblong; achenes cylindrical
..... *C. levingii*

Cacalia chinopodifolius (DC.) Kitamura ex H. Koyama in Mem. fac.Sci.Kyoto Univ., Biol., 2(2): 170. 1969; Kitamura & Gould in Enum. Fl. Pl. Nepal 3: 17.1982; Hajra in Hajra *et al.* Fl. India 13: 188.1995; Kumar & Singh, Astera. Sikkim 61. 2001. *Senecio chinopodifolius* Prodr.6: 634. 1838; Hook. f., Fl. Brit. India. 3: 354. 1881; Grierson & Springate in Grierson & Long., Fl. Bhutan 2(3): 1574. 2001.

Herbs perennial, pubescent. **Stem** flexuos; branch and inflorescens densely fulvous pubescent. **Leaves**; petiole upto 9 cm long, pubescent; triangular or obscurely 3 lobed, **lamina** 1.3 – 16 x 1.3 – 1- 15 cm, dark green on the upper surface, base cordate or truncate, broadly with auricle tooth, acuminate, margins regularly sinuate toothed; teeth mucronulate. **Capitula** drooping in axillary and terminal racemoses panicle; peduncle to 2 mm pubescent; bracts 5, broadly oblong, 2.5 – 1- 1.5 mm, obtuse, imbricate. **Disc florets** limb 5 lobed; uprose. **Achenes** obconic to 3 mm long, scabrid.

Flower : August *Fruit*: October
Exsiccatae : Panglakha 2900 m, **SR lepcha & AP. Das** 31059, dated 08.10.2004; Changu -Kyongnosla, 3300 m, **SR Lepcha & AP. Das** 32890, dated 27.10.2004.
Status : Less Common
Local Distribution : Kupu, Nathang, Kyongnosla, 3800 - 4400m .
General Distribution : INDIA (Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim), BHUTAN.

Note : Endemic to Himalaya

Cacalia levingii (C.B. Clarke) R.R. Mathur in R.R. Rao *et al.*, Fl. Indicae Enumir. Asterac. 20. 1988; Hajra in Hajra *et al.* Fl. India 13: 188. 1995. *Senecio levingii* C.B. Clarke, Comp. India 3001. 1876; Hook. f., Fl. Brit. India 3: 353. 1881.

Hersb perennial. Stem pale brown, glabrous, smooth ; young branches and inflorescence pubescent. **Leaves**; petiole to 2.3 cm long, winged; lobes deltoid, 3 lobed; **lamina** 1.7 – 13 x 1 – 14, cm, glabrous, upper surface dark green, lower surface pale with distinct venation; acuminate, base cuneate, coarsely mucronulate, margins dentate. **Capitula** discoid; peduncle ca 4.5 mm long, pubescent; bracteate; bracts linear-subulate. Involucre cylindrical, to 7 mm long, bracts linear-oblong, acute. **Disc florets** to 7.5 mm long. **Achenes** cylindrical to 6 mm long, glabrous, distinctly ribbed. **Pappus** white unequal hairs., ca 6.5 mm long.

Flower : September *Fruit* : October

Exsiccatus : Pangolakha 2950 m, *SR Lepcha & AP Das* 32818, dated 25.10. 2004.

Status : Not common

Local Distribution : Kyongnosla, Changu 3700 - 4400m .

General Distribution : NORTH HIMALAYAS; INDIA (Jammu & Kashmir).

Note : Endemic to India,

Carpesium Linnaeus

Key to the species:

1. Plants densely viscid and covers with hispid hairs, Leaf ovate – cordate; Achene Cylindrical *C. trachelifolium*
+ Plants slightly pubescent or glabrous; Leaves elliptic – linear; achene globose *C. nepalensis*

Carpesium nepalensis Lessing in Linnaea 6: 234. 1831; Kitamura in Hara Fl. E. Him. 1: 334. 1966; Kitamura & Gould in Enum. Fl. Pl. Nepal 3: 18. 1982; Kumar & Singh, Astera. Sikkim 65. 2001. var. *nepalensis*

Herbs, annual viscid. Stem slender, to 70 cm densely hispid with hairs. **Leaves** sessile, narrowly elliptic to linear, **lamina** 8 – 32 x 1- 4 mm, obtuse or subacute, attenuate at base, hispid in upper and lower, with hairs arising from cystolic bases, viscid. **Flowers** axillary to sessile, opposite or alternate. **Calyx** to 6-mm. densely hispid. **Corolla** deep pink to dull crimson, to 22 mm, sparsely pubescent. **Achene** globose.

Flower & Fruit : July – November

Exsiccatus : Phusrey 2000 m, *SR Lepcha & AP. Das* 0773, dated 13.07.2006

Status : Less common

Local Distribution : Kyongnosla, Karponang, 1500 – 2350 m

General Distribution : TEMPERATE HIMALAYA; INDIA, NEPAL, CAUCASUS, FRANCE, JAVA, JAPAN, CHINA, TAIWAN.

Carpesium trachelifolium Lessing in Linnaea 6: 233. 1831; Hook. f., in Fl. Brit. India 3: 301. 1881; Hara in Fl. E. Him. 1: 335. 1966; 3: 113. 1975; Kitamura & Gould in Enum. Fl. Pl. Nepal 3: 18. 1982; Hajra in Hajra *et al.* Fl. India 13: 11. 1995; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1494. 2001; Kumar & Singh, Astera. Sikkim 68. 2001.

Herbs, slender upto 60cm, Stem pubescent or glabrate, **Leaves** ovate-cordate, **lamina** 3.5 – 6 x 2.5 - 5 cm, oftenly acuminate ; subcordate to attenuate at base, subentire to coarsely serrate,

sparsely pubescent on both surface, sinuate-toothed or lobulate; upper leaves ovate or elliptic-lanceolate, serrate or entire. **Flowers** subracemose – pendulous, with capitula upto 0.5cm across. **Involucral** 4-5 seriate; **phyllaries** mostly oblong, obtuse, scarious, rounded at apex. **Disc florest** 5-toothed, tubular. **Achenes** cylindrical, narrowed in at base and apex.

Flower : June – August *Fruit* : July – October
Exsiccatus : Nathang – Zuluk 3600m, **SR Lepcha & AP Das** 32863, dated 27.10.2004
Status : Less common
Local Distribution : Nathang, Zeluk 2200 - 3600m
General Distribution : HIMALAYAS; INDIA (Sikkim, Kashmir) BHUTAN AND CHINA.
Note : 1. Endemic to Himalaya.
 2. Cypsela very sticky on clothes.

Cirsium Miller

Cirsium falconeri (Hook.f.) Petrak in Biblioth. Bot. 78: 9. 1912; Kitamura & Gould in Enum.Fl.Pl.Nepal 3: 20. 1982; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1428. 2001; Kumar & Singh, Astera. Sikkim 73. 2001. *Gnicus falconeri* Hook. f. in Fl. Brit. India 3: 362. 1881. *Gnicus involucratus* Hook.f. Fl. Brit, India 3: 363. 1881. *Circium verutum* (D.Don) Sprengel, Syst. Veg 3: 370. 1826; Kitamura & Gould in Enum.Fl. Pl. Nepal 3: 20. 1982

Herbs upto 1.5m tall. **Stem** sparsely pubescent at base. **Leaves** lamina 15 – 45 x 6 – 23cm, densely setulose to almost smooth above, white araneus beneath broadly auriculate at base; lowest 1-2 pinnatisect, oblanceolate in outline 7- 12 pairs of leafy segments, spinous tip, upper leaves smaller, ovate lanceolate in outline. **Flowers** in solitary branched, corymb. **Involucral bracts** upto 22cm diam. **Phyllaries** lanceolate to linear narrow acuminate; sparsely araneus; outer and middle one spiny. Suberect to recurved inner one cartiligenous. **Flower** pale to dark purple. **Corolla** tube tapered abruptly campanulate. **Achenes** obovoid, dark brown, **pappus** brownish.

Flower & Fruit : July – October
Exsiccatae : Bhimbase 4300 m, **SR Lepcha & AP. Das** 31496, dated 27.07.2005.
 Zeluk 3700 m, **SR Lepcha & AP. Das** 32947, dated 28.07.2005.
Status : Common.
Local Distribution : Donkyala, Changu, 2750 – 4300 m
General Distribution : HIMALAYAS; INDIA, (NEPAL – BHUTAN), S. TIBET, MYANMAR.

Cremathodium Bentham emend R. Good

Key to the species:

1. Achene oblong; pappus white 2
- + Achene oblanceolate; pappus brown; Achee *C. thomsonii*
2. Capitula campanulate, mostly solitary; Ray of ray floret linear oblong ... *C. decaisnei*
- + Capitula radiate 1 – many; ray of ray floret elliptic *C. cremanthoides*

Cremanthodium cremanthoides (Handel – Mazzetti) R. Good in J. Linn. Soc. 48: 279. 1929; Hajra in Hajra *et al.* Fl. India 13: 309. 1995; Kumar & Singh, Astera. Sikkim 81. 2001. *Ligularia cremanthoides* Handel – Mazzetti in Anz. Acad. Wiss. Wien. Math. Node 62.1925; Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1574.2001.

Herbs upto 55 cm tall, erect, glabrous, short black glandular hairy above. **Leaves**; radical leaves in reniform, glabrous, acutely dentate, petiolated; Cauline leaves reniform to linear with broad sheathing base. **Capitula** radiate 1 – many, arranged in corymb or in umbel. **Involucre** campanulate; bract dark brown or black, narrow, acute. **Ray** florets yellow, long; rays elliptic, ca 5 - 6 nerved, slightly longer than tube. **Disk** florets tubular. Achenes oblong, **Pappus** white.

Flower : July – September
Exsiccatus : Lam-pokri 4300 m, *SR Lepcha & AP. Das* 222, dated 13.07.2003.
Status : Rare
Local Distribution : PWS, 3600 – 4500 m.
General Distribution : EASTERN HIMALAYA; INDIA (Sikkim) in wet & rocky alpine region.
Note : Endemic to Eastern Himalaya.

Cremanthodium decaisnei C.B. Clarke, comp. Ind. 168. 1876; Hook. f., in Fl. Brit. India 3:331. 1881; Kitamura in Fl. E. Him. 3: 114. 1975; Hara *et al.* Enum. Fl. Pl. Nepal 3: 22. 1982; Hajra in Hajra *et al.* Fl. India 12:310. 1995; Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1581.2001; Kumar & Singh, Astera. Sikkim 83. 2001.

Herbs, perennial, brownish black, upto 30 cm tall. **Stem** grooved brownish pubescent above. **Leaves** reniform (radical), **lamina** 3 x 5cm across, glabrous appressed brownish white tomentose beneath. **Flowers** in solitary nodding; **capitula** campanulate, bracteolate, pubescent, bracteoles black 2 -3, linear, **Involucral** phyllaries 10 -15, campanulate, pubescent, broad, in two series. Outer linear, lanceolate, inner bracts elliptic, oblong, 3 -5 ribbed. **Ray** florets yellow, linear oblong. **Disk** florets with 0.5 cm limb. **Achenes** of ray florets oblong, glabrous, white hairs.

Flower : June – October
Exsiccatus : Kupup 4300 m, *SR Lepcha & AP. Das* 30990, dated 27.07.2003
Status : Sparse
Local Distribution : Kupup, Nathang 1800 – 2400 m.
General Distribution : HIMALAYAS; INDIA (Kashmir to BHUTAN).
Note : Endemic to Himalaya

Cremanthodium thomsonii C.B. Clarke, Comp. India. 169. 1876; Hook.f., in Fl. Brit. India 3: 331. 1881; Hara *et al.* Enum. Fl. Pl. Nepal. 3: 23. 1982; Grierson & Springate in Grierson & Long. Fl. Bhutan 2(3): 1581. 2001; Kumar & Singh, Astera. Sikkim 87. 2001.

Herbs, erect perennial, 40 cm tall. **Leaves**; petiole to 13 cm; basal leaves reniform; **lamina** 2.8 x 1.7 – 3.8 cm, obtuse, crenate apiculate tooth, deeply cordate at base, glabrous or sparsely puberulus at lower surface; cauline leaves few, reniform. **Capitulum** solitary; peduncle hairy above. **Involucral** to 18 mm in diam; **phyllaries** ovate to lanceolate, 9 – 14 x 2.4 – 5 mm, glabrous or ciliate. **Ray** corolla tube to 5 mm; **ligule** oblanceolate, yellow, deeply toothed. **Disk** corolla to 7.8 mm; **Achenes** oblanceolate. Pappus brownish, to 6.5 mm.

- Flower* : June – September
Exsiccatus : Kupup 4200 m, **SR Lepcha & AP. Das** 30951, dated 24.07.2005
Status : Sparse
Local Distribution : Changu, Rachel, Pangkha, Donkyala, Kupup 3000 – 4200 m.
General Distribution : E.HIMALAYA; INDIA, (NEPAL – BHUTAN), TIBET, CHINA.

Dubyaea DC.

Dubyaea hispida DC., Prodr. 7: 247. 1838; Kitamura in F. & Fl. Nepal Him. 338. 1966; Fl. E. Him. (1): 338.1996; Hara *et al.* Enum. Fl. Pl. Nepal 3: 25. 1882; Hajra in Hajra *et al.*, Fl. India 13: 275. 1995 ; Grierson & Springate in Grierson & Long. Fl. Bhutan 2(3): 146. 2001. Kumar & Singh, Astera. Sikkim 90. 2001. *Hierocium hispidum* D.Don, Prodr. Fl. Nepal 165. 1825, *nom. illegit.* *Lactuca dubyaea* C.B. Clarke, Comp. India 271. 1876.

Herbs, perennial, densely hispid. Stems with creeping rhizome upto 75cm tall, erect, leafy, robust. **Leaves** lamina 6 - 13 x 2.5 - 8cm; lower leaves ovate-lanceolate or ovate oblong, rarely lyrate, pinnately lobed at base; petiole winged. Inflorescence oftenly in loosely paniced or corymbs. **Flowers** heads nodding with purplish glandular hairs. **Involucral** bracts unequal; acuminate, linear lanceolate; inner linear lanceolate or linear oblong. Ligules usually yellow. **Anthers** yellow. **Achenes** fusiform lanceolate, brownish or blackish. Pappus pale whitish, much persistent.

- Flower* : July – September
Exsiccatae : Bhimbase 4150 m, **SR Lepcha & AP. Das** 31477, dated 27.07.2005
 Nathang 3950 m, **SR Lepcha & AP. Das** 30852, dated 29.07.2005
Status : Common.
Local Distribution : Bhimbase, Kupup, Changu, Nathang 3800 – 4200 m.
General Distribution : E.HIMALAYA; INDIA, (NEPAL – BHUTAN),
Note : Endemic to Eastern Himalaya.

Duhaldea DC.

Key to the species :

1. Leaves sessile; capitula heterogamous; ray florets tubes dilated *D. rubricaulis*
 + Leaves petiolated; capitula a loose corymbose ; ray floret tube not dilated *D. nervosa*

Duhaldea nervosa (Wallich ex DC.) AA. Anderberg in Pl. Syst. Evol., 176 (1-20: 104. 1991; Grierson & Springate in Grierson & Long., Fl. Bhutan 2(3): 1496. 2001. *Inula nervosa* Wallich Cat.no. 2960, *nom nud.* ; Kumar & Singh, Astera. Sikkim 110. 2001.

Shrubs upto 2 m tall. **Stem** decumbent, simple, sparsely hairy, strigose. **Leaves**; petiole to 5 mm long; elliptic **lamina** 4 – 13 x 1.5 – 4 cm, acute or acuminate, base cuneate, margin distantly serrate, , sparsely pilose ob both surfaces. **Capitula** 1 or few, loosely corymbose. **Involucre** 5 (-8) serrate; inner phyllaries linear lanceolate acute to acuminate, purple. **Outer phyllaries** suberect, dilated above. **Ray florets** tubes dilated above; ligule white. **Achenes** to 2 mm long, sericous; **pappus** white as long as disc flower.

Flower : July *Fruit:* October
Exsiccatus : On way to Rachela towards NNP border 1950 m, *SR Lepcha & AP. Das* 0230, date 13.10.2005.
Status : Less Common.
Local Distribution : Rachela Durpinay, 1600 – 2400 m.
General Distribution : HIMALAYAS AND N.E. REGION; INDIA, NEPAL, BHUTAN, CHINA, MYANMAR.

Duhaldea rubricaulis (Wallich ex DC.) AA. Anderberg in Pl. Syst. Evol., 176 (1-20): 104. 1991.
Inula rubricaulis Clarke, Comp. Ind. 126. 1876; Hook.f. in Fl. Brit. India 3: 296. 1881; Hara *et al.* Enum. Fl. Pl. Nepal 3: 31. 1982; Hajra *et al.*, Fl. India 13: 25. 1995; Kumar & Singh, *Astera*. Sikkim 110. 2001. *Amphiraphis rubricaulis* DC., Prodr. 5: 343, 1936.

Shrubs upto 2 m tall. Stem flexuous, pubescent. **Leaves** sessile; lamina 8 - 13 x 3 - 5 cm, elliptic-lanceolate, acuminate, serrate, glabrous, nerves parallel. **Heads** heterogamous, to 2 cm in diam., in a cluster of 3 - 5 borne in axillary racemes; peduncles stout and tomentose. **Involucral** bracts upto 0.9 cm long, lanceolate, acuminate, purple. **Ray florets** revolute, yellow; **ligules** to 0.5 x 0.4 cm, trilobed. **Disc florets** tubular, yellow. **Ray floret** achenes to 0.3 cm long, cylindrical; disc floret achenes to 0.13 cm long, hairy. **Pappus** to 0.6cm long, white.

Flower : December 0- February *Fruit:* June - April
Exsiccatus : On way to Rachila 2050 m, *SR Lepcha & AP. Das* 0229, dated 13.10. 2005.
Status : Less Common.
Local Distribution : Rachela Durpinay, 1800 m.
General Distribution : INDIAN PART OF SUBTROPICAL HIMALAYAS AND N.E. REGION, NEPAL, BHUTAN, MYANMAR, CHINA.

Erigeron Linnaeus

Erigeron karvinskianus DC., Prodr. 5:85. 1836, Contree Gray Herb. n.s. 52: 30. 1917; Fl. Java 2: 385. 1965; Kitamura & Gould in Enum. Fl. Pl. Nepal 3: 27. 1982 ; Hajra in Hajra *et al.* Fl.India 12: 122. 1995. Grierson & Springate in Grierson & Long., Fl. Bhutan 2(3): 1540. 2001; Kumar & Singh, *Astera*. Sikkim 96 . 2001. *E. mucronatus* DC., Prodr. 5: 285. 1836. *Vittadenia triloba* auct. DC.: Fl.E.Him. 1: 347. 1966.

Herbs, perennial, rhizomatous, diffused tufted upto 50cm.. **Stem** much branched from base. **Leaves** lamina 0.5 -1.7 x 0.3 - 0.6cm, sessile, alternate, lanceolate, (basal leaves larger and variable, often lobed), subentire, acute, base narrowed, hairy both sides, uninerved. Peduncles upto 6.5cm, thinly hairy. **Inflorescence** solitary, terminal - axillary, Heads upto 2.5cm across, radiate. **Involucral** ca. 4mm, 3 - 4 seriate, **Phyllaris** lanceolate, acuminate, pubescent, mid vein brownish. Ligule white, rarely becoming pink or fading. **Ray-florets** usually 2 seriate, longer than disc florets, white or even pink. **Disc corolla** yeallow. **Achenes** oblong. **Pappus hairs** upto 0.22cm, light white.

Flower : March – October *Fruit:* July – December
Exsiccatus : Kupup lake 4050m, *SR Lepcha & AP. Das* 30826, dated 29.07.2005.
Status : Common
Local Distribution : Karponang, Kyongnosla, 1600 – 2200 m.

General Distribution : Native of NEW ZEALAND; naturalised in SUBTROPICAL-TEMPERATE CENTRAL ASIA.

Eupatorium Linnaeus

Eupatorium adenophorum Sprengel, Syst. Veg. 3: 420. 1826; Contree Gray Herb. n.s. 60: 85. 1919 (in obs.); Blumea 1:502. 1935; Hara in Fl.E.Him 1:339. 1966; 2:137. 1971; Kitamura & Gould in. Enum. Fl. Pl.Nepal 3: 27. 1982; Grierson & Springate in Grierson & Long., Fl. Bhutan 2(3): 1624. 2001; Kumar & Singh, Astera. Sikkim 100. 2001. *E. glandulosum* H.B.K. Nov. Gen. & Sp. 4: 122. 1820; non Michaux (1803); Journ. Bom. Nat. Hist. Soc. 64 (1): 83. 1967.

Local Name: Vongnokbu (Lep.) Kalo Banmara (Nep.).

Undershrubs, perennial upto 1m tall. **Stem** reddish, covered with fulvous-glandular hairs, reddish. **Leaves** opposite, rhomboid-elliptic or almost triangular, **lamina** 3 - 8 x 1.7 - 4 cm, crenate-serrate, acute, base cuneate, dark green, coarse, almost glabrous above, glandular-hairy beneath. **Flowers heads** 0.5 cm across, discoid, arranged in corymbs. **Involucral bracts** triseriate. **Florets** white, longer than involucre. **Achenes** 5-angled, linear-oblong, glabrous. **Pappus** less than 0.4cm long, hairs minutely barbed, ash white.

Flower : June - September *Fruit*: July - October
Exsiccatus : Rigu 1700 m, **SR Lepcha & AP. Das** 0221, dated 15.08.2005.
Status : Common.
Local Distribution : Rigu, Southern Pangolakha, 1700 - 3300 m.
General Distribution : Pantropic weed. Native of Mexico..
Note : Dried leaves used extensively as potent manure in the cultivation of ginger. (Rai & Das, 2005)

Galingsoga Ruiz & Pavon

Galingsoga parviflora Cavailles Ic. Descr. Pl. 3: 41. t. 281. 1795; Hook.f., Fl. Brit. India 3: 311. 1881; Grierson & Springate in Grierson & Long., Fl. Bhutan 2(3): 1610. 2001; Kumar & Singh, Astera. Sikkim 101. 2001.

Herbs upto 70 cm. stems pubescent above. **Leaves**; petiole to 1.5 cm; ovate - lanceolate, **lamina** 1.8 - 5 x 1.6 - 4cm, acuminate, rounded or attenuated at base, shallowly seriate to crenate, ciliate and sparsely pilose on both surfaces; peduncles short pubescent, glandular eglandular. **Involucral** outer phyllaris to to 3.5mm, inner ones to 4mm, ovate. Outer palea oblong-elliptic, to 4.3 mm, ; inner palea oblanceolate; to 3.4 mm, free, trifids. **Ligule** to 1.7 mm. Disc corolla to 13 mm. Ray achene 2 mm, pappus of bristle, to 0.3 mm. Disc achenes 1.6mm.

Flower & Fruit : July - September
Exsiccatus : On way to Panglakha 2950 m, **SR Lepcha & AP. Das** 27717, dated 30.09.2004.
Status : Less common
Local Distribution : PWS, 3500 - 4300 m.
General Distribution : Cosmopolitan weed; native of TROPICAL AMERICA.

Gnaphalium Linnaeus

Gnaphalium luteo-album L., Sp. Pl. 851. 1753; Hook.f., in Fl.Brit.India 3: 288. 1881. subsp. *affine* (D. Don) Koster in Blumea 4 (3): 484. 1941; Hajra in Hajra *et al.* Fl.India 13: 87. 1995; Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1581.2001; Kumar & Singh, Astera. Sikkim 103. 2001. *Gnaphalium affine* D. Don., Prodr. Fl. Nep.173. 1825; Hook. f., in Fl. Brit. India 7: 288. 1881; Hara *et al.* Fl. E. Him. 1: 339. 1966; 3: 116. 1975; Hara *et al.* Enum.Fl. Pl. Nepal 3: 29. 1982. *G. luteoalbum* var. *multiceps* (Wallich ex DC.) Hook. f. in Fl. Brit. India 3: 288. 1881; Kumar & Singh, Astera. Sikkim 103. 2001.

Herbs, annual, erect upto 25 cm tall. **Stem** usually unbranched, white hairy. **Leaves** sessile, half-clasping, **lamina** 1.5 - 5 x 0.5 - 0.8 cm, oblong spatulate, entire, acute to rounded, gray, or white wooly-haired, usually medianly uninerved. **Flowers-heads** small upto 0.5 cm across, globular, clustered in solitary, or dense branched, bright yellow. **Involucral bracts** 0.30cm, oblong, papery. **Ray florets** absent. **Disc florets** tubular, outer female, inner ones bisexual. **Style arms** truncate.

Flower & Fruit : February - October

Exsiccatas : Padamchen - Zuluk 2200 - 3600 m, *SR Lepcha, & AP. Das* 20225, dated 29.10.2004.

Status : Most Common

Local Distribution : Padamchen above 2800 m, KAS, PWS, 2200 - 3300m, 1400 - 3600 m.

General Distribution : HIMALAYAS, MYANMAR, THAILAND, INDO- CHINA, JAVA, CHINA AND JAPAN.

Gynura Cassini

Key to the species:

1. Leaves sessile; lamina rhombic or ovate to elliptic-lanceolate... *G. nepalensis*

+ Leaves petiolated; lamina oblong or oblanceolate..... *G. cusimbua*

Gynura cusimbua (D. Don) S. Moore in Journ. Bot. 50: 212. 1912; Kitamura in Fl. E. Him. 1: 340. 1966; Chater & Kitamura in Enum. Fl.Pl.Nepal 3: 29. 1982; TBRI 50(4): 115. 1987; Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1600.2001. *Cacalia cusimbua* D. Don., Prodr. 179. 1825. *Gynura angulosa* DC. Prodr. 6: 298. 1837; Hook.f., in Fl. Brit. India 3: 334. 1881.

Herbs upto 1.5 m tall. **Leaves** sessile, alternate, , oblong or oblanceolate, **lamina** 8 - 22 x 3 - 7 cm, margin irregularly toothed, acuminate, base attached to stem (base of upper leaves often lobed), glabrous to sparsely hairy, mid-nerve prominent and impressed above, elevated beneath, lateral nerves upto 22 pairs. **Flowers** in both terminal and axillary corymbs. **Involucral bracts** un-iseriate with scarios margins. **Flower heads** many, 1.2-1.8cm across, discoid. **Pappus** hairs whitish. **Achenes** ribbed and glabrous.

Flower : October - January *Fruit* : December - March

Exsiccatae : Dohrok 2300 m, *SR Lepcha & AP. Das* 30242, dated 06.10.2004.

Status : Frequent. Padamchen - Zuluk 2400 m - 3700 m, *SR Lepcha & AP. Das* 20216, dated 08.10.2004.

Local Distribution : Rachel, Mulkharka, Kyongnosla, Dohrok 1900 - 3300 m.

General Distribution : HIMALAYAS; INDIA-Nilgiri, MYANMAR, THAILAND, CHINA.

Gynura nepalensis DC., Prodr. 6: 300.1838; C.B. Clarke, Comp.Ind. 171.1876; Hook.f., in Fl. Brit. India 3: 333.1881; Kitamura in Fl.E. Him.340. 1966; 2: 137.1971; Hara *et. al* Enum Fl. Pl. Nepal 3: 30.1982; Hajra in Hajra *et al.* Fl. India 12: 310. 1995; Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1600. 2001; Kumar & Singh, Astera. Sikkim 106. 2001.
Cacalia aurantiaca Wallich., Cat. 108 n.3146. 1831, *nom.nud.* *Cacalia foetens* Wallich., Cat. 108, n 3156, 1831, *nom.nud.* *Gynura foetens* DC., Prodr. 6: 300. 1838.

Shrubs perennial, bushy, tuberous upto 1.5 m tall. **Stem** corymbosely branched above. **Leaves**; petiolate (petiole upto 1.3 cm); rhombic or ovate to elliptic-lanceolate acute to acuminate, margins incised with mucronate teeth, **lamina** 2 - 22 x 2 - 7 cm with white hairs in upper surface, base cuneate into sessile. **Flowers**; capitula discoid campanulate, slightly longer than broad, bracteolate, **bracteole** linear, subulate with white hairs on margins; bracts 14; linear lanceolate pubescent, scarious margiss. **Involucre**; phyllaries narrowly oblong. **Florets** yellow. **Achenes** dark brown, cylindrical, pubescent, or glabrous, many ribbed. **Pappus** of white, slender hairs.

Flower & Fruit : March- May
Exsiccatae : Rachela - Panglakha 3100 m, *SR Lepcha & AP. Das* 31009, dated 02.10.2004; Dohrok 2300m, *SR Lepcha & AP. Das* 30242, dated 06.10.2004.
Status : Common
Local Distribution : Kyongnosla, Changu, Zuluk (3000 - 3800 m)
General Distribution : HIMALAYAS; INDIA (Kashmir- Assam, Sikkim) NEPAL, MYANMAR, BHUTAN, TIBET, CHINA.

Lactuca Linnaeus

Key to the Species

1. Rhizomatous herbs without stem; leaf margin entire or distantly toothed *L. cooperi*
 + Non- rhizomatous herbs with simple stem; leaf margins irregularly toothed *L. graciliflora*

Lactuca cooperi Anthony in Notes Roy. Bot. Gard. Edinb. 18: 198. 1934; Mangain & Rao in Hajra *et al.* Fl. India 12: 276. 1995; Kumar & Singh, Astera. Sikkim 114. 2001.
Youngia depressa (Hook.f & Thoms.) Babcock & Stebbins Gen. Youngia (publ. Carnegie Inst. Wash. No 484. 33.1937; Grierson & Springate in Grierson & Long. Fl. Bhutan 2(3): 1454. 2001.

Herbs, perennial with long rhizomes, stem absent. **Leaves**; petiole to 5 cm long, pubescent; all radicals, **lamina** oblong, ovate or orbicular, cordate at base, entire or minutely distantly denticulate, glabrescent. **Capitula** numerous; heads cylindric to 5.5 cm long, 10 - 15 flowered. **Flower** yellow. **Involucre** cylindrical, crimson; outer phyllaries lanceolate, inner narrowly oblong- lanceolate. **Corolla** tube to 10 mm long, exceeding ligule; luigule 9 x 2.5 mm. **Achenes** upto 6.5 mm long, compressed 9 ribbed, oblong lanceolate, hispid towards apex, contracted at beak. **Pappus** to 10 mm long, whitish, or slightly reddish brown, shining.

Flower & Fruit : August - October
Exsiccatus : Bhimbase - Lampokhri 4300 m, *SR Lepcha & AP. Das* 20455, dated 10. 08. 2004.
Status : Not common
Local Distribution : Kupup, Bhimbase 4300 m.
General Distribution : INDIA (Sikkim), BHUTAN, Chumbi (TAR)

Note : Endemic to Eastern Himalaya

Lactuca graciliflora DC., Prodr. 7: 139. 1838; Hook.f. in Fl. Brit. India 3: 406. 1881; Hara *et al.* Enum. Fl. Pl. Nepal 3: 32. 1982; Hajra *et al.* Fl. India 12: 289. 1995. Kumar & Singh, Astera. Sikkim 115. 2001. *Lactuca rostrata* (Bl.) O. Kuntze, Rev. Gen. Pl. 1: 349. 1891; Hara in Fl. E. Him. 1: 341. 1966. *Stenosseris graciliflora* (Wall. Ex Dc.) C. Shih in Acta Phytotax. sin, 29(5): 431. 1991.

Herbs erect leafy upto 65 cm tall. **Stem** simple, sometimes branched above, stout at base. **Leaves**; petioles upto 3 cm long); lower ones pinnate or pinnatifid, terminal lobe triangular-ovate, irregularly toothed, upper ones sessile, ovate to lanceolate, glabrous both surfaces. **Panicles** spreading, large, upto 50 cm long, open; peduncles slender. **Heads** many, upto 1 cm long, drooping, white, glabrous; bracts to 0.9 cm, spatulate. **Ray florets** purple. **Achenes** narrowly oblong or often oblanceolate; **Pappus** white.

Flower : September - December *Fruit*. October - April
Exsiccatus : Rachela 2980 m, *SR Lepcha & AP. Das* 0228, dated 13.10.2005
Status : Less Common.
Local Distribution : Rachela Durpinay, Middle Rachela, 1800 – 2900 m.
General Distribution : HIMALAYA; INDIA, (NEPAL – BHUTAN), JAVA, SUMATRA, W. CHINA.

Ligularia Cassini

Key to the species:

1. Stems densely covered with velvety tomentum *L. kingiana*
- + Stem glabrescent or slightly pubescent, 2
2. Leaf lamina broadly ovate to suborbicular *L. retusa*
- + Leaf lamina reniform – cordate *L. hookeri*

Ligularia hookeri (C.B. Clarke) Handel – Mazzetti in Engler, Bot. Jahrb. 69: 127. 1938; Hajra *et al.* Fl. India 13: 230. 1995; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1575. 2001; Kumar & Singh, Astera. Sikkim 126. 2001.

Cremanthodium hookeri C.B. Clarke, comp. India, 169. 1876; Hook.f., Fl. Brit. India 3: 331. 1881.

Herbs perennial upto 60 cm. **Stem** erect, glabrescence – pubescent; surrounded by leaves remain at base. **Leaves**; petiole to 1.6 cm; basal leaves reniform – cordate; **lamina** 2.5 – 10 x 2.2 – 50 cm; obtuse, deeply cordate at base, sharply dentate, glabrous to puberulous in upper surface, subglabrous to puberulous below; **Cauline** leaves similar to basal leaves. **Inflorescence** erect, racemose, hairs on apex of peduncle and base of involucre, rarely extending to phyllaries. **Capitula** 1 – 9; ligule more than 4 x width. **Disc corolla** length 1.2 x 3.2 mm, limp narrowly infundibular, toothed. **Achenes** oblong. **Pappus** white.

Flower & Fruit : July – September
Exsiccatus : Nathang 3950 m, *SR Lepcha & AP. Das* 30851, dated 29.07.2005.
Status : Less common
Local Distribution : Nathang, Kupup, 2500 – 4400 m.
General Distribution : E.HIMALAYA; INDIA (Sikkim), NEPAL, BHUTAN.
Note : Endemic to Eastern Himalaya.

Ligularia kingiana (W.W. Smith) Handel – Mazzetti in Journ. Bot., London 76: 289. 1938; R. Mathur in R.R. Rao *et al.* Fl. India Enum. Aster. 53. 1988; Hajra in Hajra *et al.* Fl. India 13: 235. 1995; Grierson & Springate in Grierson & Long. Fl. Bhutan 2(3): 1575. 2001; Kumar & Singh, Astera. Sikkim 128. 2001.

Senecio kingianus W.W. Smith in J. Pro. As. Soc. Bengal 7: 71.1911.

Herbs perennial, erect upto 1.5 m tall. Stem erect densely covered with velvety tomentum, corymbosely branched. **Leaves**; petiole to 30 - 45cm long, not winged; radical leaf broadly orbicular - cordate, **lamina** 32 x 42 cm, obtuse, deeply cordate, mucronately denticulated; glabrous on upper surface, lower surface pubescent - velvety tomentum on veins; cauline leaves alternate, orbicular or reniform, denticulated, tomentose, base sheathing; sheath much dilated. Capitula narrowly radiate, campanulate, 9 x 2-5mm, 3 - 7flowered; bracteolate, bracteoles 3-5, to 4 mm, subulate. **Involucre** narrowly campanulate; bract oblong, suotuse, rare acute, with narrow scarios margins. 2. 8 mm in diam; **phyllaries** 5 - 8 oblong. **Ray flowers** 3-4, linear, apex denticulated. Disc florets hermaphrodite, tubular. Corolla tube to 6.3 mm.; ligule to 13 mm. **Achenes** cylindrical - oblong, papus of short white hairs, to 11 mm. **Pappus** to 5 mm, white.

Flower & Fruit : July - September

Exsiccatus : Donkyala 3950 m, **SR Lepcha & AP Das** 0301, dated 13.07.2005.

Status : Not common

Local Distribution : Gnathang, Chhangu, Donkyala, PWS, 3200 - 4300 m.

General Distribution : E. HIMALAYA; INDIA (Sikkim)

Note : Endemic to E. Himalaya (Sikkim).

Ligularia retusa DC., Prodr. 6: 314. 1838. Hajra *et al.* 13: 317. 1995; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1574. 2001; **Cremanthodium retusum** (DC.) R. Good in Journ. Linn. Soc. Bot. 48: 278. 1929; Kumar & Singh, Astera. Sikkim 87. 2001.

Senecio retusus (Wallich ex Dc.) C.B. Clarke, Comp. India 206. 1876; Hook. f., Fl. Brit. India 3: 350. 1881.

Herbs perennial upto 1 m tall. **Stem** blackish, usually pubescent towards apex. **Leaves**; petiole to 25 cm; broadly ovate to suborbicular, **lamina** 5.5 - 19 x 8 - 20 cm, deeply cordate, toothed, slightly glabrous on both upper and lower surfaces, cauline leaves sub-orbicular, bearing sheaths, radical leaves reniform. **Capitula** mostly 2 - 9 in panicles racemes, sometime solitary, Involucral to 2.7 cm in diam; phyllaries lanceolate, dark. **Ray corolla** yellow; **ligule** oblanceolate, toothed. **Disc corolla** short to 1.3 cm. **Achenes** oblong. **Pappus** white.

Flower : July - September

Exsiccatus : Lampokhri 4050 m, **SR Lepcha & AP. Das** 0206, dated 07.07.2005

Status : Not common

Local Distribution : Lampokhri, PWS, 3600 - 4500 m.

General Distribution : E. HIMALAYAS; INDIA (Sikkim)

Note : Endemic to the Eastern Himalaya.

Myriactis Lessing

Key to the Species

1. Leaves subsessile- sessile; flower heads globose; involucre bracts reflexed
..... *M. nepalensis*
- + Leaves petiolated (winged) rarely sessile; flower heads semi-globose;
involucre bracts not reflexed *M. wallichii*

Myriactis nepalensis Lessing in Linnaea 6: 128, t. 2F. 1831; C.B. Clarke, Comp. India 38. 1876; Hook f. in Fl. Brit. India 3: 247. 1881; Kitamura in Fl. E. Him. 342. 1966; 2: 139. 1971; 3: 117. 1975; Hajra in Hajra *et al.* Fl. India 12: 134. 1995; Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1529. 2001; Kumar & Singh, Astera. Sikkim 130. 2001.

Lavenia dentata Wallich, Cat. 111, n. 3216. 1831, *nom. nud.* *Levenia sphaerantha* Wallich, Cat. 111, n.3217. 1831, *nom. nud.* *Myriactis wallichii* Lessing in Linnaea 6: 129. 1831.

Herbs annual, 15-50cm tall hispid or glabrous. **Stem** prominently ribbed, glabrous at base and centre. hispid or glabrous. **Leaves** lamina 6 - 15 x 2.5 - 3, lanceolate or ovate, equally serrate, usually sub-sessile but sometimes sessile. **Flowers** heads globose, borne on short and rigid peduncles, oftenly sub-paniculate. **Involucre** bract, usually acute, reflexed. Ray florets ca 10-seriate. **Disc florets** very few. **Achenes** mucronate, Ca 1.5 mm long.

- Flower* : June *Fruit:* October
Exsiccatus : Nathang - Panglakha 3390m, *SR Lepcha & AP. Das* 27789, dated 30.09.2009.
Status : Common.
Local Distribution : Kyongnosla, Nathang - Panglakha 1700 - 3300 m.
General Distribution : INDIA (Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Sikkim, U.P.) AFGHANISTAN, BHUTAN, CHINA, IRAN, AND NEPAL.

Myriactis wallichii Lessing in Linnaea 6: 129.1831; Hook f., Fl. Brit. India 3: 247. 1881; Hajra in Hajra *et al.* Fl. India 12. 135. 1995; Grierson & Springate in Grierson & Long., Fl. Bhutan 2(3): 1530. 2001. Kumar & Singh, Astera. Sikkim 130. 2001.

Herbs, annual slender, rather low herbs, upto 25cm tall. **Leaves** elliptic lanceolate; petiolate, petiole often winged rarely sessile in upper part; lamina 1.5 - 6 x 0.4 - 2.5cm, elliptic lanceolate, unequally serrate, hispidulous on both surfaces,. **Flower** heads semi-globose slender pedicelled forming a wide paniculates inflorescence. **Involucre** bracts 2 - 3 seriate, lanceolate, erect not reflexed. **Ray florets** 3 - 5 seriate, ligule ovate, tip notched, style bifid. **Disc florets** 1mm long, 5 lobed, companulate. **Achenes** flattered smooth.

- Flower* : June *Fruit:* August
Exsiccatus : Durpiney dara (NNP border) 2400 m, *SR Lepcha & AP Das* 29383, dated 30.09.2004.
Status : Common.
Local Distribution : Durpiney dara, Above Dohrok, 2200 - 4000m.
General Distribution : INDIA (Himachal Pradesh, Sikkim, Uttar Pradesh) JAVA, NEPAL.

Saussurea DC.

Key to the species:

1. Plants more than 50 cm tall 2
- + Plants less than 50 cm tall 3

2. Achene oblong 4
- + Achene oblanceolate *S. candolleana*

4. Herbs less than 1 m tall 5
- + Herbs more than 1 m tall *S. deltoidea*

5. Capitula 3 – 15; pappus oftenly fused in a ring *S. auriculata*
- + Capitula usually solitary, at branch end; pappus not fused in a ring *S. uniflora*

3. Flowers with solitary capitula6
- + Flowers with numerous capitula *S. gossipiphora*

6. Phyllaries mostly linear lanceolate *S. taraxacifolia*
- + Phyllaries obovate, oblong or oblanceolate *S. eriostemon*

Saussurea auriculata (Sprengel ex DC.) Sch. Bip. in *Linnaea* 19: 331. 1846; Hara in *Fl. E. Him.* 2: 139. 1971; 3: 117. 1975; Chater & Kitamura in *Enum. Fl. Pl. Nepal* 3: 38. 1982; Hajra in Hajra *et al.* *Fl. India* 12: 192. 1995; Grierson & Springate in Grierson & Long., *Fl. Bhutan* 2(3): 1442. 2001. Kumar & Singh, *Astera. Sikkim* 139. 2001.

Cnicus auriculatus Wallich, *Cat.* 100 n. 2899. 1831. *Aplotaxis auriculata* Spreng. ex DC., *Prodr.* 6: 541. 1838. *Saussurea hypoleuca* Spreng. ex C.B. Clarke, *Comp. Ind.* 234. 1876; Hook. f. in *Fl. Brit. India* 3: 374. 1881.

Herbs, perennial, erect 95 cm tall. **Stem** leafy, branched or sometime unbranched above. **Leaves** auriculate basally, lower ones usually larger than upper ones, **lamina** 6 - 16 x 4 - 8 cm, pinnately lobed, terminal lobe slightly larger, triangular; thinly hairy and rough above, and white felted beneath. Capitula usually solitary, at branch end. **Flower** heads usually upto 4.5cm diam., globular, usually solitary, consisting of **disc florets** only. **Involucral bracts** usually many, linear or nearly lanceolate, rarely recurved, purple. **Receptacle** with bristly scales. Achene obovate, with 2 rows of pappus, inner ones being slightly longer bases of **pappus** oftenly fused in a ring.

Flower : July - September *Fruit*: September - January
Exsiccatus : Premlakha – Panglakha 2400 – 3100 m, **SR Lepcha & AP. Das** 20225, dated 29.10.2010.

Status : Common.

Local Distribution : Premlakha, Jorpokhari, Rachel Peak. 2700 – 3100 m.

General Distribution : HIMALAYAS; INDIA, (Jammu & Kashmir – Sikkim), NEPAL, BHUTAN

Note : Endemic to the Himalaya.

Saussurea candolleana Wallich ex DC., *Prodr.* 6: 541. 1838, *pro syn.* *S. candolleana* Wallich ex Sch.- Bip. In *Linnaea* 19: 331. 1846. Grierson & Springate in Grierson & Long, *Fl. Bhutan* 2(3): 1450. 2001; Kumar & Singh, *Astera. Sikkim* 141. 2001.

Aplotaxis candolleana DC., *Prodr.* 6: 541. 1838; Hook. f., *Fl. Brit. India* 3: 372. 1881.

Herbs upto 1 m tall narrowly winged, thinly puberulous, **Leaves** lamina 5 – 13 x 1.5 – 5.5, cauline leaves narrowly ovate elliptic, acuminate, narrowed and deccurrent at base, remotely denticulate or finely dentate, sparsely puberulous or minutely scabridulous above, araceous beneath. **Flowers** in terminal or axillary corymb, dense 10-20. **Involucral** to 5mm in diam. **Phyllaries** obovate, acuminate – narrowly oblong or oblanceolate, acute or obtuse, dark violet at apex; outer ones sparsely araceous. **Corolla** upto 12mm including lobes. **Achenes** oblanceolate, compressed; papus double, brownish, inner series upto 10mm, outer series upto 5mm, scabrid, caduceus.

Flower & Fruit : July – October
Exsiccatu : Padamchen – Panglakha 2800 m, *SR Lepcha & AP. Das* 32880, dated 27.10.2004.
Status : Commn
Local Distribution : Kyongnosla – Changu 3000 – 4500 m
General Distribution : PAKISTAN, HIMALAYAS; INDIA, NEPAL, BHUTAN.

Saussurea deltoidea (DC.) C.B. Clarke, Comp. India 235.1876; Hook.f. in Fl.Brit.India 3: 374. 1881; Act. Phytotax. Geobot. 19: 13. 1961; Hara *et al.* Fl. E.Him.1: 342.1966; 2: 140. 1971; Hajra in Hajra *et al.* Fl. India 12:197.1995; Grierson & Springate in Grierson & Long., Fl. Bhutan 2(3): 1442.2001.; Kumar & Singh, Astera. Sikkim 143. 2001.
Aplotaxis deltoides DC., Prodr. 6:541. 1838.

Herbs, perennial, erect upto 2 m tall. **Stem** branched above, white hairy. **Leaves** with short petioled 0.2 - 0.5 cm); leave lamina 2.5 – 7.5 x 1.5 - 2.8 cm, upper deltoid or triangular ovate, lower lyrate-pinnatifid, sinuate-toothed, acute, base narrow, above glabrous and greenish, beneath white-tomentose, nerves usually prominent below. **Flower heads** 1.5 - 2 cm long, peduncled, usually scattered or nodding paniced. **Involucral bracts** ovate, purple margins. **Pappus** single. **Achenes** oblong, 4-5 angled.

Flower : September – December *Fruit*: October - January
Exsiccatu : Bhimbase – Donkyala 4200 m , *SR Lepcha & AP. Das* 31474, dated 28.07.2005;
Status : Less Common.
Local Distribution : Tinsimana, Jorpokhari, 2000 – 3000 m.
General Distribution : HIMALAYAS, INDIA, NEPAL, BHUTAN), MYANMAR, INDO-CHINA, CHINA, TAIWAN, THAILAND

Saussurea eriostemon Wallich ex C. B. Clarke Cent.: Wall. 2912 (type of *S. eriostemon*); olunin 1466. East: Stainton 1141; Nishioka 673; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1446.2001; Kumar & Singh, Astera. Sikkim 149. 2001.
Saussurea nepalensis Spreng., ; Syst. Veg. 3: 380. 1826.

Herbs upto 25 cm tall fibrous with leaf remains. **Leaves** lamina 5 – 15 x 1 – 4 cm, basal leaves pinnatisects, oblanceolate in outline, though slightly paler beneath, pubescent in veins particularly beneath; lateral segments 4 – 8 pairs, ovate or oblongacute or rounded, mucronate, denticulate or toothed. **Flowers** in solitary capitula. **Involucral bracts** campanulate, **Phyllaries** subglabrous, dark purplish margined. Outer ones ovate lanceolate with upper part sparsely araceous. **Corolla** upto 12mm including lobes. **Achenes** oblanceolate, compressed; **papus** double, brownish, inner series upto 10mm, outer series upto 5mm, scabrid, caduceus.

Flower & Fruit : July – October

Exsiccatus : Kupup lake 4200 m, **SR Lepcha & AP. Das** 0717, dated 10.10.2002.
Status : Common
Local Distribution : Changu, Baba mandir, 3000 – 4500 m
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, S. TIBET.
Note : Endemic to Himalaya.

Saussurea gossipiphora D.Don in Mem.Wern.Nat.Hist.S.3: 414.1821; Hook.f., in Fl.Brit. India 3: 376; 1881; Chater & Kitamura in Enum. Fl. Pl. Nepal 3: 39.1982; Hajra in Hajra *et al.* Fl.india 12: 200. 1995; Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1436. 2001; Kumar & Singh, Astera. Sikkim 145. 2001.
Aplotaxis gossipiphora DC., Prodr.6: 54. 1838.

Herbs, upto 30 cm tall. **Stem** covered with long white wooly hairs. **Leaves** linear, usually embedded in dense wooly hairs, runcinate pinnatifid, **lamina** 3 – 12 x 2 – 0.8cm , sessile. **Flowers** head cylindrical, sometimes few to many, embedded in wooly hairs. **Involucral** bract linear oblong, short, wooly. **Receptacle** pitted, bristles equating achenes. **Corolla** purple. **Anthers** tails slender, nearly entire. **Achenes** narrowly obovoid; **papus** hairs few, scabrid or absent.

Flower & Fruit : July – August
Exsiccatae : Kupup – Bhimbase 4100 m, **SR Lepcha & AP. Das** 104, dated 13.10. 2007. Lam pokhri – Kupup 3990 m, **SR Lepcha & AP Das** 109, dated 17.10.2007.
Status : Less Frequent.
Local Distribution : Sherabathang, Kupup, Nathula upto 4400 m,
General Distribution : HIMALAYAS; INDIA (Jammu & Kashmir to Sikkim), BHUTAN, S. TIBET, S.W. CHINA (YUNNAN), NEPAL.

Note : Endemic to Himalaya

Saussurea taraxacifolia Wallich (Cat.100,n.2914.1831, *nom.nud.*) ex DC., Prodr.6: 532. 1838; C.B. Clarke, Comp.India 228. 1876; Hook.f.in Fl.Brit.india 3: 368. 1881; Chater & Kitamura in Enum Fl. Pl. Nepal 3: 40. 1982; Hajra in Hajra *et al.* Fl.India 12: 214. 1995 ; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1448.2001. Kumar & Singh, Astera. Sikkim 155. 2001.
Cyathidium taraxacifolia Lindl. Royle. 111. B. Him.251, t.56, t.2. 1835. *S.caespitosa* Wallich, Cat. 2913. 1831.

Herbs upto 30cm tall, senesed leave base surrounding several shoots. **Leaves** lamina , 20 – 1130 x 4 – 30 mm, deeply pinnatisect, linear in outline,subglabrous above, white araneous beneath; lateral lobes pairs, triangular to oblong, retrose rarely spreading, mucronate. **Flowers** in solitary. **Involucral bracts** to 10 mm in diam. **Phyllaries** mostly linear lanceolate, subglabrous or sparsely araneous; corolla upto 20mm including lobes . **Achenes** ribbed,. **Pappus** double inner brownish, outer spasesly plumose.

Flower & Fruit : July – October
Exsiccatae : Lampokhri 4200 m, **SR Lepcha & AP. Das** 30238, dated 24.07.2005.
Status : Less Frequent.
Local Distribution : Lampokhri, Bhimbase, 3000 – 4500 m
General Distribution : HIMALYAS; INDIA(Jammu & Kashmir to Arunachal Pradesh), NEPAL, BHUTAN, S. CHINA, TIBET.

Note : Endemic to Himalaya

Saussurea uniflora (DC.) Wallich ex Sch.-Bip. In Linnea 19: 330. 1846; Hook.f., Fl. Brit. India 3: 366. 1881; Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1439. 2001; Kumar & Singh, Astera. Sikkim 156. 2001. *Aplotaxis uniflora* DC., Prodr. 6: 539. 1838.

Herbs erect upto 70 cm tall. **Stem** sparsely whitist above surrounded by leaf remains. **Leaves**; Petiole upto 13cm.; **lamina** 3 - 120 x 1.5 - 4 cm, \pm acute subatenuate at base, deticuante sparsely pubescent on both sides, mid cauline leaves \pm ovate, sessile, upper one dark red or purplish, membranous, enveloping capitula. **Flowers** in terminal corymb, capitula 3 - 15. Involucral; **phyllaries** ovate - linear, blackish or purple, sparsely villous. Corolla upto 13 cm including lobes. **Achenes** oblong; ribbed. **Pappus** double, inner upto 14mm, outer scabrid.

Flower & Fruit : July - December

Exsiccatus : Bhimbase 4200 m, *SR Lepcha & AP. Das* 0124, dated 13.08.2006.
Donkya 3800 m, *SR Lepcha & AP. Das* 022, dated 15.06.2004.

Status : Less Frequent.

Local Distribution : Bhimbase, Kupup, Donkyala 3050 - 4500 m

General Distribution : E. HIMALAYA; INDIA (Sikkim), NEPAL, BHUTAN.

Note : Endemic to Eastern Himalaya.

Senecio Linnaeus

Key to the species:

1. Herbs 2
- + Climbers *S. scandens*

2. Involucral bracts campanulate - broadly campanulate 3
- + Involucral bracts linear *S. biligulatus*

3. Leaf bracts 2 - 3, linear; pappus hairs reddish *S. raphanifolius*
- + Leaf bracts 10 -13 linear lanceolate; pappus hairs whitish *S. wightiana*

Senecio biligulatus W.W. Smith in JASB n.s. 7: 69.1911; Hara *et al.* Enum. Fl. Pl. Nepal 3: 41. 1982. Hajra in Hajra *et al.* Fl. India 13: 243. 1995; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1596.2001. Kumar & Singh, Astera. Sikkim 159. 2001.

Herbs, perennial, rhizomatous upto 1m tall. **Stem** usually flexuous, hairy. **Leaves**; petioles winged and basally auriculate, auricles dentate; **lamina** 6 -10 x 2.2 - 5 cm, lanceolate, margin pinnatifid and lobed into triangular, dentate lateral lobes, hairy above. **Flowers**; capitula densely arranged in terminal corymb. **Involucral bracts** upto 0.5cm long, linear, obtuse at apex. **Ray florets** 0.35 - 0.8 cm, linear-oblong, yellowish. **Disc florets** 0.30 - 0.5cm long, yellow. **Achenes** slightly ribbed, glabrous. **Pappus** whitish.

Flower & Fruit : June - September

Exsiccatus : Mulkharka -Phusrey 2100 m, *SR Lepcha & AP. Das* 107, dated 03. 10,2003.

Status : Less Frequent.

Local Distribution : NNP border, Mulkharka, 2100 - 2600 m.

General Distribution : EASTERN HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR.

Senecio scandens Buch.-Ham. ex D. Don, Prodr. Fl. Nepal 178. 1825; Hook.f. in Fl. Brit. India 3: 352. 1881. Hara in Fl. E. Him. 1: 344. 1966; 2: 140. 1971; Kitamura in Enum. Fl. Pl. Nepal 3: 42. 1982. Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1593. 2001. Kumar & Singh, Astera. Sikkim 162. 2001.

Climber, oftenly with crisscross branches. **Stem** stout, slightly grooved, glabrous. **Leaves** ; petiolate, 0.5 – 1.8cm; **lamina** 3 – 7.5 x 0.7 – 2.5cm, hastate, entire or coarsely toothed, acuminate, base oblique, green and usually glabrous above, thinly pubescent beneath, lateral nerves upto 7 pairs. **Flower** heads 0.5 - 0.8 cm long, bright yellow, usually clustered in lax lateral and terminal corymbs. **Involucral bracts** linear - oblong, glabrous. **Ray-florets** 0.3 cm, ligulate. **Achenes** slender, ribbed.

Flower : October – January *Fruit*: December – March
Exsiccatae : Padamchen 3100 m, **SR Lepcha & AP. Das** 31084, dated 08.10.2004.
Status : Common.
Local Distribution : Rachela, 1900 – 2600 m.
General Distribution : INDIA, MYANMAR, INDIA, SRI LANKA, PHILIPPINES, JAPAN, THAILAND, S. CHINA.

Senecio raphanifolius Wallich ex DC. 6: 366. 1836; Hajra in Hajra *et al.* Fl. India 3: 275. 1995; Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1595. 2001; Kumar & Singh, Astera. Sikkim 162. 2001.

Senecion diversifolia Wallich ex DC., Prodr. 6: 366; Hook.f. in Fl. Brit. India 3: 340. 1881

Herb perennial rhizomatous, tomentose upto 1.5m tall. **Leaves**; petiole expanded above to 8cm long; auricle or amplexicaul; **lamina** 6 x 25 x 1.5 – 6 cm, both radical and cauline, radical leaves oblanceolate, pinnatifid into a large terminal lobe and few lateral lobes, dentate. **Flowers** heads in spicate globose clusters, ca 0.4cm across, campanulate, bracteolate; bracteole 2-3, linear. Peduncle stout. **Involucral bracts** campanulate; bract brownish, oblong acuminate above. **Ray florets** 4 veined. **Disc florets** numerous. **Achenes** glabrous. **Pappus** reddish

Flower : July - October
Exsiccatae : Kyongnosla (Bombay hill) 3200 m, **SR Lepcha & AP. Das** 32818, dated 25.10.2004. Zuluk – Panglakha 2900 m, **SR Lepcha & AP. Das** 32858, dated 26.10.2004.
Status : Common
Local Distribution : Changu, Padamchen, Panglakha, Rachela 2800 – 3200 m,
General Distribution : E. HIMALAYA; INDIA, (Sikkim, Meghalaya), NEPAL, BHUTAN, CHINA, MYANMAR

Senecio wightianus DC. in Wight. Contrb. Bot. India 22. 1834; Hajra *et al.* Fl. India 3: 283. 1995

Herb, perennial scandants, glabrous. **Stem** branched. **Leaves** ; petiole auricled; leaves **lamina** 2.2 – 13 x 3 - 4 cm, pale green, elliptic lanceolate or hastate, acuminate, cordate, deeply dentate, and cauline, radical leaves oblanceolate, pinnatifid into a large terminal lobe and few lateral lobes, dentate. **Flowers** in corymbose pannicale with capitula radiate. **Involucral bracts** broadly

campanulately glabrous; bract 10 -13 linear lanceolate membranous, with broad scarious margin. **Ray florets** yellow, linear oblong. **Disc florets** yellow. **Achenes** ribbed. **Pappus** hairs white.

- Flower* : September – December
Exsiccatus : Padamchen – Nathang 4100 m, *SR Lepcha & AP. Das* 32872, dated 27.10.2004.
Status : Commn
Local Distribution : Kyongnosla, Serathang, Memenchu 3500 – 4000 m.
General Distribution : INDIA (Himachal Pradesh, Meghalaya, Tamil Nadu, NEPAL, BHUTAN, MYANMAR, CHINA, THAILAND, JAPAN, PHILLIPINES

Note : A new distribution record for Sikkim

Siegesbeckia Linnaeus

Siegesbeckia orientalis L., Sp. Pl. ed 1: 100. 1753; Hook.f. in Fl. Brit. India 3: 304. 1881; Hara in Fl. E. Him. 1: 344. 1966; 2: 140. 1971; Chater & Kitamura in Enum.Fl.Pl.Nepal 3: 43. 1982; Hajra in Hajra *et al.* Fl. India 12: 407. 1995; Grierson & Springate in Grierson & Long., Fl. Bhutan 2(3): 1613. 2001; Kumar & Singh, Astera. Sikkim 163. 2001.

Herbs erect annual, upto 1.6m tall. **Leaves** long petioled; triangular ovate, **lamina** 7 - 14cm across, acute, crenate, base truncate, pubescent. **Capitula** ca 2 x 0.9-1.2cm, dull yellow. **Involucral bracts** 2 - seriate, herbaceous, glandular, inner spatulate and spreading, outer ones shorter and glandular. **Ray florets** female, to 0.3 cm long, trilobed, yellowish. **Disc florets** bracteate, bract to 1.7 long, glandular, with oblong anthers. **Cypsela** incurved, obtuse.

- Flower* : July – December *Fruit* : September - January
Exsiccatus : Singhaney 2400 m, *SR Lepcha & AP. Das* 0228, dated 17.10.2004.
Status : Common in low altitude
Local Distribution : 1200 – 2200 m.
General Distribution : AFGHANISTAN, AFRICA, IRAN, ASIA MINOR, CAUCASUS, INDIA, NEPAL, SRI LANKA, CHINA, MYANMAR, MALAYSIA, JAPAN, AUSTRALIA

Note: Cypsela sticks to clothes and rough surface.

Sonchus Linnaeus

Sonchus wightianus DC., Prodr. 7: 187. 1838; Ic. Pl. India Or. 3:t. 1142. 1846; B. Bot. 125: 295, 297. 1972; B. Not. 126: 185. 1973; Kitamura in. Enum.Fl. Pl. Nepal 3: 43. 1982; Hajra in Hajra *et al.* Fl.India 12: 321. 1995 ; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1480. 2001. Kumar & Singh, Astera. Sikkim 167. 2001.

S. arvensis auct non L., Clarke in Comp. India 27. 1876, p.p.; Hook.f. in Fl. Brit. India 3: 414. 1881, p.p.; Hara in Fl.E.Him. 1: 345. 1966; 2:140. 1971; 3: 118. 1975.

Susp. wightianus

Herbs, perennial, upto 45cm tall. **Rootstock** usually creeping. **Stem** erect, leafy, usually glabrous, subumbellately branched above. **Leaves** lamina 4.5 - 9.5 x 1.5 – 4 cm, runcinate-pinnatifid, spinous-toothed; cauline leaves semiamplexicauled, auricles rounded. **Flowers**;

capitula upto 1cm long, in lax corymbs, glandular hispid, dark yellow. **Ray florets** 0.55 - 0.9cm long, yellowish. **Cypsela** 0.22 - 0.5m, narrow, and ribbed. **Pappus**, white.

- Flower* : April - October *Fruit*: July - December
Exsiccatus : Dohrok 2300m, **SR Lepcha & AP. Das** 30293, dated 06.10.2004.
Status : Common
Local Distribution : Dohrok, Thartharay towards NNP border. 700 – 1750 m.
General Distribution : PAKISTAN, AFGANISTAN, THROUGHOUT INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, INDONESIA, PHILIPPINES.
 Note : The species is a potential fodder. Roots are used in the treatment of jaundice.

Sorosaris Stebbins

- Sorosaris hookeriana** (C.B. Clarke) Stebbins, in Mem. Torr. Bot. Cl. 19(3): 45. 940; Grierson & Springate in Grierson & Long., Fl. Bhutan 2(3): 1460. 2001. Kumar & Singh, Astera. Sikkim 168. 2001.
Crepis hookeriana Ball., in Journ. Bot. 11: 371.1873. ssp. *hookeriana*: Sharma *et al* 12: 239. 1995.

Herbs perennial, dwarf. Stem hollow, to 32 cm exposed, scale leaves few or absent. Leaves; petiole to 5.6cm, lanceolate – oblanceolate or linear, **lamina** 3 – 13 x 0.5 – 3.8 cm, shallowly pinnatifid – deeply pinnatisect. **Inflorescence** convex or elongate, - 15 c; bract densely hirsute at base; **involucral** 2.3mm in diam; inner phyllaris to 13mm, hirsute inner most to 5 mm wide. **Corolla** to 17 mm; tube 5.7 mm; **ligule** yellow, to 13 mm, bearing small teeth; anthers dark rarely yellowish. **Papus** white, bearing bluish tips, to 13 mm.

- Flower & Flower* : July – September
Exsiccatae : Kupup 4300 m, **SR Lepcha & AP. Das** 0173, dated 18.07.2005; Bhimbase 4300 m, **SR Lepcha & AP. Das** 018, dated 13.07.2005.
Status : Less common
Local Distribution : PWS, 3500 – 4300 m.
General Distribution : HIMALAYAS; INDIA (Sikkim), BHUTAN, TIBET
 Note : Endemic to Eastern Himalaya.

Synotis (C.B. Clarke) Jeffrey *et* Chen

Key to the species:

1. Plants less than 1 m tall 2
 + Plants more than 1 m tall 3
2. Leaf obovate; pappus whitish *S. cappa*
 + Leaf elliptic or lanceolate; pappus yellowish *S. acuminata*
3. Petiole toothed and dilated wings; involucral bracts linear *S. alata*
 + Petiole without toothed and dilated wing; involucral bracts oblong ... *S. wallichii*

Synotis acuminata (Wallich ex DC.) C. Jeffrey & Y. Chan in Kew. Bull. 39(2): 323. 1984; Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1587.2001. Kumar & Singh, Astera. Sikkim 172. 2001.

Senecio acuminatus Wallich (Cat.107, n. 3107. 1831, *nom. nud.*) ex DC., Prodr. 6: 368.1838; C.B. Clarke, comp. Ind. 187. 1876; Hook.f., in Fl. Brit. India 3: 354. 1881; Kitamura in Fl. E. Him. 343. 1966; Hara *et al.* Enum Fl. Pl. Nepal 3:41. 1982.

Herbs perennial, scrambling upto 1.6m tall. **Stem** glabrous. **Leaves**; petiole upto 17mm; leaf elliptic or lanceolate, **lamina** 10 – 13 x 1.5 – 6 cm, acuminate, caudate or roundate base, denticulate, glabrous on both surface. **Flowers** axillary in corymb, capitula radiate, numerous. **Involucral** to 2 mm diam. **Phyllaries** oblong, 5 x 1.3 mm, acute glabrous, **Corolla** tube 3mm; **ligule** 2.5 x 4mm, bisexual. **Flowers** upto 3 mm. **Achenes** oblong, upto 3mm. **Pappus** yellowish.

Flower & Fruit : June – October
Exsiccatus : Dohok 2400 m, **SR Lepcha & AP. Das** 0772, dated 15.07.2006.
Status : Less Frequent.
Local Distribution : Dohrok, Jorepokhri, 2500 – 4300m
General Distribution : E. HIMALAYA; INDIA (Sikkim), NEPAL, BHUTAN, MYANMAR.

Synotis alata (Wallich ex DC.) Jeffrey *et* Y.L. Chen, KB 39(2): 308. 1984; Hajra in Hajra *et al.* Fl. India 13: 287. 1995; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1581.2001; Kumar & Singh, Astera. Sikkim 173. 2001.

Senecio alatus Wallich ex DC., Prodr. 6: 368. 1838; Fl.Brit.India 3: 353. 1881; Hara in Fl. E. Him.1: 343. 1966; 2: 140. 1971; 3: 118. 1975; Hara *et al.* Enum.Fl. Pl. Nepal 3: 41. 1982.

Herbs, stout, pubescent upto 50cm tall. **Stem** long. **Leaves** usually few; petioles long upto 8.5cm, with toothed and dilated wings; **lamina** 7.5 - 13 x 5 -10.5cm, ovate-cordate, upper stem leaves lanceolate, serrate, membranous, acuminate, base round-cordate, dark green, densely hairy, nerves distinct, lateral nerves upto 8 on either halves. **Flower** heads shortly pedicelled, ligulate, arranged in branched panicles. **Involucral bracts** linear, usually hairy. **Pappus** white.

Flower : October - January *Fruit*: December – May
Exsiccatae : On way to Panglakha from Dohrok, 2600 m, **SR Lepcha & AP. DAS** 29371, dated 30.09.2004; Jorepokhri (between Panglakha – Rachela), 2700 m, **SR Lepcha & AP. Das** 27718, dated 30.09.2004.
Status : Common
Local Distribution : Rachila, Panglakha 2200 – 2700 m.
General Distribution : HIMALAYAS; INDIA (Himachal Pradesh to West Bengal), NEPAL, BHUTAN, CHINA.

Note : Endemic to Himalaya.

Synotis cappa (Buch.-Ham. ex D. Don) C. Jeffrey *et* Y.L.Chen in KB 39(2): 319. 1984; Hajra in Hajra *et al.* Fl.India 13: 291. 1995; Kumar & Singh, Astera. Sikkim 173. 2001.

Senecio cappa Buch-Ham. ex D. Don, Prodr. Fl. Nepal 179. 1825. 1987. *S. densiflorus* Wallich ex DC. Prodr. 6: 369. 1838; Hook.f., in Fl.Brit.India 3: 355. 1881; Indian Trees 403. 1906; Fl. Assam. 3: 123. 1939.

Undershrubs, perennial upto 2 m tall. **Stem** stout, wooly, young parts gray-white. **Leaves** ; petioles upto 1.8cm long, auricled, with white felted; obovate, **lamina** 9 – 21 x 5 – 7.5cm, oblanceolate-elliptic or elliptic, margin doubly serrate, acute, stiff hairs above, adpressed gray or white cottony hairy beneath, lateral nerves 11 - 19 on either halves, raised and prominent on undersurface. **Flower** heads 0.5 - 0.8 cm in axillary and terminal paniced corymbs; **involucre** white, involucral bracts wooly, linear, acute. **Florets** yellow; **ray florets** 7 - 10; **anthers** tailed, yellow. **Achenes** brown; **pappus** white.

Flower : November - December *Flower*: February - April
Exsiccatus : Phusrey 2650m, **SR Lepcha & AP. Das** 30299, dated 07.10.2004.
Status : Common
Local Distribution : Rachela, Mulkharka, Dohrok 1800-2350m.
General Distribution : E. HIMALAYA; INDIA (Darjeeling-Sikkim to Meghalaya), NEPAL, BHUTAN, MYANMAR, W. CHINA.

Synotis wallichii (DC.) C. Jeffrey et Y. L. Chen, KB 39 (2): 305. 1984; Hajra in Hajra et al. Fl. India 13: 302. 1995; Grierson & Springate in Grierson & Long Fl. Bhutan 2(3): 1587. 2001; Kumar & Singh, Astera. Sikkim 178. 2001.
Senecio wallichii DC., Prodr. 6: 364. 1838; Hook.f., in Fl. Brit. India 3: 353. 1881; Kitamura in Fl. E. Him. 344. 1966; 2: 140. 1971. Hara et al. Enum. Fl. Pl. Nepal 3: 42. 1982.

Herbs upto 30 cm tall, usually pubescent. **Stem** leafless, Flower stem hairy towards apex. **Leaves** radicle whorled; petiole hairy; broadly ovate-cordate, **lamina** 2.5 – 11 x 2.4 – 6.5, broadly ovate-cordate, margins wavy and sinuate-toothed, membranous, acute-acuminate, base deep cordate, green and thinly hairy above, nerves distinct, hairy beneath. **Capitula** heads upto 1cm, with 2 ray-florets and a few disc-florets. **Involutral** bracts 0.3 cm broad, oblong and blunt. Ligules 2. **Achenes** glabrous. **Pappus** white.

Flower & Fruit : September – November
Exsiccatus : Rachela trijunction 2900m, **SR Lepcha & AP. Das** 0771, dated 17.09. 2004.
Status : Common.
Local Distribution : Rachela trijunction, 2100 – 2900 m.
General Distribution : HIMALAYAS; INDIA, (NEPAL – BHUTAN), CHINA.
Note : Endemic to Eastern Himalaya.

Tanacetum Linnaeus

Tanacetum atkinsonii (C.B. Clarke) S. Kitamura in Enum. Fl. Pl. Nepal, 3: 45. 1982; Hara et al. Enum. Fl. Pl. Nepal 3: 45. 1982; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1549. 2001. *Chrysanthemum atkinsonii* C.B. Clarke, Comp. India 147. 1876; Hook f., in Fl. Brit. India 3: 315. 1881; Hajra in Hajra et al. Fl. India 12: 48. 1995; Kumar & Singh, Astera. Sikkim 69. 2001.

Herbs erect with fleshy rootstock. Stems erect, simple, to 45 cm, puberulous. **Leaves**; basal leaves 3 – 4, pinnatisect, obovate, **lamina** 13 – 32 cm, pubescent with long fine hairs; ultimate segments oblong, acuminate, to 0.5 mm; caulin leaves reduced, mostly 2, pinnatisect. **Capitula** solitary, terminal more on lateral branches rarely 1 -3, radiate. **Involute** hemispherical to 4.5 cm in diam, phyllaries oblong lanceolate, 4 – 12 x 1.4 – 3 .2 mm, obtuse, margin eroded. **Flowers** glandular below, corollas yellow. **Ray flowers** 15 – 25; ligules, densely papillose inside; staminodes exerted. Disc corolla to 5 mm. **Achenes** 5 ribbed, minutely glandular. **Papus** absent.

Flower & Fruit : July – October
Exsiccatus : Nathang – Panglakha 3050 m, **SR Lepcha & AP. Das** 30822, dated 29.07.2005.
Status : Common in low altitude
Local Distribution : Changu, Kyongnosla, Nathang 3400 – 4400 m.

General Distribution : E. HIMALAYA; INDIA (NEPAL – BHUTAN), TIBET.

Note : Endemic to Eastern Himalaya.

Taraxacum F.H. wiggers

Taraxacum officinale Wiggers var. *eriopoda* (DC.) Hook.f. in Fl. Brit. India 3: 401. 1881; Kumar & Singh, *Astera*. Sikkim 178. 2001.

Taraxacum eriopodum DC., Prodr. 7: 147. 1938, van Soest in *Wentia* 10: 43. 1963; Hara *et al.* Enum. Fl. Pl. Nepal 3: 46. 1982; Hajra in Hajra *et al.* Fl. India 12: 257. 1995. Grierson & Springate in Grierson & Long., Fl. Bhutan 2(3): 1466. 2001.

Herbs, perennial upto 30cm tall. **Leaves** rosset, sessile, oblanceolate-linear lamina 4 -9 x1.5 - 2.5cm, runcinate-pinnatifid below, sinuate above with acute lobes. **Flowers** in solitary capitula to 1.8 cm in diam., borne on long leafless peduncles, 5 – 10 cm. **Involucral bracts** multiseriate, herbaceous, subequal, linear-oblong, usually erect or sometimes reflexed. **Florets** all rayed, yellowish; ligules 0.30 - 0.45 x 0.2-0.40m, 5-lobed; anthers sagitate; style arms exerted. **Cypsela** usually 4 - 5 angled, obovoid, ribbed, glabrous. **Pappus** usually unequal.

Flower : May – November *Fruit*: June – February

Exsiccatus : On way to panglakha 2900 m, *SR Lepcha & AP. Das* 0223, dated 12. 09. 2006.

Status : Common

Local Distribution : Singhany, Kyongnosla, Changu, 1800 – 2050 m.

General Distribution : HIMALAYAS; INDIA (Jammu & Kashmir to Assam), NEPAL, BHUTAN.

Note : Endemic to Himalayas.

Tusilago Linnaeus

Tusilago farfara L., Sp. Pl. 865.1753; Hook.f. in Fl. Brit. India 3: 330. 1882; Grierson & Springate in Grierson & Long, Fl. Bhutan 2(3): 1569. 2001.

Herbs perennial, rhizomatous. Petiole upto 13 cm. **Leaves** basal, lamina 7 – 14 x 4 – 17 cm at fruiting, obtuse or subacute, base cordate, margin toothed or denticulate, glabrous above, araneous beneath at least at first. Scapes upto 18cm inflower; scale leaves oblong. **Involucral bracts** to 10 mm in diam, sparsely araneous at base. **Phyllaries** lanceolate, upto 9 x 3 mm. Flowers yellow. Ligules often reddish. Disc corolla 10 mm. **Achenes** oblong, upto 5mm. **Pappus** white.

Flower & Fruit : April – May

Exsiccatus : Panglakha, 3000 m, *SR Lepcha & AP. Das* 29389, dated 30.09. 2004.

Status : Less common.

Local Distribution : Panglakha, Rachel, Hangey, 3000 – 3700 m

General Distribution : EUROPE, N. AFRICA, AFGHANISTAN, N.W. ASIA, INDIA (Jammu & Kashmir), BHUTAN.

Class: Liliopsida

Subclass: Arecidae

Order: Arales

ARACEAE Juss.

Key to the Genera

- | | |
|---|---------------------|
| 1. Plants strongly aromatic | <i>Acorus</i> |
| + Plants non aromatic | 2. |
| 2. Plants climbing | <i>Raphidophora</i> |
| + Plants not climbing (terrestrial herbs) | 3 |
| 3. Lamina peltate | 4 |
| + Lamina not peltate | <i>Arisaema</i> |
| 4. Plants with rhizome | <i>Colocasia</i> |
| + Plants with cormose tuber | <i>Remusatia</i> |

ACORUS Linnaeus

Acorus calamus L., Sp. Pl. ed. 1, 1: 324, 1753; Hook.f. in Fl. Brit. India 6: 555. 1893; Hara in Fl. E. Him. 1: 393. 1966; Noltie, in Fl. Bhutan 3(1): 158. 1994; Mandal in Hajra *et al.* Fl. Sikkim 1: 185. 1996.

Local Name: Ruk-Lop (Lep.) Bojho (Nep.);

Herbs strongly aromatic on marshy places with creeping rootstock. **Leaf lamina** 20 - 50 x 0.4 - 2.2cm, linear, margins wavy, acute, base equitant dark green, thick, mid-rib thick, nerves parallel, aromatic. **Peduncle** leaf-like. **Spathe** upto 40cm, densiform. **Spadix** 3 - 5 x 0.5 - 2 cm, cylindrical, dense flowered and slightly bent upward. **Sepals** 6, orbicular, tip curved inward; **stamens** equal to sepals; **anthers** reniform; **ovary** conical.

Flower & fruit : June - August

Exsiccatus : Rachela trijunction 3000 m, SR Lepcha & AP. Das 03082, dated 20. 08. 2005.

Status : Sparse.

Local Distribution : Premlakha, Lingtam, Rachela trijunction 1500-2900m.

General Distribution : EUROPE, SIBERIA, INDIA EAST TO JAPAN, AND C. and N. AMERICA.

Note : A very common medicinal plant (domesticated at other parts of Sikkim)..

Arisaema Martius

Key to the species:

- | | |
|---|------------------------|
| 1. Plants more than 1 m tall | <i>A. tortoisum</i> |
| + Plants less than 1 m tall | 2 |
| 2. Leaf elliptic, oblanceolate | 3 |
| + Leaf rhombic – ovate | 4 |
| 4. Spathe blade reddish-brown; appendix thickened | <i>A. utile</i> |
| + Spathe blade purplish-black; appendix basally swollen | <i>A. griffithii</i> |
| 3. Leaves solitary in radiate | <i>A. concinnum</i> |
| + Leaves 1 - 2, trifoliolate or palmate | 5 |
| 5. Leaves palmate or pedate | 6 |
| + Leaves trifoliolate | <i>A. propinquum</i> |
| 6. Leaf palmate; cataphylls whitish or rarely dark brown to brownish pink | 7 |
| + Leaf pedate; cataphylls pale, tinged brownish or purplish | <i>A. flavum</i> |
| 7. Lamina of spathe auricled | <i>A. nepenthoides</i> |
| + Lamina of spathe not auricled | <i>A. jacquemontii</i> |

Arisaema concinnum Schott in Bonplandia 7: 27. 1859; Hook. f. in Curtis, Bot. Mag. 97: t, 5914. 1871; Hook.f. in Fl. Brit. India 6: 505. 1894; Hara *et al.* Enum. Fl. Pl. Nepal 1: 89. 1978; Noltie, Fl. Bhutan 3(1): 148. 1994; Hajra & Verma., Fl. Sikkim 1: 187. 1996. *Arisaema alicinatum* Schott, loc. cit.,: 26. 1859. *Arisaema affine* schott. loc. cit.: 27. 1859.

Herbs dioecious with globose tubers, upto 70 cm tall. Pseudostem, cataphylls pinkish to purplish. **Leaves** solitary, radiate; leaflets 7 - 15, linear-oblanceolate, acuminate to 2 cm, sessile, cuneate base, 4 - 17 x 0.5 - 1.5 cm. **Petiole** 10 - 18cm. Peduncle often shorter than leaves; **spathe**; tube 3 - 4cm; blade oblong, scarcely wider than tube, not auriculate at base, green to dark purplish, with distinct whitish or sometime greenish stripes; appendix very slender rugose at apex. **Syndria** + sessile, yellowish, 4 loculed, **Fruiting** peduncle erect, often recurved

Flower & Fruit : April - July
Exsiccatu : Phusrey 2200 m, *S.R. Lepcha & AP. Das* 02503. dated 13.10.2005
Status : Common.
Local Distribution : Phusrey 2100 - 2500 m.
General Distribution : TEMPERATE HIMALAYAS, KHASIA HILLS AND MYANMAR.

Arisaema flavum (Forsk.) Schott in Prodr. 40. 1860; Hook.f. in Fl. Brit. India 6: 503.1894; Noltie, Fl. Bhutan 3(1): 146. 1994. *Arum flavum* Forsk., Fl. Aeg. Arab.157. 1775.

Local Name: Maney (Nep.)

Herbs monoecious with pseudo-stem upto 30 cm long. **Petiole** and peduncle green; cataphylls pale, tinge brownish or purplish; 1 - 2, central leaflet oblanceolate, acuminate, cuneate, sessile **lamina** 4 - 6 x 1 - 3.5 cm. 3 - 5 segments. **Peduncle** oftenly exceeding leaves. **Spathe** tube swollen, 0.6 - 0.9cm. blade sub-erect 0.6 - 2.9 x 0.6 - 1.7 cm, bright yellow, unstriped, purple at base and in tube. **Appendix** ellipsoid, sessile, yellowish. **Synadria** ± sessile, creamy.

Flower & Fruit : June - August.
Exsiccatu : Gnathang 3800 m, *SR. Lepcha & AP. Das* 30854, .dated

25.07.2005

Status : Common
Local Distribution : Gnathang 1800 – 4000m
General Distribution : INDIA, BHUTAN, MYANMAR, S.E. TIBET.

Arisaema griffithii Schott, Syn. Aroid 26. 1856; Prodr. 54, 1860; Bot. Mag. t. 6491. 1880; Hook.f. in Fl. Brit. India 6: 499. 1894, Pfl. Reich IV-23 F, Ht. 73: 219, f. 53. 1920; Hara in Spring Fl. Sikkim Him. f. 110 - 112. 1963; Hara in Fl. E. Him. 395. 1966; Noltie, Fl. Bhutan 3(1): 151. 1994; Hajra & Verma, Fl. Sikkim 1: 188. 1996. *A. hookerianum* Schott in Oester. Bot. Wochenbl 7: 334 . 1857. *A. hookeri* Schott, Gen. Aroid. t. 6, f. 11-19. 1858.

Herbs tuberous upto 35 cm tall. **Tuber** usually depressed. **Leaves** solitary, trifoliate or 2; petiole 20 cm, stout; leaflets 3, sessile; **lamina** 8 – 20 x 8 – 13 cm, rhombic-ovate, margins faintly yellow, entire to obscurely crenate, rounded-acute, dark green, glabrous, nerves sunk, impressed above, lateral nerves upto 12 on either sides. **Peduncle** shorter than petiole; basal bracts large. **Spathe** upto 13 cm long, conspicuously striped, tube broad, curved back, pale ribbed with white; limb incurved, rounded. **Spadix** often stout, narrowed to tail-like appendage.

Flower & Fruit : March - May
Exsiccatus : Singahey, 2490m, **SR Lepcha & AP. Das** 02504, dated 14.10.2005
Status : Frequent.
Local Distribution : Singhaney, Rachel below 1900 – 2500 m.
General Distribution : E.HIMALAYA; INDIA (Sikkim)

Note : 1. Endemic to E. Himalaya.

2. Bread can be prepared from its tuber paste through processing in running water.

Arisaema jacquemontii Blume in Rumphia 1: 95. 1835; Voy. t. 168. 1844; Pfl.-reich IV-23 F, Ht. 73: 197, f. 45 A-C. 1920; Hara in Fl. E. Him 395. 1966; Hara *et al*, Enum. Fl. Pl. Nepal 1: 90. 1978; Noltie, Fl. Bhutan 3(1): 146. 1994; Hajra & Verma, Fl. Sikkim 1: 189. 1996. *A. cornutum* Schott in Bonplanda 7: 27. 1859; Hook.f. in Fl. Brit. India 6: 506. 1894. *A. exile* Schott in Bonplanda 7: 26. 1859.

Herbs herbaceous upto 65 cm tall. **Petiole** and peduncle pale green; cataphylls whitish, sometime dark brown; palmate, leaflets 6 - 7, middle leaflet oblanceolate to elliptic acuminate, cuneate, sessile, **lamina** 1.5 x 13 x 2-5 cm, pale green. **Outer** leaflets narrowly acuminate. Peduncle exceeding leaves. **Spathe** usually pale green with whitish stripes, sometimes dark purple in whole blade. Tube 3-5.5cm. **Appendix** horizontal to decurved and base swollen greenish below, purplish above. **Synandria** widely spaced, cream or tinge dark purplish.

Flower & Fruit : June. – August
Exsiccatus : Kupup, 3900m, **SR. Lepcha & AP. Das** 02502, dated 13.02.2004
Status : Less Common.
Local Distribution : Kupup 1900 – 4200 m.
General Distribution : AFGANISTAN; HIMALAYAS; INDIA, (Kashmir – Sikkim).

Arisaema nepenthoides (Wall.) Mart. in Flora 2: 458. 1831; Hook.f. in Fl. Brit. India 6: 504. 1894; Pfl.-reich IV-23 F, Ht. 73: 218 f, 49. 1920; Hara in Spring Fl. Sikkim Him. 106. 1963; Hara in Fl. E. Him. 395. 1966; Noltie, Fl. Bhutan 3(1): 145. 1994; Hajra & Verma, Fl. Sikkim 1:189. 1996. *Arum nepenthoides* Wall., Tent. Fl. Nepal 26, t. 18. 1824. *Arisaema ochraceum* Schott *sensu* Lacaita in Journ. Linn. Soc. 43: 483. 1916.

Local Name: Gurbay (Nep.).

Herbs upto 60 cm tall. **Tuber** globose. Stem clouded with dark streaks. **Leaves** 2, digitate; petioles 7 - 13 cm, green to red-brown spotted; leaflets 5 - 11, sessile to subsessile; **lamina** 3 - 13 x 0.7-3.2 cm, narrow elliptic or oblanceolate, entire, acute, glossy, green, glabrous, lateral nerves upto 23 on either sides. **Peduncles** shorter than petioles. **Spathes** triangular-ovate and slightly curved forward, like cobra hood, greenish-brown to reddish brown, with white stripes on the back, tube elongated, limb-base dilated into two conspicuous rounded lobes. **Spadix** much shorter than spathe, pale green or whitish.

Flower & Fruit : February - June
Exsiccatus : Singhaney 2350 m, **SR Lepcha & AP. Das** 02505, dated 14.10.2005
Status : Frequent.
Local Distribution : Singhaney, Rachel Middle, 1900 - 2600 m.
General Distribution : HIMALAYAS; INDIA, (NEPAL -BHUTAN), khasia, MYANMAR, W.CHINA.

Arisaema propinquum Schott in Oesterr. Bot. Wochenbl. 7: 333. 1857; Hook.f. in Fl. Brit. India 6: 501. 1894; Hara in Fl. E. Him. 397. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 1: 90. 1978; Noltie, Fl. Bhutan 3 (1): 153. 1994; Hajra & Verma, Fl. Sikkim 1: 190. 1996. *A. wallichianum* Hook.f., Fl. Brit. India 6: 500. 1893. *A. sikkimense* Chatterjee in Bull. Bot. Surv. India 3: 18. 1949. *A. costatum* auct. non Mart: Chatterjee in Bull. Bot. Surv. India 8: 137. 1955. *A. wallichianum* var. *sikkimense* (Chatterjee) Hara in Journ. Jap. Bot. 36: 76. 1961.

Herbs, upto 60 cm tall. **Tuber** globose, depressed. **Leaves** single; petioles upto 25 cm long, stout, brown-spotted, leaflets 3, shortly stalked, **lamina** 22 - 24 x 4 - 10 cm, elliptic to ovate, entire, caudate-acuminate, base oblique, dark green, lateral nerves many, very close, parallel and strong beneath. **Spathes** dark purple with longitudinal white stripes, limb incurved and narrowed into a tail-like tip. **Spadix** appendage long, stipitate.

Flower & Fruit : April - July
Exsiccatus : Beusa, 2370m, **SR Lepcha & AP. Das** 02506, dated 14.10.2005
Status : Frequent.
Local Distribution : Phusrey, Durpiney, 2000 - 2850 m.
General Distribution : HIMALAYAS; INDIA (Kashmir - BHUTAN) and S. TIBET.
Note : Endemic to Himalaya.

Arisaema tortuosum (Wall.). Schott in Schot. & Endl, Melet. Boy.: 17. 1832; Hook f., Fl. Brit. India 6: 502. 1894; Hara *et al.* Enum. Fl. Pl. Nepal 1: 90. 1978; Hara & Verma, Fl. Sikkim 1: 191. 1996; Noltie, Fl. Bhutan 3(1):147.1994. *Arum tortuosum* Wall., Pl. Asiat. Rar. 2: 10, t. 114. 1831. *Arisaema turtuosum* var. *halleborifolium* (Schoot) Engl. in DC., Monogle. Phan. 545. 1879.

Herbs, monoecious, upto 2 m tall. **Corm** usually rigid 2.5 - 4.5 cm in diameter. Cataphylls, pseudo stem blotched with pinkish, gray to purplish brown. **Leaves** usually 2 - 3, pedately 6 - 15 foliate, dull above, dark green below. **Central** leaflets narrow to elliptic oblong, acuminate, base cuneate, often petiolate (0.4 - 6.5 cm), outer petiolate, 3 - 7 segments each, petiole in upper 3.5 - 16.5 cm; Peduncle exceeds leaves. **Spathes** yellow-green, rarely striped tube green 1 - 5 cm; blade oblong-lanceolate, acute to acuminate, spreading horizontally, 3.5 - 10.5 x 1.5 - 3.5 cm. **Appendix** ascending, sessile, acute apex, green, blue-purplish at base. **Synandria** often widely spaced, stalked (1 - 2 mm), creamy. **Anthers** 2 - 4 - 5 each with 2 locules, dehiscing by lateral slits.

Flower : April *Fruit*: June
Exsiccatae : Rachel 2850m, **SR. Lepcha & AP. Das** 31031, dated 07.10.2004:

Kupup 3950 m, **SR Lepcha & AP. Das** 31473 dated 27. 07.2005.

- Status* : Not frequent
Local Distribution : Kupup Bhimbase 1400 – 4300 m.
General Distribution : HIMALAYA; INDIA, (Punjab – Sikkim), Khasia, Nilgiris, Manipur, and W. CHINA.
Note : Endemic to Himalaya.

Arisaema utile Hook.f. ex Schott, Prodr. Syst. Aroid. 30. 1860; Hook.f. in Fl. Brit. India 6: 499. 1894; Hara *et al.* Enum. Fl. Pl. Nepal 1: 90. 1978; Noltie, Fl. Bhutan 3(1): 147.1994; Hajra & Verma, Fl. Sikkim 1: 191. 1996.

Herbs perennial, dioecious, corm 2 - 5.5 cm diameter. **Cataphylls** very wide (to 5.5 cm), often whitish matter with darker. **Leaves**; petiole 15 – 45 cm; solitary - 2, trifoliate, leaflets sessile-sub sessile, margin yellowish-reddish; rhombic, ovate or obovate with undulated pale green in colour in golden margins, less than 15cm, **lamina** 8 - 35 x 5.5 – 28 cm. . **Spathes** limb coarsely reticulate, blade paler reddish brown, lobes narrow 1-2 cm, without reticulate mark, truncate base tapering upwards, and petiole not unspotted.

- Flower* : May – July. *Fruit*: September – October
Exsiccatas : Bhimbase 4350m, **SR Lepcha & AP. Das** 30977, dated 27.07.2005:
Status : Less Common
Local Distribution : Karponang-Changu, Lachen, Gamothang. 2700 – 3900 m.
General Distribution. : E. HIMALAYA; INDIA.
Note : 1. Endemic to Eastern Himalaya
2. Tubers of this species are locally eaten.

Colocasia Linnaeus

Colocasia esculenta (L.) Schott in Schott & Endl., Melet. Bot. 18. 1832; Hara *et al.* Enum. Fl. Pl. Nepal 1: 91. 1978; Noltie, Fl. Bhutan 3(1): 136. 1994; Hajra & Verma, Fl. Sikkim 1: 191. 1996. *Arum esculentum* L., Sp. Pl. 965. 1753. *Colocasia antiquorum* Schott in Schott and Endl., Melet. Bot. 18. 1832; Hook.f. in Fl. Brit. India 6: 523. 1894.

Local Name: Sungti (*Lep.*) Mane (Nep.).

Herbs, perennial, rhizomes tuberous. **Petioles** to 80 cm, sheathing below, greenish; **lamina** 13 – 45 x 7 – 35 cm, oblong-ovate to suborbicular, broadly cuspidate, base shallow-cordate, glaucous. Peduncle upto 30 cm. **Spathe-tube** 3 – 6 x 1 – 2 cm, greenish; lamina narrowly lanceolate, acuminate, creamy yellow. Monoecious. **Spadix**: basal part female separated by a zone of sterile male flowers ; male part to 6 cm; appendix to 4.5 x 0.4 cm. **Ovary** unilocular; stigma broadly peltate; ovules many, parietal. **Syuandria** upto 0.2cm diam.; **anthers** subsessile.

- Flower* : June *Fruit*: December
Exsiccatas : Phusrey 2190 m, **SR Lepcha & AP. Das** 02501, dated 10.10.2004
Status : Less Common.
Local Distribution : Dhorok, Neora Valley National Park border, 1500 – 2100 m.
General Distribution : HIMALAYAS; INDIA, NEPAL, BHUTAN, BANGLADESH, SRI LANKA.

Note : Young petiole and rhizomes are eaten as vegetables. The plant is also an ideal fodder for pigs.

Raphidophora Hasskarl

Raphidophora glauca (Wall.) Schott in Blonplandia 5: 45.1875; Hook.f., Fl. Brit. India 6: 547. 1894; Noltie, Fl. Bhutan 3(1): 126. 1994. *Pothos glaucus* Wall., Pl. Asiat. Rar. 2: 45t.156. 1832.

Vern. name ; *Tuklop* (Lep.).

Liana climbing on tree trunk, stem 1 - 1.5 cm diameter. **Lamina** ovate, symmetric, acuminate, base cuneate, oblique, 9 - 28 x 8.5 - 20 cm, asymmetrically pinnately cut, pinnae 2 - 5 each side, ascending midrib, base round. **Mid-leaf-apex** truncate with 3 strong, parallel costae reaching midrib, round at base. **Sheath** reaches upto base of leaf blade. **pulvinus** indistinct. **Peduncle** spreading. **Spathe** oblong ovate. acuminate pale yellow. **Filaments** flat. **Ovary** apex truncate, **stigma** flat, sessile, circular or elliptic.

Flower & Fruit : August - April

Exsiccata : Hangey 1900 m, *SR Lepcha & AP. Das 30214*, dated 06.10.2004

Status : Fairly Common.

Local Distribution : Dhorok, Phusrey 1000 - 2500 m.

General Distribution : E. HIMALAYA; INDIA, (NEPAL -BHUTAN), Khasia, Manipur, Naga hills.

Note : 1. Endemic to Eastern Himalaya

2. This species is traditionally used as an ornamental plant..

Raphidophora grandis Schott in Oester. Bot. Wochenbl. 349.1858; Noltie, Fl. Bhutan 3(1): 128. 1994; Hajra & Verma. Fl. Sikkim 1:194. 1996.

Local Name: *Tungking* (Lep.). *Thulo Kanchirna* (Nep.).

Liana larger than *R. glauca*. **Stem** upto 5 cm thick. **Lamina** 34 - 90 x 35 - 70 cm, oblong, blunt, not glaucous beneath; pinnae broad, 6-10 per side, sometimes even upto 12 per side, more wider, pinna of mid-leaf 4 - 5 cm wide, truncate at apex, sinuses narrow, lateral costae not parallel. **Peduncles** stouter. **Spadix** big 20 - 25 x 3 - 7 cm; ovaries fibrous, domed; stigma raised.

Flower & fruit : May - March

Exsiccatus : Singhaney 2250 m, *SR Lepcha AP. Das 02500*, Dated 13.10.2005

Status : Common.

Local Distribution : Dhorok Phusrey 1800 - 2500 m.

General Distribution : TROPICAL AND SUBTROPICAL HIMALAYAS; INDIA, Kumaon, Sikkim, Darjeeling, Khasi Hills.

Note : 1. Endemic to Himalayas

2. A well known fodder plant.

Remusatia Schott

Remusatia pumila (D. Don) H. Li & A. Hay, Acta Bot. Yunn., Suppl. 5. 28.1992; Hajra & Verma, Fl. Sikkim 1: 193. 1996. Noltie, Fl. Bhutan 3(1): 135. 1994. *Gonatanthus pumilus* (D. Don) H. Li & A. Hay, Acta Bot. Yunn., suppl. 5: 28.1992. *Gonathanthus pumila* (D. Don) Engl. & Krause in Engler, Pflanzenreich iv -23E.Ht.71: 19,t.5a-m. 1920. *Caladium pumilum* D. Don, Prodr. Fl. Nepal 21. 1825.

Herbs perennial, tuberous. **Cataphyll** usually 1, slender, acute. **Leaf-blade** ovate or oblong – ovate, acute acuminate; base cordate without coloured on both sides, 1.5 - 5 x 7 - 20 cm, sometime purple below and above at between primary veins. **Petiole** short 8 - 28 cm. **Spadix** upper held at angle, lanceolate, acuminate, sessile with whorl of sterile ovaries and sometime also at apex, stiped 4-5 mm purple. **Ovary** green, streaked white.

Flower & Fruit : May - July
Exsiccatus : Dhorok 2300m, **SR Lepcha & AP. Das** 03024, dated 03.10.2004
Status : Common.
Local Distribution : Dhorok Phusrey 1900 - 2250 m.
General Distribution : HIMALAYAS; INDIA, (Simla-Sikkim), Khasia, Manipur, THAILAND, W. CHINA.

Subclass: Commelinidae

Order: Commelinales

COMMELINACEAE R. Brown.

Key to the Genera

- | | |
|---|----------------------|
| 1. Lamina linear-lanceolate; stem much branched | 2 |
| + Lamina elliptic-ovate; stem moderately or less branched, climbing | <i>Streptolirion</i> |
| 2. Corolla tubular; stamens 6 | <i>Cyanotis</i> |
| + Corolla not tubular; stamens 2 or 3 | <i>Commelina</i> |

Commelina Linnaeus

Commelina paludosa Bl., Enum. Pl. Jav. 1: 2. 1827; Hook. f., Fl. Brit. India 6: 372. 1894; Hara et al. Enum. Fl. Pl. Nepal 1: 82. 1978; Hajra & Verma, Fl. Sikkim 1: 169. 1996. *Commelina obliqua* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. 45. 1825; Hook. f., Fl. Brit. India 6: 372. 1894.

Local Name: Tukjor Reep (Lep.)

Herbs perennial, straggling, much branched. **Stem** prostrate to semi- erect. **Leaves** sessile; upper stem leaves lanceolate, 6 - 15 x 2 - 6 cm, acuminate, base cuneate extended to be petiole like leaf sheath, densely brown hispid at month, glabrous on both surfaces; spathes terminal, shortly stalk, lanceolate, acuminate. **Involucre** bracts often 3 - 8, forming a terminal heads, sessile, funnel form, ca 3 x 1.7 - 2cm, glabrous, apex acute; peduncle ca 1.5cm. **Flowers** many or solitary, white or pale blue. **Petals** 2, blue, oblong. Filaments coiled; outer anthers ellipsoid; anther 2 - 3mm. **Ovary** ellipsoid, style recurved at apex. **Capsules** oblong- trigonous; seeds 1 per valve, dark brown, ellipsoid, 3.5mm, slightly flattened.

Flower : August - October *Fruit:* October - April
Exsiccatus : Rachela 2750m, **SR Lepcha & AP. Das** 31004, dated 02.10.2004
Status : Common.
Local Distribution. : Rachela Panglakha, 1700 - 2890 m
General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, THAILAND,

Cyanotis D. Don

Cyanotis vaga (Lour.) J.A. & J.H. Schult. in R. & S., Syst. Veg. 7: 1153. 1830; Hara *et al.* Enum. Fl. Pl. Nepal 1: 82. 1978; Noltie, Fl. Bhutan 3(1): 220. 1994; Hajra & Verma, Fl. Sikkim 1: 169. 1996. *Transescantia vaga* Lour., Fl. Cochinch. 193. 1790. *Cyanotis barbara* D. Don, Prodr. Fl. Nepal 46. 1825; Hook. f., Fl. Brit. India 6: 385. 1894.

Herbs perennial, bulbiferous, bulbs globose. **Stem** decumbent, much branched, 7 – 55 cm. Basal leaves to 35 cm long. Stem leaves lanceolate; all cauline, 4 - 8 x 3 – 11 mm. **Inflorescence** rarely terminal. **Flowers** in axillary heads, peduncle present and absent. Subtended by leaf like spathes; bracteole overlapping, white hairs, purplish. **Sepals** fused oblanceolate, acute, 3.2 - 4 x 1 - 2 mm, pale brown. **Petals** pale blue, lower half tubular, 5.5 – 7 mm. **Filaments** long exerted from corolla, blue. **Capsules** obovoid, trigonous. **Seeds** gray-brown, striate and finely reticulate.

Flower : July – September. *Fruit*: October – November
Exsiccatus : Phusrey 2250 m, *SR Lepcha & AP. Das* 507, dated 13.10.2005.
Status : Common.
Local Distribution : KAS, Dhorok, Phusrey, 915 – 2300 m,
General Distribution : INDIA, NEPAL, BHUTAN, CHINA, LAOS, VIETNAM,
 MYANMAR, THAILAND.

Streptolirion Edgeworth

Streptolirion volubile Edgew. in Proc. Linn. Soc. 1: 254. 1845; Trans. Linn. Soc. 20: 90, t. 2. 1846; Commel. & Cyrt. Beng. t. 40. 1874; Hook.f. in Fl. Brit. India 6: 389. 1894; Hara in Fl. E. Him. 402. 1966; Noltie, Fl. Bhutan 3(1): 219. 1994; Hajra & Verma, Fl. Sikkim 1: 172. 1996. *Tradescantia cardifolia* (non Swartz 1788) Griff., Priv. Journ. 208. 1847. *Streptolirion cordifolium* (Griff.) O. Kuntze, Rev. Gen. Pl. 2: 722. 1891.

Local Name: Pur 'chyok bee (Lep.)

Herbs twining with stem upto 2 m, flaccid, often rooting from nodes, glabrous or thinly hairy. **Leaves** long petioled (petiole 1 – 9 cm long), lamina 2 - 10 x 1.5 - 5.5 cm, ovate-cordata, entire, long acuminate, base inwardly deep-lobed, greenish, glabrous both surfaces, lateral nerves upto 15 arising from base, concentric, leaf-sheaths 2 cm with ciliate mouth, brownish and membranous.

Flower & fruit : August – October
Exsiccatus : Padamchen- Premlakha 2500 m, *SR Lepcha & AP. Das* 2508, dated 13.08.2004
Status : Common.
Local Distribution : Padamchen, Phusrey (Commonly grows in areas 1600 – 2800 m).
General Distribution : SUBTROPICAL AND TEMPERATE HIMALAYAS; INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, JAPAN, CAMBODIA, MALAYSIA, INDONESIA.

Order: Juncales

JUNCAECEAE A. Jussieu

Juncus Linnaeus

Key to the species

- | | |
|--|------------------------|
| 1. Stem leaves absent; bracts in continuation with stem | <i>J. inflexus</i> |
| + Stem leaves present; bracts not in continuation with stem | 2 |
| 2. Lamina flat, grass like, non-tubular or unchannelled | 3 |
| + Lamina filiform, not grass like, tubular or channeled | 4 |
| 3. Tepals dark reddish-brown; anthers sub-equalling filaments | <i>J. amplifolius</i> |
| + Tepals pale straw coloured; anthers much shorter than filaments | <i>J. clarkei</i> |
| 4. Inflorescences of fertile flowers; bracts not golden yellow | 5 |
| + Inflorescences of sterile flowers; bracts golden yellow | <i>J. ochraceus</i> |
| 5. Tepals white, creamy or pale straw coloured | 6 |
| + Tepals non white, brown or greenish | 11 |
| 6. Lowest bract non-foliaceous, brown or chestnut coloured | 7 |
| + Lowest bract foliaceous, green | 9 |
| 7. Scale leaves loosely encircling stem, not shiny | 8 |
| + Scale leaves tightly encircling stem, shiny | <i>J. leucanthus</i> |
| 8. Upper stem leaf present unitubular; septa visible externally | <i>J. allioides</i> |
| + Upper stem leaf absent pluritubular; septa not-visible externally | <i>J. thomsonii</i> |
| 9. Leaves aseptate or obscurely septate; septa not-visible externally..... | 10 |
| + Leaves prominently septate; septa visible externally | <i>J. grisebachii</i> |
| 10. Leaves 2-3; bitubular in cross-section | <i>J. benghalensis</i> |
| + Leaf single, X or Y shaped in cross-section | <i>J. khasiensis</i> |
| 11. Tepals greenish, seeds without tail | 12 |
| + Tepals brownish to reddish-brown or blackish, seeds tailed | 13 |
| 12. Annuals; stamens 6; capitula 1-flowered | <i>J. bufonius</i> |
| + Perennials; stamens 3; capitula 3- to10 -flowered | <i>J. wallichianus</i> |
| 13. Inflorescences unbranched; capitulum single | 14 |
| + Inflorescences branched; capitula in pair or more | 15 |
| 14. Capitulum 2-5- flowered; anthers shorter than filaments | <i>J. triglumis</i> |
| + Capitulum 1-flowered anthers longer than filaments | <i>J. uniflorus</i> |
| 15. Capitula 3 or more; tepals reddish brown; capsule longer than tepals | <i>J. himalensis</i> |
| + Capitula 2; tepals chestnut or blackish-brown; capsules shorter or equalling tepals | <i>J. sikkimensis</i> |

Juncus allioides Franchet in Nouv. Arch. Mus. Hist. Nat. Paris Ser. 2, 10: 99. 1887; Noltie, Fl. Bhutan 3(1): 262. 1994; Mandal in Hajra & Verma, Fl. Sikkim 1: 172. 1996; Shukla *et al.* in Indian J. Forest. 23(4): 469. 2000.

Local Name: Mung-chyit-muntsan (Lep.)

Herbs rhizomatous; rhizome short. Flower stems usually 10 – 52 cm, densely tufted. **Scale leaves** loosely encircling stem, shining brown or reddish brown. Leaves of non flowering shoots slender, usually shorter than flower stems; stem leaves 2, sub-basal, blades slightly cylindric, unitubular, septate; septa visible externally when dry, 3.5 – 18 cm, 0.6-1.9 mm, wide; upper leaf with conspicuous sheath and bristle like blade to 4.2 cm. Aurides blunt, brownish, free part 0.4 - 1.8 -1.5 mm. **Inflorescence** sub globose, usually 12 - 32 flowered; lowest bracts spathe like in bud, slightly exceeding capitulum, lanceolate, to 4.5 mm side, ribbed aristate; flowers distinctly pedicellate. **Tepals** narrowly lanceolate, sub acute, whitish. Filaments usually exceeding tepals at maturity; **anthers** linear, exserted, 2-2.8 mm. **Ovary** ellipsoid, 2.6-3 mm, abruptly contracted into style; stigma lobes stout, 0.6-1.6 mm. **Capsules** ellipsoid trigonous, 3.4-5.8 mm, beak party exserted; seeds 2 tailed.

Flower & Fruit : June – September.

Exsiccatae : Premlakha to Panglakha 2600, *SR Lepcha & AP. Das* 32955 & 32960, dated 26.10.2004; Kupup, 3800 m, *SR Lepcha & AP. Das* 30967, dated 08.08.2004; Lampokhari to Bhimbasa 4280 m, *S.R. Lepcha & AP. Das* 31418 dated 27.07.2005; Premlakha 2500 m, *S.R. Lepcha & AP. Das* 32935, dated 22.10.2005..

Local Distribution : Premlakha, Panglakha, Bhimbasa 2400 – 4350 m.

General Distribution : INDIA: Kashmir, Meghalaya, Sikkim, BHUTAN, CHINA, NEPAL.

Note : Endemic to Himalaya

Juncus amplifolius A. Camus in Not. Syst. 1(10): 281. 1910; Noltie, Fl. Bhutan 3(1): 261. 1994; Shukla *et al.* in Indian J. Forest. 23(4): 469. 2000.

Local Name: Mung-chyit-syel (Lep.)

Herbs, rootstock stout, woody, bearing persistent, fibrous remain of old leaves non-flowering rosettes and singly inserted flower stem. **Scale leaves** 1 or sometime more, reddish. **Rosette leaves** to 12 x 0.5 cm. Flowering stem 6 – 42 cm; stem leaves usually 3, blades flat, gradually tapered to acute apex, ridged beneath, margin with transparent border, shorter than stems. Sheaths lacking aurides. **Inflorescence** terminal with (1-) 2 - 5 unequal peduncled, 3 - 5 (-7) flowered capitula; lowest bract leaf like, shorter than to joint over topping inflorescence. **Tepals** lanceolate, acute to finely acuminate, sub equal or outer shorter than inner, reddish brown. **Stamens** shorter than tepals; **anther** (1.8) 2 – 2.8 mm, shorter than equaling filaments; **Ovary** ellipsoid, 1.7 - 3.5 mm, narrowed into beak like style; stigma lobes erect, twisted, 2.6 mm. **Capsules** ellipsoid, contracted into slender, exserted beak, golden brown. **Seeds** 2 tailed, golden, tail usually long and thin.

Flower : June – July

Fruit: August.

Exsiccatu : Zuluk 3200 m, *SR Lepcha, AP. Das* 30048, dated 08.06.2006.

Status : Less common

Local Distribution : Zuluk, 3270-4000

General Distribution : INDIA: Sikkim; BHUFAN, CHINA, NEPAL, MYANMAR, TIBET.

Juncus benghalensis Kunth, Enum. Pl. 3: 360. 1884; Lewis in Hara *et al*, Enum. Fl. Pl. Nepal 1: 84. 1978; Noltie, Fl. Bhutan 3(1): 267. 1994; Hajra *et al*. Fl. Sikkim 1: 172. 1996. *J. bracteatus* Buchenau in Engler Bot. Jahrb .6: 220. 1885; *J. membraceus auct.non.* Royle ex D.Don in Proc. Linn. Soc. 1: 10, 1839; Hook.f. ,Fl. Brit. India 6: 397. 1890.

Local Name: Mung-chyit-dyep (Lep.)

Herbs stoloniferous, stolon filiform. Flower stems slender, and born singly, 5 - 2cm. **Scale leaves** one or more, whitish brown; stem leaves usually 2 (-3); lower leaf basal, acute, filiform, channeled above and usually bitubular in section to 9.5 cm, c 0.3m wide; upper stem leaf usually present but absent sometimes. Blade to 6.9 cm. Sheath long and slightly inflated of brown tinged. Auricles oblong, blunt, usually conspicuous, brownish. **Inflorescence** 3 - 12 flowered; lowest bract developed into leaf like point to 2.2 cm. **Tepals** sub acute, equal, and often narrowly lanceolate. **Anthers** usually very narrow, 1.9 - 2.8mm, exerted at maturity. **Ovary** ellipsoid, 2.5-3.8 mm; Style 1.8- 2.2 mm; stigma lobes erect. **Capsules** distinctly short stipitate, ellipsoid-trigonous, shorter than tepals, 2.8-3.5mm, contracted into beak 0.5-1.2 mm; seeds 2 tailed.

Flower : June – August

Fruit: September

Exsiccatus : Bhimbase 4200 m, **SR Lepcha & AP. Das** 02519, dated 08.08.2004.

Status : Common

Local Distribution : Bhimbase 4200 m

General Distribution : INDIA: Arunachal Pradesh, Jammu and Kashmir, Sikkim, W. Bengal, BHUTAN, S. CHINA, NEPAL.

Note : Endemic to Himalaya

Juncus bufonius L., Sp. Pl. 328.1753; Hook.f., Fl. Brit. India 6: 392. 1892; Noltie, Fl. Bhutan 3(1): 252. 1994; Shukla *et al.* in Indian J. Forest. 23(4): 471.2000.

Local Name: Mung-chyit-gung (Lep.)

Herbs annual slender, Flower stems to 25cm, branched usually from base. **Leaves**; stem leaves sub-basal, solid, filiform, channeled above, up to 5.5cm long 0.6 - 2.8mm wide. Auricles absent, flowers usually borne solitary, sessile, oftenly enclosed by 2 ovate-acuminate, transparent bracteoles. **Tepals** unequal; outer finely acuminate, margin membranous, 3.2 - 5.8mm; inner acute, membranous margin slightly wider, 3.5 - 5.2mm. **Stamens** 6, usually shorter than tepals; filaments 0.6 - 1.3mm; anthers 0.4 - 0.8mm. **Ovary** usually narrowly ellipsoid, 1.8 - 2.2mm; Style very short; stigma lobes very short, deflexed. **Capsule** narrowly ellipsoid-trigonous, apex truncate 3 - 5 x 1 - 2.5mm, oftenly shorter than inner tepals, straw coloured, seeds, without membranous testa, pale brown.

Flower : May *Fruit* : September

Exsiccatus : Hatichirey to Tal-kharka upto 1600 m, **SR Lepcha & AP. Das** 20227, dated 08.10.2004.

Status : Common

Local Distribution : Haticheray , Phusrey upto 1800 m.

General Distribution : INDIA: Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Jammu & Kashmir, Kerala, Madhya Pradesh, Punjab, Rajasthan, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh; AFGANISTAN, AUSTRALIA, BHUTAN, CHINA, EUROPE, JAPAN, KAZAKHSTAN, KOREA, MONGOLIA, NEPAL, PAKISTAN, RUSSIA, SRI-LANKA, THAILAND, VIETNAM, N&S AMERICA, S-W ASIA.

Juncus clarkei Buchenau in Engler Bot. Jahrb. 6: 210. 1885; Hook.f., Fl. Brit. India 6: 400. 1892; Satake in Hara, Fl. E. Him. 1: 402. 1966; Noltie, Fl. Bhutan 3(1): 260. 1994; Mandal in Hajra & Verma, Fl. Sikkim 1: 174. 1996; Shukla *et al.* in Indian J. Forest. 23(4): 473. 2000.

Local Name: Mung-chyit-mundel (Lep.)

Herbs rhizomatous, flower stem usually 12 – 38 cm. **Stem leaves:** blade flat, gradually tapered to acute apex, upper usually over topping inflorescence margins sometimes narrowly membranous, minutely toothed at junction with sheath to 25cm, 2.5 - 4.2 mm wide. Sheath often reddish without aurides. **Inflorescence** lateral of 1- 4 unequally peduncled 4-13 flowered, hemispheric capitula; lowest bract erect, leaf like, exceeding inflorescence; flowers erect with very short pedicelled. **Tepals** usually lanceolate, outer acute, midrib inner broader, usually longer, pale straw-coloured, filaments (3.1-) 3.5 - 5.5 mm; anthers 1.6 - 2.8 mm partly exerted. **Ovary** ovoid inflated, gradually tapered into style, ovary + style 5.5 - 8.2 mm, straw coloured; **Stigma** lobes 0.1 - 2.1mm, **Capsules** ovoid, tapered into persistent style, long exerted from tepals, pale straw-coloured.

Flower : July *Fruit:* October
Exsiccatus : Panglakha to Rachel, upto 3090 m. *SR.Lepcha & AP. Das 31052*, dated 02.10.2004.
Status : Common
Local Distribution : Panglakha, Rachel, upto 3060 m,
General Distribution : EUROPE, HIMALAYA (Uttar Pradesh – BHUTAN) West Bengal Assam, Manipur, Nagaland,; CHINA,

Juncus grisebachii Buchenau in Abh. Naturwiss, Vereine Bremen 3: 295. 1872; Hook.f., Fl. Brit. India 6: 394. 1892; Satake in Hara, Fl. E. Him. 402. 1966; Noltie, Fl. Bhutan 3(1): 257. 1994; Mandal in Hajra & Verma, Fl. Sikkim 1: 174. 1996; Shukla *et al.* in Indian J. Forest. 23(4): 476. 2000.

Local Name: Mung-chyit-gyel (Lep.)

Herbs stoloniferous. Flower stems erect, 18 – 80 cm. **Leaves;** stem leaves up to 4 near base, blade semi- to sub cylindrical, channeled above, septate, Septa usually visible externally, upto 30 mm long and 6 - 2.7mm wide. Auricles blunt, pale brown, usually membranous. **Inflorescence** terminal, branched, of 2 - 5 (-11) flowered capitula; lowest bract leaf-like, erect, usually exceeding inflorescence. **Tepals**, acute, usually lanceolate, outer usually shorter than inner, whitish to pale coloured. **Stamen** 6; filament 3.5 - 5.5 mm; anther linear, 2.8 - 3.7 mm; partly exerted, creamy. **Ovary** ellipsoid, 2.3 - 3.4 mm, tapered into long style (2.2 - 3.8 mm); **Stigma** lobes twisted and stout. **Capsules** broadly trigonous-ellipsoid, with short beak (0.2-1.6 mm), orange-brown; seeds 2-tailed, tails sub equal.

Flower & Fruit : July – October
Exsiccatae : Kupup to Nathang 4100 m, *SR Lepcha & AP. Das 30969*, dated 24.07.2005 ; Panglakha to Rachel 2840 m, *SR Lepcha & AP. Das 31068*, dated 02.10. 2004 (BSHC).
Status : Common
Local Distribution : Kupup, Nathang, Rachel, upto 4150 m.
General Distribution : HIMALAYA : , (Uttar Pradesh - Arunachal Pradesh), CHINA,
Note : Endemic to himalaya

Juncus himalensis Klotzsch in Klotzsch & Garcke, Bot. Reise Pr. Waldemar 60, t. 97. 1862; Hook.f., Fl. Brit. India 6: 398. 1892; Noltie, Fl. Bhutan 3(1): 255. 1994; Mandal in Hajra & Verma, Fl. Sikkim 1: 174. 1996; Shukla *et al.* in Indian J. Forest. 23(4): 477. 2000.

Local Name: Mung-chyit-lhosa (Lep.)

Herbs stoloniferous, upto 65 cm. **Stem leaves** up to 4, erect stiffly, blade usually narrow, semi-cylindric, lapered, margins of channel very serrulate, septate, to 25 cm. Auricles conspicuous free part c.1 x 2.5 mm, tinged brown. **Inflorescence** terminal, with 10 - 12 unequalling peduncled, 2 - 10 flowered. Capitula, flowers sub sessile. **Tepals** lanceolate, acute, midrib, greenish, inner with membranous margins and tips. **Stamens** always shorter than tepals; **Ovary** ellipsoid, tapered into style; **Capsule** trigonous-ellipsoid oblong, exceeding tepals. Seeds 2 tailed.

Flower & Fruit : June - August.

Exsiccatu : Kupup lake surrounding, 3900 m, **SR Lepcha & AP. Das** 02560, dated 24.07.2005. Gnathang - Kupup, 3900 m, *S.R. Lepcha, AP. Das, T. M. Hynniewta & G. M. Chhetri* 30117, dated 24. 07. 2005.

Status : Less common

Local Distribution : Kupup lake, 3920 m

General Distribution : PAKISTAN, (Jammu & Kashmir - BHUTAN), CHINA, TIBET, E. ASIA.

Juncus inflexus L., Sp. Pl. 326. 1753; Noltie, Fl. Bhutan 3(1): 252. 1994; Mandal in Hajra & Verma, Fl. Sikkim 1: 174. 1996; Shukla *et al.* in Indian J. Forest. 23(4): 478. 2000.

Local Name: Mung-chyit-dyem (Lep.)

Herbs rhizomatous. A flower stem bears no true leaves, erect, tufted, cylindric, longitudinally ridged, 32 - 98 cm, pith white. **Scale leaves** to 5.5 cm, blackish brown lower greenish uppermost, 16-19 cm aristate. **Inflorescence** compound head appearing lateral, a lax irregular, branches slender flowers small. **Tepals** unequal, acute, lanceolate, outer 2.5 - 3.8mm, inner 1.5 - 3.2mm, midrib brownish to greenish, margins membranous. **Stamen** 6, usually shorter than tepals; anther 0.7 - 0.8 mm, normally equaling filaments. **Ovary** oblong-ellipsoid, 0.3-1.1 mm; style short; stigma lobes very short (0.3 - 0.8 cm). **Capsule** trigonous ellipsoid-oblong, exceeding outer tepals, 2.3 - 2.9 mm; seeds not tailed, but membranous ridge on one side.

Flower & Fruit : April - September

Exsiccatu : Hatichiray to Talkharka, upto 1400, **SR Lepcha & AP. Das** 27781
Dated 08.10.2004.

Status : Not common

Local Distribution : Haticheray - Talkharkha upto 1500 m.

General Distribution : AFRICA, PAKISTAN, (Jammu & Kashmir - Manipur), Maharashtra, Kerala, Tamil Nadu, Uttarakhand, SRI LANKA, MYANMAR, MALAYSIA, INDONESIA, PHILIPPINE ISLANDS.

Juncus khasiensis Buchenau in Engler Bot. Jahrb. Syst. 12: 407. 1890; Hook.f., Fl. Brit. India 6: 399. 1892; Noltie, Fl. Bhutan 3(1): 260. 1994; Shukla *et al.* in Indian J. Forest. 23(4): 478. 2000.

Local Name: Mung-chyit-nok (Lep.)

Herbs, flower stems 6 - 14 (-32) cm, slender. **Scale leaves** 7 or sometime 2, chaffy, pale. Stem leaf 1, sub basal, blade filiform with 3 or 5 deep channels, in Y or X-shaped in cross section, not

septate, to 15cm, 0.8 - 1.4mm wide. Auricle short 0.2-0.5 mm. **Inflorescence** with (1-) 3 (-5) unequal peduncled, 3 (-5) flowered **capitula**; lowest bract leaf like, usually half length to equaling longer peduncle. **Tepals** usually narrowly lanceolate, acute, sub equal or outer shorter (3.2 - 4.1) than inner (3.5 - 4.8 mm), pale straw coloured. Anther 1.1-1.9 mm usually exerted from tepals. **Capsule** narrowly ellipsoid, tapered into persistent style, exceeding tepals, golden brown; **Stigma** lobes 1-1.5 mm. Seeds 2 tailed, one wider than other.

Flower : June - September
Exsiccatus : Kupup to Nathang 3850 m, **SR Lepcha & AP. Das 30909**, dated 24.07.2005
Status : Not common
Local Distribution : Kupup Nathang, Rachelā, upto 3850 m.
General Distribution : E. HIMALAYA (Uttarakhand; Sikkim, BHUTAN. Assam, Meghalaya, Nagaland, BANGLADESH,

Note : Endemic to Eastern Himalaya

Juncus leucanthus Royle ex D. Don in Trans. Linn. Soc. London 18: 318. 1840; Hook.f., Fl. Brit. India 6: 397. 1892; Satake in Hara, Fl. E. Him. 403. 1966; Noltie, Fl. Bhutan 3(1): 264. 1994; Mandal in Hajra & Verma, Fl. Sikkim 1: 175. 1996; Shukla *et al.* in Indian J. Forest. 23(4): 480.

Local Name: Mung-chyit-kaak (Lep.)

Herbs perennial non stoloniferous, tuft. 4-15 (18) cm tall. Rhizome creeping. Stem subterete, 0.5-1 mm in diam. Catephylls few, **stem leaves** 2, sub basal, upper part of stem leaf less. Basal leaves 1 or 2; leaf sheath auricles absent or obtuse, membranous, ca. 0.5mm; leaf blade flat, unitubular, 2-7 cm x 0.5-1 cm, margin convolute to subterete. **Inflorescence** terminal, head solitary, 5-12 flowered; **bracts** 3-6, pale brown, lanceolate; basal 1-2 bracts leaf like. **Perianth** segments lanceolate, 4.-5.5 x ca. 1.5 mm, sub equal, margin yellowish, apex obtuse. **Stamen** 6; filaments 2.5- 4.5mm. **Ovary** ellipsoid-trigonous. Style 1.5-2 mm; stigmas lobes 0.5-1.5mm. **Capsule** ovoid-oblong, usually shorter than perianth. 3-septate, apex mucronet. Seeds sawdustlike; appendages 2, long tailed.

Flower & Fruit : June - September.
Exsiccatus : Kupup, 3900 m, **SR Lepcha & AP. Das 27552 & 27560**, dated 08.08. 2004.
Status : Fairly common
Local Distribution : Kupup, Jalepā (3650-4870m.)
General Distribution : HIMALAYA (Jammu & Kashmir -BHUTAN), CHINA.
Note : Endemic to Himalaya

Juncus ochraceus Buchenau in Abh. Naturwiss. Vereine Bremen 3: 262. 1872; Hook.f., Fl. Brit. India 6: 394. 1892; Satake in Hara, Fl. E. Him. 403. 1966; Noltie, Fl. Bhutan 3(1): 253.1994; Mandal in Hajra & Verma, Fl. Sikkim 1: 176. 1996; Shukla *et al.* in Indian J. Forest. 23(4): 481. 2000.

Local Name: Mung-chyit-dangsa (Lep.)

Herbs, perennial, tufted, 10 - 35 cm tall. Rhizome short. Stem terete. Ca. 1.5 mm in dia. **Leaves** mostly basal, filiform, grooved, bi-tubular, septate; leaf sheath auricles obtuse, membranous; leaf blade linear 5 - 17cm, apex acute. **Inflorescence** cymose, much branched, to 11.5 cm; **Involucral** bract leaf like, golden, fertile flowers inconspicuous. **Perianth** segments lanceolate, center greenish, margin hyaline, apex acute. **Stamens** 5 - 6; shorter than tepals

filaments 1-2 mm; anthers 1.5 – 2 mm. Often twisted ovary widely ellipsoid. 1.5 - 2.5 mm. Stigmas erect, twisted 1.5 – 3 mm, **Capsule** trigonous oblong, ca 2.4 mm; Seeds (immature) apparently not append aged at both ends.

Flower & Fruit. : September – May
Exsiccatae : Rachela 3000 m, **SR Lepcha & AP. Das** 30294, dated 06.10.2004;
Zuluk to Premlakha 3700 m, **SR Lepcha & AP. Das** 2556, dated
27.10.2004.
Status : Common
Local Distribution : Rachela, Changu, Panglakha, upto 3800 m.
General Distribution : NE HIMALAYA (NEPAL – BHUTAN), West Bengal Arunachal
Pradesh, Assam, CHINA,

Juncus sikkimensis Hook.f., Fl. Brit. India 6: 399.1892; Noltie, Fl. Bhutan 3(1): 256. 1994 & Edinb. J. Bot. 51(2): 134. 1994; Shukla *et al.* in Indian J. Forest. 23(4): 483. 2000.

Local Name: Mung-chyit-mungyal (Lep.)

Herbs stoloniferous, creeping, upto 25cm. **Scale leaves:** upper leaf blade narrowed below, apex blunt, semi-cylindric of large central hollow, septate, 3.5 - 25.5 cm, 1 - 2.5 mm wide; auricles short. **Inflorescence** lateral with usually 2 peduncle 2 unequal, capitula 2 - 4 flowered, bract lowest stout, exceeding, shortly pedicelled; **tepals** lanceolate irregular in length, mucronate, dark brown to blackish. **Stamens** usually shorter than tepals; anthers twisted. Stigma lobes erect, twisted usually yellowish-green. **Capsule** trigonous, ellipsoid, beak short; seeds 2 tailed.

Flower : June *Fruit.* October
Exsiccatae : Kupup 3900 m, **SR Lepcha & AP. Das** 25121 dated 13. 10. 2006;
Nathang 3880 m, **S.R. Lepcha & AP. Das** 30106, dated 24.07.2005.
Local Distribution : Kupup, Nathang upto 3900 m
General Distribution : E. HIMALAYA (NEPAL – BHUTAN) Arunachal Pradesh, S.TIBET.
Note : Endemic to Himalayas

Juncus thomsonii Buchenau in Bot. Zeit. 25: 148. 1867 & in Engler Pflanzenr. 25: 224. 1906; Noltie, Fl. Bhutan 3(1): 268.1994; Mandal in Hajra & Verma, Fl. Sikkim 1: 177. 1996; Shukla *et al* in Indian J. Forest. 23(4): 484. 2000. *Juncus leucomelas sensu* Hook.f., Fl..Brit..India 6: 397. 1892 p.p.

Local Name: Mung-chyit-mundok (Lep.)

Herbs perennial, tufted in tussocks 8 - 25cm tall. Rhizome short. Stems terete, 0.5 - 1.5 mm in diameter. **Leaves** all sub-basal, usually 2: leaf sheath reddish brown, auricles acute; leaf blade linear, 4 – 8 cm, apex with a callus. **Inflorescence** terminal, solitary, 4-8 mm in diam., 2 – 7 flowered bract 2 or 3, ovate- lanceolate, shorter than head, apex obtuse. **Perianth** segments yellowish white, oblong lanceolate. **Stamens** 6: filaments 3 - 5.5 cm; **anther** linear, 1.5 – 2 mm style short. **Ovary** ellipsoid, 2-4mm, tapered into style. **Capsule** ellipsoid - trigonous equaling to exceeding tepals. 3.5 – 4.5 mm. Seeds orange, oblong 0.5 – 1 mm; appendages 2, whitish.

Flower : July – August *Fruit:* August – September
Exsiccatus : Kupup-Bhimbase, 4200 m, **SR Lepcha & AP. Das** 30905, dated 24.07.
2005.
Status : Sparse
Local Distribution : Kupup to Bhimbase, Talkharka, 2000 – 4000 m.
General Distribution : PAKISTAN, HIMALAYA (Jammu & Kashmir – BHUTAN),

BURMA, CHINA, C- ASIA.

Juncus triglumis L., Sp. Pl. 328. 1753; Hook.f., Fl. Brit. India 6: 396. 1892; Satake in Hara, Fl. E. Him. 404. 1966; Noltie, Fl. Bhutan 3(1): 269. 1994; Mandal in Hajra & Verma, Fl. Sikkim 1: 178. 1996; Shukla *et al.* in Indian J. Forest. 23(4): 484. 2000.

Local Name: Mung-chyit-matsam (Lep.)

Herbs annual. **Scale leaves** reddish brown; stem leave 2, stem blade linear, apex erect blunt. Sheaths with membranous margins; auricles curved, acute. **Inflorescence** 4 -10 flowered; lowest bracts subequal, lanceolate to ovate normally boat shaped. **Tepals** lanceolate, subequal, **Ovary** ellipsoid. **Capsules** ellipsoid-trigonous. Seed 2 tailed.

Flower & Fruit : June - September

Exsiccatae : Kupup lake surrounding, 3900 m, **SR Lepcha & AP. Das** 30961, dated 24.07.2005, **SR Lepcha, AP Das, T.M. Hynniewta & Geeta Chettri** 30116, dated 24.07.2005.

Status : Not common

Local Distribution : Kupup, Nathang, upto 4000m.

General Distribution : N.AMERICA, EUROPE, RUSSIA, (NEPAL - BHUTAN)
Arunachal Pradesh, CHINA, JAPAN, KOREA, MONGLIA,

Juncus uniflorus W.W. Smith in Rec. Bot. Surv. India 6: 104. 1914; Noltie, Fl. Bhutan 3(1): 270. 1994; Mandal in Hajra & Verma, Fl. Sikkim 1: 178. 1996; Shukla *et al.* in Indian J. Forest 23(4): 485. 2000.

Local Name: Mung-chyit-mungkaat (Lep.)

Herbs, Flower stems 2.5 - 4cm. **Scale leaves** striate, long aristate, yellowish brown coloured; Stem leaves usually 1- 2, narrowly filiform, bitubular, often twisted, deeply channeled above, to 3 - 4 cm, 0.3 - 0.6 mm wide. Auricle acute, transparent. **Inflorescence** a solitary with very short pedicelled flowered, anthesis spreading horizontally, sheathing base boat shaped, brown-membranous, upper bract often ovate. **Tepals** narrowly lanceolate, reflexed, acute to sometime acuminate, sub equal or inner slightly longer 2.2 - 3.5 (4.2) mm, pale reddish brown. **Stamens** shorter than tepals; filaments 0.6-0.8 mm; anthers 0.6-1.5-2 mm. **Ovary** ellipsoid, 0.7 -1.8mm, tapered upwards into style 1-1.8mm; stigma lobes erect, twisted, 1.6 - 3.5 (-4.8) mm, reddish. **Capsules** ellipsoid-trigonous, tapered into beak, darkish brown.

Flower & Fruit : June - October

Exsiccatus : Kupup Lake surrounding 3900 m, **SR Lepcha & AP. Das** 30113, dated 24.07.2005.

Status : Rare

Local Distribution : Kupup, Bhimbase upto 4200 m.

General Distribution : E. HIMALAYA (NEPAL - BHUTAN), S.E TIBET.

Note : Endemic to Eastern Himalayas

Juncus wallichianus Laltarpe, Monogr. Junc. 139. 1827; Satake in Hara, Fl. E. Him. 403. 1966; Noltie, Fl. Bhutan 3(1): 231. 1994; Mandal in Hajra & Verma, Fl. Sikkim 1: 178. 1996; Shukla *et al.* in Indian J. Forest. 23(4): 485. 2000.

Local Name: Mung-chyit-vaalik (Lep.)

Herbs tuft perennial, upto upto 25 cm tall. **Leaves** upto 3, evenly placed along stem. Blades laterally compressed and tapered to acute apex, tubular, normally orange brown scale leaf, sheaths slightly inflated; auricles rounded; flower stem smooth grooves. **Inflorescence** much branched and with few flowers, **stamen** 3, oftenly septate. **Ovary** oblong to narrowly ovoid tapred to narrow beak. **Capsule** shorter than tepals obovoid –trigonus upto 3.5mm. **Seeds** pale brown with dark tip, without tail.

- Flower & Fruit* : May – October
Exsiccatus : Lampokhari-Bhimbase 4320 m, *SR Lepcha & AP. Das* 31100, dated 24.07.2005
Status : Not common
Local Distribution : Lampokhri, Bhimbase, Kupup, upto 4270 m.
General Distribution : RUSSIA (SIBERIA), NEPAL – BHUTAN), West Bengal, Assam, Arunachal Pradesh, SRI LANKA, CHINA, JAPAN, KOREA.

Order: Cyperales

CYPERACEAE A. Jussieu

Key to the Genera

- | | | |
|---|---|---------------------|
| 1 Bristles absent | 3 | |
| + Bristles present | 2 | |
| 2. Stamens 1 – 2; stigmas 3 | | <i>Erioscirpus</i> |
| + Stamens 3; stigmas 2 | | <i>Blysmus</i> |
| 3. Leaves mostly basal or near base | | <i>Fimbristylis</i> |
| + Leaves throughout stem | 5 | |
| 5. Glumes spiral (rarely distichous) | 6 | |
| + Glumes distichous | 7 | |
| 6. Nuts trigonous | | <i>Bulbostylis</i> |
| + Nuts obovoid-trigonous | 8 | |
| 7. Stigmas 3 | | <i>Cyperus</i> . |
| + Stigmas 2 | 9 | |
| 8. Rhizomes non-creeper; flowers unisexual; leaf “V” shaped in section | | <i>Carex</i> |
| + Rhizomes creeper; flowers rarely unisexual; leaf not “V” shaped in section .. | | <i>Kobressia</i> |
| 9. Stems tufted; inflorescence condensed | | <i>Pycreus</i> |
| + Stems not tuft; inflorescence a dense head | | <i>Kyllinga</i> |

Bulbostylis Kunth

Bulbostylis densa (Wall. ex Roxb.) Karsten & Schenk, Vegetations 20 (7): 16. 1930; Koyama in Hara, Fl. E. Him 380. 1966; Noltie, Fl. Bhutan 3(1): 298. 1994; Hajra & Verma, Fl. Sikkim 1: 198. 1996. *Scirpus densus* Wall. ex Roxb., Fl. Indica ed. Carey, 1: 231. 1820. *Bulbostylis capillaris* C.B. Clarke var. *trifida* (Kunth) C.B. Clarke in Fl. Brit. India 6: 652. 1894.

Herbs annual, slender tufted. Stems to 20 cm, filiform. **Leaves** erect, basal and sub-basal, half the stem length or slightly more. Sheaths hairy at apex, pale brown. **Inflorescence** umbellate, sometime reduced to a single spikelet. **Spikelet** sessile, 0.25 - 0.50 x 0.13 - 0.30 cm, ovoid, acute; lowermost bract shorter than inflorescence and with filiform tip. **Glumes** spiral, rarely distichous, ovate, acute, fimbriate, 3-veined. **Stamens** 2; style upto 0.10 cm, glabrous; stigmas 3. **Nut** strongly trigonous, finely papillose.

Flower : April *Fruit*: September
Exsiccatus : Rachela below 2600 m, **SR Lepcha & AP. Das 2541**, dated 08.07.2005
Status : Common
Local Distribution : Changu, Padamchen upto 2600 m .
General Distribution : E. HIMALAYA; CHINA, JAPAN.

Blysmus Panzer ex J.A. Shultes

Blysmus compressus (L.) Panzer in Link. Hort. Berol. 1: 278. 1827; Noltie, Fl. Bhutan 3(1): 1994. *Schoenus compressus* L., Sp. Pl. 43. 1753. *Scirpus planifolius* Grimm., Nov. Act. Cur. 3: App. 259.1767. *Scirpus caricis* Retz., Fl. Scand. 11. 1799; C.B. Clarke in Hook.f., Fl. Brit. India 6: 660.1893.

Herbs stout, rhizomatous. Stem upto 50 cm tall. **Leaves** slightly wide near base, narrowly tapered at apex, inrolled, \pm equaling to the stem to 1.2 - 4.8 mm wide, lower sheath persistent, ribbed, brown. **Inflorescence** to 3 cm; lowest bract with glume-like base and green midrib extended into leaflike, slightly shorter than exceeding spike. **Spikelets** 2 - 12, lowest distant, linear ellipsoid. **Glumes** ovate, subacute to 4.5 x 2.5 - 3 mm, golden to reddish brown, margins hyaline. Bristle 6, retrose, barbed slender, reddish brown, to equaling stigma. Stigma exceeding style. **Nut** obovate flattend.

Flower : June *Fruit*: September
Exsiccatus : Kupup 3990 m, **SR. Lepcha & AP. Das 2540**, dated 20.0.2005.,
Status : Not common
Local Distribution : Changu, Padamchen upto 3600 m.
General Distribution : NE- INDIA, BHUTAN, NEPAL.
 Note : Endemic to Eastern Himalya

Carex Linnaeus

Key to the species

1. Midrib of female glumes prominently excurrent 2
- + Midrib of female glumes not excurrent *C. pulchra*
2. Utricle with beaked 3
- + Utricle without beak or rarely beaked *C. duthiei*
3. Margin of beaks setose 4
- + Beaks smooth 7
4. Spikes commonly drooping *C. myusorus*
- + Spikes not drooping 5
5. Utricle without deflexed beaked 6
- + Utricles with deflexed beaked *C. insignis*
6. Female spikes linear *C. setosa*
- + Female spikes cylindric *C. alopecuroides*

- 7. Spikes subsessile 8
- + Spikes on slender peduncles 9
- 8. Female glumes with orange-brown tinges *C. inanis*
- + Female glumes with pale-yellow strip 10
- 11. Leaf sheath bases golden-brown, glazy *C. daltonii*
- + Leaf sheath bases chestnut-brown, shining *C. crassipes*
- 9. Rhizomes creeping; leaf sheath base reddish-purple *C. filicina*
- + Rhizomes not creeping; leaf sheath base pale brown 12
- 12. Utricles swollen, beaks straight..... *C. cruciata*
- + Utricles not swollen; beaks curved..... 13
- 13. Culms trigonous; utricles lanceolate and glabrous brous..... *C. nubigena*
- + Culms not trigonous; utricles rhomboid and hispid..... 14
- 14. Spikes 5-11, upper males, middle female; utricles beaked *C. teres*
- + Spikes 4-7, mostly females; utricles not beaked *C. obscura*

Carex alopecuroides D. Don ex Tillich et Taylor var. ***chlorostachys*** (D. Don) Cl. in Jour. Linn. Soc. 36: 271. 1903; Noltie, Fl. Bhutan 3(1): 394. 1994; Hajra & Verma, Fl. Sikkim 1: 199. 1996. *C. chlorostachys* D. Don in Trans. Linn. Soc. 14: 330. 1825, non Steven 1813. *C. japonica sensu* Cl. in Fl. Brit. India 6: 736. 1894 p.p., non Thunb. *C. japonica* ssp. *chlorostachys* (Kuk.) Koyama in Hara, Fl. E. Him. 382. 1966. *C. doniana* Spr., Syst. Veg. 3: 825. 1823.

Local name : Mongsher (Lep.).

Herbs annual or perennial, with creeping rhizomes, ribbed-scaly. Stems slightly tufted. **Leaves** basal, sheathing at the lower part of culm, blades to 1.8 cm. Culm to 50cm, acute, trigonous. **Inflorescence** terminal. **Male spike** 1, to 5.5 cm long, erect; peduncle to 3 cm long. **Female spikes** 3 - 5, erect, to 5 cm long, cylindrical, peduncled; **prophylls** fused forming utricles 0.3 - 0.42 x 0.13 cm, ellipsoidal, trigonous, gradually tapering into longer beak, apex herbaceous and glabrous; stigmas 3. **Female glumes** acuminate, midrib greenish. **Male glumes** oblong or lanceolate, subacute to acuminate, tip cabrid.

Flower & Fruit : April - May

Exsiccatus : Near Rachel Peak 2800 m, **SR Lepcha & AP. Das** 2513 dated 25.10.2004

Status : Frequent.

Local Distribution : Gangtok, Tumlong, Karponang, 1700 - 2000 m.

General Distribution : E. HIMALAYA; INDIA, C. CHINA, NORTHEASTWARD TO JAPAN.

Carex crassipes Boeckeler in Linnacea, 11: 329. 1876; Noltie, Fl. Bhutan 3 (1): 385. 1994.

Herbs perennial. Rhizome slender, creeping to 22 cm. **Lamina** 0.30 - 0.47 cm long, slightly narrowed, sheaths with shining dark brown towards bases. Fascicles with many slender peduncles, upto 13 cm, disposition of sexes similar, utricles hispid with bifid beak, gradually narrowed. **Spikes** and **glumes** comparatively less and smaller, straw-coloured to dark brown, awns very short (0.8 cm).

Flower & Fruit : May - July

Exsiccata : Phusrey 2250 m, **SR Lepcha & AP. Das** 2514, dated 23.10.2004

Status : Less Common.

Local Distribution : Phusrey 2000 – 2500 m.
General Distribution : E. HIMALAYA; INDIA (Darjeeling-Sikkim), Bhutan.
Note : Endemic to Eastern Himalaya.

Carex daltonii Boott, *Illust.* 1: i. 5, t. 16. 1958; C.B. Clarke in *Hook.f., Fl. Brit. India* 6: 726. 1894; Noltie, *Fl. Bhutan* 3(1): 384. 1994; Hajra & Verma, *Fl. Sikkim* 1: 202. 1996.

Herbs with creeping rhizome. **Leaves** in basal rosettes, usually solitary on lower part of culm, blades to 1.5 cm, slightly shorter than culm, more stiffy; leaf-sheaths golden brown at base. Culm 45 - 75 cm long, erect and stout. **Fascicles** numerous, usually pedunculate, desposition of male and female Flower distinctly similar. Peduncles to 14cm, slender. Utricles 0.5 x 0.2 cm, hispid, tapering into a bifid beak. **Female glumes** smaller, to 0.30 x 0.4 cm, dark brown or straw yellow; awn to 0.22 cm.

Flower & Fruit : March – July
Exsiccatus : Rachela Middle 2450 m, *SR Lepcha & AP. Das* 2515, dated 26.10. 2004
Status : Less Frequent.
Local Distribution : Trijunction Rachela Middle, 2400 - 2900m.
General Distribution : E. HIMALAYA (Sikkim-BHUTAN).
Note : Endemic to Eastern Himalaya.

Carex cruciata Wahlenberg in *Vet.-Akad, Nya Handl. Stokh.* 24: 149. 1803; *Illust. Carex* 3: t. 247-249. 1862; C.B. Clarke in *Hook.f., Fl. Brit. India* 6: 715. 1894; Koyama in Hara, *Fl. E. Him* 381. 1966; Hajra & Verma, *Fl. Sikkim* 1: 201. 1996. *C. condensata* Nees *ex* Wight, *Contrib. Bot. India* 123. 1834; *Fl. Brit. India* 6: 716. 1894.

Herbs perennial rhizomatous. Stems with remnants of leaves at apex. Culm upto 90 cm. Leaf sheaths pale brown, dark veined at base. **Leaves** sub-basal, lamina 0.45 - 0.80 cm across. **Inflorescence** to 30 cm long; panicles pyramidal; bracts leafy. Bracteoles filiform. **Spikes** mostly female. Utricles glabrous, swollen, parallelly veined, abruptly tapered into a beak. **Female glumes** ovate, mucronate deep red with pale yellow stripe. **Male glumes** to 0.5 cm, lanceolate, obscurely mucronate. Utricles glabrous, slightly swollen, parallelly veined, tapered into beak.

Flower & Fruit : April - January
Exsiccatus : Phusrey 2200m, *SR Lepcha & AP. Das* 2526, dated 07.07.2005.
Status : Frequent.
Local Distribution : Karponang, Kyongnosla, 2300 – 2900 m.
General Distribution : MEDAGASCAR, INDIA, NEPAL, BHUTAN, INDO-CHINA, FORMOSA, S. JAPAN

Carex duthiei C.B. Clarke in *Hook.f., Fl. Brit. India* 6: 831. 1804; Noltie, *Fl. Bhutan* 3(1): 388. 1994. *Carex atrata* L. ssp. *pullata* (Boott.) Kuenth. in *Eng.Pflanzenr.* 38: 400. 1909. *Carex atrata* L., *Sp. Pl.* 1387. 1753; C.B. Clarke in *Hook.f., Fl. Brit. India* 6: 731:1894 var. *pullatta* Boott, *Illustr.* 3: 114.t. 364.1862.

Herbs perennial upto 15 - 90cm tall. Rhizome short, stem tufted. Bases of leaf sheaths striped brownish to blackish red. **Leaves** basal-sub-basal 1 - 3 on lower culm, blades about ½ lengths to culm, 2 - 5.5mm wide. Culm 20-90cm, trigonous. **Inflorescence** of 2 - 4 in drooping spikes, 2 - 3 upper peduncle short, crowded, longer peduncle distant. **Spikes** narrowly cylindrical, tapering to apex, 1.5 - 6 x 5 0.7cm, gynaeandrous terminal, lowest bract with setaceous and exceeding inflorescence, “auricles” short, clasping, upper bracts conspicuous. Utricles elliptic-oblong-trigonous, 2.5 - 3.6 x 1 - 1.7mm, glabrous, pale green, beakless, aperture entire, black; stigmas 3. **Female glumes** lanceolate, acuminate-acute, purplish-black, midrib excurrent.

Flower : June – July *Fruit:* July – October
Exsiccatu : Bhimbase 3660m, **SR Lepcha & AP. Das** 30962, dated 24.07.2005;
 Kupup 4200m, **SR Lepcha & AP. Das** 30966, dated 24.07.2005
Status : Common
Local Distribution : Changu, Kyonglasha, Sherathang 3260 – 4570 m.
General Distribution : ALPINE REGION of EASTERN HIMALAYA, E. TIBET. CHINA,
 and JAPAN.

Carex filicina Nees in Wight, Contrib. India 23.1834 (incl. var. *meiogyna* (Nees) Strachey); C.B. Clarke in Fl. Brit. India 6: 717.1894; Noltie, Fl. Bhutan 3(1): 377. 1994; Hajra & Verma, Fl. Sikkim 1: 207:1996. *Carex nilagirica* Steud., Syn. Cyp. 207. 1855. *Carex filicina* var. *minor* Boott, Illustr. 3: 106.t. 317 & 318.

Herbs perennial, stout with creeping rhizome creeping. Bases of leaf Sheaths cream or reddish purple, fibrillose margin; blade less sheaths with reddish-purple. **Leaves** basal, 1 - 2, blade equaling to culm, 1.5 – 1.5 cm wide. Culm 2.2 - 11cm. **Inflorescence** panicles in unequal pairs; bracts shorter than inflorescence. Partial panicles rigid, open, triangular in outline, spikes decreasing in length or variable in size within inflorescence, borne directly on axis in upper half and on other branches in lower half. **Spikes** initially female, utricle lax, deflexed at maturity; female section 4.5 - 18.5mm; male section 2.5 - 5.8mm. Utricles ellipsoid-trigonous, curved, narrowed into beak; ribbed, olive green; beak deflexed, apex hyaline, aperture oblique, not notched; **stigmas** 3. **Male glumes** lanceolate. **Female glumes** ovate, acute, hispid minutely; pale brown, straw coloured.

Flower & Fruit : July – August
Exsiccatu : Lungthung 3800m, **SR Lepcha & AP. Das** 20277, dated 28.10.2004;
 Panglakha 2700 m, **SR Lepcha & AP. Das** 29374, dated 30.09.2004;
 Zuluk- Padamchen 2500-3800 m, **SR Lepcha & AP. Das** 32892, dated
 27.10.2004.
Status : Common
Local Distribution : Karponang, Padamchen, Lungthung 600 – 4000 m.
General Distribution : INDIA, BHUTAN. MYANMAR, INDO-CHIN, MALAYSIA, CHINA,

Carex inanis Kunth, Enum. Pl. 2: 522. 1837; C.B. Clarke in Hook.f., Fl. Brit. India 6: 743. 1894; Pfl. Reich. IV-20, Ht. 38: 419. 1909; Hara *et al*, Enum. Fl. Pl. Nepal 1: 103, 1978; Noltie, Fl. Bhutan 3(1): 404. 1994; Hajra & Verma, Fl. Sikkim 1: 204. 1996.

Herbs with short rhizome. Stems densely tufted. Leaves usually longer than culms, inserted on base of column, to 0.3 cm wide, often sheathed, basal leaf sheaths fibrilous, purplish-brown, persistent. Culm to 40 cm, rounded - trigonous. Spikes 4 - 7, subsessile, erect, apically crowded. **Male spike** terminal in position, to 2.3 cm long; **Female spike** with 3 - 6 spikes to 2.5 cm long, rarely branched at base into 1 or 2. Bracts often longer than inflorescence. Utricles 0.4 x 0.5 cm, broadly ellipsoid to obscurely obovoid with abrupt bidentate short beak, shortly whitish hairy, olive-brown; **stigmas** 3. **Female glumes** 0.28 x 0.18 cm, oblong to lanceolate, acute, sometime minutely emarginate, orange-brown with greenish midrib. **Male glumes** oblanceolate, deeply keeled midrib.

Flower & Fruit : June – October
Exsiccata : Karponang 2280 m, **SR Lepcha & AP. Das** 2516, dated 30.10.2004.
Status : Less Frequent.
Local Distribution : Karponang, Kyonglasha, 2300 – 3800 m.
General Distribution : TEMPARATE HIMALAYAS.

Note : Endemic to Himalaya.

Carex insignis Boott, Illustr. 1: 5, t.14. 1858; C.B. Clarke in Hook.f., Fl. Brit. India 6: 725. 1894; Noltie, Fl. Bhutan 3(1): 384. 1994.

Herbs perennials, upto 60 cm tall. Rhizome stout. **Leaves** completely hidden by sheaths, blades evenly narrowed. **Inflorescence** slightly longer upto 13 nodes. Peduncle unequal. **Spikes** predominantly female, oftenly branched at each fascicles androgynous, uppermost fascicle entirely male flower. Beak deflexed. **Female glumes** smaller. 2 - 4 x 0.8 - 1.9 mm.

Flower : September *Fruit*: November
Exsiccatus : Phusrey 2200 m, **SR Lepcha & AP. Das** 30273 dated 27.10.2004
Status : Common
Local Distribution : Karponang, Kalapokhri, 2400 - 3750 m.
General Distribution : EASTERN HIMALAYA; (NEPAL - BHUTAN) and ASSAM.
Note : Endemic to Eastern Himalaya.

Carex myosurus Nees in Wight, Contrib. 122. 1834. C.B. Clarke in Fl. Brit. India 6: 723.1894; Noltie, Fl. Bhutan 3(1): 381. 1994; Hajra & Verma, Fl. Sikkim 1: 226. 1996.

Vern.Name.: Mungshel (Lep.)

Herbs perennial, with short rhizome, woody. **Stem** tufted. Sheath base reddish to brownish-purple. **Leaves** usually inserted along lower half of culm, leaves blade course, 0.6- 1.8cm wide. Culm angled rounded 60- 170cm long. **Inflorescence** slender, 15 - 70 cm long, nodes 5 - 11, bracts leaves like, often exceeding the inflorescences. **Spikes** upto 10, androgynous, drooping, rarely erect. Utricles male suberect, Utricles slightly ellipsoid trigonous, narrowed into short beak, stigma 3. **Female glumes** lanceolate to oblong, acute dark brown; midrib scabrous. **Male glumes** narrowly lanceolate, slightly tapered at apex, reddish brown.

Flower : August - October *Fruit*: September - July
Exsiccatus : Dhurok 2300m, **SR Lepcha & AP. Das** 30275, dated 07.10.2004
Status : Common
Local Distribution : Karponang, Premlakha, Padamchen, upto 2500 m
General Distribution : INDIA, NEPAL, BHUTAN.

Carex nubigena D. Don ex Tilloch & Taylor in Phil.Mag.62: 455.1823; C.B. Clarke in Fl. Brit. India 6: 702.1894; Noltie, Fl. Bhutan 3(1): 364. 1994; Hajra & Verma, Fl. Sikkim 1: 207. 1996.

Local Name: Jyak cha (Bhut. & Sherp.)

Herbs perennial. Rhizome short, woody stems. Leaf sheath base straw coloured, persistent as fiber. **Leaf** inserted along lower half of culm, blades shorter than to equaling culm., base straw coloured. Culm slender. **Inflorescence** narrowly cylindrical; spike greenish. **Spike**, androgynous. Lateral spike sessile, usually long and narrow. Utricles ellipsoid, dense, ascending. **Male** section scarcely visible at Fruit. **Stigma** 2. **Female glumes** oblong-lanceolate to ovate, acuminate 3 - 4 x 2 - 2.5mm; hyaline at midrib.

Flower : May - July *Fruit*: June - October
Exsiccatus : Gnathang 3990 m, **SR. Lepcha & AP. Das** 31104, dated 13.10.2004
Status : Common
Local Distribution : Karponang, Kyonglasha, Kupup, Nathang 2700 - 3900 m,
General Distribution : TEMPERATE HIMALAYAS; INDIA, NEPAL, BHUTAN and

CHINA

Note : Endemic to Himalaya.

Carex obscura Nees in Wight, Contrib. Bot. Ind. 126. 1834; C.B. Clarke in Hook.f., Fl. Brit. India 6: 731. 1894; Noltie, Fl. Bhutan 3(1): 390. 1994; Hajra & Verma, Fl. Sikkim 1: 207. 1996.

Herbs rhizomatous. Stem densely tufted. **Leaves** usually equal to culm, 0.2 - 0.60 cm wide. Leaves sheaths bladeless, shining dark purple. Culms 16 - 82 x 0.20 - 0.25 cm, erect. **Spikes** 4 - 7, crowded, subsessile, lower mostly females, terminal gynaeandrous; bracts to 0.45 cm wide, lowermost sheathless. **Utricles** rhomboid, trigonous beakless, hispid; **stigmas** 3. **Female glumes** smaller, ovate or orbicular, dark purple, mid nerve greenish.

Flower & Fruit : June - October.

Exsiccatus : Kyongnosla 2895 m, *SR Lepcha & AP. Das 2517*, dated 30.10.2004.

Status : Common.

Local Distribution : Kyongnosla, Trijunction Rachel, 2100 - 2900 m.

General Distribution : HIMALAYAS; INDIA (Kashmir-Kumaon), Sikkim, Darjeeling.

Note: Endemic to Himalaya.

Carex pulchra Boott, Illustr. 1: 4, t. 13. 1858; C.B. Clarke in Hook.f., Fl. Brit. India 6: 727. 1894; Noltie, Fl. Bhutan 3(1): 385. 1994; Hajra & Verma, Fl. Sikkim 1: 210. 1996.

Herbs perennial, rhizomatous, with tufted stems. **Leaves** in rosettes, almost to culm length, 0.20 - 0.5 cm wide, hispid above when young, leaf-sheaths bases dull, pale orange-brown, persistent. Culm 18 - 48 cm long. **Inflorescence** slender, nodding, originated at nodes; peduncle single or in pairs, each bearing single spike rarely more. **Fascicles** of 3-11 slender scabrid. Most spikes female, slightly longer peduncled. **Spike** of the fascicle sometimes gynaeandrous, spikes in terminal fascicle bears occasionally all male, female spikes to 3.5 cm long, linear, utricles ellipsoidal trigonous, beaked; **stigmas** 3. **Female glumes** to 0.30 x 0.13 cm, oblong-obovate, subacute, yellowish brown. **Male glumes** to 0.5 x 0.14 cm, narrow-lanceolate, acute with keeled midrib.

Flower & Fruit : July - October

Exsiccatus : Premlakha above 1900 m, *SR Lepcha & AP. Das 2518*, dated 30.10.2004.

Status : Frequent.

Local Distribution : Karponang, Premlakha, 1800 - 2550 m.

General Distribution : E. TO C. HIMALAYAS; INDIA, NEPAL - BHUTAN.

Note : Endemic to Central & Eastern Himalaya

Carex setosa Boott, illus. 3:108, t. 327-329. 1862; C.B. Clarke in Hook.f., Fl. Brit. India 745. 1894; Noltie, Fl. Bhutan 3(1): 398. 1994; Hajra & Verma, Fl. Sikkim 1: 211. 1996.

Herbs rhizomatous. Stems tufted. **Leaves** shorter than culm, lamina 0.25 - 0.25 cm, wide, flat. Leaf-sheaths bases pale brown. Culm to 65 cm long, slender. **Inflorescence** lax. **Male spike** to 3 cm long, 1 oftenly terminal. **Female spikes** slightly longer than male spike, linear, slender, lowest spike sometime basally brached. Peduncles upto 9 cm long, slender. Bracts stiff, sheathed, brownish hyaline. **Utricles** 0.38 x 0.3 cm, linear-ellipsoidal, margins sparsely setose, beak notched; **stigmas** 3. **Female glumes** 0.3 x 0.20 cm, oblong-ovate, blunt, red-brown, midrib scabrid. **Male glumes** to 0.5 x 0.3 cm, acute.

Flower & Fruit : April – September
Exsiccatus : Rachela below 2400 m, *SR Lepcha & AP. Das* 2522, dated 30.10.2004
Status : Common
Local Distribution : Changu, Kupup, Nathula, Jalepla, Rachela, 1600 – 3500 m.
General Distribution : HIMALAYAS; INDIA, (Kashmir-Sikkim).
 Note : Endemic to Himalaya.

Carex teres Boott, Illustr. 1: 62, t. 167. 1858; C.B. Clarke in Hook.f., Fl. Brit. India 6: 707. 1894; Noltie, Fl. Bhutan 3(1): 372. 1994.

Herbs rhizomes. **Leaves** almost equal or slightly longer than culm, **lamina** 0.3 - 0.8 cm wide, apex trigonous; leaf sheaths red-brown, persistent. Culm to 65 cm long, stout; peduncles to 2 cm long. **Inflorescence** with 5 – 11 spikes, terminal male, gynaeandrous or usually female Flower in middle, usually shorter than female spikes; lower 4 - 10 spikes female; bract basal foliaceous, sheathed at base, upper filiform. Utricles to 0.33 x 0.3 cm, elliptic, biconvex, sharply 3 - 5 nerved, brownish-olive, purplish glandular; stigmas 2. **Female glumes** with scabrid awn 0.30 x 0.13 cm, oblong to elliptic, apex truncate or emarginate, mid-rib with 3 veins. **Male glumes** longer than female ones, oblanceolate, subacute to shortly mucronate.

Flower : April – July
Exsiccatus : Panglaxha 2900m, *SR Lepcha & AP. Das* 2525, dated 07.07.2005.
Status : Frequent.
Local Distribution : Rachela trijunction, 2300 – 2900 m.
General Distribution : E. HIMALAYA; INDIA, (Darjeeling and Sikkim Himalayas).
 Note : Endemic to Darjeeling and Sikkim Himalayas.

Cyperus Linnaeus

Cyperus rotundus L., Sp. Pl. ed. 1, 45.1753; Fl. Brit. India 6: 614. 1893; Pfl.-reich IV -20, Ht. 101: 107, f. 13. 1935; Bull. Bot. Gard. Lucknow no. 85: t. 10. 1963; Koyama in Hara, Fl. E. Him 388. 1966; Noltie, Fl. Bhutan 3(1): 316. 1994; Hajra et Verma, Fl. Sikkim 1: 217. 1996. *C. retzii* Nees in Wt., Contrib. 82. 1834, non Poir. 1806. *C. tuberosus sensu* C.B. Clarke in Fl. Brit. India 6: 616. 1894 p.p. non Rottb.

Local Name: Mothey (Nep.); Mutha (Beng.); Nut Sedge (Eng.).

Herbs annual with slender stolons, tubers usually fibrous. Stems to 32 x 0.20 cm. **Leaves** compact at stem base, lamina half to length of stem, sheaths, membranous, pale. **Inflorescence** to 8 x 7 cm, usually 1, compound; primary rays 1-5 nos; involueral bracts shorter or equal to inflorescence. **Inflorescence** with 4-7 spikelets forming cylindric spikes; rachis to 0.30 - 0.55 cm. **Spikelets** 1 – 2.5 x 0.10 - 0.4 cm, linear, acute. **Glumes** upto 22 nos., ovate, overlapping, blunt, strongly 3 veined. **Stamens** 3; style short to 0.02 cm. **Nut** oblong-elliptic, concave, pale brown, papillose.

Flower : April *Fruit*: August
Exsiccatus : Phusrey 2300, *SR. Lepcha & AP. Das* 2542, dated 08.07.2005.
Status : Common
Local Distribution : Rachela below, Changu, Padamchen to 2350 m
General Distribution : COSMOPOLITAN WEEDS.

Erioscirpus Palla

Erioscirpus cosmosus (Wall.) Palla, Bot. Zeitung. Liv. I. 148, in obs. 151, in Clavi 1896; Noltie, Fl. Bhutan 3(1): 281. 1994. *Eriophorum comosum* (Wall.) Wall. ex Nees in Wight, contrib.. 110 (Wall. cat.n. 3446).

Herbs perennial tufted. Stem upto 35 m long, solid, obscurely trigonous. **Leaves** slightly exceeding stems, basal to 0.50 cm wide, serrate margin, blades narrow and channelled. Sheaths persistent. **Inflorescence** diffuse, terminal, compound panicle, to 45 cm; bracts leafy, exceeding inflorescence. **Spikelets** numerous, borne either singly or in pairs, narrowly ellipsoid, paniced, sessile. **Glumes** spirally inserted on axis, to 0.5 x 1 cm, ovate-oblong, acute or blunt, midrib greenish. **Stamens** 1-2; stigmas 3, papillose, reddish-brown. **Nuts** narrow, flattened, trigonous, oblong, dark brown.

Flower : May *Fruit*: December
Exsiccatus : Dohrok above 2300 m, **SR. Lepcha & AP. Das 2531**, dated 07.07.2005
Status : Common
Local Distribution : Padamchen, Lungthung, Neora Valley NP border, 1400 – 2300 m.
General Distribution : HIMALAYAS; INDIA, MYANMAR, TONKIN, CHINA.

Fimbristylis Vahl

Key to the species

1. Herbs rhizomatous 2
- + Herbs non rhizomatous 3
2. Leaf half the length of stem. *F. dichotoma*
- + Leaf almost equal to or slightly longer than stems *F. miliaceae*
3. Inflorescence compound; Nut trigonous *F. complanata*
- + Inflorescence simple ; Nut biconcave *F. stolonifera*

Fimbristylis complanata (Retz.) Link, Hort. Berol. Descr. 1: 292. 1827; C. B. Clarke in Hook.f., Fl. Brit. India 6: 646. 1894; Koyama in Hara, Fl. E. Him. 390. 1966; Noltie, Fl. Bhutan 3(1): 291. 1994; Hajra *et* Verma, Fl. Sikkim 1: 220. 1996. *Scirpus complanatus* Retz., Obs. Bot. 5: 14. 1789.

Herbs perennial, rhizomatous. Stems tufted, compressed above. **Leaves** basal and sub-basal, abruptly tapering at apex, **lamina** 6 – 32 x 0.3 - 0.55 cm, margins thickened, serrate, stiff; sheaths pale-brown, ligulate. **Inflorescence** compound with primary rays flattened and longest being upto 10 cm; lower most bract upto 5 cm long, leaf-like. **Spikelets** sessile, borne singly, linear-ellipsoid, acute. **Glumes** ovate, acute or apiculate, strongly keeled, brownish. **Stamens** 3; style basally swollen, glabrous; stigmas 3, erect. **Nuts** trigonous.

Flower : April – May *Fruit*: July – August
Exsiccatus : Phusrey 2300 m, **SR. Lepcha & AP. Das 2533**, dated 07.07.2005
Status : Less frequent
Local Distribution : Gangtok, Penlongla, Padamchen, Karponang, 1100 – 2300 m.
General Distribution : INDIA TO MALAYSIA, S. CHINA AND JAPAN.

Fimbristylis dichotoma (L.) Vahl, ssp. *dichotoma* Enum. Pl. 2: 287. 1806; Kew Bull. 1935: 150. 1935; Koyama in Hara, Fl. E. Him. 391. 1966; Noltie, Fl. Bhutan 3(1): 294. 1994; Hajra & Verma Fl. Sikkim 1: 220. 1996. *Scirpus dichotomus* L., Sp. Pl. ed. 1, 50. 1753. *F. diphylla*

(Retz.) Vahl, Enum. Pl. 2: 289 1806; C.B. Clarke in Hook.f., Fl. Brit. India 6: 636. 1894, incl. var. *annua* C.B. Clarke.

Herbs non-rhizomatous, tufted. Stems compressed, densely tufted, not less than 13 cm. **Leaves** basal and on lower stem part, nearly half in length of stem, ligulate, acute. Sheaths short hairy, brownish. **Inflorescence** to 13 cm, compound; primary rays unequal, longest being upto 8.5 cm. Lower bracts 5 - 11 cm long, leafy. **Spikelets** to 1.5 cm, borne singly. **Glumes** ovate, acute, 3-veined with distinct greenish mid nerve. **Stamen** 1; style deep brown with fimbriate margins basally; stigmas 2, deflexed.

Flower : March - May *Fruit*: October
Exsiccatus : Mulkharka 2250 m, *SR. Lepcha, & AP. Das* 2536, dated 08.07.2005.
Status : Common
Local Distribution : Gangtok, Dikchu, Karponang, 1600 - 3000 m.
General Distribution : TROPICAL AND SUBTROPICAL REGIONS OF THE WORLD.

Fimbristylis miliacea (L.) Vahl, Enum. 2:287. 1806 *quoad basionym, non sensu* Cl. in Hook.f., Fl. Brit. India 6: 644. 1894; Koyama in Hara, Fl. E. Him 391.1966; Noltie, Fl. Bhutan 3(1): 293. 1994; Hajra & Verma, Fl. Sikkim 1: 221. 1996. *Scirpus miliaceus* L., Syst. Veg. 10:868. 1759. *F. quinquangularis* (Vahl) Kunth, Enum. 2: 229. 1873; C.B. Clarke in Hook.f., Fl. Brit. India 6: 664. 1894; Blumea 8: 118. 1955.

Herbs annual without rhizome. Stem to 50 cm long, compressed, 3 - 4 angled, densely tufted. **Leaves** almost equal to stem or often larger, stouter, stem-leaves reduced to elongated sheaths with minute blades, basal leaves with flat blades and minutely serrate margins. **Spikelets** to 0.55 x 0.4 cm, acute and strongly angled; **glumes** to 0.20 x 0.5 cm, acute with shortly excurved midnerve, strongly keeled. **Stamens** 1-2; style thickened and fimbriate at base; stigmas 3. **Nut** rounded-trigonal.

Flower : July - May *Fruit*: October
Exsiccatus : Dohrok 2300 m, *SR. Lepcha & AP. Das* 2536, dated 07.07.2005.
Status : Common
Local Distribution : Phusrey, Ramitey, 1400 - 2200 m.
General Distribution : OLD WORLD TROPICAS (FROM AFRICA-INDIA, EASWARD TO FORMOSA, MALAYSIA, AND N. AUSTRALIA).

Fimbristylis stolonifera Clarke in Hook.f., Fl. Brit. India 6: 637. 1893; Noltie, Fl. Bhutan 3(1): 295. 1994; Hajra & Verma, Fl. Sikkim 1: 221. 1996.

Herbs slender, usually with creeping stolon. Stem tufted, grooved. **Leaves** margin minutely serrate. **Inflorescence** simple. **Spikelets** 0.30 - 0.80 x 0.20 - 0.50 cm. **Glumes** 0.22 - 0.35 x 0.15 - 0.25 cm, dark red-brown, midrib green. **Stamens** 3; style fimbriate in upper half portion. **Nuts** biconcave, faces obovate, borne on conspicuous gynophore, wider and with 12 vertical rows of cell rows at each face, sometime tuberculate.

Flower : July - May *Fruit*: September - October
Exsiccatus : Phusrey 2250 m, *SR. Lepcha & AP. Das*, 2538, dated 07.07.2005.
Status : Common
Local Distribution : KAS, Phusrey, 1600 - 2300 m.
General Distribution : E. HIMALAYA (Nepal-Bhutan).
Note : Endemic to Eastern Himalaya.

Kobresia Willdenow

Key to the species

- | | |
|---|-------------------------|
| 1. Inflorescence branched | 2 |
| + Inflorescence not branched | 4 |
| 2. Lower bract shorter than inflorescence | <i>K. uncinoides</i> |
| + Lower bracts leaf-like, usually exceeding inflorescence | 3 |
| 3. Inflorescence linear, curved; lateral spikes overlapping | <i>K. fragilis</i> |
| + Inflorescence spike-like panicle; lateral spikes 5 – 8, not overlapping | <i>K. curticeps</i> |
| 4. Spikelets unisexual | 5 |
| + Spikes androgynous | <i>K. nepalensis</i> |
| 5. Plant extremely shorter less than 10 cm tall | <i>K. pygmaea</i> |
| + Plant not so short more than 10 cm tall | <i>K. stiebritziana</i> |

Kobresia curticeps Kukenthal in Engl. Pflanzenreich, Cyperac. – Caricoid. 47. 1909. Noltie, Fl. Bhutan 3(1): 340. 1994. *Carex curticeps* C. B. Clarke in Hook.f., Fl. Brit. India 6: 129.1894.

Herbs rhizomatous with tufted stem and remains of old leaf sheaths at base. Culm trigonous; leaf lamina 20 – 90 x 1 – 2.6 cm, flat, equaling culm to 8 mm wide, keeled, pale brown. Flowers bisexual but rarely with female only. **Inflorescence** in a stiffly nodding; lateral spikes 3 – 12 ± appressed; lower bracts leaf-like, slightly exceeding the inflorescence. **Spikes**; terminal spike androgynous or entirely female, lateral spikes linear; upper spikelets single flowered male rarely female. **Prophyll** utriculation, linear lanceolate, open only near apex, ribbed, margins hairy rarely glabrous. **Nut** shortly stipitate, linear ellipsoid- trigonous pale brown. Racheola fimbriate at apex.

Flower & Fruit : June – October

Exsiccatu : Rachela trijunction 3000 m, **SR Lepcha & AP. Das 2511**, dated 07.08.2005

Status : Common

Local Distribution : Kyongnosla, Changu, Lungthung, Nathula, upto 3800m.

General Distribution : E. HIMALAYA; INDIA,

Note : Endemic to Eastern Himalaya.

Kobresia fragilis C.B. Clarke in Journ. Linn. Soc. 36: 267. 1903; Koyama in Hara et al, Enum. Fl. Pl. Nepal 1: 113. 1978; Noltie, Fl. Bhutan 3(1): 342. 1994.

Herbs perennial tufts. Culm to 40 cm, slightly curved. **Basal leaves** sub-basal, shorter than culm, margin inrolled. Sheaths fibrous, pale brown. **Inflorescence** linear, curved; lateral spikes overlapping, lower one branched. Lowest bract equal or slightly longer than inflorescence., filiform, base clasping. Lateral spikes androgynous. **Male spikelets** 1 – 4. **Female spikelets** 2 – 7, male and female single-flowered. **Female glumes** to 0.40 x 0.18 cm, ovate, rounded to acute, mucronate, hyaline yellowish-brown. **Prophyll** 0.30 x 0.13 cm, lanceolate, curved, pale brown; keels 2, greenish and glabrous. **Nuts** ellipsoidal, trigonous, brown; racheola ciliate, equal to prophyll, 2-nerved.

Flower & Fruit : June - October

Exsiccatu : Near Mulkharka at Neora Border, 2480 m, **SR Lepcha & AP Das 2509**, dated 07.08. 2005

Status : Less Common.

Local Distribution : Karponang, Kyongnosla, Changu, Nathula 2300 - 4000m.
General Distribution : E. HIMALAYA; INDIA, (NEPAL, Sikkim, Darjeeling, BHUTAN).
Note : Endemic to Eastern Himalaya.

Kobresia nepalensis Kukenthal in Engl. Pflanzenreich, Cyperac. – Caricoid. 40. 1909; Noltie, Fl. Bhutan 3(1): 348. 1994.

Herbs with densely tufted. **Tuft** with yellow- dark brown collar, fibrillose sheath bases. **Culm** stiffly erect, sub-terete. **Leaves** mostly basal, lamina filiform, semicircular in section, channeled above, equals to culm, not keeled. **Inflorescence** a linear spike, lax below, androgynous short. **Spikelets** all singled flowered upper few male, majority female. **Female glumes** ovate to lanceolate, subacute to blunt mucronate 2 – 4.5 x 2 – 3 mm, midrib with 1 strong central nerve rarely 2. **Prophyll** utriculiform, curved linear lanceolate open only near apex, keels ciliate. **Nuts** stipitate, oblong, pale brown, stout. **Racheola** linear, 2 veined, usually ciliate

Flower & Fruit : June - October
Exsiccata : Jalepla 4400 m, *SR Lepcha & AP. Das 2512*, dated 13.08.2005
Status : Common
Local Distribution : Nathula, Jalepla, Chakung Chu Rachela upto 4400 m.
General Distribution : HIMALAYA; INDIA, (NEPAL – BHUTAN).
Note : Endemic to Eastern Himalaya.

Kobresia pygmaea (Clarke) Clarke in Hook.f., Fl. Brit. India 6: 696. 1894; Noltie, Fl. Bhutan 3(1): 349. 1994; Hajra & Verma, Fl. Sikkim 1: 225. 1996. *Hemicares pygmaea* Clarke in Journ. Linn. Soc. Bot. 20: 383. 1883.

Herbs perennial tuft upto 5 cm tall. **Leaf** sheaths base brownish. **Culm** to 5 x 0.1i cm, sub-terete, erect. **Leaves** all basal, as long as culm, tubular, channelled above, not keeled. **Inflorescence** dense spike, 0.3 - 0.5 x 0.20 - 0.5 cm, androgynous. **Spikelets** single-flowered. **Male glumes** to 0.5 x 0.22 cm, apparently deciduous. **Female spikelets** 3 - 6, lowermost bract aristate and glume-like. **Female glumes** to 0.40 x 0.30 cm, ovate, acute, midrib broad and green. **Prophyll** to 0.25 x 0.13 cm, oblong-elliptic, opening towards base, keels ciliate at apex. **Nut** to 0.18 x 0.5 cm, obovoid-trigonous, apiculate, pale brown.

Flower & Fruit : May - September
Exsiccatas : Rachela trijunction 3100 m, *SR Lepcha & AP. Das 2510*, dated 07.08.2005
Status : Common
Local Distribution : Rachela tri-junction, Jalepla, Rachela middle, 3000 – 4400 m.
General Distribution : HIMALAYA; INDIA, S. TIBET.
Note : Endemic to Himalaya.

Kobresia stiebritziana Hand.-Maz. in Anz. Akad. Wiss. Wien, 1920, 57. 54. Noltie, Fl. Bhutan 3(1): 348. 1994; Hajra & Verma, Fl. Sikkim 1: 226. 1996.

Herbs perennial, extremely densely tuft, covered by yellowish dark brown fibrillose sheath bases. **Culm** stiffly erect, sub-erect, 10 - 35 cm x 0.5 - 1.5 mm wide. **Leaves** basal, blades stiffly, filiform, semicircular, about equaling glume. **Inflorescence** a linear spikes stouter, dense above, **glumes** narrowed, acute, sides' dark brown, more widely hyaline. **Prophyll** open almost to base at maturity; **racheola** shorter or less than half of nut.

Flower & Fruit : July - September

Exsiccatu : Bhimbase 4500 m, **SR Lepcha & AP. Das 30835**, dated 29.07.2005
Status : Less common
Local Distribution : Jalepla, Nathula, Bhimbase, 3900 – 4500 m
General Distribution : HIMALAYA; (NEPAL – BHUTAN).
 Note : Endemic to Eastern Himalaya.

Kobresia uncinoides (Boott) Clarke in Hook. f., Fl. Brit. India 6: 698. 1894; Pfl.- reich. iv -20, Ht. 38: 46. 1909; *Koyama in Hara Fl. E. Him.* 3: 129. 1975; Noltie, Fl. Bhutan 3(1): 337. 1994; Hajra & Verma, Fl. Sikkim 1: 226. 1996. *Carex uncinoides* Boott, Illust. Carex 1: 8. t. 23. 1858.

Herbs perennial, rhizomes woody, not spreading **Leaves** basal and sub-basal, shorter than culm; 0.5 - 0.7 cm wide, acute; sheath bases thin, pale. Culm sub-terete, (2)-9 – 39 x 0.10 - 0.20 cm. **Inflorescence** spike-like panicle; lateral spikes 5 - 8, androgynous, short appressed; basal spike peduncled. Lower bract glum-like with clasping base, tip aristate. **Spike-lets** all single-flowered, lower ones female. **Female glumes** 0.5 - 0.62 x 0.30 - 0.40 cm, lanceolate to oblong-lanceolate, acute or obtuse, pale yellow, awn as long as 0.5 cm. **Prophyll** linear-lanceolate with ciliate keels. stipitate, oblong, brownish.

Flower & Fruit : June – October
Exsiccatu : Panglakha 2750 m, **SR Lepcha & AP. Das 30841**, dated 29.07.2005
Status : Fairly Common.
Local Distribution : Chola, Yakla, Sherabthang, Changu, Rachel, 1900-2750m.
General Distribution : E. HIMALAYAS; Tibet, S.W. CHINA,
 Note : Endemic to Himalaya.

***Kyllinga* Rottboell (nom. cons.)**

Key to the species

1. Plant upto 50 cm tall; sheaths pale green or grey, reddish nerves; stamens 3*K. nemoralis*
 + Plant less than 40 cm tall; sheaths reddish brown; stamens 1 -3*K. brevifolia*

Kyllinga brevifolia Rottb., Descr. and Ic. 13. t. 4, f. 3. 1773; C.B. Clarke in Hook.f., Fl. Brit. India 6: 588. 1894; Nam. Noltie Fl. Bhutan 3 (1):324. 1994; Hajra & Verma, Fl. Sikkim 1: 227. 1996.

Herbs perennial rhizomatous (creeping). Stems to 35 cm, triquetrous. **Leaves** sub-basal, slightly shorter than stem, upto 0.40 cm wide. Sheaths reddish brown. **Inflorescence** to 0.90 x 0.9 cm, rarely hemispheric with 1-2 subsidiary heads. Involucral bracts 2 - 4, to 18 cm. **Spikelets** sessile, to 0.40 x 0.1 cm, lanceolate. **Glumes** 3, lowermost sterile, to 0.13 x 0.2 cm, ovate; **middle glume** sterile, oblong-ovate with recurved mucro, midrib greenish, keeled; upper glume fertile, to 0.3 x 0.1 cm, oblong-ovate. **Stamens** 1-3; style to 0.06 cm. **Nut** oblong-obovate or oblong-elliptic, truncate, red-brown.

Flower : April *Fruit*: August
Exsiccatu : Mulkharka – Phusrey **SR Lepcha & AP. Das 2530**, dated 07.07.2005
Status : Common
Local Distribution : Padamchen, Lungthung upto 3650 m.
General Distribution : COSMOPOLITAN

Kyllinga nemoralis (J.R. & G. Foster) Dandy ex Hutch. & Dalziel, Fl. W. Trop. Afr. 2: 487. 1936. *K. monocephala* Rottb. Descr. & Ic. 13, t. 4, F, 4.1773 nom. superfl.; C.B. Clarke in Fl. Brit. India 6: 588.1894. *Cyperus kyllinga* Endl. Cat.Hort.Ac. Vindob. 1: 94. 1842.

Herbs perennial upto 50 cm tall. Rhizome slender, creeping. Stem slender. **Leaves** often as long as the stem or shorter, upto 4 cm. Leaves almost equaling stem; sheaths up to 45 mm, pale green or grey, with reddish nerves, mouth margin almost straight; blades, green or grayish green, flat or slightly keeled, margins smooth or scabrous, apex short, flat or trigonous, scabrous. **Inflorescence** a compact, **spikes** ovoid, head-like, globose or ellipsoid cluster of ca 10cm spikes, white or brownish; 3 - 4 bracts foliose, spreading, spikes spirally arranged, each on a minute pedicel, the two opposite glumes sharply keeled, folded, acuminate, midrib winged, sides brown-dotted, scarious, with 4 - 5 nerves. **Stamens** 3, ovoid, biconvex, brown, **Achenes** bearing glume broadly winged on the part of keel, wing gland-dotted, obovoid, yellowish brown.

Flower : March *Fruit*: August
Exsiccatæ : Dohrok 2280 m, **SR Lepcha & AP. Das 30230**, dated 06.10.2004;
 Zeluk 3800 m, **SR Lepcha & AP. Das 32897**, dated 27.10.2004.
Status : Less common
Local Distribution : Padamchen, Lungthung upto 3700 m,
General Distribution : TROPICAL AFRICA S of SAHARA, MADAGASCAR,
 AKISTAN, INDIA, CHINA to JAPAN, S.MALAYSIA;

Pycreus P. Beauvois

Pycreus sanguinolentus (Vahl) Nees ex Clarke in Hook.f., Fl. Brit. India 6: 590.1894; Hara *et al*, Enum. Fl. Pl. Nepal 1: 117. 1978; Hajra & Verma, Fl. Sikkim 1: 232. 1996. *Cyperus sanguinolentus* Vahl, Enum. Pl. 2: 351.1806. subsp. *sanguinolentus*.

Herbs annual, decumbent at basal upto 42 cm tall. **Leaves** much shorter than stem, blade ½ to equaling stems. 0.5 - 1.5mm wide; sheath often reddish brown. **Inflorescence** with many flower 3 - 22 spikelets; involucre bract usually 1-3, spike lets linear oblong, culms with few to several nodes below the middle. **Glumes** ovate blunt, keeled, 3 veined. **Stamen** 2. Style short (ca. 0.4 mm). **Nut** ellipsoid, apiculate and black.

Flower & Fruit : May - September.
Exsiccatæ : Panglakha 3200 m, **SR Lepcha & AP. Das 27795**, Dated 30,09.2004
Status : Fairly common
Local Distribution ; Panglakha, upto 3200 m
General Distribution : Wide spread in temperate, subtropical and tropical regions of the Mediterranean coast, AFRICA, ASIA AND OCEANIA.

POACEAE Barnhart (*nom. alt.*)

Key to the Genera:

1. Arboreal grass or bamboo like; woody, diameter 1-25 cm; sheath with minute blades or bladeless 2
- + Herbaceous grass like; culm soft, if slightly woody then reed like, diameter to 1 cm; sheath with normal blades 8

2. Culm diameter large 7-25 cm	3
+ Culm diameter smaller 1-7 cm	4
3. Internode smooth, shining	<i>Bambusa</i>
+ Internodes densely covered with furry wax	<i>Dendrocalamus</i>
4. Internode more than 50 cm long	<i>Cephalostachyum</i>
+ Internode less than 50 cm long	5
5. Plants grow spreading	<i>Yushania</i>
+ Plants grow tufted	6
6. Culms more than 5 m tall	<i>Himalayacalamus</i>
+ Culms upto 4.5 m tall	7
7. Nodes swollen with distinct ring, stem dark green	<i>Drepanostachyum</i>
+ Nodes not swollen, no ring, stem light reddish to yellowish	<i>Thamnocalamus</i>
8. Inflorescence digitate panicle	9
+ Inflorescence condensed cylindrical or spreading panicle	11
9. Racemes always 2, opposite, base of plant compressed	<i>Axonopus</i>
+ Raceme more than 2, base of plant not compressed	10
10. Rachis not winged; Sessile spikelet awned	<i>Arthraxon</i>
+ Rachis winged, margins hispid; spikelets unawnwd	<i>Digitaria</i>
11. Inflorescence linear or condensed cylindrical panicle	12
+ Inflorescence lax spreading panicle	14
12. Spikelets unawned or if present only at lower lemma	24
+ Spikelets awned	13
13. Florets 2 or 3, glumes shorter to equaling than spikelets	<i>Trisetum</i>
+ Florets 4 to 6, glumes long, much exceeding spikelets	<i>Danthonia</i>
14. Spikelets very minute under 1mm	15
+ Spikelets larger than 1.5mm	16
15. Plant reed like, unbranched; leaves more than 3cm wide	<i>Thysanolaena</i>
+ Plant herbaceous, much branched; leaves less than 1cm wide	<i>Capillipedum</i>
16. Some spikelets subtended by stiff bristle, leaves <2cm wide ..	<i>Setaria</i>
+ Spikelets not subtended by stiff bristle, leaves >1cm wide	17
17. Glumes shorter than spikelet	18
+ Glumes exceeding spikelets	23
18. Spikelets (lemmas) long aristate or awned	19
+ Spikelets unaristate or unawned	20
19. Plants herbaceous, soft, inflorescence long hairy	<i>Muhlanbergia</i>
+ Plants crustaceous, harder, inflorescence not hairy	<i>Festuca</i>
20. Spikelets always with 2 florets	21
+ Spikelets with more than 3 florets	<i>Poa</i>
21. Branches of panicle terminating with a single spikelet	22
+ Branches (Raceme) bear many spikelets along the lower side	<i>Paspalum</i>
22. Spikelets borne paired, falling entire at maturity	<i>Panicum</i>
+ Spikelets borne singly, breaking up at maturity	<i>Isachne</i>
23. Spikelets with 2 florets	<i>Arundinella</i>
+ Spikelets with more than 3 florets	<i>Agrostris</i>

24. Plant non rhizomatous and tuft.; leaf linear lanceolate *Echinochloa*
 + Plant rhizomatous; leaf lanceolate *Coelachne*

Agrostis Linnaeus

Key to the species :

1. Herbs annual or short lived perennial; palea absent *A. pilosula*
 + Herbs perennial; palea ca one third of length of lemma or minute 2
2. Leaf abaxial surface scabrid; Lemma awned to 3.5 mm *A. triaistata*
 + Leaf abaxial surface smooth; Lemma awnless or rarely awnlet to 0.5 mm *A. nervosa*

Agrostis pilosula Trin. In Med. Acad. Sci. Petersls. Ser. 6, 6: 372. 1841; Hsu in Hara, Fl. E. Him. 349. 1966; Hara *et al*, Enum. Fl. Pl. Nepal 1: 120. 1978; Hajra & Verma, Fl. Sikkim 1: 278. 1996. *Calamagrostis pilosula* (Trin.) Hook.f., Fl. Brit. India 7: 263. 1897. Noltie, Fl. Bhutan 3(2): 605. 2000. *Calamagrostis Jacquemontii* Hook.f., Fl. Brit. India 7: 265. 1897.

Herbs annual or short-lived perennial. Culms usually decumbent at base and rooting from lower nodes, 25 – 90 cm tall, 3- or 4-noded. **Leaf sheaths** glabrous; leaf blades linear, upto 20 cm × 3 – 4.5 mm, both surfaces scabrid; ligule 3 – 5.5 mm, apex lacerate. **Panicle** lanceolate to ovate in outline, upto 30 cm, open or slightly contracted; branches 2 – 7 at each node, upto 6 cm, bearing branchlets mainly in distal half. **Spikelets** 3.5 – 5 mm, green or purple; **glumes** oblong-lanceolate, **lower glume** slightly longer than upper glume, **keel** conspicuously hispidulous, apex acuminate, upper glume scabrid upward on keel, apex acute; **lemma** ca. one third of spikelet length, villous except below apex, **awned**, apex truncate, erose; **awn** geniculate, 2.5 – 3.5 mm; **palea** usually ca. one third length of lemma. **Anthers** short 0.5 – 1.3 mm.

- Flower* : July – August *Fruit*: September – October
Exsiccatus : Panglakha 3000 m, *SR Lepcha & AP. Das 20561*, dated 12.10.2004
Status : Common
Local Distribution : Panglakha, Rachel, Dokyala, 3000 – 4200 m.
General Distribution : PAKISTAN, INDIA, NEPAL, BHUTAN, CHINA, SRI LANKA

Agrostis nervosa Nees ex. Trin. in Mim. Acad. Sci. Petersb. Ser. 6.6: 328. 1841; Hara *et al*, Enum. Fl. Pl. Nepal 1: 120. 1978; Hajra & Verma, Fl. Sikkim 1: 278. 1996. Noltie, Fl. Bhutan 3(2): 601.2000. *Agrostis Clarkei* Hook.f., Fl. Brit. India 7: 257. 1897.

Herbs perennial. Culms often slender, erect, upto 60cm tall. **Leaves; leaf sheaths** loose; leaf blades narrowly linear to setaceous, flat or involute, 2.5 – 13 cm × 0.6 – 3.5 mm, abaxial surface smooth, adaxial surface scabrid; ligule short 0.3 – 4 mm, back smooth or scaberulous, apex obtuse. **Panicle** pyramidal, open to laxly contracted, narrowly lanceolate to ovate; branches 2 – 5 per node, spreading, 1.5 – 5.5 (–9) cm. **Spikelets** 1.7 – 3.5 mm, dark purple or purplish green; glumes lanceolate, unequal; **lower glume** 1.5 – 3.5 mm, **keel** scabrid above middle, long acuminate, **upper glume** 1.5 – 3 mm, apex acute; callus glabrous; **lemma** two third to forth fifth of spikelet length, awnless or rarely of awnlet up to 0.5 mm below apex, apex obtuse or emarginate; **palea** minute.

- Flower* : August – September
Exsiccatus : Zeluk - Panglakha 2950 m, *SR Lepcha & AP. Das 20561*, dated 12.10.2004
Status : Common
Local Distribution : Panglakha, Rachel, 2000 – 4000 m.

General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, CHINA.

Agrostis triaistata (Hook.f.) Bor, Grass. Ind. 391. 1960.; Noltie, Fl. Bhutan 3(2): 604. 2000; Hajra & Verma, Fl. Sikkim 1: 279. 1996. *Calamagrostis tripilifera* Hook.f., Fl. Brit. India 7 : 262. 1897. *Deyeuxia triaristata* Hook.f., Fl. Brit. India 7: 266. 1897.

Herbs perennial, slender, tuft, perennial. **Culms** upto 45 cm tall. **Basal** leave short filiform; culm leaf lamina 5 – 13 x 10 – 4.5 mm, linear- lanceolate, very acute. Leaf sheaths smooth; ligule acute. **Inflorescence** purplish or green to 13 cm, laxly pyramidal, branches filiform, lowest in 2-5 in whorls. **Spikelets** to 4 mm. **Glumes** glabrous, equal or subequal; lower to 5.5 mm, lanceolate, acuminate, margins with hyaline or purplish, 3- veined, keel green, hispid. **Callus** hairy; rachilla rudimentary. **Lemma** awned to 3.5 mm, broadly lanceolate, with mucros, in between two lateral and median awn to 3.5 mm, apex truncate- lacerate, lateral veins setae. **Paleae** to 2.5 mm, linear lanceolate, acute. **Anthers** to 0.6 mm.

Flower : July- October

Exsiccatus : Rachela 2800 m, **SR Lepcha & AP. Das 02593**, dated 22.10.2005

Status : Less common

Local Distribution : Rachela 2800 - 4100m.

General Distribution : Tropical and temperate regions (Continental INDIA, Western TIBET, SRI LANKA).

Arthraxon P. Beauvouis

Arthraxon lancifolius (Trin.) Hochst., Flora 39: 188.1856; Hsu in Hara, Fl. E. Him. 350. 1966; Noltie, Fl. Bhutan 3(2): 815. 2000; Bhat & Nagendran, Sedg & Gras.244. 2001. *Anthropogon lancifolius* Trin., Mem. Acad. Imp. Sci. Peterab. Ser. 6,2: 271.1832. *Arthraxon microphyllus* sensu Fl. Brit. India 7. 147 (non Trin.) Hochst., 1856).

Herbs annual, tuft. **Culms** upto 45 cm tall, very slender. **Leaf** linear lanceolate to ovate, lamina 0.5 – 2.5 x 0.3 – 0.7 cm, pilose above, and beneath, minutely serrate, tubercle- base cilia at margins, sheaths short, glabrous; ligule very small to 0.4 mm. **Inflorescence** of 7 – 12 unequal, to 2.5 cm long spike. **Spike** sessile to 4.5 cm long, linear- lanceolate, laterally compressed. **Lower glumes** lanceolate or linear oblong, bicuspidate, rounded at the back, not keeled. **Upper glumes** equal to lower, lanceolate. **Lower lemma** shorter than a lower glume, lanceolate, acuminate. **Upper lemma** equal to lower, ovate lanceolate, subacute, awned from near base; awn to 12 mm long. **Stamens** 2; **anthers** to 0.5 mm long.

Flower & Fruit : August – October

Exsiccatus : Bara Ramitey Dara 2380 m, **SR Lepcha & AP. Das 31098**, dated 02.10.2004.

Status : Rare

Local Distribution : Bara Ramitey, Tungya, 1700 - 2500m.

General Distribution : TEMP. HIMALAYAS; INDIA, SRI LANKA to BURMA, THAI, CHINA, MALAYSIA and tropical AFRICA.

Note : Thrives well in waste and dump sites (lower areas).

Arundinella Raddi

Arundinella setosa Trin., Gram. Panic. 63. 1826.Hook.f., Fl. Brit. India 7: 70.1897. Hsu in Hara, Fl. E. Him. 352. 1966; Noltie, Fl. Bhutan 3(2): 750.2000.

Herbs, perennial. Rhizome short with scaly buds. **Culms** erect 45 – 190 cm tall, rarely branched, 3 – 8 noded, nodes glabrous. **Leaves**; leaf sheaths usually shorter than internodes, glabrous; leaf blades linear, **lamina** 8 – 35 cm × 2.5 – 10 mm, glabrous, rarely tuberculate-hispid; ligule ca. 0.3 mm. **Panicle** open or slightly contracted, to 42 cm; branches 5 – 25 cm, ascending or spreading, solitary or fasciculate, loosely spiculate; pedicels scabrid, apex with long hairs. **Spikelets** 4.5 – 7 mm, green tinged purple; **glumes** glabrous or rarely setose, lower glume 3 (–5)-veined; upper glume 5 - veined; lower floret staminate, shorter or equaling lower glume; upper floret, lemma apex awned, awn flanked by 2 slender erect bristles; **awn** geniculate with brown twisted column, callus hairs one forth to one third length of lemma.

var. *setosa*

Leaf sheaths usually loose; leaf blades finely glabrous. **Panicle** 13 – 42 cm, branches up to 25 cm; pedicels with slightly long stiff hairs at apex. **Spikelets** 3.5 – 6.5 mm; **glumes** usually glabrous; upper lemma with numerous lateral bristles; awn 5.5 – 13 mm, geniculate, column twisted; **callus** hairs one forth to one third length of lemma.

Flower : August - September **Fruit**: December
Exsiccatus : Dhorok 2300 m, *SR Lepcha & AP. Das 222*, dated 17.04.2004
Status : Common
Local Distribution : Dhorok Phusrey, 200–2300 m.
General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, THAILAND, INDONESIA, MALAYSIA, SRI LANKA, NEW GUINEA, PHILIPPINES, VIETNAM; AUSTRALIA.

Axonopus P. Beauvois

Axonopus compressus (Swartz) P. Beauv., Ess. Agrostogr. 12. 1812. Hsu in Hara, Fl. E. Him. 352. 1966; Noltie, Fl. Bhutan 3(2): 70.2000. *Milium compressum* Swartz, Prodr. 24. 1788; *Paspalum compressum* (Swartz) Raspail (1825), not Rafinesque (1817).

Herbs, perennial with vigorous creeping stolons. **Culms** 15 – 60 cm tall, nodes bearded. **Leaves**: leaf sheaths loose, strongly compressed, keeled, basal sheaths imbricate, Leaf blades broadly linear to lanceolate, flat or folded, 4.5 – 13.5 × 0.5 – 1.5 cm, glabrous or adaxial surface pilose, apex obtuse; ligule 0.2 – 0.8 mm. **Racemes** 2 – 5, digitate or subdigitate, 4 – 13 cm, only slightly diverging; rachis glabrous. **Spikelets** oblong - lanceolate, 2.2 – 2.5 mm long, pilose or glabrous, apex acute; upper glume and lower lemma 2 – 4-veined, midvein absent, laterals marginal; upper lemma pale, oblong-elliptic, shorter than spikelet, obtuse with an apical tuft of hairs; stigmas pale.

Flower : June – July
Exsiccatus : Dhorok 2200 m, *SR Lepcha & AP. Das 30296*, dated 06.10.2004
Status : Very Common.
Local Distribution : Dhorok, upto 2250m.
General Distribution : NATIVE TO AMERICA, widely introduced and naturalized worldwide
Note : Used in lawn and fodder grass.

Bambusa Schreber

Bambusa nutans Wall. ex Munroe in Trans.Linn.Soc.26(1):92,1868; Gamble, Ann. Roy. Bot. Gard.Cal.7: 32,t.30, 1896; et Hook.f., Fl. Brit. India 7: 387. 1896; Stapleton in Noltie, Fl. Bhutan 3 (2): 490. 2000.

Local Name: Maat-lo, Walho, (Lep.), Mal-bans (Lep.)

Bamboo, arboreal grass like, straight, upto 25 m tall. **Culms** to 9 cm in diam; erect to drooping; nodes scarcely raised; branching uniform, branch 2 cm in diam. Culm sheath with appressed, black hairs; auricles large; broad; oral setae numerous, wavy, copper coloured; blade cupped, readily deciduous, interior pubescent. Leaf sheath glabrous; auricle small, oral setae few, erect, deciduous; ligule short, truncate, lamina to 35 cm.

Flower & Fruit : not observed.

Exsiccatu : Lingtam below 1330 m, **SR Lepcha, T. Sharma & AP. Das 3435**, dated 13. 10. 2008

Status : Common

Local Distribution : Lingtam, Rigu, 1500 m.

General Distribution : INDIA, NEPAL, BHUTAN.

Note : The leaves are good fodder. The matured culms is mainly used in construction of houses bridges, fences, etc. The spinous woody nails derived from the matured culms, is used as an alternative nails for numerous purpose. The long straight culms are also been used while hosting the prayer flags in Sikkim and other adjoining places.

Capillipedum Stapf

Capillipedum assimile (Steud.) A. Camus in Lecomte, Fl. Gen. De l' Indo-Chine 7: 314. 1922; Hsu in Hara, Fl. E. Him. 354. 1966; Hajra & Verma, Fl. Sikkim 1: 247. 1996; Noltie, Fl. Bhutan 3(2): 114. 2000; *Andropogon assimile* Steud. in Zoll. Syst. Verz. 58. 1854; Hook.f., Fl. Brit. India 7: 179. 1897. *Dichanthium assimilis* (Steud.) Deshpande in fasc. Fl. India 15: 6. 1894

Herbs perennial, tufted upto 1.5 m tall. **Culms** glabrous woody at base. **Leaf** lamina to 13 x 0.8 cm, acuminate, tapered to base, with scattered hairs above, more densely hairy beneath; sheath glabrous, shining, with tuft of long cilia at apex; ligule to 0.8 mm. **Inflorescence** pyramidal to 12 cm, racemes of 2 paired a terminal triad of spikelets, **internodes** to 2 mm, margins, with long a white cilia. Spikelets flushed beneath pinkish, sessile or to 3 mm. **Callus** hairs to 1 mm; **lower glumes** 2 – 3 x 0.3 – 0.6 mm oblong – elliptic, acute, oblong- elliptic, acute, truncate or bidentulate, back partly convex, 5 veined, keeled long – hispid in upper half, back sometime minutely hispid on surface; **upper glumes** to 3 mm long, oblong- lanceolate, subacute, ciliate margins, **awn** to 15 mm, **anthers** to 1.4 mm; **lower glumes** 2.6 – 4 m.

Flower & Fruit : June - December

Exsiccatu : Bekchung 1790 m, **SR Lepcha & AP. Das 30291**, dated 07.10.2004.

Status : Less common

Local Distribution : Bekchung – Phusrey, 1600 – 2400 m.

General Distribution : E. HIMALAYA, INDIA, NEPAL – BHUTAN, THAILAND, CHINA, FORMOSA, MALAYSIA.

Cephalostachyum Munro

Cephalostachyum capitatum Munro, in Trans. Linn. Soc. 26: 139. 1868; Stapleton in Noltie, Fl. Bhutan 3(2): 496. 2000. *Schizostachyum munroe* S. Kumar & P. Singh in Ind. Bot. Soc. 1992. *Sczostachyum capitatum* (Munro) R.B. Mujumdar in Karthikeyan *et al.*, Fl. Enum. Monocot 281. 1989, non Rupr. 1840.

Local Name: Po-Young (Lep.), Gapay bans (Nep.).

Bamboo, scandent to 13 m tall. Stems slightly yellowish. Internodes upto 1m long. **Culm**-sheaths 16 - 35 x 5 - 10 cm, truncate at the top, pale brown and pubescent. **Ligule** toothed. Leaf-sheaths glabrous. Leaves ovate-lanceolate, tip setaceous, base obliquely rounded, glabrous.

- Flower & Fruit* : Not observed
Exsiccatu : South Rigu border, 1500 m, **SR Lepcha, T. sharma & AP. Das 3440**, dated 19.10.2008.
Status : Fairly Common.
Local Distribution : Subhaney - Singhaney above, 1500 - 2500 m.
General Distribution : E. HIMALAYA;(Sikkim-BHUTAN), Naga Hills.

Note : 1. Endemic to Eastern Himalaya.

2. The matured culms are used for making, flutes including several folk musical instruments, walking stick etc. It is also being used by the Lepchas for making Bows and arrows. The fine strings derived from the matured culm along with cane are used in making "Sumok Thyaktuk" a Lepcha hat. Leaves also used as a fodder. The tribal of the hills including the Lepchas often used its small culms for making local straw for drinking brewed- millet (Chee; Lep).

Coelachne R. Brown

Coelachne simpliciuscula (Wt. & Arn.) Munro ex Benth. in Journ. Linn. Soc. 19: 93. 1881; Hsu in Hara, Fl. E. Him. 356. 1966; Hajra & Verma, Fl. Sikkim 1: 284. 1996; Noltie, Fl. Bhutan 3(2): 89. 2000. *Panicum simpliciouscula* Wt. ex Arn. ex Steud., Syn. Pl. Glum. 1: 96.1854. *Coelachne pulchella sensu* Hook.f., Fl. Brit. India 7: 270. 1897

Herbs perennial, rhizomatous, forming mat. **Culms** erect - decumbent upto 25 cm tall. Leaf lamina lanceolate- 0.5 - 3 x 0.1 - 0.7 cm, subacute, glabrous, nodes hairy; sheaths glabrous; ligules short. **Inflorescence** purplish to 6.5 cm. **Spikelets** to 2.8 mm. Lower glumes 0.7 - 1.3 x 0.7 - 1.5 mm, ovate, convex, 3 veined, margin with hyaline; upper widely ovate, truncate, 5-veined. Lower florets; **lemma** 2.5 - 1 mm, lanceolate, subacute. **Upper florets**; stipe to 1 mm; lemma lanceolate, hairy on back; **palea** equal to lemma.

- Flower* : July - October
Exsiccatu : Phede, 3250 m, **SR Lepcha & AP. Das 31096**, dated 02.10.2004
Status : Less common
Local Distribution : Panglakha-Rachela, 2800 - 4100 m.
General Distribution : INDIA, NEPAL - BHUTAN, SOUTH EAST ASIA, CHINA and MADAGASKAR.

Danthonia DC.

Danthonia cumminsii Hook.f., Fl. Brit. India 7: 282. 1896; Hara *et al*, Enum. Fl. Pl. Nepal 1: 128. 1978; Hajra & Verma, Fl. Sikkim 1: 286. 1996. Noltie, Fl. Bhutan 3(2): 645. 2000. *D. Cachemyryiana sensu* Hook.f., Fl. Brit. India 7: 281. 1897. *D. Jacquemontii* Bor in Kew Bull. 1952: 80. 1952.

Herbs, perennial, basal sheaths leathery, yellowish. **Culms** 13 - 60 cm tall. **Leaf** blades filiform, stiff, up to 25cm, 1.5 - 2.5mm wide, glabrous or abaxial surface pubescent. **Inflorescence**

variable, 3 – 13 cm, a dense, narrow, many-spiculate panicle few-spiculate raceme; branches and pedicels puberulous, rarely forming a ring of hairs below spikelet. **Spikelets** with 4 (– 6) florets spaced on a filiform rachilla; **glumes** (9 –)13 – 18 mm, gray-green and purple-tinged, elliptic-lanceolate, rarely hairy, denticulate or mucronate; callus villous; **lemma** elliptic, 7 – 9-veined, thinly hairy on upper margins, hairs sometimes weakly tufted, infrequently short hairs also on lower back, lobes acuminate into slender awns; central awn with dark brown column, awns of lobes 3.5 – 6.5 mm. **Anthers** 2.2 –3. 5 mm. Caryopsis narrowly elliptic-oblong,; hilum linear.

Flower & Fruit : May – October

Exsiccatus : Panglakha 3000 m, **SR Lepcha & AP. Das** 263, dated 29.09.2005

Status : Common

Local Distribution : Panglakha, 3000 – 4500 m.

General Distribution : PAKISTAN, INDIA, NEPAL, BHUTAN, CHINA.

Note : This is an important component of alpine pasture, providing excellent fodder for yaks.

Dendrocalamus Nees

Key to the species

- 1. Culm-sheaths glabrous or rarely with stiff hairs 2
- + Culm-sheaths velvety or with dark brown erect hairs 3
- 2 Internodes more than 40cm long; leaf tessellate *D. hamiltonii*
- + Internodes less than 35 cm long; leaf not tessellate *D. patellaris*
- 3. Internodes cavities medium; Culm-sheath dark brown with “V” shape lines ... *D. hookeri*
- + Internodes cavities large; Culm-sheath dark brown but no “V” shape lines *D. sikkimensis*

Dendrocalamus hamiltonii Nees et Arn. ex Munro, Trans. Lin. Soc. 26: 151. 1868; Hsu in Hara, Fl. E. Him. 379. 1966; Hajra & Verma, Fl. Sikkim 238.1996; Stapleton in Noltie, Fl. Bhutan 3(2): 492. 2000.

Local Name: Ruveet (Lep.); Choya Baans, Taama (Nep.).

Bamboo, arboreal grass like, straggling rarely straight to 20 m tall. **Culm** capitose, thick to 8 inches in diam, branched above, dull green. Nodes bearing old root-scars; internodes more than 40 cm long. **Culm-sheaths** long and stiff, to 42 cm long, glabrous or rarely with stiff hairs. **Leaf-sheaths** appressed hairy. **Ligule** truncate. **Leaves** tessellate, to 30 x 4 cm, broadly lanceolate, base rounded into a short petiole, serrate, smooth above.

Flower : Not seen

Exsiccatus : Phusrey below 1530 m, **SR Lepcha, T. Sharma & AP. Das** 3438, dated 15.10.2008.

Status : Not common

Local Distribution : Phusrey below, Rigu, 500 -1800 m.

General Distribution : SUBTROPICAL E. HIMALAYA, Assam, MYANMAR and THAILAND.

Note: Fine string derived through the culms is excellent for knitting, mats, roofs, containers etc; the matured culms are generally used for making water vessels, and for house building, fences etc. Pickles prepared from its young shoots are quite popular in the hills; juvenile shoots are commonly eaten as vegetables.

Dendrocalamus hookeri Munro in Trans. Linn. Soc. 26 (1): 151. 1868 Gamble in Ann. Roy. Bot. Gard. Cal. 7: 83, t. 73, 1896; *et* Hook.f., Fl. Brit. India 7: 405. 1896; Hajra & Verma, Fl. Sikkim 238. 1996; Stapleton in Noltie, Fl. Bhutan 3(2): 492. 2000.

Local Name: Patu (Lep).

Bamboo, arboreal grass like, straight, upto 20 m tall. **Culms** to 9 cm in diam nodding to drooping, brown, waxy furry. Internodes cavity medium, **Nodes** with dense short aerial roots, branches usually absent near base. **Culm-sheaths** deciduous, broad, with "V" shapes lines of dense, dark brown erect hairs; auricle to 2.4 cm, rounded; oral setae few curved; **ligule** broad, serrate. **Leaf-sheaths** glabrous; ligule truncate; auricle absent; oral setae few, erect; lamina to 45 cm.

Flower & Fruit : Not seen
Exsiccatus : Lingtam above, 1330 m, **SR Lepcha & AP. Das** 2602, dated 09.08.2005
Status : Fairly Common.
Local Distribution : Rachel, upto 1600 m.
General Distribution : INDIA, NEPAL - BHUTAN, MYANMAR.

Dendrocalamus patellaris Gamble in Ann.Roy.Bot.Gard.Cal.7:86.t.75.1896; *et* in Hook.f., Fl. Brit. India 7: 406,1896; Hajra & Verma, Fl. Sikkim 238. 1996; Stapleton in Noltie, Fl. Bhutan 3 (2): 511. 2000.

Local Name: Niba (Nep.)

Bamboo, arboreal grass like, medium size upto 6 m ; **young shoots** thick, glutinous exudates, drying to a thin, white bracts internodes to 35 cm, smooth red above and below nodes, nodes white slightly raised. **Culm- sheaths** glabrous, apex broad, asymmetric, distally obtuse; **auricles** and oral setae absent; liguel broad, short. **Leaves** sheath glabrous; **auricle** and oral setae absent; ligule rounded, short, **lamina** glabrous.

Flower & Fruit : April – May
Exsiccatus : Subaney dara, 1700 m, **SR Lepcha & AP. Das** 02603, dated 09.08.2005
Status : Fairly Common.
Local Distribution : Singhaney, Panglakha-Rachel, 2000 – 3100 m.
General Distribution : INDIA, BHUTAN, NEPAL.

Dendrocalamus sikkimensis Gamble in Hook., Ic. Pl. t. 1770. 1888 *et* in Ann. Roy. Bot. Gard. Calc.7: 82.t.72.1896 *et* in Hook.f., in Fl. Brit. India 7: 405. 1896; Hsu in Hara, Fl. E. Him. 380. 1966; Hajra & Verma, Fl. Sikkim 239. 1996; Stapleton in Noltie, Fl. Bhutan 3(2): 492. 2000.

Local Name: Podyang (Lep.)

Bamboo, arboreal grass like, straight, upto 25 m tall. **Culms** to 15cm in diam erect to nodding, densely brown, furry waxy; glossy orange; **Internodes** cavities large; nodes with aerial roots; branches absent near base; central branch to 5.5 cm in daim. **Culms** sheaths deciduous, with velvety, dark brown erect hairs,; auricle to 5.5 cm, wavy; oral setae long; ligule curved , broad, rolled fimbriate. **Leaf-sheaths** glabrous; ligule short, truncate; auricle absent; **oral setae** numerous erect; lamina to 45 cm.

Flower & Fruit : not observed.
Exsiccatus : South Rigu border, 1400 m, **SR Lepcha & AP. Das** 2604, dated

09.08.2005

Status : Fairly Common.
Local Distribution : Rachela, 1400 m.
General Distribution : E. HIMALAYA, INDIA, (NEPAL – BHUTAN)

Note : 1. Endemic to Eastern Himalaya.
2. The matured culms is used in construction of house, bridges, fences, water vessels etc. and in other useful household materials. The young and matured culm is also being used in making bamboo vessel (Dungro) through which brewed millet (Chee; Lep.) are served.

Drepanostachyum P.C. Keng

Drepanostachyum intermedium (Munro) P.C. Keng, L. Bomb. Res. 2: 28. 1983; Hajra & Verma, Fl. Sikkim 1: 239. 1996; Stapleton in Noltie, Fl. Bhutan 3(2): 506. 2000. *Arundinaria intermedia* Munro, Trans. Lin. Soc. 26: 28. 1868; Hook.f., Fl. Brit. India 7: 381. 1897; Hara, Fl. E. Him. 379. 1966. *Chimonobambusa intermedia* Nakoi, JAA 6: 151. 1925.

Local Name: Titay Nigalo (Nep.).

Bamboo, small caespitose with tufted annual stems. **Culms** 3.5 – 4.3 m tall, nodes swollen with distinct ring; internodes upto 26cm long. Sheaths 18 - 25cm, ciliate, papery. **Leaves** tessellate; ligule 0.8cm long, triangular; petiole swollen; lamina 7 - 15cm long, shapes variable, bright green, attenuate at base into a short petiole. **Leaf-sheaths** glabrous, rarely stiffly hairy; callus minute.

Flower & Fruit : Not seen
Exsiccatae : Hattidara, 2549m, *SR Lepcha, T. Sharma & AP. Das 3442*, dated 15. 10.2008.
Status : Fairly Common.
Local Distribution : Hatidara-Rachela, 1500 – 2500 m.
General Distribution : E. HIMALAYAS, (NEPAL – BHUTAN).

Note : 1. Endemic to Eastern Himalaya.
2. The finely striped strings splitted through culms is used for making mats, baskets and also as ropes in house-tieing, head loads-carrying, etc.

Digitaria Haller

Key to the Species

1. Culm not branched or rarely branched; spikelets linear lanceolate *D. ciliaris*
+ Culm branched; spikelet lanceolate – oblong *D. sanguinalis*

Digitaria ciliaris (Retz.) Koel., Descr. Gram. 27. 1802; Blumea 21: 32. 1973; Hajra & Verma, Fl. Sikkim 1:251. 1996; Noltie, Fl. Bhutan 3(2): 728. 2000. *Digitaria sanguinalis* Scop f. *ciliaris* (Retz.) Haines, Bot. Bihar & Orissa 5: 1008. 1994. *D. ciliaris* ssp. *marginata* var. *fimbriata* (Link) Jain & Das, 99: 572. 1973.

Herbs, annual upto 60 cm tall. **Culms** rarely branched from lower nodes. **Leaves** upto 10 cm long, 0.32 - 0.9 cm wide, linear-lanceolate, margins cartilaginous, apex narrowed into sharp point, base slightly contracted, glabrous or hairy. **Sheaths** glabrous or hairy at base. **Ligules**

membranous. **Recemes** 4 - 9, sub-digitate. Rachis straight with winged lateral angles. Pedicels binate, unequal. **Spikelets** 0.4 - 0.4 cm long, lanceolate to lanceolate-oblong, appressed very slightly imbricate, pale green. Lower glume ovate, obtuse to subacute, turned towards rachis; upper glume 3-nerved, ovate-lanceolate, acute. Lower floret sterile; lemma 7-nerved, palea and lodicules minute. **Lemma** oblong-lanceolate, cartilaginous; **palea** minute.

var. *ciliaris* : *Panicum ciliare* Retz., *Observ. Bot.* 4: 16. 1786;

Lower lemma pubescent to villous, but lacking glassy bristles.

Flower : June - November
Exsiccatus : Panglakha 2250 m, *SR Lepcha & AP. Das 20276*, dated 28.10.2004
Status : Very Common.
Local Distribution : Panglakha, upto 2250 m.
General Distribution : PANTROPIC. (Throughout the tropics and subtropics, but rare in AFRICA)

Digitaria sanguinalis (L.) Scop., *Fl. Carn.* ed. 2, 1: 52. 1772; Noltie, *Fl. Bhutan* 3(2): 728. 2000. *Paspalum sanguinale* L., *Sp. Pl.* 1: 57. 1753. *Digitaria sanguinalis* ssp. *vulgaris* var. *rotleriana* Henr., *Monogr. Digitaria* 986. 1950. *D. sanguinalis* ssp. *aegyptiaca* var. *frumentacea* Henr., *Monogr. Digitaria* 986. 1950;

Herbs annual. **Culms** decumbent, branched; nodes slightly swollen. **Ligules** truncate and membranous. **Leaf sheaths** loose, often hirsute; **leaf lamina** 2.5 - 13 x 0.33 - 0.7 cm, linear-lanceolate, margin white, acute. **Panicle** with many spiked, erect; rachis very short, flexuous. **Spikelets** upto 0.5 cm long linear-lanceolate; **lower glume** sometimes absent; **upper glume** upto 0.13 cm long, oblong, 3-nerved. **Lower floret**: lemma upto 0.4 cm, linear-lanceolate, acute, nerves upto 78 slightly hairy, palea absent **Upper floret**: lemma upto 0.30 cm, elliptic-lanceolate, acuminate; palea equal or slightly shorter than lemma.

Flower : August - November
Exsiccatus : Subaney, 1850 m, *SR Lepcha & AP. Das 3503*, dated 15.06. 2007
Status : Fairly Common.
Local Distribution : Hangey, 1200 - 1900 m.
General Distribution : E. HIMALAYA; E. Himalaya, Meghalaya, Assam, S.China
Note : Endemic to Eastern Himalaya.

Echinochloa P. Beauvois

Echinochloa frumentacea Link, *Hort. Berol.* 1: 204. 1827. *Panicum frumentaceum* Roxb., *Fl. Ind.* 1: 307. 1820; Noltie, *Fl. Bhutan* 3(2): 703.2000.

Herbs, annual. **Culms** robust, erect, 1.5 - 2 m tall. **Leaf sheaths** glabrous; **leaf blades** linear, 13 - 36 x 1.5 - 2.5 cm, glabrous, margins thickened. **Inflorescence** erect, lanceolate, 8 - 18 cm, axis robust, scabrous along edges and with tubercle - based hairs; racemes 1.2 - 2.6 cm, curved, simple, closely spaced and overlapping. **Spikelets** greenish, tardily deciduous, plump, ovate-elliptic to rotund, 1.8 - 3 mm, pubescent, awnless; **lower glume** one third to two third as long as spikelet; **upper glume** slightly shorter than spikelet; **lower lemma** herbaceous, sterile; **Caryopsis** long persistent.

Flower & Fruit : August - September
Exsiccatus : Dhorok 2195 m, *SR Lepcha & AP. Das 30290*, dated 07.10.2004

Status : Common.
Local Distribution : Dhorok, upto 2400 m,
General Distribution : AFRICA AND TROPICAL ASIA

Festuca Linnaeus

Festuca cumminsii Stapf in Hook.f., Fl. Brit. India 7: 349. 1897; Hajra & Verma, Fl. Sikkim 1: 292: 1996; Noltie, Fl. Bhutan 3(2): 541. 2000.

Herbs, perennials tuft. **Culms** slender. Sheath open to below the middle, **Panicles** 2-4, narrow nodding or flexuous, 6-11cm long. **Spikelets** elliptic or open, obovate, pale green or purple, **glumes** unequal, **lemma** awned, **rachilla** scabrid, flower glumes oblong- lanceolate, **Palea** 2 fid, anther elliptic, scabrid.

Flower : July – August *Fruit*: September – October
Exsiccatus : Panglakha below 2800 m, **SR Lepcha & AP. Das** 32949, dated 26.07.2005

Status : Most Common
Local Distribution : Changu, Sherathang, Chamnego, upto 4400m.
General Distribution : E. HIMALAYA, INDIA (NEPAL – BHUTAN).
Note : Endemic to E. Himalaya

Himalayacalamus P.C. Keng

Key to the species

1. Culms yellowish green; ligule hairy *H. falconeri*
+ Culms bluish green purple or rarely yellow; ligule glabrous *H. hookerianus*

Himalayacalamus falconeri (Hook.f. ex Munro) Keng f., Journ. Bomb. Res. 2: 24. 1983; Hajra & Verma, Fl. Skim 1:240. 1966; Stapleton in Noltie, Fl. Bhutan 3(2): 510. 2000. *Thamnocalamus falconeri* Hook.f. ex Munro, Trans. Linn. Soc. 26: 34. 1868; Hara *et al*, Enum. Fl. Pl. Nepal 1: 147. 1978. *Drepanostachyum falconeri* (Hook.f. ex Munro) J. Camp. ex McClintok, Bomb. Soc. News 15: 12. 1992.

Bamboo small-sized laxly, caespitose. **Culms** usually upto 8m tall, fistular, rarely striped, yellowish-green; internodes to 17 cm long. **Branchlets** slightly fascicled at nodes. **Culm**-sheaths upto 32 cm long, usually straw-coloured and striate; ligule hairy. **Leaves** lamina 5.5 – 9.5 x 0.7 – 1.8 cm, acuminate, base attenuate. **Sheaths** slightly truncate above and glabrous.

Flower & Fruit : Fruit not seen
Exsiccatus : Dhorok 2300m, **SR Lepcha & AP. Das** 2597, dated 21.10.2004
Status : Common
Local Distribution : Dhorok-Phusrey, 2000 – 2500 m.
General Distribution : TEMP. HIMALAYAS; (Kumaon to BHUTAN).

Note : 1. Endemic to Eastern Himalaya.
2. Young shoots eaten as vegetable and also a good fodder for Red Panda.

Himalayacalamus hookerianus (Munro) Stapleton in Fl. Bhutan 3(2): 510. 2000. *Arundinaria hookeriana* Munro, Trans. Lin. Soc, 26: 29. 1868; Ann. Bot. Gard. Cal. 7: 17, t. 15. 1896; Hook.f., in Fl. Brit. India 7: 382. 1896; Stapleton in Noltie, Fl. Bhutan 3(2): 510. 2000. *Sinarundinaria hookeriana* (Munro) Chao & Renvoise, Kew Bull. 44: 358. 1989. *Chimonobambusa hookeriana* (Munro) Nakai, Journ. Arn. Arb. 6: 151. 1925; Fl. E. Himal. 379. 1966; Fl. Sikkim 1: 237. 1996. *Drepanostachium hookerianum* (Munro) Keng f., Journ. Bamb. Res. 2(1): 17. 1983.

Local Name: Prong, parang (Lep.) Pareng (Nep)

Bamboo, culms upto 8 m long, internodes to 45 cm, smooth, uniformly bluish green – purple or yellow. **Culm** sheaths glabrous, very long, long acuminate apically, auricle and oral setae absent; ligule rounded, lamina glabrous.

Flower & Fruit : Not seen

Exsiccatae : Phusrey below, 1800 m, *SR Lepcha & AP. Das* 2598, dated 05.10. 2004; Subaney dara below, 1600 m, *SR Lepcha, T. sharma & AP. Das* 3441; dated 17.10. 2008.

Status : Common

Local Distribution : Dhorok-Phusrey, 1600 – 2300 m.

General Distribution : TEMP. HIMALAYAS; (NEPAL – BHUTAN).

Note : 1. Endemic to Eastern Himalaya

2. The species is widely used in the hills of Sikkim and Darjeeling for making various types of basket, e.g. Doko, Tokri. The matured culms are often useful for making roof of the houses. The young shoots are one of the good source of wild vegetables and are being sold in the market.

Isachne R. Brown

Isachne albens Trin., Sp. Gram. Ic. t. 25. 1828; Hook.f. in Fl. Brit. India 7: 22. 1897; Hsu in Hara, Fl. E. Him. 366. 1966; Reinwardtia 2(2): 280. 1953; Hara *et al*, Fl. E. Him. 366. 1966; Hajra & Verma, Fl. Sikkim. 1: 296. 1996; Noltie, Fl. Bhutan 3(2): 743. 2000.

Herbs or grass perennial upto 45 cm tall. **Culms** erect or spreading. **Leaves** lamina 2.5 – 12 x 0.40 - 0.9 cm, linear to linear-lanceolate, margin ciliate, scabrid. Sheaths smooth, striate. **Ligule** with a rim of stiff hairs. **Panicles** decompound, 4.15 – 26 cm long, branches capillary. Pedicels erect, or spreading. **Spikelets** slightly globose. **Lower glumes** 0.2cm, orbicular, nerves many, glabrous. **Upper glume** equalling the lower one. **Lemmas** with infolded margins. Lower **floret** male, upper usually hermaphrodite; **palea** equal or slightly shorter than lemmas. **Anthers** 2, short.

Flower : August – November *Fruit:* October – December

Exsiccatu : Panglakhā –Rachela, 2700m, *SR Lepcha & AP. Das* 27704, dated 30. 09.2004

Status : Common.

Local Distribution.: Rachela middle, upto 2700 m.

General Distribution : AFRICA; E. HIMALAYA; INDIA, NEPAL, BHUTAN, THAILAND, CHINA, FORMOSA TO MALAYSIA; TEMPERATE REGIONS OF SOUTH- EAST ASIA.

Muhlenbergia Shreber

Muhlenbergia huegelii Trin. in Mem. Acad. Sci. Petersb. Ser. 6, 6(2): 41 et 293. 1841; Ohwi in Bot. Mag. Tokyo 55: 397. 1941; Bor, Grass. Ind. 401.1960; Hsu in Hara, Fl. E. Him. 368. 1966; Noltie, Fl. Bhutan 3(2): 673. 2000. *Muhlenbergia viridissima* Nees ex Steud., Syn. Pl. Glum. 1: 178. 1854; Hook.f. in Fl. Brit. India 7: 259. 1897.

Herbs rhizomatous. Culms weak usually scrambling, to 1.6 m long. Leaf lamina 5. – 13 x 04 – 07 cm oblong, acute scabrid above and below; sheaths glabrous scabrids near margins, ligules to 0.8 mm. Inflorescence purplish 8 – 27 x 1 – 4 cm. Spikelets to 3.5, excluding awn. Glumes less than lemma, lanceolate, subacute to finely acuminate, midrib indistinct, rarely hispid. Lemma lanceolate, acute, hispid on back and veins, with tuft of white hairs either side of midrib. Awn to 14 mm, apex filiform, flexuous. Palea lanceolate.

Flower & fruit : August – January
Exsiccatus : Beusa 1780m, *SR Lepcha & AP. Das* 20276, dated 28.10. 2004.
Status : Rare
Local Distribution : Hangey, Beusa, Phusrey, 1700 – 2590 m.
General Distribution : Temperate Himalaya, (NEPAL – BHUTAN), AMUR, CHINA, KOREA, JAPAN, FORMOSA, and PHILIPPINES.

Panicum Linnaeus

Panicum notatum Retz., Observ. Bot. 4: 18. 1786; Hsu in Hara, Fl. E. Him. 370. 1966; Noltie, Fl. Bhutan 3(2): 691. 2000.

Herbs, perennial. Culms usually rooting at lower nodes upto 2 m long branched, glabrous. Leaves cauline; leaf sheaths striate, puberulous to subglabrous, ciliolate on margins; leaf blades lanceolate, 3.5 – 18 x 1.5 – 3.5 cm, subglabrous to pubescent, margins scabrid, base cordate, apex finely pointed to acuminate; ligule minute ca. 0.4 mm, a ciliolate membrane. Panicle broadly ovate in outline, 9 – 38 cm, much branched; branches slender, glabrous, scabrid, bearing spikelets at distally. Spikelets elliptic, 1.5 – 2.3 mm, puberulous; lower glume ovate or oblong, third forth as long to equaling the spikelet, 3 – 5-veined, usually separated by an internode; spikelet, 3 – 5-veined; lower lemma similar to upper glume, palea absent; upper floret as long as spikelet, pale yellow or green.

Flower & Fruit : May – November
Exsiccatus : Panglakha 2795 m, *SR Lepcha & AP. Das* 27790, dated 08.10.2004
Status : very Common.
Local Distribution : Panglakha, Rachel, 2195 m,
General Distribution : INDIA, NEPAL, BHUTAN, MYANMAR, CHINA, VIETNAM, THAILAND, MALAYSIA, BORNEO, INDONESIA, LAOS, PHILIPPINES,

Paspalum Linnaeus

Paspalum scrobiculatum L., Mant. 1: 29. 1767; Hook.f. in Fl. Brit. India 7: 10. 1897; Hsu in Hara, Fl. E. Him. 372. 1966; Hara et al., Enum. Fl. Pl. Nepal 1: 139. 1978; Hajra & Verma, Fl. Sikkim 1: 265. 1996; Noltie, Fl. Bhutan 3(2): 712. 2000. *P. orbiculare* G. Forster, Fl. Insul. Austree Prodr. 7. 1786. *P. cartilagineum* Pressep. Rel. Haenk. 1: 216. 1830.

Herbs or grass tufted upto 60 cm tall. **Culms** spongy at base. **Leaves** upto 26 cm long, 0.3 - 0.7 cm wide, sublanceolate-linear, pointed into a fine point, base obscurely contracted, smooth and glabrous both sides. Leaf sheaths loose, scarios, persistent. **Inflorescence** of false spikes, erect or drooping. **Rachis** 0.2 - 0.4 cm wide, smooth and glabrous. Pedicels stout. **Spikelets** in 2 rows, overlapping. **Lower glume** 0, upper glume 5-nerved, glabrous. Lower floret sterile, 3-nerved membranous. **Upper floret** often hermaphrodite; lemma punctate, yellow, or brownish, **palea** just like lemma; **stamens** 3.

Var. scrobiculatum

Herbs annual or perennial. **Culms** erect or decumbent at base, up to 155cm tall. **Leaf** blades 9 - 18 × 0.5 - 1.4 cm, glabrous. **Spikelets** single, suborbicular, 2.5 - 3 mm; **upper glumes** 7 - 13 - veined, lower lemma 7 - 9-veined, veins often back; upper lemma dark brown at maturity.

- Flower & Fruit* : May - November
Exsiccatu : Padamchen 2495 m, **SR Lepcha & AP. Das** 20249, dated 28.10.2004
Status : Very Common.
Local Distribution : Padamchen, Zeluk, Changu, upto 3500 m.
General Distribution : INDIA, CHINA, TROPICS OF THE WORLD.
Note : The domesticated annual form is an important cereal [*Mong* (Lep), *Kudo* (Nep.), Millet].

Poa Linnaeus

1. Panicle stiff, often sub-secund; spikelets green or purple; lower palea nearly equal to glume *P. annua*
 + Panicle flexus; spikelets pale green ; lower palea shorter than glume *P. gammieana*

Poa annua L., Sp. Pl. ed. 1, 68. 1753; Hook.f. in Fl. Brit. India 7: 345. 1897; Act. Phytotax. Geobot. 10: 120. 1941; Reinwardtia 2(2): 322. 1953; Hsu in Hara, Fl. E. Him. 372. 1966; Hajra & Verma, Fl. Sikkim 1: 300. 1996; Noltie, Fl. Bhutan 3(2): 556. 2000.

Herbs, annual or sub perennial tufted. **Culms** upto 32 cm tall and usually rooting basally. **Ligules** 0.2 cm, oblong to ovate. **Leaves**; sheaths oftenly loose and slightly compressed; **lamina** 2.4 - 3.3 cm x 0.25 -0.33 cm, linear, margin scaberulous, acute, flaccid. **Panicles** upto 6.9cm long, branched, stiff and often sub-secund. **Spikelets** 3 - 8 flowered, ovate, lower ones usually lanceolate, green or purple; **lower glume** lanceolate, acute; **upper glume** longer, ovate and 3-nerved; **lemmas** oblong, sub-acute or obtuse; **palea** nearly equal to lower glume; keels ciliate; **anthers** short upto 0.2 cm.

- Flower & Fruit* : March - November
Exsiccatu : Singhaney 2800 m, **SR Lepcha & AP. Das** 32978, dated 28.07.2008
Status : Common.
Local Distribution : Singhaney, Neora-Sikkim Border, 1500 - 2600 m.
General Distribution : COSMOPOLITAN IN SUBTROPICAL AND TEMPERATE REGIONS OF THE WORLD.

Poa gammieana Hook.f., Fl. Brit. India 7: 345.1896; Hajra & Verma, Fl. Skim 1: 300. 1996; Noltie, Fl. Bhutan 3(2): 553. 2000.

Herbs annual upto 50 cm tall. **Culms** leafy, terete. **Leaves lamina** 6 - 14 x 0.5 - 1.5 cm, scattered upto panicle, linear, long acuminate, glabrous, sheaths lax, mostly smooth or asperulous; ligule acute, pubescent beneath. Panicle upto 15 cm long, flexuous. **Spikelets** 0.9 cm long, pale green; **upper glume** lanceolate, 3 nerved with entire margin; **lower glume** narrow oblong, trinerved, flowering glumes 0.6 cm long, acute, keel silky-hairy; **palea** shorter than glumes, keels ciliate; anthers oblong. **Lodicules** nearly bilobed.

Flower : June - July
Exsiccatus : Rachel - Panglakha, 2450 m, **SR Lepcha & AP. Das** 3403, dated 13.07.2008.
Status : Very Common.
Local Distribution : Beusa, Premlakha above, upto 2500 m.
General Distribution : EASTERN HIMALAYA (Sikkim, Darjeeling, Bhutan).
Note : Endemic to Eastern Himalaya.

Setaria P. Beauvois

Key to the species

1. Herbs annual; leaf tip acute; leaf sheaths keeled, smooth *S. intermedia*
+ Herbs perennial; leaf tip acuminate; leaf sheaths ciliated or hispid *S. palmifolia*

Setaria intermedia Roem. et Schult., Syst. Veg. 2: 489. 1817; Hook.f., Fl. Brit. India 7: 79. 1897; Hajra & Verma, Fl. Sikkim 1: 273. 1996; Noltie, Fl. Bhutan 3(2): 722. 2000. *S. pumila* (Poir) Roem. et Schult., Syst. Veg. 2: 891. 1817. *Panicum pumilum* Poir. in Lamk., Ency. Meth. Bot. Suppl. 4: 273. 1816. *Setaria pallidifusca* (Schum.) Stapf & Hubb. in Kew Bull. 1930: 259. 1930.

Herbs, annual, tufts slender to 20 cm long. **Leaves** 3-10 x 0.25 - 0.7 cm, linear, finely tapered into acute tip, flat or infolded, glabrous except basal region. Leaf sheaths keeled, smooth. Ligule truncate. **Inflorescence** an erect false spike, to 5 cm, rufous. **Rachis** slender, minutely pubescent. **Spikelets** upto 0.25 cm long, subtended by single or more glabrous bristles. Pedicels reduced to small stumps. **Lower glume** subacute or obtuse, 3-nerved, membranous, upper one 5-nerved. Lower floret male or barren, anthers if present 0.25 cm long; upper lemma not keeled, finely rugose, dorsally curved, 5-nerved and membranous; **palea** elliptic-oblong to oblong. **Upper** florets hermaphrodite, boat-shaped; **lemma** transversely rugose; palea granular-punctate.

Flower : June - September
Exsiccatus : Panglakha to Premlakha 2850 m, **SR Lepcha & AP. Das** 20288, dated 28.10.2004.
Status : Common.
Local Distribution : Lake below Tinsimana, Rachel Chowk, Upto 2500 m.
General Distribution : TROPICS OF THE OLD WORLD.
Note : Used as a fodder for cattle.

Setaria palmifolia (Koen.) Stapf in Journ. Lin. Soc. Bot. 42: 186. 1914; Hsu in Hara, Fl. E. Him. 376. 1966; Hajra & Verma, Fl. Sikkim 1: 273. 1996; Noltie, Fl. Bhutan 3(2): 723. 2000. *Panicum palmaefolium* Koen. in Naturf. 23: 208. 1788. *P. spicatum* Willd.(non-Lamk.):Hook.f. in Fl. Brit. India 7: 55. 1897.

Herbs or grass, perennial upto 2 m tall. **Culm** 30 cm. **Leaves** broad, 12 - 42 x 1.5 - 4.5 cm, linear-lanceolate, acuminate, base narrow, glabrous or sparsely hairy, blades folded between

primary nerves, leaf sheaths ciliated, or hispid, ligulate. **Panicles** 27 - 55 cm, spreading, open, loosely-spiculate. **Rachis** branched, scabrid. **Spikelets** 0.4 cm long, solitary, sessile, deciduous, glabrous. **Lower glume** half to spikelet in length, broadly ovate, obtuse 5-nerved and membranous; **upper glume** ovate, obtuse, 7-nerved and membranous. Lower oftenly floret barren, lemma ovate, shortly apiculate; **palea** hyaline, ovate. Upper floret hermaphrodite; **lemma** ovate-oblong, pale yellow with involute margins; **palea** ovate, striate.

Flower : September - October
Exsiccatus : Singaney 2600 m, **SR Lepcha & AP. Das** 20288, dated 20.10.2004
Status : Common.
Local Distribution : Chitray, Rachel Chowk, Upto 2600 m.
General Distribution : TROPICS OF THE OLD WORLD.

Thamnocalamus Munro

Thamnocalamus aristatus E.G. Camus, *Bambus.* 54. t. 36 E. 1913; Hsu in Hara, *Fl. E. Him.* 380. 1966; Hara *et al*, *Enum. Fl. Pl. Nepal* 1: 147. 1978; Hajra & Verma, *Fl. Sikkim* 1: 242. 1996. *Arundinaria aristata* Gamble, *Bamb. Brit. India* 18, t. 17: 1896; Hook.f., *Fl. Brit. India* 7: 382. 1897.

Local Name: *Pumom* (Lep.) *Rato Nigalo* (Nep.).

Bamboo gregarious. Stems usually tufted. **Culms** robust, to 4 m tall, branched, glaucous green; branches slightly red with long and thin sheaths. **Internodes** to 33 cm long. **Culm-sheaths** 13 - 23 x 5 - 7.5 cm, broad at the base; ligule pubescent. **Leaves** clustered at the branchlets tops; petioles upto 0.35 cm long, glandular; lamina oblong - lanceolate, base attenuate, lateral nerves 3 - 5 pairs. **Leaf-sheaths** 5 - 9 cm long; ligule acute.

Flower & Fruit : Not seen
Exsiccatae : Premlakha - Panglakha, 2580 m, **SR Lepcha & AP. Das** 2599, dated 09.10.2004; on way to NVNP border, 2650 m, **SR Lepcha, T. Sharma & AP. Das** 03445, dated 15.10. 2008.
Status : Rare
Local Distribution : Rachel, 1200 - 2550 m.
General Distribution : E. HIMALAYA (NEPAL-NEFA).
Note : Endemic to Eastern Himalaya.

Thysanolaena Nees

Thysanolaena latifolia (Roxb. ex Horn.) Honda, *Journ. Fac. Sc. Tokyo Sect. III. Bot.* 3: 312. 1930; Hajra & Verma, *Fl. Sikkim* 1: 305. 1996; Noltie, *Fl. Bhutan* 3(2): 648. 2000. *Thysanolaena maxima* (Roxb.) O. Kuntze, *Rev. Gen. Pl.* 794. 1891; *Act. Phytotax. Geobot.* 10: 272. 1940; Hara, *Fl. E. Him.* 378. 1966.

Local Name: *Pusyor* (Lep), *Amliso*, *Kuccho* (Nep.).

Shrubby, perennial; **culms** 1.5 - 3 m tall, solid, rounded and glabrous. **Ligules** truncate and cartilagenous. Sheaths tight, hard. **Leaves** numerous, sub-amplexicul, lamina 23 - 50 x 4.5 - 13 cm, broadly lanceolate, margin scabrid, acuminate, glaucous below. **Panicle** upto 55 cm long, branches filiform, further redivided into numerous branchlets. **Spikelets** 0.13 - 0.15 cm, 2-flowered, ovoid-lanceolate, acuminate; **glumes** ca. 0.75 cm long, lanceolate, glabrous, 1-nerved. Upper floret ovate, acute; **paleae** truncate; **stamens** 2 - 3; **anthers** very short; styles free.

- Flower* : August – April
Exsiccatus : Talkharka 1700 m, **SR Lepcha & AP. Das** 30290, dated 07.10.2004
Status : Less Common.
Local Distribution : Talkharka, Premlakha, Subaney, Singhaney 1400 – 2000 m.
General Distribution : SUBTROP. & TEMP. REGIONS OF INDIA, NEPAL, BHUTAN, MYANMAR, INDOCHIN, CHINA, etc.
Note : Brooms are made from its panicles roots used in traditional medicine.

Trisetum Persoon

- Trisetum spicatum* (L.) Richt. Pl. Eur. 1: 59. 1890; Hara *et al*, Enum. Fl. Pl. Nepal 1: 148. 1978. Hajra & Verma, Fl. Sikkim 1: 306. 1996. *Aira spicata* L., Sp. Pl. 64. 1753.
Avena subspicata L., Syst. Nat. ed. 10: 873. 1759, Hook.f., Fl. Brit. India 7: 278. 1897. *Trisetum* sub Ess. Agrost. 88. 149. 1812. *spicatum* (L.) P. Beauv.,

Herbs perennial upto 70 cm tall. **Culms** usually pubescent. **Lamina** and sheaths densely pubescent to glabrous. **Panicles** linear to narrowly oblong, often interrupted below, 4.5 – 6.5 cm, green or brownish. **Spikelets** with 2 (–3) florets; **lower glume** 3 – 3.9 mm, **upper glume** 3.8 – 4.8 mm; lowest lemma 3.5 – 5.5 mm, scaberulous, tips entire or 2-denticulate; **awn** 2 – 5.5 mm, outwardly curved near base, not twisted.

- Flower* : June – August *Fruit*: September – October
Exsiccatus : Nathang – Panglakha, 3500m, **SR Lepcha & AP. Das** 30802, dated 29.07.2005
Status : Common
Local Distribution : Panglakha, 3200 – 5000 m.
General Distribution : KAZAKHSTAN, KYRGYZSTAN, TAJKISTAN, PAKISTAN, INDIA, NEPAL, BHUTAN, CHINA, etc.

Yushania P.C. Keng

Key to the species

1. Arboreal grass upto 5 m tall; culm slender; culm sheath auricled *Y. maling*
 + Arboreal grass more than 6 m tall; culm straight; culm sheath not auricled ... *Y. pantlingii*

Yushania maling (Gamble) R.B. Majumdar in Karthikeyan *et al*, Fl. Ind. Enum. – Monocot. 283. 1989; Hajra & Verma, Fl. Sikkim 1: 242. 1996; Stapleton in Noltie, Fl. Bhutan 3(2): 503. 2000. *Arundinaria maling* Gamble in Kew Bull. 1912: 139. 1912; Hara, Fl. E. Him. 379. 1966; Hara *et al*, Enum. Fl. Pl. Nepal 1: 122. 1978. *A. racemosa* Munro in Trans. Lin. Soc. Lond. 26: 17. 1868 p.p., Hook.f. in Fl. Brit. India 7: 379. 1897 p.p.

Local Name: Malingo (Nep.).

Shrubby erect, upto 5 m tall. **Culms** slender, fistular, nodes in between 25 - 45 cm gaps; internodes 22 – 35 cm long, 2.5 - 3 cm in diam., scabrid. **Culm-sheaths** upto 30 cm long, 8 cm in wide, blade subulate, erect or reflexed, coriaceous, apex attenuate, broadly auricled, scarcely yellowish -hispid; ligule 1 cm, fimbriate. **Leaves** 4.5 - 13 x 0.40 - 1.5 cm, linear-lanceolate, acuminate, base attenuate into a short stalk, glabrous, veinlets conspicuous. **Sheaths** striate, sparsely ciliate at the mouth, and back; ligule truncate, pubescent

- Flower & Fruit* : Not observed
Exsiccatus : On way to Rachel, 2550 m, **SR Lepcha, T. Sharma & AP. Das** 3443, dated 17.10. 2008.

Status : Fairly Common.
Local Distribution : Subaney – Singhaney, 1800 –2900 m.
General Distribution : E. HIMALAYA AND KHASIA HILLS

Note : 1. Endemic to Eastern Himalaya.
2. Leaves used as a fodders and roofing mats, floors mats for cattle. The culms are used for making numerous household articles.

Yushania pantlingii (Gamble) R.B. Mujumdar in Karthikeyan *et al*, Fl. Ind. Enum. – Monocot. 283.1989. Hajra & Verma, Fl. Sikkim 1: 242.1996; Stapleton in Noltie, Fl. Bhutan 3(2): 504. 2000. *Arundinaria pantlingii* Gamble in Ann. Roy. Bot. Gard. Calc.7: 129.t. 118. 1896 *et in* Hook.f., Fl. Brit. India 7: 380. 1896; *Semiarundinaria pantlingii* (Gamble) Nakai in Journ. Arn. Arb. 6: 151. 1925.

Bamboos, rhizomatous. **Culms** to 8.5 m long; internodes striate, scabrous. **Culm-sheath** tough, appressed brown setose apically, or pilose towards base, margin ciliate, with basal fringe of reflexed, light brown hairs; auricle absent or small; oral setae few, erect; ligule long, rounded shortly pubescent, fimbriate. **Leaves sheaths** glabrous, tough, margin ciliate ; ligule very short ; auricle absent; oral setae long, erect, scabrous at base; exterior ligule long ciliate on one side or short ciliate on both sides.

Flower : Not observed
Exsiccatius : Rachela, 2950 m, *SR Lepcha, T Sahrma & AP. Das 03444*, dated 15.06.2008

Status : Fairly Common.
Local Distribution : Subaney- Singhaney, upto 2800 m.
General Distribution : E. HIMALAYA AND KHASIA HILLS
Note : Endemic to E. Himalaya

Subclass: Zingiberidae

Order: Zingiberales

MUSACEAE A. Jussieu

Musa Linnaeus.

Musa sikkimensis Kurze in Journ. Agric. Hort. Soc. Ind. n.s.v. 164.1865-1866; J.G. Baker in Fl. Brit. India 6: 262. 1894. *Musa hookeri* King ex A.M. & J.M. Cowan Trees Bengal 135.1929; Noltie, Fl. Bhutan 3(1):180.1994.
Local Name: *Tyangmoo fo-gom* (Lep.)

Plant robust upto 5 m tall. **Pseudo stem** 4.3 m long, fleshy, with girth ca. 45 cm in diam. **Leaves** spreading; Leaf sheath waxy, blackish brown; petiole upto 70cm; channel margin erect, blackish, blades oblong lanceolate, base rounded or cordate, **lamina** 1.5 – 2 x 0.8m, yellowish green , shining on both surface usually purplish when young. . **Bract**

ovate or obtuse not reflexing, deep purple to crimson, glaucous outside, 1 -2 male bracts opening at one. **Male bud** to 13 x 10cm turbinate, . **Male flower** compound **tepal** to 4cm long, creamy – orange, free tepal, translucent, stamen equalling to tepal. **Fruit** in bunch oblique, 7 - 9 fruits born in two rows. **Fruits lax**, arise from axis. Pericarp green turning brown in maturity. Seed numerous, sharply angled, black, pulp dirty white – pale brown.

- Flower & Fruit* : October - April
Exsiccatus : Dhorok (lower region) 1980 m, *SR Lepcha & AP. Das* 03091, dated 26.08.2005
Status : Sparse,
Local Distribution : Premlakha, Subanney – Singhaney, Phusrey below upto 2000 m
General Distribution : E. HIMALAYA (NEPAL – BHUTAN) W. Bengal,
Note : 1. Endemic to Eastern Himalaya.
 2. Loves to grow on wet places.

ZINGIBERACEAE R. Brown.

Key to the Genera:

1. Herbs upto 50cm tall *Globba*
 + Herbs more than 50cm tall 2
2. Root fiber thick; Corolla lobes dorsal narrow; anther cell connective produced at the base into a forked appendages *Cautleya*
 + Root fiber thin; Corolla lobes dorsal spreading; anther cell not connective produce..... *Hedychium*

Cautleya (Benth.) Hook.f.

Key to the Species :

1. Leaf lanceolate; base attenuate; staminode spatulate *C. gracilis*
 + Leaf elliptic; base narrow round; staminode oblanceolate oblong *C. spicata*

Cautleya gracilis (J.S.Smith) Dandy in Journ. Bot. 70. 328. 1954; Hara in Fl. E. Him. 1: 421. 1966; Noltie. Fl. Bhutan 3(1): 193. 1994; Hajra & Verma, Fl. Sikkim 1: 123. 1996. *Roscoea gracilis* J.E. Smith. in Trans. Linn. Soc. 13: 460. 1812. *Cautleya lutea* (Royal) Hook.f., in Bot. Meg. T. 699. 1888; Baker in Hook. f., Fl. Brit. India 6: 208. 1890. *Roscoea lutea* Royal, illustr. Bot. Him. 361. t. 89. f. 2. 1839.

Herbs perennial, with pseudo stem upto 55 cm tall. **Leaves** 3 - 5, lanceolate ± sessile, long caudate; leaf sheath greenish white or with purple red spot; ligule ca 2.5mm; adaxially green, abaxially usually purple or green, lanceolate, **lamina** 4.5 -13 x 1.5 - 7cm, glabrous, base attenuate, apex caudate-acuminate. **Inflorescence** 5 - 10cm, bracts usually red, acute. **Calyx** red, unilaterally split. **Corolla** tube 2-2.5cm, **petal** oblong, rounded, lateral **staminode** ± spatulate, lip bilobed; **filament** short, **anther** 2cm.

- Flower* : June-October.
Exsiccatus : Panglakha-Rachela *SR Lepcha & AP Das* 31034, 07.10.2004

Status : Common
Local Distribution : Rachela, Singhaney upto 3200 m,
General Distribution : INDIA (Kashmir), BHUTAN, MYANMAR, NEPAL, THAILAND,
VIETNAM.

Cautleya spicata (Smith) Baker in Fl.Brit.India 6: 209. 1890; Pfl.-reich IV-46, Ht. 20: 125. 1904; Fl. Simla 512, f. 170. 1921; Hara in Fl.E.Him. 1: 421. 1966; H.J. Noltie. Fl. Bhutan 3(1): 193. 1994; Hajra & Verma Fl. Sikkim 1:124. 1996.

Local Name:Pahinlo Sana (Nep.).

Herbs 55 - 65 cm tall. **Stem** glabrous. **Leaves** ; petiolate much broader; **lamina** 13.5 - 23 x 3 -6.5 cm, narrow elliptic, entire, acute to acuminate, base narrow round, lateral nerves upto 16 pairs on either sides. **Spike** upto 13 cm long, shortly peduncled, terminal and erect. **Braets** oblong, as long as sepals, red. **Flowers** few or many, yellow. **Sepals** upto 1 - 2.1 cm long, red, obtusely toothed. **Petal-tube** shorter or hardly equal to sepal, upper segment upto 2.3 cm; lip bright yellow, **staminodes** nearly as long as the petal, oblanceolate - oblong. **Capsule** globose, red; seeds black.

Flower & Fruit : June - September
Exsiccatus : Panglakha 2870 m, *SR Lepcha & AP Das* 29379, dated 30.09.2004
Status : Less Common.
Local Distribution : Panglakha , Ramitey 1900-2500m.
General Distribution : TEMPERATE HIMALAYAS; INDIA, BHUTAN.

Hedychium Koenig.

Hedychium spicatum Buch-Hamilton ex J.E.Smith in Rees Cyclop. 17: 3. 1811; Hajra *et al.* Fl. Sikkim 1: 130. 1996; Baker in Hook. f., Fl. Brit. India 6: 227. 1892. *Var. acuminatum* (Rose) Wall. In Hook., Kew Journ. Bot. 5: 328. 1853; Hajra *et al.* Fl. Sikkim 1: 130., 1996; Baker in Hook. f., Fl.Brit. India 6: 227. 1892; Roa & Verma in Bull. Bot. Surv. India 14; 130. 1972.

Herbs robust. Pseudo-stem usually 0.5 - 2.5m long. Ligule ca 3.5mm long, apex obtuse; **petiole** ca 4.5mm long. **Leaf** oblong, lanceolate, acuminate, **lamina** 8 - 35 x 3 - 15cm pubescent cent. **Inflorescence** narrowly cylindric, 10 - 35cm long. **Flower** golden yellow or white tinged yellow or reddish at base, **Calyx** ca 5.5mm, obliquely split on 1 side. **Corolla** tube ca 7mm, lobes linear. **Petals** 2 - 3cm long. Lateral **staminode** lanceolate \pm equaling petals. **Lip** 4 - 4.5cm. ; **stamen** shorter than lips, usually orange. **Fruit** yellow, orange, stigma ciliate.

Flower : August - September
Exsiccatus : Dhorok Phusrey 2200-2300 m, *SR Lepcha & AP Das* 30246,
dated 06.10.2004
Status : Common
Local Distribution : Dhorok-Phusrey 2200-2300 m,
General Distribution : CULTIVATED AS AN ORNAMENTAL

Globba Linnaeus

Globba racemosa Smith, Exot. Bot. 2: 15. t. 117. 1804; Baker in Fl. Brit. India 6: 201. 1890; Noltie, in Fl. Bhutan 3(1): 191. 1994; Hajra *et al.* Fl. Sik. 1:127. 1996.

G. orixensis Roxb. in As. Res. 11: 358. 1810; Baker in Fl. Brit. India 6: 201. 1890.

G. clarkei Baker in Fl. Brit. India 6:201. 1890; Hara in Fl. E. Him. 1: 421.1966.

G. hookeri Cl. ex Baker in Fl. Brit. India 6: 201 1890.

Herbs, 10 - 45 cm tall. Rhizome short. **Stem** erect, leafy. **Leaves**; petioles upto 3cm. Leaf lamina 8 - 13 x 3 - 6 cm, oblong-lanceolate, entire, sub-caudate, base narrowed, dark green, glabrous or scantily hairy beneath. **Panicles** upto 20cm long, narrow. **Bracts** usually small, caducous. **Calyx** short to 0.4cm, slightly funnel-shaped, lobe short, yellowish. **Corolla**-tube, deep yellow, segments ovate, reflexed. **Capsule** smooth.

Flower & Fruit : June - September

Exsiccatus : Phusrey below 1850m, **SR Lepcha & AP. Das** 03080, dated 20.08. 2005.

Status : Frequent.

Local Distribution : Sakam, Phari, Chouda Feri, Jaributti. 700-1800m.

General Distribution : E. HIMALAYA; INDIA, Assam, Meghalaya, Manipur.

Note: 1. Endemic to Eastern Himalaya.

2. Cultivated as an ornamental.

Subclass: Liliidae Order: Liliales

LILIACEAE A. Jussieu

Key to the species

- | | |
|---|---------------------|
| 1. Leaves dichotomously branched | <i>Disporum</i> |
| + Leaves not dichotomously branched | 2 |
| 2. Leaves mostly basal, rarely emerged from stem; lamina filiform | <i>Lyoydia</i> |
| + Leaves emerged from stem; lamina linear to ovate | 3 |
| 3. Leaf petiolated; basal leaves in rosette | <i>Cardiocrinum</i> |
| + Leaf sessile; leaves not in rosette | 4 |
| 4. Flower greenish; bulb scale not more than 2 | <i>Fritillaria</i> |
| + Flower purplish or yellowish; bulb scale up more than 7 | <i>Allium</i> |

Allium Linnaeus

Allium wallichii Kunth, Enum. Pl. 4: 443. 1834; Hook.f. in Fl. Brit. India 6: 341. 1892; Hara, Fl. E. Him. 405. 1966; Noltie, Fl. Bhutan 3(1): 79. 1994; Hajra & Verma, Fl. Sikkim 1: 145. 1996.

Herbs upto 1 m. Bulb solitary or clustered, cylindrical; yellowish brown. **Leaves** linear to oblong-lanceolate or lanceolate, shorter than to sub equaling scape, lamina 2.5 - 5.5 x 20 mm wide, base narrowed into petiole, midvein distinct, Scape lateral, 3-angled, sometimes narrowly 3-winged, leaf sheaths only at base. **Spathe** 1- or 2-valved, deciduous. **Umbel** hemispheric, laxly or densely flowered. Pedicels sub-equal, ebracteolate. **Perianth** stellately spreading, pale red, red, or purple to blackish purple, rarely white; segments oblong - elliptic to narrowly so, apex retuse or obtuse.

Filaments subulate, shorter than to subequaling perianth segments, connate at base. **Ovary** obovoid-globose; **ovules** 2 per locule; style longer than ovary.

var. *wallichii*

Leaves linear to broad, base not narrowed into a petiole. Scape covered with leaf sheaths only at base.

- Flower* : July *Fruit*: October
Exsiccatus : Kupup 3950m, *SR Lepcha & AP. Das* 2563, dated 23.09.2005
Status : Common
Local Distribution : Kupup, Nathang, Rachel, Pangola, 2300 – 4800 m
General Distribution : HIMALAYA (Simla – NEFA), S.E. TIBET, N. BURMA.
Note : 1. Endemic to Himalaya.
2. Young shoots are eaten as vegetable and made into pickle.

Cardiocrinum Lindley

Cardiocrinum giganteum (Wall.) Makina, Bot. Mag. Tokyo 27: 125. 1913; Hara, Fl. E. Him. 406. 1966; Noltie, Fl. Bhutan 3(1):104. 1994; Hajra & Verma, Fl. Sikkim 1:146. 1996. *Lilium giganteum* Wall., Tent. Fl. Nep. 21, t. 12-13. 1824, excl. *syn.*, Fl. Brit. India 6: 349. 1892.

Herbs bulbous, upto 3 m tall. **Bulbs** with ovate scales. **Stem** fistular. **Petioles** upto 23 cm long; basal leaves in rosette, to 35 x 38 cm, ovate, obscurely acute, base deeply cordate, lateral veins dichotomous; **Stem leaves** smaller than basal ones, acuminate, cordate. **Racemes** few to 25-flowered. **Bracteoles** deciduous. **Flowers** purple white, fragrant; **tepals** 8 – 19 x 1 – 3.5 cm, narrow-oblongate, rounded and reflexed at tip, base saccate; **anthers** purple-yellow; ovary to 3.5 cm, cylindrical; **style** to 5 cm long, yellowish; stigma trilobed. **Capsules** oblong; seeds reniform

- Flower* : June *Fruit*: August
Exsiccatus : Bhimbase 4300m, *SR Lepcha & AP. Das* 2564: dated 24.05.2005
Status : Common
Local Distribution : Bhimbase, 2000 – 2700 m
General Distribution : E. HIMALAYA (Simla – NEFA) S. TIBET, Khasia, Manipur, and N. Burma.
Note : Endemic to Himalaya.

Disporum Salisbury

Disporum calcaratum D. Don, Trans. Linn. Soc. 18:516.1841; Hook.f., in Fl. Brit. India 6:359.1892; Hajra & Verma, Fl. Sikkim 1:148. 1996.

Herbs upto 70 cm tall. **Roots** pale white, slightly fleshy. **Stem** dichotomously branched above ascending branches. **Leaves** ; scale leaves 7 or more, loosely sheathing, membranous; shortly petiolate; leaf lamina 3.5 - 13 x 1.5 – 5 cm, lanceolate, acute to acuminate, base cuneate, veins slightly elevated and papillose in dorsal side. **Inflorescence** lateral. Pedicels to 2cm long, papillose. **Tepals** oblong to oblongate, creamy or dull purple, spurred at base, spurs divergent from pedicel; filaments to 1cm, papillose; **anthers** oblong. **Ovary** obovoid; stigma lobes extending. **Berry** black.

- Flower & Fruit* : April - October
Exsiccatus : Kyongnosla 2480 m, *SR Lepcha & AP. Das* 03087, 20.08.2005.

Status : Frequent.
Local Distribution : Kyongnosla, Padamchen, NVNP border, 1800 - 2600m.
General Distribution : TEMPERATE E. HIMALAYAS, Meghalaya, Manipur and Myanmar.
Note : Endemic to Eastern Himalaya

Fritillaria Linnaeus

Fritillaria cirrhosa D. Don, Prodr. Fl. Nepal. 51. 1825; Hook.f., Fl. Brit. India. 6: 353. 1892; Hara, Fl. E. Him. 408. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 1: 72. 1978; Noltie, Fl. Bhutan 3(1): 107. 1994; Hajra & Verma, Fl. Sikkim 1: 149. 1996.

Herbs bulbous, bulb of 2 scales, to 3cm in diam. Stem to 45 cm, mostly underground. **Leaves** whorled and sometime alternate; leaf blade linear to linear-lanceolate, apex filiform or cirrhose, 4 - 7 x 3 - 4.5 cm, vein 3 or more. **Inflorescence** 1 - 4 flowered; bract 3, apex curved or cirrose. **Flower** nodding companulate, Pedicle 2 - 3cm. **Flower** drooping, olive brown, inside yellowish green checkered dark red; Pedicle 3 - 6 cm. **Tepals** yellow or yellowish green, slightly spotted or tessellated with purple, usually elliptic, 3 - 7 x 1 - 1.9 cm; **Stamen** 2.5 - 3 cm. **Style** 3 lobed. **Capsule** narrowly winged.

Flower : May - July. *Fruit*: August - October.
Exsiccatus : Nathang, 3880m, **SR Lepcha & AP. Das 2561**, dated 03.8.2005
Status : Not common
Local Distribution : Kyongnosla, Changu, Memenchu, 1500 - 4800 m.
General Distribution : HIMALAYA (Kashmir to BHUTAN), S. TIBET, W. CHINA.
Note : Endemic to Himalaya.

Lloydia Salisbury ex Reichenbach

Lloydia delicatula Noltie in Edinburgh J. Bot. 50(10): 55. 1983; Noltie, Fl. Bhutan 3(1): 109. 1994.

Herbs with bulbs densely clumped. Scape to 2 cm. **Leaf** 1 basal filiform exceeding stem to 0.6mm wide. **Bracts** leaf like (3 lower and 2 sub opposite) on upper part of scape. **Flower** single, erect. **Tepals** oblong, narrowly elliptic or rhombic, to sub acute apex and base, to 6 x 2 mm, white with prominent purplish veins arising from nectary. **Nectary** round or transversely elongated, yellowish. **Filament** glabrous; anther ±circular; **Ovary** narrowly ellipsoid to oblong - ovoid; **stigma** capitate. **Capsule** lobes spatulate.

Flower : June - July *Fruit*: October
Exsiccatus : Kupup, 3990 m, **SR Lepcha & AP. Das 800** dated 13.10.2006
Status : Not common
Local Distribution : Changu, Nathula, Kupup, 3600 - 4300 m
General Distribution : INDIA, NEPAL, BHUTAN, CHINA.
Note : Endemic to Himalaya.

MELANTHACEAE Batsch

Aletris Linnaeus

Aletris pauciflora (Kotzsch.) Hand- Mazz., Symb. Sin. 7: 1220. 1936. Hajra & Verma. Fl. Sikkim 1: 142. 1996. *Stachyopogon pauciflorus* Kotzsch. In Kotzsch & Garcke, Bot. Reise Pr. Waldemer 49. t. 94. 1862. *Aletris nepalensis* Hook. f., Fl. Brit. India 6: 264. 1898, nom. Illegit.

Herbs small, root thickened with stout rhizome. **Leaves** usually rather few (6 - 12) and laxly tufted, lamina linear lanceolate to linear, 2 - 22cm x 1 - 8 mm. **Scape** 3.5 - 35cm. **Raceme** to 5.5 cm. **Flowers** pedicellate; pedicel to 10 mm, pubescent; bract lanceolate, to 15 mm. **Perianth** dark, red, pink, orange, greenish yellow, or white, glabrous; lobes recurved, oblong-ovate to lanceolate. 2 - 2.5 x 0.5 - 1.6 mm, apex obtuse or rounded. **Capsule** ovoid-ellipsoid or ovoid-conical.

Flower : April *Fruit* : August
Exsiccatus : Nathang 3800 m, *SR Lepcha & AP. Das* 03088, dated 24. 08. 2005.
Status : Common
Local Distribution : Chhangu, Rachela, Panglakha, Nathang (1500 - 4300 m).
General Distribution : HIMALAYA (Kashmir - BHUTAN) and W. CHINA
Note : Endemic to Himalaya

TRILLIACEAE Lindl.

Paris Linnaeus

Paris polyphylla Smith in Rees. Cyclop. 26: Paris n. z. 1813; Hook. f, Fl. Brit. India 6: 362. 1892; Hara in Fl. E. Him. 1: 410. 1966; Hara *et al.* Enum. Fl. Pl. Nepal 1: 76. 1978; Nolas, Fl. Bhutan 3(1). 22. 1994; Hajra & Verma in Fl. Sikkim 1: 156. 1996.

var. *Polyphylla*.

Local Name: *Satuwa (Nep.)*, *Patar-ko (H)*.

Herbs unbranched, rhizomatous, erect, upto 150cm tall. **Leaves** 5 - 10; Petiole 0.5 - 6cm; **Leaves** blade oblong to lanceolate, 5 - 12 x 0.4 - 5 cm, base rounded to cuneate. **Peduncle** 5 - 30cm. **Outer tepal** green or yellow green, ovate-lanceolate; **Inner** ones usually yellow-green narrowly linear, shorter than outer one. **Stamen** 2 as many as outer tepals; **Filament** 3 - 9mm; anther 4 - 11mm; **Ovary** sub globose, ribbed, 1-loculed, sometimes tuberculate, **style** short, base enlarged, purple to showy white; **stigma** 4 lobes. **Capsule** globose, seed enveloped by red, succulent aril.

Flower : April - July *Fruit* : August - November
Exsiccata : Rachela 3300 m, *SR Lepcha & AP Das* 31055, dated 08.10.2004
Status : Less Common
Local Distribution : Panglakha-Rachela 1800-3300 m.
General Distribution : CHINA, BHUTAN, INDIA, THAILAND, VIETNAM, NEPAL, MYANMAR, LAOS.

UVALIARACEAE Kunth

Key to the Genera

1. Flowers cup shaped; single; anther basifixed *Streptopus*
 + Flower campanulate; 2 - 9; anther dorsifixed *Disporum*

Disporum Salisbury ex D. Don

Key to the species:

1. Plant dichotomously branched; filaments not thickened below *D. calcaratum*
+ Plant simple or rarely branched; filaments thickened below *D. cantoniense*

Disporum calcaratum D. Don, Trans. Linn. Soc. 18: 516. 1841; Hook.f., Fl. Brit. India 6: 359. 1892; Noltie, Fl. Bhutan 3(1): 96. 1994; Hajra & Verma, Fl. Sikkim 1: 148. 1996.

Herbs upto 70 cm tall. Roots fleshy, pale white. **Stem** branched above dichotomously with ascending branches. Scale leaves 7 or more, loosely sheathing, membranous. **Leaves** shortly petiolate, lamina 3 - 10.5 x 1.3 - 3 cm, lanceolate, acute to acuminate, base cuncate, veins elevated and papillose beneath. Inflorescence lateral. Pedicels 1 - 1.9 cm long, papillose, deflexed in fruits. **Tepals** oblong to oblanceolate, creamy or dull purple, spurred at base, spurs to 0.8 cm long, often divergent from pedicel; filaments papillose; **anthers** oblong; **ovary** obovoid; style to 1 cm; stigma lobes extending. **Berry** blackish.

- Flower* : April *Fruit*: September
Exsiccatus : Lower Padamchen, 2195 - 2500 m, **SR Lepcha & AP. Das** 2565, dated 26.08.2005
Status : Less Common
Local Distribution : NNP border, 2100 - 2600 m
General Distribution : TEMPERATE E. HIMALAYAS; INDIA, Meghalaya, Manipur, NEPAL, BHUTAN, and MYANMAR.

Disporum cantoniense (Lour.) Merr. in Philip. J. Sci. 15:229.1919; Hara, Fl. E. Him. 407. 1966; Noltie, Fl. Bhutan 3(1): 95. 1994. *Fritillaria cantoniensis* Lour., Fl. Cochinch 206. 1790. *Uvularia chinensis* Ker- Gawl in Bot. Mag. t. 916. 1806. *D. pullum* Salisb. in Trans. Hort. Soc. Lond. 1: 331. 1812; Hook.f., Fl. Brit. India 6: 360. 1892 p.p.

Local Name: *Bhuin Harchur* (Nep.)

Herbs erect upto 50 cm tall. Simple or rarely branched. Stem loosely sheathed with membranous, brownish scale, root-stock creeping. **Leaves**; petioles to 0.5 cm; lamina 4 - 6 x 1 - 4.5 cm, lanceolate, acuminate, base cuneate, nerves raised beneath. **Inflorescence** apparently lateral, few flowered. Pedicels 1 to 2 cm long, papillose. **Flowers** 1 - 3 cm long, pendulous; **tepals** oblong to oblanceolate, tapered at apex, creamy or dull purple, saccate at base, rounded; filaments to 1 cm long, thickened below; **anthers** oblong; **ovary** to 0.3 x 0.3 cm, obscure obovoid; **style** upto 1 cm long; stigma lobed and extending. **Berries** blackish.

- Flower* : April *Fruit*: June
Exsiccatus : Mulkharka -Phusrey, 2095 - 2300 m, **SR Lepcha & AP. Das** 256i6, Dated 07.08.2005
Status : Common
Local Distribution : Mulkharka, NNP border, 2100 - 2600 m
General Distribution : TEMPERATE HIMALAYAS; INDIA Khasia Hills, Manipur, BHUTAN, MYANMAR, THAILAND, INDO-CHINA, MALAYSIA.

Streptopus Michaux

Streptopus simplex D. Don, Prodr. Fl. Nepal. 48. 1825; Hara, Fl. E. Him. 349. 1966; Noltie, Fl. Bhutan 3(1): 97. 1994.

Herbs upto 90 cm tall. Stem glabrous. Scale leaves to 3, oblong, pale brown. **Leaves** mostly born on the upper half of the stem; lanceolate, - elliptic, finely acuminate, base cordate, basal lobes with clasping stems, **lamina** 4.5 – 11 x 1.5 – 5 cm, with numerous parallel veins. **Flowers** white, rarely spotted with red, tinged greenish, yellowish, or purplish at base, cup shaped; **tepals** oblong – elliptic, to 2 cm. **Filament** flattened lanceolate, slightly shorter than anther; **anther** lanceolate, base cordate; **ovary** obovoid, style stout, stigma lobes equaling to style. **Berry** red.

Flower & Fruit : May – July

Exsiccatus : Lingtu 2750 m, *SR Lepcha & AP. Das 0245*, dated 05.08.2003.

Status : Fairly Common.

Local Distribution : Yakla, Sherabthang, Nathang, Lingtu, 1900 - 2750m.

General Distribution : HIMALAYAS (Kumaon – NEFA) S. TIBET, N. BURMA, W, CHINA.

Note : Endemic to Himalaya.

IRIDACEAE G.J. Lewis ex Goldblatt

Iris Linnaeus

Iris clarkei Baker ex Hook.f., Fl. Brit. India 6: 275. 1894; Hara in Fl. E. Him. 1: 420. 1966; Hajra & Verma, Fl. Sikkim 1: 137. 1996. *Iris himalaica* Dykes in Gard. Chron. 45: 3, 36. 1909.

Local Name: *Si-takpa* (Lep.) *Tehma* (Sherpa & Tibetan)

Herbs upto 1m tall. Rhizome creeping, cylindric. **Leaves** grayish green and dull on 1 surface and glossy on other, sword shaped, linear 23 - 53 x 0.3 - 1.5cm. **Flowering** stem 2 or 3 branched, solid, 1 - 3 leaves, green broadly lanceolate. 6.8 – 10 cm. **Flowers** bluish violet with white or greenish - yellow tinged patch at base violet, with white or greenish-yellow tinged patch at base 5.5 - 8cm in diam. Pedicel slender, 3 – 4 cm long. **Perianth** tube green, ca 2 x 4 mm; outer segments mottled darker on central. **Style** branches broad, forming flattened top to flower lobes half-ovate. **Anthers** usually whitish - mauve or cream. **Capsules** oblong - trigonous, abruptly contracted at apex and bottom. **Seeds** flattened, D-Shaped.

Flower : August *Fruit*: October

Exsiccatus : Kupup 3950 m, *SR Lepcha & AP. Das 148*, dated 13.10. 2003; Nathang 3800m, *SR Lepcha & AP Das 2550*, dated 13.07.2005.

Status : Common

Local Distribution : Nathang, Kupup, Bhimbase, upto 4200 m.

General Distribution : E. HIMALAYA (E. NEPAL to BHUTAN) and S. TIBET.

Note : 1. Endemic to Himalaya.

2. The dried leaves (*Thema*) are potential winter fodder in high altitude areas.

SMILACACEAE Ventenat

Smilax Linnaeus

Key to the species

1. Leaf hastate to truncate; umbels sessile *S. aspera*
- + Leaf not truncate; umbels peduncled 2
2. Stem prickles absent or rarely present *S. aspericaulis*
- + Stem without bristles; prickles recurved 3
3. Leaf lamina ovate-elliptic; umbel single *S. ovalifolia*
- + Leaf lamina narrowly ovate; umbels one paired 4
4. Leaf lamina ovate-cordate; ovary ovoid *S. elegans*
- + Leaf lamina lanceolate to oblong, rarely orbicular; ovary not ovoid 5
5. Petioles upto slightly longer; winged *S. ferox*
- + Petioles absent or very short, without wing *S. rigida*

Smilax aspera L., Sp. Pl. ed. 1:1028. 1753. Hook.f. in Fl. Brit. India 6: 306. 1892; Koyama in Hara, Fl. E. Him. 414. 1966; Noltie, Fl. Bhutan 3(1): 27. 1994; Hajra & Verma, Fl. Sikkim 1: 163. 1996. *S. maculata* Roxb., Fl. Ind. ed. 2. 3: 796. 1832. *S. fulgens* Wall. [Cat. No. 5122.1830] *nom. nud.*

Local Name: Pa'lan jyu (Lep.).

Climber with prickles. **Leaves** alternate; petioles upto 3 cm, prickled, base narrowly winged; **lamina** 3.5 – 13 x 2.5 – 6 cm, triangular to hastate, lanceolate or ovate, acute or mucronate, base truncate to slightly cordate, margins with spines, costae 5 - 9, midrib prickles below, coriaceous. Tendrils emerged from apex of petiole wings. **Racemes**, emerged from axils of prophylls of lateral branch with upto 12 sessile umbels. **Female umbels** consist of upto 3 flowered; receptacle globose; bracteoles brownish; female flowers smaller than male ones, ovary ellipsoidal; stigmas 3; staminodes 6. **Male umbels** upto 16 flowers; tepals oblanceolate; anthers oblong. **Berries** reddish.

Flower : September – November *Fruit* : April - August
Exsiccatum : Singhaney dara 2400 m, **SR Lepcha & AP. Das** 2612, dated 23.08.2004
Status : Frequent.
Local Distribution : Rachela, Dohrok, Premlekha, upto 2800 m,
General Distribution : MEDITERRANEAN REGION throughout SOUTHERN CENTRAL ASIA eastwards to INDIA and SOUTHWARDS TO SRI LANKA.

Smilax aspericaulis Wall. ex DC., Monogr. Phan. 1: 195. 1878; Hook.f. in Fl. Brit. India 6: 306. 1892; Noltie, Fl. Bhutan 3(1): 29. 1994; Hajra & Verma, Fl. Sikkim 1: 163. 1996.

Local Name: Pa'lan jyu (Lep.) Kukurdaine (Nep.).

Climber. Stems and branches with bristle, recurved prickles. Tendrils terete, glabrous. **Leaves** simple, alternate; petioles to 2.5 cm long, sheathing at the base; **lamina** 4 – 20 x 3 - 12 cm, ovate-oblong, or linear-oblong, acute, base cuneate or rounded, margin entire, cartilaginous, costae 3. **Umbels** solitary or 2 - 3, pedunculate. **Male umbels** with numerous flowered with globose receptacle, tepals reflexed, biseriate. **Female umbels** upto 22 flowered; **tepals** similar to male flowers; stigma lobes recurved, staminodes 3. **Berries** globose.

Flower : October – December *Fruit*: February – May
Exsiccatus : Phusrey 2200 m, **SR Lepcha & AP. Das 2613** dated 24.08.2004
Status : Less Frequent.
Local Distribution : Phusrey, Premlakha, Talkharka, 1300 – 2200 m.
General Distribution : E. HIMALAYAS,; INDIA, MYANMAR.
Note : Fruits edible.

Smilax elegans Wall. (Cat. No. 5117 B. 1830, *nom. nud.*) ex A. DC., Monogr. Phan. 107. 1878; Cowan & Cowan, Trs. N. Beng. 135. 1829; Hajra & Verma, Fl. Sikkim 1: 163. 1996. *S. glaucophylla* Klotz., Reise Prinz. Wald. Bot. 45, t. 91. 1862. Koyama in Hara, Fl. E.Him. 415. 1966; Hara *et al.*, Enum.Fl. Pl. Nepal 1: 89. 1978; Noltie, Fl. Bhutan 3(1): 35. 1994. *S. parviflora* Wall. ex Hook.f., Fl. Brit. India 6: 304. 1892. *S. longibracteolata* Hook.f. in Fl. Brit. India 6: 305. 1892.

Shrubs, climbing on trees. Stem glabrous. Tendrils simple with sinistorse coils, glabrous. Petioles upto 2 cm long. **Leaf** lamina 4 -13 x 1 – 6 cm, ovate-cordate, acute, cordate at base, margin entire, costate upto 5. **Umbel** with many flowered, bracteolate. **Flowers** pedicelled; **sepals** linear-oblong; **petals** 0.2 x 0.2 cm, ovate-oblong, glabrous; **stamens** 4 with whitish; **ovary** ovoid; **staminodes** 3.

Flower : April - May
Exsiccatus : Neora pathak, 2600m, **SR Lepch & AP. Das 1950**, dated 04.11.1997.
Status : Frequent.
Local Distribution : Rachela below, Neora pathak, upto 2800 m.
General Distribution : E. HIMALAYA.
Note : Endemic to Eastern Himalaya.

Smilax ferox Wall. [Cat. No. 5119. 1830, *nom. nud.*] ex Kunth, Enum. Pl. 5:251. 1850; Monog. Phan.1: 103. 1878; Hook.f. in Fl. Brit. India 6: 307. 1892; Noltie, Fl. Bhutan 3(1): 33. 1994; Hajra & Verma, Fl. Sikkim 1: 164. 1996.

Climber with recurved prickles. **Leaves** alternate, simple; petioles upto 70 cm, winged, semi-elliptic, membranous and pale; tendrils rarely on older wood; leaf **lamina** 3 - 13 x 2 - 3 cm, lanceolate to oblong, mucronate, base cuneate to rounded, coriaceous, glaucous beneath. **Umbels** single, upto 22 flowered; peduncle upto 2.5 cm long; bracteoles lanceolate, brown. **Flowers** unisexual, differentiated into 2 whorls each of 3 free tepals. **Male flowers** campanulate. **Female flowers**: stigmas; staminodes 2 - 3. **Berries** red.

Flower : April - May *Fruit* : May – November
Exsiccatus : Below Panglakha 2750 m, **SR Lepcha & AP. Das 2614**, dated 14. 10.2005
Status : Fairly Common.
Local Distribution : Below Jorpokhari, Reshete, Hattidara, Thosum Hill, 1900 – 3000 m.
General Distribution : E. HIMALAYA; INDIA, Manipur.
Note : Endemic to Eastern Himalaya

Smilax ovalifolia Roxb., Fl. Ind. 3: 794. 1832; Koyama in Hara, Fl. E. Him. 417. 1966; Noltie, Fl. Bhutan 3(1): 30. 1994; Hajra & Verma, Fl. Sikkim 1: 165. 1996. *S. macrophylla* Roxb., Fl. Ind. 3: 793. 1832; Hook.f. in Fl. Brit. India 6: 310. 1892, *non* Willd. 1805. *S. zeylanica* L., Sp. Pl. 1029. 1753; Hook.f. in Fl. Brit. India 6: 309. 1892; Hara *et al.*, Enum. Fl. Pl. Nepal 1: 79. 1978.

Local name: Kukurdaine (Nep.)

Climbers, branchlets glabrous, rarely with prickled. Tendrils sinistrorsely coiled, glabrous.

Leaves; petioles 2- 2.5 cm long; lamina 9 - 17 x 7 - 14cm, ovate-elliptic, acute, cuneate at base, margin entire, 7-nerved. **Umbels** many flowered, on branched peduncle. Bracteoles upto 0.20 cm long. **Flowers** pedicellate (pedicels upto 2 cm long); **tepals** short; filament linear. **Berries** reddish.

Flower : March – August *Fruit*: September – December
Exsiccatus : Phusrey below 1500 m, **SR Lepcha & AP. Das** 1503, dated 04.7.2005.
Status : Sparse
Local Distribution : Phusrey, upto 1500 m.
General Distribution : TROP. HIMALAYA, INDIA, Central provinces and Concan.,
BANGLADESH, MYANMAR,

Smilax rigida Wall. ex Kunth, Enum. Pl. 5: 164. 1850; Monog. Phaner. 1: 105. 1878; Hook.f. in Fl. Brit. India 6: 304. 1892; Koyama in Hara, Fl. E. Him. 417. 1966; Noltie, Fl. Bhutan 3(1): 32. 1994.

Local name: Kukurdaine (Nep.).

Shrub 1- 3 m tall. Stems spiny, decurrently ridged from leaf bases. Spines straight, less than 1cm. **Leaves** sessile or petioles with ciliate and brownish free stipular, scales at base; leaf lamina 1- 2.5 x 0.70 – 2 cm, ovate, orbicular, mucronate, base rounded to cordate, costae 3, coriaceous. **Tendrils** absent. **Umbel** 2 - 5 flowered; peduncle emerged from lower leaf axil of lateral shoots. **Female flowers** with 2 seriate tepals, outer tepals 0.30 x 0.19 cm, inner tepals 0.13 cm wide; stigmas 3, staminodes 3. **Male flowers** campanulate, outer tepals 0.20 - 0.25 x 0.13 - 0.15 cm, inner one 0.2 cm wide; **Berries** blackish.

Flower : May – June *Fruit*: September – October
Exsiccatus : Near Jorhpokhari, 2600 m, **SR Lepcha & AP. Das** 1765, dated 15.07. 2004.
Status : Frequent.
Local Distribution : Jorhpokhari, upto 2900 m.
General Distribution : E. HIMALAYA; INDIA, BHUTAN.
Note : Endemic to Eastern Himalaya.

DIOSCOREACEAE R. Brown

Dioscorea Linnaeus

Key to the species:

1. Tuber globose; leaf lamina ovate; bract lanceolate *D. bulbifera*
+ Tuber ovoid flobose; leaf lamina elliptic to oblanceolate; bract ovate *D. pentaphylla*

Dioscorea bulbifera L., Sp. Pl. ed. 1:1033. 1753; Hara in FL. E. Him. 1:419. 1966; Noltie, Fl. Bhutan 3(1):9. 1994. *D. sativa* Thunb., Fl. Jap. 151. 1784; non L. (1753); Hook.f. in Fl. Bhutan 6:295. 1892.

Local Name: Kucha'ng (Lep.); Gittha (Nep.).

Twinnners. Tubers globose, pale yellow mesocarp. **Stem** climbing and twining almost without prickles; Bulbils several, warty. **Leaves** alternate; petioles as long as leaf blade, winged above

and auriculate at base; lamina 6 – 23 x 4 - 13cm , ovate, acuminate, base cordate. **Male inflorescence** spikes in fascicles on axillary axes, in groups of 4-6 in main axils. **Flowers** sessile and borne singly. Bracts lanceolate, acuminate. **Male flowers**: sepals and petals similar, linear-lanceolate, sub-acute, whitish in young bud and brown to purple at maturity. **Stamens** 6. **Female spikes** axillary and in groups of 2-5; flower overlapping. **Sepals** and petals alike with male flowers, whitish, aromatic. **Capsules** oblong-elliptic, reflexed, winged.

Flower : June – September *Fruit* : September - October
Exsiccatus : *Subaney dara* 1700 m, SR Lepcha & AP Das 03078, dated 20.08.2005.
Status : Frequent.
Local Distribution : Reshete, Sakam, Machuki. Upto 2100m.
General Distribution : TROPICS OF THE OLD WORLD.

Dioscorea pentaphylla L., Sp. Pl. ed.1, 1032. 1753; Hook.f., in Fl. Brit. India 6: 289. 1892; Ann. Roy. Bot. Gard. Calc. 14(1):160. 1936; Hara in Fl. E. Him. 1:420. 1966; Noltie, in Fl. Bhutan 3(1):10. 1994. *D. jacquemontii* Hk. f., Fl. Brit. India 6:290. 1892.
Local Name: Bhegur (Nep.); Sili Kussok (Lep.).

Twiner. Tubers ovoid-globose, with rootlets on surface. Stems subglabrous to appressed pubescent, rarely with prickles. **Leaves** 3 to 5 foliolate; petiole to 5cm; leaflets 5.5 - 20 x 2.2 - 5cm, elliptic to oblanceolate, cuspidate, base narrowed, white-hairy above, subglabrous beneath. **Spikes** in male inflorescence many, borne on branched inflorescence axis, solitary or pairs, greyish-white, pubescent. **Bracts** ovate, cuspidate, brownish. **Male flowers** sessile, globose, borne singly. Sepals, lanceolate, acute, brownish. **Petals** oblanceolate, rounded, glabrous and brownish; staminodes 3; pistillode columnar. **Female spikes** slender. **Female flowers**: sepals, lanceolate, acute, scarcely bristly; petals glabrous; ovary whitish and hairy. **Capsules** oblong, reflexed, winged.

Flower : June – September *Fruit* : November - December
Exsiccatus : Subhaney dara 1740 m, SR Lepcha & AP. Das 03079 , dated 20. 08. 2005.
Status : Sparse.
Local Distribution : Subhaney, Prelakha below, Below phusrey, upto 1750m.
General Distribution : HIMALAYAS (Simla- BHUTAN), BURMA, THILAND, INDO-CHINA, MALAYSIA, CHINA.

Order: Orchidales

ORCHIDACEAE A. Jussieu

Key to the Genera

1. Plants leafy, non-saprophytic	2
+ Plants leafless, saprophytic	<i>Yuania</i>
2. Plants terrestrial	3
+ Plants epiphytic, rarely lithophytic	16
3. Tubers or pseudobulbs present	4
+ Tubers or pseudobulbs absent	14
4. Plants with stems	5
+ Plants with pseudobulbs	10
5. Lips without spur	<i>Herminium</i>
+ Lips with 1 or 2 spurs	6
6. Lips with 1 spur	7
+ Lips with 2 spurs	<i>Satyrium</i>
7. Stigma lobes with stigmatophores	<i>Habenaria</i>
+ Stigma lobes without stigmatophores	8
8. Tubers often Finger-like or 5-lobed	<i>Dactylorhiza</i>
+ Tubers usually entire, rarely 2-lobed	9
9. Lip entire	<i>Platanthera</i>
+ Lip 3-lobed	<i>Orchis</i>
10. Flowers tubular	<i>Anthogonium</i>
+ Flowers not tubular	11
11. Leaves petioled	<i>Spathoglottis</i>
+ Leaves sessile	12
12. Pollinia 4	13
+ Pollinia 8	<i>Calanthe</i>
13. Lip without auricles	<i>Liparis</i>
+ Lip with auricles	<i>Malaxis</i>
14. Inflorescence spirally twisted	<i>Spiranthes</i>
+ Inflorescence not spirally twisted	15
15. Claws of Lip with toothed flange	<i>Odontochilus</i>
+ Claws of Lip without toothed flange	<i>Zeuxine</i>
16. Plants with pseudobulbs	17
+ Plants without pseudobulbs	<i>Oberonia</i>
17. Pseudobulbs directly rooting on host	21
+ Pseudobulbs arise from stems or rhizomes	18
18. Pollinia 8	<i>Eria</i>
+ Pollinia 4	19
19. Sepals unequal; Lip mobile	<i>Budbophyllum</i>
+ Sepals equal; Lip not mobile	20

20. Leaves 2, Pollinia lying in pairs	<i>Coelogyne</i>
+ Leaves few to many; Pollinia lying together	<i>Dendrobium</i>
21. Pseudobulbs formed of leaf-bases; Pollinia 2	<i>Cymbidium</i>
+ Pseudobulbs distinct from the leaves; Pollinia 4	22
22. Lateral sepals united at base forming a mentum	<i>Dendrobium</i>
+ Lateral sepals free, not forming a mentum	23
24. Leaves and flowers appearing together	<i>Otochilus</i>
+ Leaves and flowers not appearing together.....	<i>Pleione</i>

Anthogonium Wallich ex Lindley

Anthogonium gracile Lindl., Gen. Sp. Orchid. Pl. 426. 1840; Hara, Fl. E. Him. 408. 1966; Tuyuma in Hara, Fl. E. Him. 425. 1966; Pearce & Cribb in Fl. Bhutan 3(3); 280. 2002. Lucksom in Orchid. Sikkim & NE. Him. 394. 2007. *A. griffithii* H.G. Reichenbach f. in Bonplandia 2: 90. 1851.

Terrestrial herbs, upto 60 cm tall. **Pseudobulbs** ovoid, partly buried in soil, with 2–5 leaves. Stem the basal part is enveloped in single 5.6 – 6.8 cm long tubular clasping sheath. **Leaves** usually 2 – 5, usually 3, blade narrowly linear lanceolate, 6.5 – 40 × 1.5 x 3.5 cm, base petiolate, apex acuminate; petioles and sheaths forming a pseudostem. **Inflorescence** erect; peduncle slender, glabrous, rachis bearing laxly 4 – 8-flowered; floral bracts ovate-lanceolate. **Flowers** nodding, lip rose-pink or white and tinged with red. **Sepals** half forming a tube with apical half free; dorsal sepal oblong-lanceolate; lateral sepals falcate-spatulate. **Petals** narrowly oblong-spatulate. **Lip** ca. 1.2 cm, cuneate, apical part 3-lobed; lateral lobes ovate-triangular; mid-lobe subovate. **Column** ca. short 1.3 cm.

Flower : June *Fruit*: October
Exsiccatus : Tungya 2250 m, **SR Lepcha & AP. Das** 31008, dated 04.08.2004
Status : Common.
Local Distribution : Deorali Dara, 1600 – 2300 m.
General Distribution : TEMPERATE HIMALAYA; INDIA, (NEPAL – BHUTAN) Khasia, Naga hills and Burma.

Bulbophyllum Thouars

Key to the species

1. Leaf single; flower pale green; anther dome shaped	<i>B. reptans</i>
+ Leaves 2; flower yellowish green; anther helmet shaped	<i>B. viridiflorum</i>

Bulbophyllum reptans (Lindl.) Lindl., Gen. Spec. Orch. Pl. 51. 1830; Hook.f., F. Brit. India 5: 768. 1885; Tuyuma in Hara, Fl. E. Him. 427. 1966; Hajra & Verma, Fl. Sikkim 1: 37. 1996; Pearce & Cribb in Fl. Bhutan 3(3); 454. 2002; Lucksom in Orchid. Sikkim & N.E. Him. 702. 2007. *Tribrachia reptans* Lindl., Collect. Bot. t. 41 a. 1826. *Bulbophyllum grandiflorum* Griff., Itin. Pl. Khasyah Mts.: 146, no. 705. 1848; Not. Pl. Asiat. 3: 293. 1851. Icon. Pl. Asiat. 3: t. 294. 1851. Pearce & Cribb in Fl. Bhutan 3(3); 280. 2002.

Epiphytic herbs. **Pseudobulb** small obpyriform bottle green enveloped in tatters skin fibrous sheaths continually till the tip. Petioles 0.7 – 1.2 cm long. **Leaf 1, lamina** 4 - 13 x 0.8 – 1.2 cm, linear-loblong, sub-acute, apex obliqually notched, base narrowed dark green above, pale green

below. **Inflorescences** 1 or rarely 3, 3.5 – 10 cm long, peduncle 2 – 25 cm long, basally sheathed, terete; rachis decurved, green shaded with purplish brown, bearing 4 – 15 shortly pedicellate laxly flowers; **Flowers** pale green, with dark purple spot; floral bracts oblanceolate; pedicellate ovary dark- purplish brown. **Sepals** sub-equal, apically spreading, 3 nerved, pale green, with dark purple spot; the dorsal sepal lanceolate, lateral pairs lanceolate, bearing slightly concave dilated base. **Petals** oblong, blunt, shorter than sepals, 1-nerved, translucent pale green with two dark purple band from base to apex. **Lips** stipitate, oblong, expanded and grooved at the base pale green bearing two dark purple band, ca 1.5 mm long, bearing lateral wings, with two filiform apical processes and short lateral wings; **anthers** dome-shaped, yellow; **pollinia** subglobose, translucent yellow, ovary green.

Flower : October – December
Exsiccatu : Dhorok 2300 m, **SR Lepcha & AP. Das 30213**, dated 06.10.2004
Status : Common
Local Distribution. : Dhorok, Phusrey, 1600 – 2400 m.
General Distribution : E. HIMALAYA; INDIA (E.NEPAL – BHUTAN) Khasia, Naga hills),
 Note : Endemic to Eastern Himalaya.

Bulbophyllum viridiflorum (Hook.f.) Schltr. in orchis 4: 108. 1910; Tuyama in Hara, Fl. E. Him. 428.1966. Seidenf. in Dansk Bot. Ark. 29 (1): 237 : t. 131. 1973; Pearce & Cribb in Fl. Bhutan 3(3); 465.2002; Luckson in Orchid. Sikkim & N.E. Him. 715. 2007. *Cirrhopetalum viridiflorum* Hook.f., Fl. Brit. India 5: 779.1885; 1898.

Epiphytic, Pseudobulbs 2.5 x 3 x 0.7 x 1.5 cm, coepitose, ovoid, much taper at apex. **Leaves** usually 2, **lamina** 6 – 13 x 3 – 4.2 cm oblong-lanceolate or narrowly oblong, acute narrowed to sessile, deciduous after flowering. **Inflorescence** upto 25 cm long, erect; peduncle 6- 13 cm long, teret, glabrous yellowish green suffused with dark- purple, bearing tubular sheaths; rachis 4.5 – 11 cm long, arching, slightly flattered, green with dark-purple strips, many flowered; pedicellate ovary dark green, ribbed; floral bracts ovate, acuminate, yellowish – brown, 3 nerved. **Flowers** upto 2.5 cm long, drooping, imbricate, yellowish –green turning to golden yellow on maturity. **Sepals** sub-equal, greenish to yellow, acute; the dorsal sepals oblong-ovate, concave, 5 nerved; lateral pairs dimediate ovate – laceplate, 8 nerved. **Petals** sub-orbicular with dark purple central patch and bearing dark purple glandular hairs on edge. **Lips** oblong, blunt entire, edged of the grooved lower half up-turned. **Column** bearing broadly falcate hook apical processes; foot short, perpendicular to column, translucent white striped with purple lines in front. **Anthers** helmet-shaped, papillose, creamed coloured; pollinia inner ones minute but outer ones narrowly reniform, dull orange-yellow.

Flower : September – November
Exsiccata : Dhorok 2300 m, **SR Lepcha & AP. Das 30280**, dated 07.10.2004
Status : Rare
Local Distribution : Alubari, Reshete, 1600 – 2400 m.
General Distribution. : E. HIMALAYA; INDIA (Sikkim, Meghalaya, Nagaland).
 Note : Endemic to NE. Himalaya

Calanthe R. Brown

Key to the species

1. Plant with cylindrical pseudobulb; Flowers pink, whitish purple *C. puberula*
- + Plant with conical pseudobulb; Flowers white with brownish purple shade *C. brevicornu*

Calanthe brevicornu Lindl., Gen. Sp. Orchid. Pl. 251. 1833; Hook.f., Fl.Brit. India 5: 848. 1885; King & Pantl. in Ann.Roy. Bot. Calc. 8: 168.t. 277. 1898 (incl.var.*watii*.Hook.f.); Pearce & Cribb in Fl.Bhutan 3(3); 284.2002; Lucksom in Orchid. Sikkim & N.E. Him. 424. 2007. *Alismorchis brevicornu* (Lindl.) Kuntze, Revis. Gen. Pl. 2: 650. 1891. *Calanthe lamellosa* Rolfe in Bull.Misc. Inform. Keew. 1896. 197. 1896.

Terrestrial, herbs upto 50 cm tall. **Pseudobulbs** conical, with 3 or 4 sheaths. **Leaves** 3 or 4, not deciduous; blade elliptic or obovate-lanceolate, 15 – 33 × 4.5 – 10.5 cm, apex acute; petiole-like base sheathing, forming a pseudostem. **Inflorescences**, scape arising from leaf axil, puberulous; rachis to laxly 5 – 13 -flowered; floral bracts persistent, lanceolate. **Flowers** white with brownish purple shade to yellowish green, with pinkish red striations; pedicel and ovary puberulous. **Sepals** similar, oblong, abaxially puberulous, 5-veined. **Petals** oblong-lanceolate, glabrous, 3-veined; lip adnate to base of column wings, base 3-lobed; lateral lobes falcate-oblong; mid-lobe nearly reniform or orbicular; disk pinkish red, with 3 yellow lamellae; spur very short, ca. 1.3 mm, puberulous. **Column** dilated toward apex, ventrally villous; rostellum 2-lobed; operculum beaked; pollinia obovoid.

Flower : May *Fruit:* July
Exsiccatus : Dhorok 2300 m, **SR Lepcha & AP. Das** 20255, dated 03.08.2004
Status : Fairly common
Local Distribution : Dhorok Phusrey, 1600 – 3100 m.
General Distribution : E. HIMALAYA ; INDIA (NEPAL –Sikkim) BHUTAN.
 Note : Endemic to Eastern Himalaya.

Calanthe puberula Lindl., Gen. Sp. Orchid. Pl. 252. 1833; Hook.f., Fl.Brit. India 5: 848. 1885; King & Pantl. in Ann. Roy. Bot. Gard. Calc. 8:166.t.224. 1898; Pearce & Cribb in Fl.Bhutan 3(3); 289.2002; Lucksom in Orchid. Sikkim & N.E. Him. 421. 2007. *Calanthe amoena* W.W. Smith in Notes Roy .Bot .Gard. Edinburg 13: 191. 1921; *C. lepida* W.W. Smith, *op.cit.*192.1921.

Terrestrial herbs upto 60 cm tall. **Pseudobulbs** cylindrical, under leaf sheaths. **Leaves** 4 or 5, basal, not deciduous; blade elliptic or elliptic-oblong, 9 – 23 × 4.5 – 6 cm, glabrous or sparsely puberulous along 5 main veins, apex acute or acuminate. **Inflorescences** scape(s) 1 or 2, arising from near apex of pseudobulb, with several lanceolate sterile bracts; rachis with laxly 4 –10 -flowered; floral bracts persistent, lanceolate. **Flowers** pink; whitish purple, pedicel and ovary puberulous. **Sepals** similar, ovate-lanceolate, puberulous, 5-veined; lateral sepals oblique. **Petals** linear, whitish purple, 1 – 3-veined, single nerved. **Lip** adnate to base of column wings, spurless, 3-lobed; lateral lobes oblong-falcate; mid-lobe rhombic-elliptic to obovate-cuneate, margin dentate or fringed; disk without lamellae or calli. **Column** wing with mucronate projection, purplish – white, glabrous; rostellum 3-lobed; operculum ovate-cordate. Pollinia clavate; viscidium linear. Capsule narrowly elliptic.

Flower : July *Fruit:* August
Exsiccatus : Phusrey 2100 m, **SR Lepcha & AP. Das** 30243, dated 06.10.2004;
 Tungya 2190 m, **SR Lepcha & AP. Das** 31040, dated 08.10.2004
Status : Common
Local Distribution : Phusrey, Panglaxha 1600–3000 m
General Distribution : INDIA, NEPAL, BHUTAN, CHINA, JAPAN, VEITNAM.

Chusua Nevski

Chusua pauciflora (Lindl.) P.E. Hunt in Kew Bull.26(1): 175. 1971; Pearce & Cribb in Fl.Bhutan 3(3); 135.2002; Lucksom in Orchid. Sikkim & N.E. Him. 169: 2007. *Ponerorchis chusua* (D. Don) Soó, Acta Bot. Acad. Sci. Hung. 12: 352. 1966. *Orchis pauciflora sensu* Fisher ex Lindl., loc.cit. 1835, *nom.nud.*, non Tenore 1810. *Orchis chusua* D. Don, Prodr. Fl. Nepal. 23. 1825.

Terrestrial herbs upto 20 cm tall. Tubers oblong or globose. Stem with 1 – 3 tubular sheathing at base, 2 – 5-leaved. **Leaves** cauline, alternate, green, linear, oblong-lanceolate, or elliptic, lamina 3.5 – 13 × 0.3 – 3.5 cm, apex acute or acuminate. **Inflorescence** erect or slightly curved; rachis bearing upto 20-flowered; floral bracts lanceolate. **Flowers** pink, purplish red, or purple, medium-sized; ovary fusiform. **Sepals** : dorsal sepal erect, oblong or ovate-oblong, 3-veined; lateral sepals reflexed, ovate-lanceolate, oblique, 3-veined. **Petals** erect, forming a hood with dorsal sepal, narrowly ovate, ovate-oblong, oblique 3-veined. **Lip** broadly oblong to obovate, spurred, disk tinged white at base, marked with deep purple blotches; lateral lobes broadly oblong to subtriangular, falcate, apex obtuse or acute; mid-lobe oblong, subentire to notched and forming 2 lobules, spur pendulous, curved upward toward apex, attenuate.

Flower & Fruit : July

Exsiccatus : Nathang 3700 m, *SR Lepcha & AP. Das* 32987 & 32888, dated 03.10.2004.

Status : Common

Local Distribution : Nathang, KAS, Kupup, upto 4300 m.

General Distribution : HIMALAYA; INDIA (Kumaon – Sikkim) BHUTAN, S. CHINA.

Note : Endemic to Eastern Himalaya

Coelogyne Lindley

Key to the species

1. Leaf blade narrowly lanceolate; anthers dome shaped *C. punctulata*
+ Leaf blade narrowly oblong; anthers ovate *C. nitida*

Coelogyne nitida (Wall. ex D. Don) Lindl., Gen. Sp. Orchid. Pl. 40 . 1830; Pearce & Cribb in Fl.Bhutan 3(3); 332.2002; Lucksom in Orchid. Sikkim & N.E. Him. 476. 2007. *Cymbidium nitidum* Wall. ex D. Don, Prodr. Fl. Nepal. 35. 1825. *Coelogyne ochracea* Lindl. in Bot.Reg.32: t.69. 1846.

Epiphytic herbs, rhizomatous with scaly sheaths. **Pseudobulbs** cylindrical, furrowed, bearing 4 -5 scaly sheath, yellowish brown and strongly wrinkled when dried with 2 leaves at apex. **Leaves** 1 – 2, lamina ca. 16 – 30 x 2.5 – 3.6 cm, narrowly oblong, channeled petiole or base attenuate into petiole. **Inflorescence** ca. 4.5 cm, lower part covered by sheaths; rachis 2- or 3-flowered; floral bracts caduceous. **Flowers** white or light tinged yellowish, lip with 2 eye-like colored blotches, fragrant. **Sepals** subequal, pure white, dorsally keeled at base, 7-nerved, dorsal sepals ellipting oblong, subacute; lateral pair oblong ovate, acute, slightly twisted. **Petals** broadly linear or narrowly oblong, pure white 7 nerved. **Lip** oblong - ovate, 3-lobed; lateral lobes erect, subobovate, white with brownish lines, mid-lobe nearly elliptic. **Column** slightly broadly winged at apex. **Anthers** ovate, 2 chamber; pollinia 4, broadly oblong, compressed, yellow. Capsule 4 -4, narrowly clavate, yellowish green,

Flower : April *Fruit:* June
Exsiccatus : Tungya 2200m, *SR Lepcha & AP. Das 32312*, dated 13.09.2004
Status : Common.
Local Distribution : Tungya, Hangey, Singhaney, 1900 – 2500 m.
General Distribution : INDIA, NEPAL, BHUTAN, CHINA, MYANMAR.

Coelogyne punctulata Lindl., Coll. Bot. sub. t. 33. 1821; Pearce & Cribb in Fl.Bhutan 3(3); 332.2002 Lucksom in Orchid. Sikkim & N.E. Him. 480. 2007. *Cymbidium nitidum sensu* Roxb., Hort. Bengal. 63. 1814, *nom.nud.*, Fl. Indica ed. 3. 459. 1832 *non* Wall.ex D.Don.

Epiphytic herbs with short rhizome. **Pseudobulbs** bright yellow when dried, with 2 apical leaves; sheaths ovate-oblong; **Lamina** narrowly lanceolate, 6.5 – 13 × 1 – 3 cm, adaxially veinlets, apex acuminate. **Inflorescence** hysteranthous, slightly recurved; peduncle laterally compressed, glabrous; rachis 3- 4 cm bearing 2 – 4-flowered; floral bracts caducous, many nerved, scarious brown, suboblong-lanceolate; pedicellate ovary glabrous, pedicel white, ovary greenish white, distinctly lobed. **Flowers** white, with orange yellow spots or deep-colored eye-like blotches on lip. **Sepals** lanceolate or oblong-lanceolate; dorsal sepal elliptic – oblong, slightly arched over column but its tip reflexed; lateral pairs oblong – lanceolate, spreading. **Petals** linear to elliptic – lanceolate, pure white, single nerved. **Lips** elliptic oblong, 3 lobed, 3-lobed; lateral lobes erect, suborbicular, broad yellow blotch at its anterior end bordering by orange- brown; mid-lobe ovate-lanceolate, dentate lamellae extending from base of lip. **Columns** arcuate, both sides winged at apex, crenulate, 3 – orange – brown lines in front. **Anthers** dome-shaped cream – green, glabrous; pollinia 4 ca 2.5 x 2.2 mm, clavate, yellow. Capsules obovoid-oblong.

Flower : October *Fruit:* November
Exsiccatus : Tungya 2200m, *SR Lepcha & AP. Das 31150*, dated 03.10.2004
Status : Rare
Local Distribution : Tungya, 1300 – 2000 m.
General Distribution : INDIA, BHUTAN, CHINA, MYANMAR, THAILAND.

Crepidium Blume

Crepidium acuminatum (D. Don) Sziachetko, Fragm. Florist. Geobot., Suppl. 3: 123.1995; Pearce & Cribb in Fl.Bhutan 3(3); 214.2002; Lucksom in Orchid. Sikkim & N.E.Him. 323: 2007. *Malaxis acuminata* D. Don, Prodr. Fl. Nepal. 29. 1825. *M. wallichii* Lindl. Gen.Sp. Orchid. Pl.: 20. 1830.

Terrestrial herbs, usually lithophytic upto 35 cm tall. **Pseudobulb** enclosed in 2 – 3, upto 6.5 cm long sheathing bract. Stem cylindrical. **Leaves** 3 – 4, obliquely ovate, ovate- lanceolate, acute – acuminate, 5 – 13 × 2 – 6.5 cm, many nerved, thinly membranous, sheathing petiole. base contracted into a sheathlike, amplexicaul. **Inflorescences** erect; peduncle wingless; 10- or more flowered; floral bracts lanceolate. Flowers 13 – 35 cm long, ribbed, peduncle 5.5 – 13 cm long, ebracteate rachis laxly many flowered; pedicellate ovary ribbed, glabrous, lanceolate, reflexed. **Flower** yellowish green, **Sepals** subequal, margin convolute, reflexed, dorsal sepals 5.5 – 6.5 x 1.4 – 2mm, linear – oblong, acute; lateral pair 5.5 – 6 x 2 – 2.6 mm, broadly oblong, obtuse. **Petals** narrowly linear, margin revolute. **Lip** superior, ovate-oblong or obovate-oblong, shallowly 2-lobed, with a sinus 1.5 (–2) mm deep, with a pair of auricles embracing column, adaxially with a central groove in apical half; auricles ± narrowly ovate. **Column** long, fleshy; anther ovate, two chambered; pollinia 4.

Flower : June *Fruit:* August
Exsiccatus : Tungya, 2200m, *SR Lepcha & AP. Das 2577*, dated 23.07.2004

- Status* : Less common
Local Distribution : Tungya, Singhaney, upto 2300 m
General Distribution : INDIA, NEPAL, BHUTAN, CHINA, MYANMAR, VIETNAM, THAILAND, MALAYSIA, PHILIPPINES, JAVA.

Dactylorhiza Necker

Dactylorhiza hatagirea (D. Don) Soó, Nom. Nova Gen. *Dactylorhiza* 4. 1962; Pearce & Cribb in Fl. Bhutan 3(3); 581.2002. *Orchis hatagirea* D. Don, Prodr. Fl. Nepal. 23. 1823.

Terrestrial herbs, slender to robust, 30 - 60 cm tall. **Stem** with 2 or 3 tubular sheaths at base, slightly angular, glabrous green, 3 - 6 -leaved. **Leaves** 3 -5, upper 3 - 4, linear lanceolate, redcing in size upwards, sheathing petiole, dark green above and light green below, clustered subopposite near base of stem, alternate above, not spotted, 6.2 - 18 × 1.5 - 5.5 cm, obtuse or acuminate. **Inflorescences** upto 30 cm long, angular, glabrous; peduncle upto 10cm long, ebracteate; rachis densely many flowered; floral bracts lanceolate. **Flowers**, green to greenish yellow, medium-sized. **Sepals** subequal, oblong, ovate, the dorsal reflex. Elliptic, adnate to the petal to form hood over column; lateral pairs, oblong, - ovate, reflexed. **Petals** broadly ovate, subacute to acute, pale green. **Lip** oblong obtuse, slightly broader towards base. **Column** long, stout. **Anther cells** close together, parallel without tubes; pollinia elliptic, slightly clavate, without caudicles; staminodes obovate, lying transversely below the anther, above the conjoint stigma; spur pendent, ± straight to slightly curved forward, slightly shorter than ovary.

- Flower* : September - october
Exsiccatus : Nathang 3760 m, **SR Lepcha & AP. Das** 30805, dated 29.07.2005
Status : Rare
Local Distribution : Nathang, Donkyala, upto 3800 m
General Distribution : RUSSIA, SIBERIA, PAKISTAN, INDIA, NEPAL, BHUTAN, MONGOLIA.

Dendrobium Swartz

Dendrobium longicornu Lindl., Gen. Sp. Orchid. Pl. 80. 1830; Tuyuma in Hara Fl. E. Him. 432. 1966; Pearce & Cribb in Fl. Bhutan 3(3); 417.2002; Lucksom in Orchid. Sikkim & N.E. Him. 628. 2007. *Dendrobium flexuosum* Griff., Not. Pl. Asiat. 3: 317. 1851. *D. longicornu* var. *hirsuta* (Griff.) Hook.f., Fl. Brit. India 5: 720. 1885.

Epiphytic herbs. **Pseudobulb** upto 35 cm long, tuft, slender, covers with short coarse black hairs. **Leaves** many, 2.5 - 6 x 0.7 - 1.9 cm, linear lanceolate, bearing tubular stem clasping sheaths. **Inflorescences** corymb, terminal or axillary on leafless stem. Peduncle smooth, ovate to ovate lanceolate, acute bearing imbricate sheaths with black hairs; rachis slightly tetrete 1 -3 pedicellate flowers pedicellate ovary obscurely ribbed. **Flowers** white with orange yellow laminae of lip. **Sepals** subequal, not spreading, slightly opening at mouth, externally keeled, white, dorsal oblong -ovate, acute or acuminate, white, the lateral pair, ovate lanceolate, acute - acuminate. **Petals** ovate - lanceolate, acute or acuminate externally keeled, white. **Lips** upto 3.0 cm long, broughtly triangular 3-lobed, with a broad ridge running the centre from the base to the apex. **Column** 4 -5 mm long, bearing funnel shaped spur. **Anthers** dome-shaped, lip truncate, fringed, white, Pollinia unequal, inner one narrower.

- Flower* : August - December

- Exsiccatu* : Tungya 2300 m, **SR Lepcha & AP. Das 30218**, dated 06.10.2004
Status : Common.
Local Distribution : Panglakha, 1830 – 3000 m.
General Distribution : TEMPERATE HIMALAYA; INDIA, (NEPAL, Sikkim) Khasia, Naga Hills.
Note : Endemic to Eastern Himalaya.

Eria Lindley

Key to the species

1. Plants epiphytic; flowers 1 – 3; lips oblong ovate *E. spicata*
 + Plants epiphytic or lithophytic; flowers solitary; lips suborbicular *E. excavata*

Eria excavata Lindl., Gen. Sp. Orchid. Pl. 67. 1830; Tuyuma in Hara Fl. E. Him. 434. 1966; Pearce & Cribb in Fl. Bhutan 3(3); 381.2002; Luckson in Orchid. Sikkim & NE. Him. 562. 2007.
Pinalia excavata (Lindl.) Kuntze, Revis. Gen. Pl. 2: 679. 1891.

Epiphytic Herbs or lithophytic. **Pseudobulbs** cylindrical, bearing 1 distinct internode, base sheathing 4- or 5-leaved, distinctly many nerved. **Leaves** 4 – 6, 6.5 - 14.5 x 0.85 – 2.8 cm, elliptic-oblong, base slightly contracted into petiole, acute. **Inflorescence** born on leaf axil, reddish brown pubescent, sparsely few flowered; floral bracts lanceolate, abaxially brown pubescent, apex acuminate, peduncle puberulous. **Flowers** single, dull white or white suffused with pink, puberulous. **Sepals** subequal, distinctly 3 nerved, externally puberulous; dorsal sepal subelliptic, lateral sepals falcate-lanceolate. **Petals** elliptic – oblong, obtuse, distinctly 3 nerved, whitish pink. **Lip** suborbicular, 3-lobed white obovate in outline; lateral lobes ovate-triangular, obtuse, each with an erect callus adaxially, white stripe with redish purple line; mid-lobe subreniform, or thickened veins from base; central one extending to apex forming an apiculum. **Column** foot incurved; pollinia clavate elliptic. **Capsules** cylindrical.

- Flower* : May – June
Exsiccatu : Neora Pathak 2700 m, **SR Lepcha & AP. Das 2588**, dated 05.09.2004
Status : Common.
Local Distribution : Neora Pathak, Bara Ramitey, Siighaney 1800 – 2743 m.
General Distribution : TEMPEARETE HIMALAYA; INDIA, (NEPAL – Sikkim) Khasia, CAMBODIA, LAOS, MYANMAR, VEITNAM.

Eria spicata (D. Don) Hand.-Mazz., Symb. Sin. 7: 1353.1936; Pearce & Cribb in Fl. Bhutan 3(3); 383.2002; Luckson in Orchid. Sikkim & NE. Him. 559. 2007. *Octomeria spicata* D. Don, Prodr. Fl. Nepal. 31. 1825. *Eria convallarioides* Lindl. in Wall. Cat. ; 1975 .1829, *nom. nud*; Gen. Sp. Orchid. Pl. 70. 1830.

Epiphytic herbs. **Pseudobulb** cylindrical, oblong flattened many nerved, fusiform with internode, 2 – 4-leaved. **Leaves** 4 -6, unequal, uppermost petiolate and lower one sessile, elliptic or obovate-lanceolate, lamina 4.5 – 23 x 1.5 – 6.5 cm, apex obtuse. **Inflorescences** usually 1 – 3, densely many flowered, with 2 basal sheaths; rachis, pedicel, and ovary densely rusty puberulent; floral bracts lanceolate, glabrous. **Flowers** white or pinkish white. **Sepal** subequal, broadly oblong – obtuse, white or with shade of pale straw colored, 5 – nerved; ; dorsal sepal oblong – ovate subacute, concave; lateral sepals ovate, falcate, adnate to the foot of column to form a short obtuse mentum concave. **Petals** narrowly elliptic-oblong, shortly acuminate, 3-nerved. **Lip** 3-lobed, whitish purple, cuneate, oblong ovate with purple shade, the disc without lamellae; lateral lobes perpendicular to mid-lobe, ovate-triangular; mid-lobe deltoid. **Column** slender, upper part slightly enlarged. **Anthers** ca 1.4 x 1 mm. dark purple, two chambered. **Capsules** cylindrical.

Flower : February *Fruit* : August
Exsiccatu : Bara Ramitey Dara 2400 m, **SR Lepcha & AP. Das** 30233, dated 02.09.2004
Status : Common.
Local Distribution : Bara Ramitey Dara, 330 – 2330 m.
General Distribution : INDIA, NEPAL, BHUTAN, CHINA, MYANMAR, THAILAND.

Habenaria Willdenow

Habenaria stenopetala Linl., Gen. Sp. Orchid. Pl. 319. 1835; Tuyuma in Hara Fl. E. Him. 439. 1966; Pearce & Cribb in Fl. Bhutan 3(3); 153.2002; Lucksom in Orchid. Sikkim & N.E. Him. 222. 2007. *Habenaria delessertiana* Kranzlin in annuaire Conserv. Jard. Bot. Geneva 1: 108. 1897. *H. lineripetala* Hayta, Icon. Pl. Formos.4: 126, t.23. 1914. *H. amanoana* Ohwi in J. Japan Bot. 31(5): 136. 1956.

Terrestrial herbs upto 110 cm tall. Stem upto 80 cm long, bearing nodes and internodes. **Leaves** 10 – 13, **lamina** 6 – 18 x 2.5 – 6.5 cm, ovate lanceolate to oblong – lanceolate, acute to acuminate, margin undulate, base usually broad amplexicaulis. **Inflorescence** 13 – 23 cm long, erect terminal peduncle upto 5 cm long, terete, glabrous, linear lanceolate, acute to acuminate sheathing bracts; rachis 8 – 16 cm long, bearing crowded pedicellate flowers; pedicellate – ovary, shallowly ribbed, glabrous and slightly curved at top; floral bract ovate-lanceolate to linear – lanceolate, acuminate, 3-nerved. **Flowers** 1 – 3 cm long, pale green, lip brownish. **Sepals** subequal, ovate – lanceolate, acuminate, 3-nerved; dorsal sepals erect, slightly reflexed; lateral sepals weakly falcate, acuminate to sub-caudate, totally reflexed. **Petals** linear, acute, erect. **Lip** 0.7 – 1.5 cm long, shortly clawed at base astutely 3 – partite; central segment 6 – 8.5 cm long, horizontal. **Column** 3 – 5 mm long, stout. **Anther cell** parallel, narrow, erect, tubes long; pollinia oblong, caudicles slender long, staminotes ovate, rigose; stigma 2, oblong.

Flower : August – September
Exsiccatu : Padamchen below, 2050 m, **SR Lepcha & AP. Das** 2567, dated 14.10.2004
Status : Extremely Rare
Local Distribution : Padamchen, 300 – 2050 m.
General Distribution : INDIA, NEPAL, CHINA, BHUTAN
 Note : Endemic to Eastern Himalaya

Herminium R. Brown

Key to the species

1. Plants to 80 cm tall; leaf linear lanceolate; 3 lobed *H. lanceum*
 + Plants to 20 cm tall; leaf oblong elliptic; obscurely 3 lobed *H. macrophyllum*

Herminium lanceum (Thunb. ex Sw.) Vuijk in Blumea 11(1): 228. 1961; Pearce & Cribb in Fl. Bhutan 3(3); 162.2002; Lucksom in Orchid. Sikkim & N.E. Him. 175. 2007. *Ophrys lancea* Thunb. ex Sw., Kongl. Vetensk. Acad. Nya. Handl. 21: 223. 1800. *H. angustifolium* (Lindl.) Benth. et Hook.f., Gen Pl. 3: 622. 1880; Hook.f., in Fl. Brit. India 6: 129. 1885.

Terrestrial herbs, 20 – 80 cm tall. Tuber small, single, oblong or ellipsoid, puberulous. Stem 13 – 40 cm, with 2 tubular sheaths at base. **Leaves** 3 – 4, cauline **lamina** 7.5 – 23 x 1.5 – 2.1 cm, linear or linear lanceolate, acute to acuminate, many nerved, sub tubular sheaths. **Inflorescences**

spike 15 - 43cm long, erect, peduncle 5 - 13 cm long, cylindrical, angular lanceolate, bearing many flowers. **Flowers** 5 - 7 mm across, green, glabrous; flower bracts 1 - few, linear lanceolate. **Sepals** subequal, green 1-nerved oblong-ovate,; dorsal sepal fused with petals to form a hood over column; lateral sepals spreading. **Petals** united linear, single nerved, translucent pale green. **Lip** 3-lobed, deflexed from the base, oblong in general outline the hypochile minutely auriculate ; mesochile concave epichile narrowly tri-fid. **Column** long, white; staminode large lying externally towards base of anther cell; **anther-cells** parallel closed together; pollinia globose, viscidia orbicular.

Flower : July - August

Exsiccatus : Nathang - Panglaxha, 3600m, *SR Lepcha & AP. Das* 30867, dated 16.10.2004

Status : Common.

Local Distribution : Tungya, Nathang - Panglaxha, 2100 - 3600 m.

General Distribution : TEMPERATE HIMALYA; INDIA, BHUTAN, MYANMAR, THAILAND, INDOCHINA, INDONESIA, KOREA, PHILIPPINES, VEITNAM, MALAYSIA, CHINA, AND JAPAN.

Hermanium macrophyllum (D. Don) Dandy in J. Bot.70: 328. 1932; Pearce & Cribb in Fl.Bhutan 3(3); 164.2002; Lucksom in Orchid. Sikkim & N.E. Him. 174. 2007. *Neottia macrophylla* D. Don., Prodr. Fl. Nepal. 27. 1825. *H. congestum* Lindl. in Bot. Reg. 18 sub t. 1499. 1832.

Terrestrial herbs, upto 20 cm tall. Tuber ovoid- globose, hairy. **Stem** erect, terete, glabrous, bearing obtuse open mouth, tubular. **Leaves** 2 - 3, arising close together near base, **lamina** 3.5 - 13 x 0.5 - 2 cm, narrowly oblong - elliptic, rarely lanceolate, acute, or acuminate, distinctly nerved, narrow to short sheathing base. **Inflorescence** 2.5 cm long, ribbed, green, glabrous peduncle often naked but rarely bearing a solitary upto 2 mm long, ovate, acute sheathing bract; rachis to 5 cm long, many flowered; pedicellate ovary ovoid, hooked at apex; floral bracts ovate lanceolate to triangular, acute. **Flowers** to 3.5 mm across , drooping. **Sepals** subequal, obtuse; dorsal sepals broadly ovate, obtuse, 1 nerved; lateral sepals narrowly oblong - ovate, subacute, slightly spreading. **Petals** obliquely triangular - lanceolate, 1 nerved. **Lip** obscurely 3 -lobed, fleshy, triangularly ovate - lanceolate, blunt. **Column** 0.5 - 0.8 mm tall; pollinia broadly ellipsoid with blunt ends, caudicles very short, its glandoblique; staminodes oblong with tapering ends. **Capsule** ca 0.55 cm long.

Flower : August

Exsiccatus : Singhaney 2500 m, *SR Lepcha & AP. Das* 27780, dated 17.10.2004

Status : Most common

Local Distribution : Padamchen, 2800 - 4300 m.

General Distribution : INDIA, NEPAL, BHUTAN, CHINA.

Liparis L.C. Richard

Liparis resupinata Ridley, Journ. Linn. Soc., Bot. 22: 290. 1886. *L. ridleyi* Hk.f., Icon, Pl. ser. 3 (19): f.1887. 1889; Hook.f. in Fl. Brit. India 5: 705. 1885; Tuyuma in Hara Fl. E. Him. 441. 1966; Pearce & Cribb in Fl.Bhutan 3(3); 209.2002; Lucksom in Orchid.Sikkim & N.E.Him.289. 2007. *L. resupinata* var.*ridleyi* King et Pantling in Ann. Roy. Bot Gard.(Calcutta) 8: 37,t. 1898.

Epiphytic herbs. **Pseudobulbs** subcylindrical or \pm spindle-shaped, with 3 or 4 remote leaves. **Leaves** 2- 4; **lamina** linear-lanceolate, acute or acuminate, membranous, 3.5 – 6.5 \times 0.3 – 1.3 cm, base slightly contracted, articulate, subsessile, margin serrate. Scape arching or pendant with several sterile bracts. **Inflorescences** 13 – 33 cm long, sub-pendulous, laterally compressed; peduncle erect, laceolate, concave; rachis 7 – 30 cm long, pedulous, 4 ribbed bearing many well spaced pedicellate 10 – 50-flowered; floral bracts lanceolate. **Flowers** brownish – yellowish green, smooth. **Sepals** sub-equal, oblong, obtuses longer than lip, margin recurved; dorsal sepal oblong or elliptic-oblong, 1-veined, retroflexed, abaxially carinate; lateral pair not carinate. **Petals** narrowly linear; light brownish yellow. **Lip** broadly oblong ovate; hypochile with semi-orbicular lobes on both sides, centrally with 1 bilobed callus. **Column** erect, semi-orbicular wings on both sides, greenish yellow with translucent white wings; anther ovate, two chambered, pale brownish-green. Pollinia orange yeallow, clavate. **Capsules** obovoid-oblong.

Flower : October *Fruit.* March
Exsiccatu : Phusey 2100 m, **SR Lepcha & AP. Das 30277**, dated 07.10.2004
Status : Common.
Local Distribution. : Dhorok, 600 – 4100 m.
General Distribution : E. HIMALAYA; INDIA (Sikkim), and Assam.

Note : Endemic to Eastern Himalaya.

Malaxis Soland ex Swartz

Malaxis mucifera (Lindl.) Kuntze, Rev. Gen. Pl. 2: 673. 1891; Tuyuma in Hara Fl. E. Him. 444. 1966; Pearce & Cribb in Fl. Bhutan 3(3):219. 2002; Luckson in Orchid Sikkim & N.E.Him. 319. 2007. *Dienia mucifera* Lindl. in Wall. Cat.: 1835. 1829, *nom. nud.*; Gen. Sp. Orchid. Pl. 23. 1830. *Microstylis mucifera* (Lindl.) Ridley in Journ. Linn. Soc. 24: 333. 1888.

Terrestrial herbs. **Pseudobulbs** enveloped in 3 -4 1.5 – 4.5 cm long, many nerved, ovate shortly acuminate sheath. **Stem** upto 4cm long, bearing sheathing bract. **Leaves-** 2 unequal; lamina 3.5 x 11.5 – 1.5 x 5.5 cm, obovate – rotund to ovate – lanceolate; cordate base sheathing petiole. 2 – 6 (-13) \times 1.5 – 3.5(-5) cm, base contracted into \pm amplexicaul petiole 3–5.5 cm, obtuse or subacute. **Inflorescence** straight or ribbed, glabrous, peduncle upto 14cm long; ebracteate, raceme bearing many minute flowers; pedicellate ovary 4 – 4.7 cm long, ovary ribbed; floral bracts lanceolate. **Flowers** ca 5.5 mm long. **Sepals** unequal, oblong, lanceolate, acute to acuminate; dorsal 1.8 - 2.5 \times 0.7 – 1.7 mm; lateral pair 1.9 - 2.2 \times 0.7 – 1.5 mm. **Petals** linear, very narrow, subacute, reflexed. **Lip** broadly ovate, fleshy concave at base slightly acuminate at upper portion. **Column** 0.7 mm long, fleshy. **Anthers** transversely oblong, two chambered; pollinia 4, ellipsoid, unequal, inner one smaller.

Flower : June *Fruit:* August
Exsiccatu : Beusa, 2580 m, **SR Lepcha & AP. Das 31045**, dated 27.07.2005
Status : Rare
Local Distribution : Panglaxha, 2600 – 4300m
General Distribution : AFGHANISTAN AND TEMPERATE HIMALAYA; INDIA, (Gharwal – BHUTAN)

Oberonia Lindley

Oberonia falcata King & Pantling in Journ. Asiat. Soc. Beng. 64(3): 329. 1896; Tuyuma in Hara Fl. E. Him. 445. 1966; Pearce & Cribb in Fl. Bhutan 3(3); 229.2002; Lucksom in Orchid. Sikkim & N.E. Him 244. 2007. *Oberonia pendula* Ridley in Journ. Straits branch Roy. Asiat. Soc. 61: 38. 1912.

Epiphytic herbs. Stem 3.5-13 cm long, laterally complexed, leaf sheaths smooth pale green. **Leaves** 5-6, **lamina** 1 - 5.5 x 0.4 - 0.50 cm falcate, ensiform, acute or shortly acuminate. **Inflorescence** 6 - 13 cm long, erect; peduncle upto 2 cm long, terete, acuminate, bracts; rachis ribbed, bearing many short pedicellate flowers; **pedicellate ovary translucent green**; **floral bracts** lanceolate, translucent green. **Flowers** upto 3 mm long, orange yellowish - green, glabrous. **Sepals** ovate, subacute or obtuse, entire. **Lip** 1.3 - 1.8 mm long, orange yellow, broadly oblong in outline. **Column** very short bearing 2 staminal wings, green. **Anthers** ovate, membranous, light white; **pollinia** ovate, orange yellow.

Flower & Fruit : July - October

Exsiccatus : Nathang - Panglakha, 2800 m, **SR Lepcha & AP. Das 02590**, dated 07.09.2005

Status : Common

Local Distribution : Nathang, Rachela, upto 3500 m.

General Distribution : HIMALAYA; INDIA, (E. NEPAL - Sikkim)

Note : Endemic to Eastern Himalaya.

Odontochilus Blume

Odontochilus lanceolatus (Lindl.) Blume, Coll. Orchid. 80. t. 29. 1858; Pearce & Cribb in Fl. Bhutan 3(3); 105.2002; Lucksom in Orchid. Sikkim & N.E. Him. 2007. *Anoectochilus lanceolatus* Lindl., Gen. Sp. Orchid. Pl. 499. 1940. *A. luteus* Lindl., Journ. Proc. Linn. Soc., Bot. 1: 179. 1857.

Epiphytic herbs upto 40 cm tall. Stem terete, glabrous, 4 - or 5-leaved. **Lamina** abaxially pale green, adaxially dark green with whitish stripes along midvein and 2 lateral veins, ovate, ovate-lanceolate, or elliptic, 2 - 6.5 x 1.5 - 5.5 cm, acute; petiole-like base with tubular sheath. **Inflorescence**: peduncle pubescent, with 1 or 2 sheathing sterile bracts; rachis 4 - 7 cm, ± 10-flowered, **floral bracts lanceolate to ovate-lanceolate, abaxially glabrous, acuminate**. **Flowers** resupinate, yellow; ovary and pedicel twisted. **Sepals** yellowish green, glabrous, 1-veined; dorsal sepal forming a hood with petals, ovate to ovate-oblong; lateral sepals ovate-elliptic, oblique. **Petals** whitish green, ovate, strongly oblique, 1-veined. **Lips** golden-yellow, Y-shaped, hypochile slightly dilated, bisaccate; mesochile with a pectinate flange along either margin; epichile transversely dilated, 2-lobed; cuneate-oblong to obovate. **Column** short, with 2 deltoid wings toward apex; rostellum twisted.

Flower : August

Fruit: September

Exsiccatus : Dhorok, 2250 m, **SR Lepcha & AP. Das 30205**, dated 24.10.2004

Status : Rare.

Local Distribution : Phusrey, Singhaey, Hangey, 1500 - 2200 m.

General Distribution : INDIA, BHUTAN, MALAYSIA, PHILIPPINES; SULAWESI, SUMATRA.

Otochilus Lindley

Otochilus albus Lindl., Gen. Sp. Orchid. Pl. 35. 1830; Pearce & Cribb in Fl.Bhutan 3(3); 342.2002; Luckson in Orchid. Sikkim & N.E. Him. 509. 2007. *Broughtonia pendula* Wall. ex Lindl., Gen. Sp. Orchid. Pl. 35. 1830, *nom. nud.*

Epiphytic herbs, or lithophytic. **Pseudobulbs** subcylinder, grooved, enclosed in tubular sheaths. Leaf -2, narrowly elliptic - oblong, acuminate, lamina 8 -18 × 1.3 - 2.5 cm, acuminate. **Inflorescence** synanthous with young leaves, bearing gland dotted imbricate sheaths, peduncle terete, sheathed; rachis slender, with laxly 8- or 9-flowered; floral bracts caducous, ovate-lanceolate. **Flowers** uniformly white with yellowish brown band at the middle of the lip. **Sepals** subequal, oblong - lanceolate, acute, concave, white; dorsal sepal narrowly oblong, 3-veined, acuminate; lateral sepals slightly oblique. **Petals** narrowly oblong-lanceolate, 3-veined, acute. **Lips** 3-lobed; lateral lobes embracing column, nearly one fifth to one fourth of its length; mid-lobe oblong, adaxially ± papillate, apex apiculate. **Columns** upto 6 mm; rostellum usually broadly ligulate, oblong, slightly winged towards apex, bent downwards at its base.

Flower : June - July

Exsiccatus : Phusrey, 2150 m, **SR Lepcha & AP. Das 30205**, dated 06.10.2004;
Beusa 2200 m, **SR Lepcha & A.P Das 30749**, dated 12.08.2005

Status : Common

Local Distribution : Phusrey, Beusa, upto 2200 m.

General Distribution : INDIA Sikkim, NEPAL BHUTAN, Assam, khasia, MYANMAR, THAILAND, VIETNAM.

Platanthera L.C. Richard

Key to the species

1. Plant upto 50 cm tall; leaves 3 - 5; flower not strongly fragrant *P. bakeriana*
+. Plant more than 50 cm tall; leaves 3 - 11; flower strongly fragrant *P. clavigera*

Platanthera bakeriana (King & Pantl.) Kranzlin, Orchid. Gen. Sp.1: 632. 1898; Tuyuma in Hara Fl. E. Him. 448. 1966; Pearce & Cribb in Fl.Bhutan 3(3); 185.2002; Luckson in Orchid. Sikkim & N.E. Him. 144-145. 2007. *Habenaria bakeriana* King & Pantl. in Journ. Asiat. Soc. Beng. 65(2): 132. 1896.

Terrestrial herbs upto 25 - 50 cm tall. Stem upto 30cm long, slightly angular, glabrous, green, oblong- ovate, sheaths. **Leaves** usually 3 -5, **lamina** 4.5 - 23 x 13 - 6-5 cm, upper 3 - 4, linear lanceolate, tapering upwards, sheathing petiole, dark green above and light green below, with prominent midrib. **Inflorescence** erect, upto 32 cm long, angular, glabrous; **peduncle** 5 - 12 cm long, ebracteate; rachis upto 22 cm long bearing many well spaced flowers; pedicellate ovary 0.6 - 2 cm long, shortly beaked at top; floral bracts : lower most bract biggest and reflexed, linear lanceolate; **Flowers** to 1.5 cm across, greenish - yellow. **Sepals** subequal, oblong, ovate; dorsal sepals elliptic - ovate, subacute. **Petals** broadly ovate, subacute, oblique, pale green with broad base. **Lips** 5.5 - 6 1.8 mm long oblong, obtuse, slightly broader towards base; spur slender, recurved. Column 2 mm long, stout. **Anther** cell closed together, parallel without tubes; pollinia elliptic, slightly clavate, without caudicles; staminodes obovate; stigma conjoint to form a bilobed elliptic under of spur.

Flower & Fruit : September - October

Exsiccatus : Panglakha 2960 m, *SR Lepcha & AP. Das 31078*, dated 28.10.2004
Status : Rare
Local Distribution : Panglakha, Rachela, below upto 3000 m.
General Distribution : TEMPERATE HIMALAYAS; INDIA, NEPAL, BHUTAN, CHINA.
Note : Endemic to Eastern Himalaya

Platanthera clavigera Lindl., Gen. Sp. Orchid. 226. 1835; Pearce & Cribb in Fl. Bhutan 3(3); 186.2002; Lucksom in Orchid. Sikkim & N.E. Him 147, 2007. *Habenaria densa* Wall. ex Lindl., Gen. Sp. Orchid. 326. 1835. *Habenaria clavigera* Dandy, Journ. Bot. 48: 246. 1930.

Terrestrial, herbs, upto 145 cm tall. Tuber 2 one spherical, oblong, and other one oblong, horizontal, compress. Stem upto 65 cm long, erect, enveloped in 4.5 – 5.5 cm long, tubular stem clasp leaf sheaths, tubular sheath. **Leaves** 3 – 11, very unequal, **lamina** 7.5 – 16 x 2 – 8 cm, narrowly elliptic, acute, tapering towards long tubular sheaths. **Inflorescence** 35 – 75 cm long, erect, angular; peduncle 13 – 16 cm long, bearing 3 – 4, linear-lanceolate acuminate bracts, reducing in size upwards; rachis 13 – 70 cm long, bearing dense shortly pedicellate flowers; pedicellate ovary obliquely ridge, glabrous; floral bracts lanceolate, single nerved. **Flowers** 6 – 10 mm., greenish yellow, strongly fragrant. **Sepals** sub-equal, ciliolate, spreading; dorsal sepals elliptic – oblong, obtuse, concave; lateral pairs oblong – ovate, obtuse, reflexed. **Petals** oblong – lanceolate, obtuse, bearing oblique bases. **Lip** linear obtuse. Bearing a transverse callus at its base close to column; spurs ca 5 mm, clavate, pendulous. **Column** ca 1.5 – 2 mm long. Anther cells distant, parallel, without tubes; staminode large; pollinia 2, ca 0.9 mm long, elliptic, light brown; caudicle ca 0.13 mm long; gland oblong white. Stigma 2 small, Fruit suborbicular.

Flower : August – September
Exsiccatus : Singhaney, 2500m, *SR Lepcha & AP. Das 02575*, dated 30.10.2004
Status : Not Common.
Local Distribution : Singhaney, Rachela, 1800 – 2800 m
General Distribution : INDIA, NEPAL, BHUTAN, CHINA.
Note : Endemic to Himalayas

Pleione D. Don

Key to the species

1. Pseudobulbs barrel shaped; leaves upto 2; flowers solitary or rarely 2 *P. praecox*
 + Pseudobulbs conical to ovoid; leave solitary; flowers solitary *P. hookeriana*

Pleione hookeriana (Lindl.) B.S. Williams, Orch. Grow. Man. (ed. 6): 548. 1885; Tuyuma in Hara Fl. E. Him. 448. 1966; Pearce & Cribb in Fl. Bhutan 3(3); 356.2002; Lucksom in Orchid. Sikkim & N.E. Him. 503. 2007. *Coelogyne hookeriana* Lindl., Fol. Orchid. 5(Coelogyne): 14. 1854. *Pleione hookeriana* var. *brachyglossa* (Reichenb.) Rolfe in Orchid. Rev. 11: 291. 1903.

Epiphytic herbs or lithophytic. **Pseudobulb** coepitose, conical to ovoid, green or purple, 1-foliolate. **Leaves** solitary, elliptic-lanceolate or suboblong, 5.6 – 13 x 2.5 – 3 cm, base attenuate into a petiole-like stalk, many nerves, proceeding from the base of the adult pseudo-bulb, tapering towards petiole base; enclosed in tubular, overlapping sheaths.. **Inflorescence** bearing 1 – 2 pedicellate flower, arising from base of pseudobulb, erect; peduncle 5.8 – 12 cm; floral bract suboblong, 9 – 15 x 4 – 5.9 mm, apex obtuse. **Flower** solitary; sepals and petals pale purplish red to nearly white, lip white with a yellow center and purple or yellowish brown spots. **Sepals**;

dorsal sepal suboblong or oblanceolate, apex acute; lateral sepals lanceolate, falcate, slightly oblique, slightly shorter than dorsal sepal. **Petals** oblanceolate. **Lip** oblate or subcordate, 3-lobed, apical margin irregularly denticulate; disc with 7 rows of papillae. **Column** ± arcuate, wings narrow below and dilated above. **Capsules** suboblong.

Flower : May *Fruit*: July
Exsiccatae : Ramitey dara NNP border, 2400 m, *SR Lepcha & AP. Das 31125*, dated 03.10.2004; Singhaney dara 2300 m, *SR Lepcha & AP. Das 27723*, dated 03.10.2004; Phusrey 2100 m, *SR Lepcha & AP. Das 30225*, dated 07.10.2004.
Status : Rare
Local Distribution : Panglakha, 2200 – 3500 m.
General Distribution : TEMPERATE E. HIMALAYA; INDIA, (E. NEPAL – BHUTAN, MYANMAR, THAILAND

Pleione praecox (J.E. Smith) D. Don, Prodr. Fl. Nepal. 37. 1825; Tuyuma in Hara Fl. E. Him. 449. 1966; Pearce & Cribb in Fl. Bhutan 3(3); 358.2002; Lucksom in Orchid. Sikkim & N.E. Him. 504. 2007. *Epidendrum praecox* J.E. Smith, Exot. Bot. 2: 73. 1806. *Coelogyne praecox* (J.E. Smith) Lindl., Bot. 2: 73, t.97. 1806.

Epiphytic herbs. **Pseudobulb** barrel shaped, green mottles with purplish-brown, enveloped in warty fibrous sheath 2- or rarely 1-foliolate. **Leaves** -2; **lamina** elliptic-oblanceolate to elliptic, 7.5 – 23 × 3 – 6 cm, papery, base attenuate into a petiole-like stalk many nerved petiolate base; deciduous during flowering time. **Inflorescence** usually appears after withering of leaves, erect; peduncle with imbricate in 3 papillate sheaths, dark – purple mottled with green; rachis with one or rarely 2 pedicellate flower; pedicellate ovary ribbed, obovoid, obtuse, caduceus; floral bract oblong-oblanceolate. **Flowers** solitary or rarely 2, large, white suffused with purplish red. **Sepals** subequal, oblanceolate, 7 nerved, purple; dorsal sepal suboblong-lanceolate; lateral sepals slightly wider at base than dorsal sepal. **Petals** linear-lanceolate, slightly falcate, 5-nerved, purple. **Lip** ovate-orbicular, whitish purple, bearing 3-lobed; apical lobes broadly, oblong-ovate, with irregular serrulate edges into 5 laciniate keels, lateral lobes inconspicuous; mid-lobe lacerate; disc with 3 – 5 rows. **Column** bearing short sag at the base, apex expanded into a wide undulate irregularly lobulate hood, pure white. Anther 5 – 6, oblong ovate, white. Pollinia 4, in pair, clavate, yellow.

Flower : September – December
Exsiccatas : Deorali dara, 2300 m, *SR Lepcha & AP. Das 24584*, dated 15.07.2005
Status : Common.
Local Distribution : Phusrey, Deorali dara, 1900 – 3000 m.
General Distribution : INDIA, NEPAL, BHUTAN, CHINA, MYANMAR, THAILAND.

Satyrium Swartz

Key to the species

1. Stem upto 60 cm; leaves elliptic; dorsal sepal linear oblong *S. nepalense*
+ Stem upto 35 cm; leaves oblong lanceolate; dorsal sepal oblong – obtuse *S. ciliatum*

Satyrium ciliatum Lindl., Gen. Sp. Orchid. Pl. 341. 1838; Pearce & Cribb in Fl. Bhutan 3(3); 195.2002; Lucksom in Orchid. Sikkim & NE. Him. 224 -225 . 2007. *Satyrium nepalense* var. *ciliatum* (Lindl.) Hook.f., Fl. Brit. India 6(1): 168. 1885. *S. seichunicum* Kranzlin in Bot. Jahrb. Syst. 29: 266 .1900.

Terrestrial herbs slender, upto 35 cm tall. Stem enveloped by tuber sheaths 1- or 2-leaved. **Leaves** oblong – lanceolate to narrowly ovate, **lamina** 13 – 14.5 × 2.8 – 5.2 cm, acuminate to acute, long sheathing base. **Inflorescences** erect terete, peduncle 5 – 12 cm, lanceolate; rachis long, slightly angular, bearing many shortly pedicellate flowers; pedicellate ovary, ridged, dark-purple and erect; many nerved, deflexed. **Flowers** upto 8 mm across, hermaphrodite, rarely stamen abortive or absent, pinkish- white or purely white. **Sepals** ciliated margin, pink; dorsal sepal 4.5 – 5.5 × ca. 1.8 mm, oblong, obtuse; lateral sepals oblong-spatulate, 3.5 – 7.7 × ca. 1.3 mm. **Petals** linear, obtuse, bearing erose margin, pink. **Lip** 5.5mm superior, ovate, hooded, strongly keeled at the back. **Column** ca 5.5 mm long, curved, contracted at the base; pollinia 2 pyriform, bipartite, ; staminodes rugulose, hemispheric, situated in upper sides of anther cells; rostellum broadly and bluntly triangular.

Flower : July - October

Exsiccatus : Panglaxha, 2900 m, **SR Lepcha & AP. Das** 230, dated 12.10.2004

Status : Rare

Local Distribution : Panglaxha, 2600 – 4350 m.

General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN S. CHINA,

Note : Endemic to Eastern Himalaya.

Satyrium nepalense D. Don, Prodr. Fl. Nepal 26. 1825; Gen. and Spec. Orch. 340. 1838; Journ. Lin. Soc. 3: 44. 1859; Hook.f., in Fl. Brit. India 6: 168. 1885; Tuyuma in Hara Fl. E. Him. 450. 1966; Hajra & Verma, Fl. Sikkim 1: 110. 1996; Pearce & Cribb in Fl. Bhutan 3(3); 193.2002; Lucksom in Orchid. Sikkim & N.E. Him. 224. 2007. *Satyrium perrottetianum* A. Richard in Ann. Sci. Nat. (Paris) Ser.2, 15: 76. 1841. *S. albiflorum* A. Richard, loc.cit. 1841. *S. pallidum* A. Richard, op.cit.77. 1841.

Terrestrial herbs, slender upto 60cm tall. Tubers oblong-ellipsoidal 1.5 – 4.5 × 0.5–1.8 cm. Stem with 1 – 3 membranous, sheaths at base. **Leaves** 2 – 3; **lamina** 13 x 22 x 5 – 11 cm, narrowly elliptic, acute, slightly fleshy, prominently nerved, broad, tubular sheaths, dark-green above and silvery lining below, basal leaves subopposite, or cauline and rarely alternate, broadly ovate, ovate-lanceolate, or lanceolate-oblong, 3.5 x 16 × 1.5 – 6.6 cm, margin crisped, apex acute or acuminate. **Inflorescences** with more than 20 laxly pedicellate flowered; floral bracts reflexed; peduncle 4.5 – 23cm, slender to stout, with several tubular bracts; rachis slightly angular. **Flowers** fragrant, whitish, pinkish green, or pale purple, glabrous, hermaphroditic; pedicel and ovary glabrous. **Sepals**; dorsal sepal narrowly oblong-elliptic, apex obtuse; lateral sepals oblong to subovate, slightly oblique. **Petals** narrowly oblong to narrowly elliptic. **Lip** superior, strongly keeled on the back, tubular, hooded, 2-spurred, margin irregularly dentate; **Column** contracted at base, expanded at apex. **Anther cell** long, distantly separated from each other; staminodes hemispheric, rugulose; rostellum triangular, column incurved.

Flower : October *Fruit*: November

Excisicatae : Changu 3720m, **SR Lepcha & AP. Das** 29380, dated 11.10.2004; Padamchen – Premlakha 2600 m, **SR Lepcha & AP. Das** 32870, Dated 27.10.2004; Memenchu 3600 m, **SR Lepcha & AP. Das** 100, dated 20.07.2005.

Status : Rare.

Local Distribution : Rachel, 2100 – 3720m.

General Distribution : TEMPERATE HIMALAYA; INDIA, NEPAL, BHUTAN, MYANMAR, SRI LANKA.

Spathoglottis Blume

Spathoglottis ixiooides (D. Don) Lindl., Gen. Sp. Orch. Pl. 120. 1931; Pearce & Cribb in Fl. Bhutan 3(3); 307.2002; Lucksom in Orchid. Sikkim & N.E. Him. 402:1.2007. *Cymbidium ixiooides* D. Don, Prodr. Fl. Nepal 36. 1825.

Lithophytic or terrestrial herbs, Pseudobulbs, rounded-compressed pinkish-white, bearing 2 or 3 leaves. **Leaves** 2 or 3, blade linear-lanceolate, **lamina** 4.5 – 13 × 0.3 – 1 cm, base acute, sheathing; leaf base forming a pseudostem, many nerved. **Inflorescence** slender, with 2 tubular sheaths at base, sparsely pubescent; peduncle slender, terete, 1-3 pedicellate flowers; rachis short, bearing 1- or 2-flowered; floral bracts ovate-lanceolate, pubescent. **Flowers** yellow; pedicel and ovary densely villous. **Sepals**, dorsal sepal elliptic, 5- or 6-veined, outer surface sparsely villous; lateral sepals ovate-lanceolate to oblong-lanceolate, outer surface sparsely villous. **Petals** 7-veined. **Lip** erect, saccate at base, 3-lobed, with 2 acute auricles at base; disk with 1 keel; lateral lobes ovate-triangular, shallowly incised, mid-lobe obovate, keel arising from base of lip, pubescent, dividing into 2 large, rounded-obtuse extensions; **Column** upto 1.9 cm.

Flower : July *Fruit*: August
Exsiccatus : Bara Ramitey Dara 2050m, **SR Lepcha & AP. Das 30259**, dated 08.10.2004
Status : Rare
Local Distribution : Bara Ramitey Dara, 1950 – 2050 m
General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN.
Note : Endemic to Eastern Himalaya

Spiranthes L.C. Richard

Spiranthes sinensis (Pers.) Ames, Orchidaceae 2: 53. 1908; Tuyuma in Hara Fl. E. Him. 450. 1966; Pearce & Cribb in Fl. Bhutan 3(3); 117.2002; Lucksom in Orchid. Sikkim & N.E. Him. 136. 2007. *Neottia sinensis* Pers., Syn Pl. 2: 511. 1807. *Spiranthes pudica* Lindl., Coll. Bot. t.30. 1831; *S. indica* Steud., Nomencl. Bot. ed.2: 625. 1841.

Terrestrial Herbs, upto 45 cm tall. Stem stout or slender. Tuber cylindrical, fleshy. **Leaves** 3 – 5, erect; , **lamina** broadly linear to broadly linear-lanceolate, rarely oblanceolate, 3.5 – 13 × 0.6 – 1.5 cm, acute or acuminate. **Inflorescence** erect 11 – 23 cm, glabrous; rachis bearing many spirally arranged flowers; floral bracts ovate-lanceolate, long acuminate. **Flowers** purplish red, pink, or white. **Dorsal sepal** forming a hood with petals, narrowly oblong, cymbiform, glabrous, subacute; lateral sepals lanceolate, oblique, subacute, base gibbose. **Petals** rhombic-oblong, oblique, ca. as long as dorsal sepal, obtuse. **Lip** broadly oblong, concave base containing 2 clavate glands; disk papillate. **Column** erect, anther ovoid; rostellum narrowly triangular-lanceolate; ovary pale green, glabrous; stigma discoid.

Flower : March – October
Exsiccatae : Rachel 2950 m, **SR Lepcha & AP. Das 20279**, dated 25.10.2004
Singhaney – Panglakha 2850 m, **SR Lepcha & AP. Das 31153**, dated 03.10.2004.
Status : Rare
Local Distribution : Panglakha, Rachel, KAS, 2300 – 2990 m.
General Distribution : RUSSIA, INDIA, BHUTAN, AUSTRALIA, E.ASIA, MALAY ARCHIPELAGO, AND SOUTH WEST PACIFIC.

Younia

Younia pranii King & Pantling in Ann.Roy.Bot.Gard.(Calcutta) 8:175,t.237.1898; Hajra & Verma, Fl. Sikkim 118. 1996; Pearce & Cribb in Fl.Bhutan 3(3); 245.2002.

Terrestrial plant upto 13 cm, rhizome densely clothed with small, overlapping, narrowly lanceolate, acuminate appressed scales, stem glabrous. Sheaths 2 Or 3, loose, 0.5 – 1 x 0.4 – 0.4 cm. **Inflorescence** laxly 3- 4 flowered; floral bracts ovate, fleshy. **Flowers** c. 1.3 x 1.8 cm, white; pedicel and ovary uot 5 cm long. **Sepals** similar , ovate – lanceolate, subacute 3 veined. **Petals** ovate anther orbicular, obtuse, entre, 5- veined, 1.8 – 0.7 cm. **Lip** entire, spurless upto 2.5 cm long. **Column** stouts; anther anticous, broad beaked, to 7 mm long. **Fruits** fusiform.

Flower & Fruit : July

Exsiccatu : Rachela below, 2850m, **SR Lepcha & AP. Das 2990**, dated 05.10.2004

Status : Rare

Local Distribution : Rachela, upto upto 3000 m

General Distribution : E. HIMALAYA; INDIA, NEPAL, BHUTAN, VEITNAM.

Note : 1. Endemic to Eastern Himalaya

2. Extremely rare

Zeuzine Lindley

Zeuzine affinis (Lindl.) Benth. ex Hook.f., Fl. Brit. India 6(1): 108. 1840; Pearce & Cribb in Fl.Bhutan 3(3); 110.2002; Luksom in Orchid. Sikkim & N.E. Him. 118: 2007. *Etaeria affinis* Lindl. in Wall.Cat.: 7383. 1832, *nom.nud.* *Zeuzine arisanensis* Hayata, Icon. Formos.4:106,t.55(1914). *Monochilus affine* Lindley, Gen. Sp. Orchid. Pl. 487. 1840.

Terrestrial herbs or epiphytic upto 35cm tall. Rhizome slightly elongated. Stem erect, deep reddish brown to greenish brown enveloped in hyaline , subtular. **Leaves** 6 – 7, often reddish, ovate, ovate-lanceolate, **lamina** 2.5 – 4.5 × 1.5 – 3.5 cm, apex acute or obtuse; sheathing. **Inflorescence** upto 25 cm, with 1 or 2 puberulent sterile bracts, pale brown; rachis upto 7.5 cm, ± dense flowered; floral bracts ovate-lanceolate. **Flowers** resupinate or rarely erect, ovary and pedicel fusiform. **Sepals** distinctly not spreading, dark brownish green at base, white toward apex, pubescent; dorsal sepal broadly ovate, concave, 1-veined, apex obtuse or acute; lateral sepals ovate-oblong, slightly oblique, 1-veined, apex obtuse. **Petals** white, elliptic to obovate, oblique, ca. as long as dorsal sepal, 1 veined, apex obtuse; **lip** white or pale yellow, Y-shaped, 3-partite; epichile dilated, 2-lobed; lobes not diverging obovate. **Column** wings triangular; anther ovoid-lanceolate, rostellum arms oblong.

Flower : October

Fruit: Janaury

Exsiccatu : Dhorok 2100 m, **SR Lepcha & AP. Das 30206**, dated 22.10.2004

Status : Rare

Local Distribution : Phusrey, Singhaney, Premlakha, 1600 – 2400 m.

General Distribution. : INDIA, BHUTAN, CHINA, LAOS, MALAYSIA, MYANMAR, THAILAND.

Note : Extremely Rare, only report from Pangolakha, (Luksom,2007).

PLATE VII

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PLATE VIII

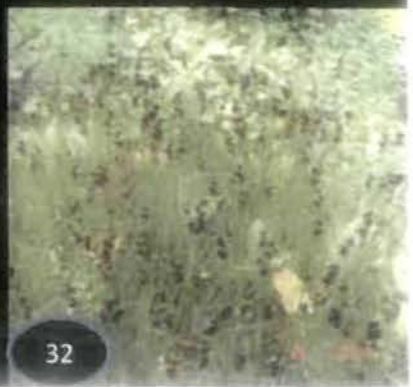
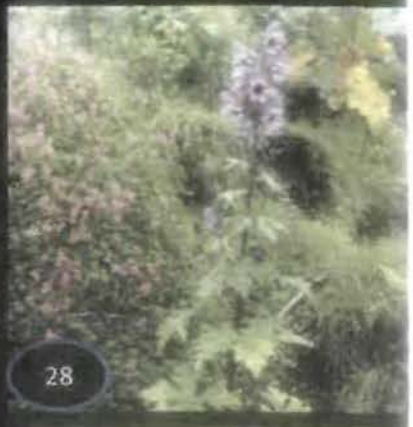


PLATE IX

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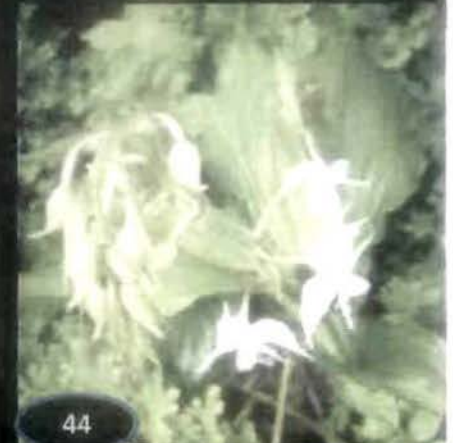




PLATE XII



PLATE XIII



PLATE XIV



PLATE XV



LEGEND OF PHOTOS

Plate VII

17. *Elastostema obtusum*
18. *Berginia purpurascens*
19. *Arisaema concinnum*
20. *Paris polyphylla*
21. *Panax seudo ginseng* var.
angustifolius
22. *Panax seudo ginseng* var. var.
bipinnatifidus
23. *Gentiana* spp.
24. *Rubia manjith*

Plate VIII

25. A young sapling of *Picrorhiza*
kurrooa
26. *Rheum acuminatum*
27. *Helwingia himalaica*
28. *Aconitum spicatum*
29. *Saxifraga montana*
30. *Pedicularis furfuraceae*
31. *Gaultheria trichophylla*
32. *Juncus grisebachii*

Plate IX

33. *Rheum australe*
34. *Rheum nobile*
35. *Zanthoxylum oxyphyllum*
36. *Saussurea auriculata*
37. *Heracleum wallichii*
38. *Nardostachys grandiflora*

Plate X

39. *Younia pranii*
40. *Anthogonium gracile*
41. *Eria spicata*
42. *Dendrobium chrysanthum*
43. *Silene gonosperma*

44. *Calanthe puberula*

45. *Pleione praecox*

46. *Spiranthes sinensis*

Plate XI

47. *Hypericum choisianum*
48. *Ribes lacinatum*
49. *Corydalis chaerophylla*
50. *Tupistra aurantiaca*
51. *Prunella vulgaris*
52. *Hydrocotyle sibthorpioides*
53. *Fragaria nubicola*
54. *Corydalis chaerophylla*

Plate XII

55. *Swertia bimuculata*
56. *Pedicularis siphonantha*
57. *Dendrocnide sinuate*
58. *Tripterospermum volubile*
59. *Bistorta amplexicaulis*
60. *Swertia bimuculata*
61. *Cremathodium decaisnei*
62. *Hedychium spicatum*
63. *Meconopsis napualensis*
64. *Potentilla peduncularis*
65. *Curculigo orchioides*
66. *Cuscuta reflexa*

Plate XIII

67. Local Trekkers, near Phusrey SW
PWS.
68. Enroute to Rachela, trench created
by water flood.
69. Horse, local facilities for carrying
goods
70. Recording field data at Rachela
trijunction point

71. Enroute to Panglakha (a near southern transit point of PWS)
72. Common Leeches of PWS
73. A research team visiting PWS
74. *Impatiens spirifer*

Plate XIV

75. *Ceropegia pubescens*
76. *Triplostegia glandulifera*
77. *Gaultheris nummularis*
78. *Rubus calycinus*
79. *Viburnum mullaha*
80. *Neillia rubiflora*
81. *Viburnum erubescens*

82. *Sanicula elata*

Plate XV

83. *Nyssa javanica*
84. *Rubus rugosa*
85. *Engelhardia spicata*
86. *Vaccinium retusum*
87. *Agapetis serpens*
88. *Impatiens urticifolia*
89. *Viola canescens*
90. *Holboellia latifolia* subsp. *latifolia*
91. *Bistorta macrophylla*
92. Habitat of *Rheum acuminatum*

Chapter-VII

Discussion

7.1. ANALYSIS OF THE FLORA

The Pangolakha Wildlife Sanctuary (PWS) is one of the less disturbed sanctuaries in Sikkim Himalaya. After the comprehensive floristic survey of the sanctuary, it is noted that the sanctuary is bestowed with immensely rich flora. A total of 890 species under 425 Genera belonging to 137 families of angiosperms, 6 genera and 6 species of gymnosperms under 3 families, besides 68 species of fern and fern allies under 39 genera belonging to 20 families are recorded from PWS during the present exploration. The reason for sustenance of enormous richness in floral diversity within the area is because of favorable factors like unique climatic, variation in edaphic, altitudinal and their natural complex inter-relationships within the species. The another reason could be of its sufficient rainfall varying from 200 – 500 cm distributed almost throughout the year due to close proximity to the Bay of Bengal with direct exposure to the southwest monsoon.

The vegetation of the the PWS uphold an integral part of “Himalaya Biodiversity Hotspot” in the East Himalayan region. It provides an enormous variety of habitats and this is reflected in the richness of its flora.

The detailed analysis of the total angiosperm flora of the sanctuary revealed that the distribution and variation in dicots have more dominance over the monocots. A clear picture emerged in the variation of the distribution and dominance of the different taxa belonging to different families. It has been recorded that the family Asteraceae with 66 species is the largest and dominant family of angiosperms occurring mainly on sub-alpine region of PWS. Other dominant families as observed during the present survey includes *Poaceae* (39 sp.), *Rosaceae* (34 sp.), *Primulaceae* (33 sp.), *Orchidaceae* (31 sp.), *Cyperaceae* (31 sp.), *Ericaceae* (28 sp.), *Apiaceae* (26 sp.), *Ranunculaceae* (25 sp.), *Polygonaceae* (21 sp.) etc.

As the sanctuary covers both temperate as well as alpine region it upholds a huge numbers of very important plant species potential to serve the humanity. It is also observed that the herbaceous species are more dominant than the shrubs and the trees in both temperate and alpine region. A very fair amount of species of useful trees represents the dense canopy of the sanctuary.

The populations of the species of temperate or sub-temperate families such as *Asteraceae*, *Poaceae*, *Rosaceae*, *Primulaceae*, *Ericaceae*, *Cyperaceae*, *Urticaceae*, *Orchidaceae*, etc. are dominating the vegetation of the PWS.

An analysis of the flora of PWS further revealed the existence of numerous important plant species which are directly or indirectly beneficial for the human sustenance. Many of the species have been recorded for having varied potential as food, medicines, etc. for humanity, besides an extraordinary rich repository of various plant resources including the large number of valuable and durable timber-yielding trees. Many of the species have also been regarded as sacred for various rites and religion by the local people.

A huge area of temperate to alpine favored the growth of different species of *Rhododendron*, and a diverse population of epiphytes, including orchids, ferns and fern allies and other plant species representing non-vascular lower groups.

The species recorded during the survey under the flora of PWS represents the Himalayan origin with major representative taxa of Sino-Himalayan, followed by South-East Asian and of Malaysian origin. Comparatively a very less number of cosmopolitan species of plants are recorded from the sanctuary. There are also records of the existence of taxa of exotic origin, migrated or may be introduced that have adapted to this part of Himalayas so far known from the countries like N. America, China, Japan, Australia, Africa, Mexico, W. Indies, South America etc.

7.1.1 Numerical Distribution of Taxa

The present floristic work on PWS deals with an account of 117 Angiospermic families, out of which 100 are dicotyledonous and the remaining 17 are monocotyledonous; 655 species under 289 genera are recorded from 100 dicot families and 164 species belonging to 88 genera in 17 monocot families. Only 6 species of gymnosperm belonging to 3 families and a total of 68 species of ferns and fern-allies were recorded under 39 genera belonging to 20 families (Table 7.1).

Table 7.1: Numerical representation of the taxa of PWS

TAXA	FAMILIES	GENERA	SPECIES
Dicotyledons	100	287	655
Monocotyledons	17	89	163
Gymnosperms	03	06	06
Pteridophytes	20	39	68
Total	140	421	892

The following tables [7.2-(a, b); 7.3 & 7.4] provide accounts of family-wise numerical distribution of Taxa of the PWS.

**Table 7.2: Family wise numerical representation of Angiospermic taxa for the flora of PWS
(A) DICOTYLEDONAE**

FAMILY	GENUS	SPECIES
ACANTHACEAE	4	7
ACERACEAE	1	7
AMARANTHACEAE	2	3
ANACARDIACEAE	3	5
APIACEAE	15	26
AQUIFOLIACEAE	1	3
ARALIACEAE	7	10
ARISTOLOCHACEAE	1	2
ASCLEPIADACEAE	3	6
ASTERACEAE	30	66
BALSAMINACEAE	1	12
BEGONIACEAE	1	8
BERBERIDACEAE	1	4
BETULACEAE	3	4
BORAGINACEAE	2	5
BRASSICACEAE	4	6
BUDDLEJACEAE	1	3
BURSERACEAE	1	1
BUXACEAE	1	1
CAMPANULACEAE	3	10
CAPRIFOLIACEAE	4	11
CARYOPHYLLACEAE	7	10
CELASTRACEAE	3	8
CHENOPODIACEAE	1	1
CONVOLVULACEAE	2	3
CORNACEAE	3	3
CRASSULACEAE	2	4
CUCURBITACEAE	4	4
CUSCUTACEAE	1	1
DAPHNIPHYLLACEAE	1	1
DIPSACEACEAE	2	3
DROSERACEAE	1	1
ELAEAGNACEAE	2	2
ELAEOCARPACEAE	2	2
ERICACEAE	4	28
EUPHORBIACEAE	1	4
FABACEAE	5	5
FAGACEAE	4	6
FLACOURTIACEAE	1	1
FUMARIACEAE	2	12
GENTIANACEAE	4	13
GERANIACEAE	1	3
GESNERIACEAE	5	9
GROSSULARIACEAE	1	2
HYPERICACEAE	1	5
HYDRANGEACEAE	2	4
JUGLANDACEAE	1	1
LAMIACEAE	11	18
LARDIZABALACEAE	1	1
LAURACEAE	7	11
LEEACEAE	1	1
LENTIBULARIACEAE	1	1

LINACEAE	1	1
LOBELIACEAE	2	4
LORANTHACEAE	2	2
MAGNOLIACEAE	2	4
MALVACEAE	1	1
MELASTOMATACEAE	4	6
MIMOSACEAE	2	2
MINISPERMACEAE	1	2
MONOTROPACEAE	1	1
MORACEAE	2	4
MORINACEAE	2	2
MYRSINACEAE	2	4
NYSSACEAE	1	1
OLEACEAE	3	3
ONAGRACEAE	2	9
OXALIDACEAE	1	3
PAPAVERACEAE	2	3
PARNASSIACEAE	1	4
PHYTOLACCACEAE	1	1
PIPERACEAE	2	5
PLANTAGINACEAE	1	2
PODOPHYLLACEAE	1	1
POLYGONACEAE	6	21
PRIMULACEAE	3	33
RANUNCULACEAE	7	25
RHAMNACEAE	1	1
ROSACEAE	10	34
RUBIACEAE	9	14
RUTACEAE	4	8
SALICACEAE	2	4
SAMBUCACEAE	1	1
SANTALACEAE	1	1
SAURAUJACEAE	1	1
SAXIFRAGACEAE	3	9
SCHISANDRACEAE	1	1
SCROPHULARIACEAE	9	18
SOLANACEAE	2	2
SONNERATIACEAE	1	1
STACHYURACEAE	1	1
STAPHYLEACEAE	1	1
SYMPLOCACEAE	1	5
THEACEAE	1	2
THYMELAEACEAE	2	4
URTICACEAE	9	20
VACCINIACEAE	2	5
VALERIANACEAE	2	2
VIOLACEAE	1	5
VITACEAE	2	2
TOTAL Families: 100	288	655

(B): MONOCOTYLEDONAE

FAMILY	GENUS	SPECIES
ARACEAE	5	12
COMMELINACEAE	3	3
CONVALLARIACEAE	4	8
CYPERACEAE	9	31
DIOSCOREACEAE	1	2
HYPOXIDACEAE	2	2
JUNCACEAE	1	1
LILIACEAE	1	16
MUSACEAE	5	5
MELANTHACEAE	1	1
ORCHIDACEAE	1	1
POACEAE	24	32
TRILIACEAE	25	35
IRIDACEAE	1	6
UVALIARACEAE	1	1
ZINGIBERACEAE	2	3
SMILACACEAE	3	4
Total Families : 17	89	163

Table 7.3: Family-wise Numerical representation of Gymnosperms of PWS.

FAMILY	GENERA	SPECIES
PINACEAE	1	1
TAXACEAE	2	2
CUPRESSACEAE	3	3
Total Families: 3	6	6

Table 7.4: Family-wise numerical representation of Pteridophytes of PWS.

FAMILY	GENUS	SPECIES
ADIANTACEAE	2	2
ASPIDACEAE	4	14
ASPLENIACEAE	1	3
ATHYRIACEAE	4	5
CYATHEACEAE	1	1
DENNSTAEDTIACEAE	3	3
EQUISETACEAE	1	1
GLEICHENIACEAE	1	3
HAMIONTIDIACEAE	1	1
HYMENOPHYLLACEAE	1	2
HYPOLEPIDACEAE	1	1
LINDSAEACEAE	2	2
LYCOPODIACEAE	1	4
OLEANDRACEAE	4	4
PHROLEPIDACEAE	1	1
POLYPODIACEAE	7	14
PTERIDACEAE	1	4
SELAGINELLACEAE	1	1
THELYPTERIDACEAE	1	1

VITACEAE		
Total Families: 20	39	68

Table 7.5: Relative distribution of different group of vascular plants in PWS.

Plant Group	Representation					
	Family		Genus		Species	
	No.	%	No.	%	No.	%
DICOTYLEDONAE	100	71.43	287	68.17	655	73.43
MONOCOTYLEDONAE	17	12.14	89	21.14	163	18.27
GYMNOSPERMS	3	2.14	6	1.43	6	0.67
PTERIDOPHYTES	20	14.29	39	9.26	68	7.62
TOTAL:	140		421		892	

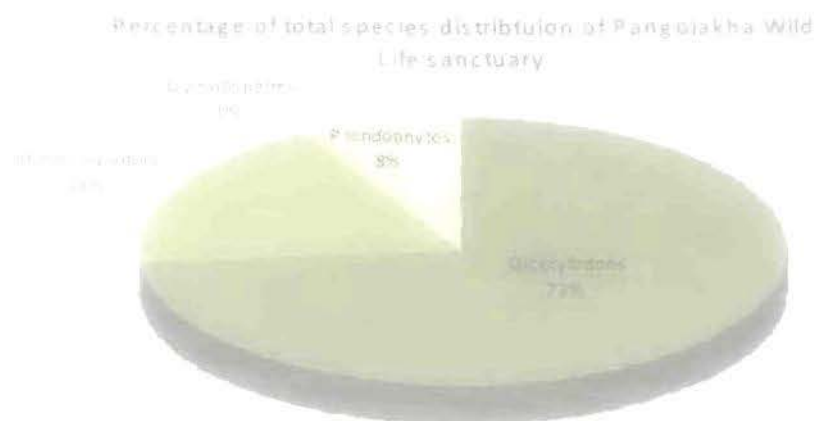


Fig. 7.1: Percentage distribution of different major taxa in the flora of PWS

Table 6.5 presents the percentage distribution (Fig. 6.1) of different major groups of vascular plants recorded from PWS. Dicotyledonous angiosperms having the major domination of 73.43% species as it is true for most of the floras in tropical and subtropical regions of the world. On the other hand, unlike the sub-alpine and alpine parts of the planet, gymnosperms are very poorly represented, only 0.67% of vascular plants. Comparing with the monocotyledonous flora of nearby regions, it also appears to be little less than the expectation. However, families like Poaceae, Cyperaceae and Orchidaceae are quite well represented and occupying quite higher positions among the ten dominant families of the sanctuary (Fig. 6.2).

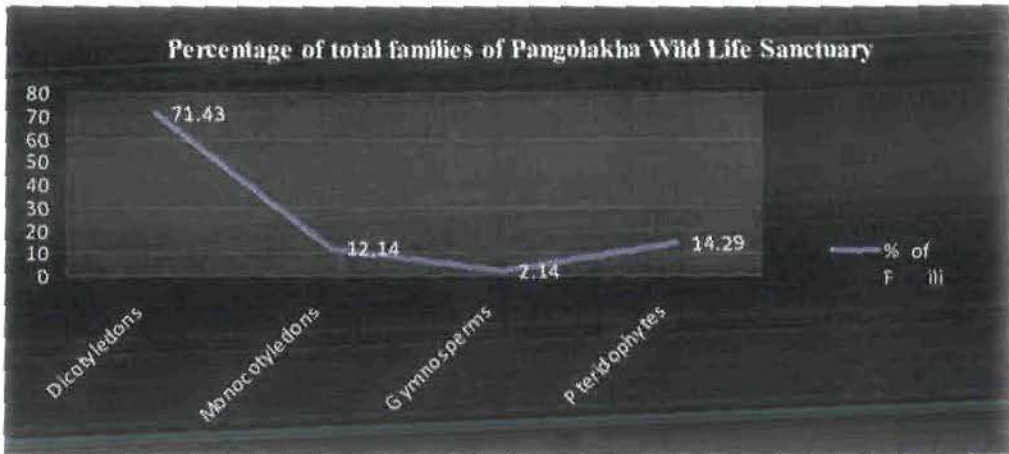


Fig. 7.2: Graphical representation of the percentage distribution of different families under the major taxa recored in the flora

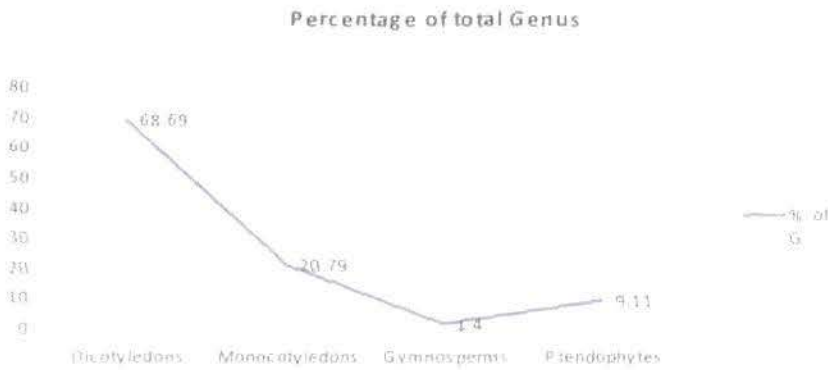


Fig. 7.3: Percentage distribution of genera under different major taxa in the flora

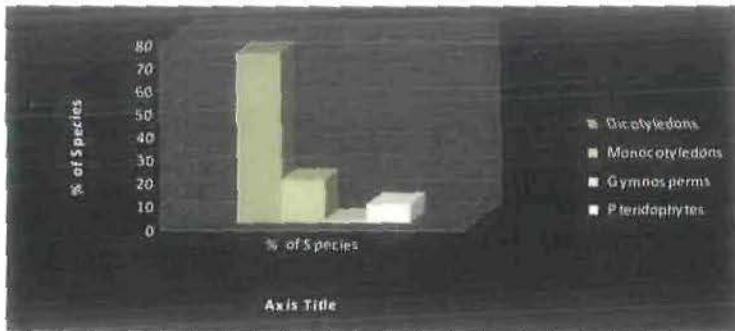


Fig. 7.4: Percentage distribution of species under different major groups of taxa

The comparison of 10 dominant families in *Flora of British India* (Hooker 1872-1897), *Flora of Eastern Himalaya* (Hara 2966, 1971; Ohashi 1975) and of Sikkim Plants (Singh & Chauhan 1998) with that of the present work (Table 6.6) shows the families, such as *Asteraceae*, *Poaceae*, *Rosaceae*, *Cyperaceae*, *Orchidaceae* etc. are the most dominant ones in generalized

term, substantiating the earlier stand (Hooker 1906,1907; Chatterjee 1940; Hara 1966, 1971) of the dominance of these families in the flora of the Eastern Himalayan region.

Table 7.6: List of 10 dominant families in Flora of British India, Flora of Eastern Himalaya, Sikkim Plants and Pangolakha Wildlife Sanctuary

SN	FBI	FEH	SP	PWS
1	Orchidaceae	Orchidaceae	Orchidaceae	Asteraceae
2	Compositae	Leguminosae	Asteraceae	Poaceae
3	Gramineae	Gramineae	Poaceae	Rosaceae
4	Rosaceae	Compositae	Fabaceae	Primulaceae
5	Cyperaceae	Cyperaceae	Cyperaceae	Cyperaceae
6	Geraniaceae	Rosaceae	Rosaceae	Orchidaceae
7	Ericaceae	Scrophulariaceae	Scrophulariaceae	Apiaceae
8	Liliaceae	Labiatae	Rubiaceae	Polygonaceae
9	Labiatae	Ranunculaceae	Lamiaceae	Lamiaceae
10	Umbelliferae	Urticaceae	Euphorbiaceae	Urticaceae

It is interesting to note that Orchidaceae is domination in all three other floras taken for comparison. But, Orchidaceae is occupying the 5th position along with Cyperaceae with the record of only 31 species. In fact, Sikkim flora represents the largest number of orchidaceous plants. Most of the orchids do not prefer the alpine or subalpine environment and the major part of PWS is prevailing with such extremely chilling climatic condition. Again, numerous herbaceous members of Asteracea prefer cooler region, thereby dominating the PWS flora.

Table 7.7: List of ten dominating Genera of PWS.

Sl. No.	Genus	Family	No. of Species
1	<i>Primula</i>	Primulaceae	24
2	<i>Rhododendron</i>	Ericaceae	18
3	<i>Juncus</i>	Juncaceae	16
4	<i>Carex</i>	Cyperaceae	14
5	<i>Rubus</i>	Rosaceae	13
6	<i>Impatiens</i>	Balsaminaceae	12
7	<i>Corydalis</i>	Fumariaceae	10
8	<i>Anaphalis</i>	Asteraceae	08
9	<i>Arisaema</i>	Araceae	08
10	<i>Pedicularis</i>	Scrophulariaceae	08

Rhododendrons are trees and form dense forests, which is prevalent in many areas of Darjeeling and Sikkim. For this, the genus *Rhododendron* appears to be most dominant not only in Sikkim but also in adjacent Bhutan (Pradhan 1999). On the other hand, Lepcha *et al* (1997) has presented

the existence of a large number of species of *Juncus* in the PWS. In addition, the herbaceous genus *Primula* is also highly dominating in this region and PWS is housing 24 such plants and expressing *Primulas* as most dominating genus of flowering plants in the Sanctuary.

7.1.2. Comparison of Flora of PWS with other Floras of Adjoining Regions

Apart from the *Flora of Sikkim (Monocotyledons)* by Hajra & Verma (1996), the most comprehensive floras pertaining to Sikkim Himalayas and the adjoining regions include (1) *The Flora of British India* by J.D. Hooker (1872-1897). (2) *The Flora of Eastern Himalaya*, Parts I - III by Hara (1966, 1971) and Ohashi (1975), (3) *Enumeration of Flowering Plants of Nepal*, Vols. I - III by Hara *et al* (1978, 1979 & 1982) and (4) *The Flora of Bhutan*, vols. 1 - 3, by Grierson & Long (1983, 1984, 1987, 1991, 1999, 2000; Nottie 1994, 2000; Pearce & Cribb 2002). The first flora, i.e. *The Flora of British India* covers the plants collected from Indian subcontinent, Eastern Himalaya including Sikkim and extending to Pakistan, Bangladesh, Myanmar, Malaysia, etc. *The Flora of Eastern Himalaya* has engrossed the plant collection from the hilly parts of North Bengal, Sikkim, Eastern Nepal and Bhutan regions in the Eastern Himalaya covering an altitudinal range of 300 m (at Tista Bazar) to 4400 m (at Oma La). The third treatise, i.e. *Enumeration of Flowering Plants of Nepal* is the outcome of compilation of the collections of Nepal plants at the Herbaria of British Museum [Natural History (BM)], Kew Herbarium (K) and Tokyo University Herbarium (TI) covering the altitudinal range between 600 - 4900 m in Nepal. The fourth treatise signed between survey of flora of Darjeeling, Sikkim and Bhutan including Terai & Duars (in West Bengal) at the altitude ranging from 140 m and above.

A numerical comparison of the different angiospermic taxa as enumerated in the three earlier floras on Eastern Himalayas, published in the recent past, and that of the present work has been highlighted in the following Table 6.8.

Table 7.8: Comparative numerical representation of different angiospermic taxa in the three recently published flora on Eastern Himalayas and in the present work

[Abbreviations used: FEH - Flora of Eastern Himalaya; EFPN - Enumeration of the Flowering Plants of Nepal; FB - Flora of Bhutan; Gen. - Genus; Sp. - Species]

FAMILIES	REPRESENTATION IN RECENT FLORAS							
	FEH		EFPN		FB		Present Work	
	Gen.	Sp.	Gen.	Sp.	Gen.	Sp.	Gen.	Sp.
DICOTYLEDONS								
<i>Acanthaceae</i>	19	46	31	69	27	83	4	7
<i>Aceraceae</i>	1	11	1	13	1	13	1	7
<i>Actinidiaceae</i>	2	4	1	2	1	8	0	0
<i>Alangiaceae</i>	1	2	1	3	1	2	0	0

<i>Aizoaceae</i>	1	1	2	2	2	3	0	0
<i>Amaranthaceae</i>	9	16	11	19	11	21	2	3
<i>Anacardiaceae</i>	5	8	12	20	9	14	4	5
<i>Annonaceae</i>	3	3	5	8	9	18	0	0
<i>Apiaceae</i>	13	28	32	73	41	94	15	26
<i>Apocynaceae</i>	12	13	16	19	22	35	0	0
<i>Aquifoliaceae</i>	1	7	1	10	1	12	1	3
<i>Araliaceae</i>	10	15	12	24	13	27	7	10
<i>Aristolochiaceae</i>	1	3	2	6	1	6	1	2
<i>Asclepiadaceae</i>	19	32	26	49	25	68	3	6
<i>Asteraceae</i>	70	166	110	382	126	370	30	66
<i>Balanophoraceae</i>	1	4	2	4	2	5	0	0
<i>Balantaceae</i>	0	0	0	0	1	1	0	0
<i>Balsaminaceae</i>	1	29	1	39	1	39	1	12
<i>Basellaceae</i>	1	1	2	2	1	1	0	0
<i>Begoniaceae</i>	1	16	1	18	1	20	1	8
<i>Berberidaceae</i>	2	11	3	34	2	15	1	4
<i>Betulaceae</i>	4	5	4	8	4	7	3	4
<i>Bignoniaceae</i>	2	2	9	15	7	9	0	0
<i>Bischofiaceae</i>	0	0	0	0	1	1	0	0
<i>Bixaceae</i>	0	0	0	0	1	1	0	0
<i>Bombacaceae</i>	1	1	1	1	1	1	0	0
<i>Boraginaceae</i>	11	19	21	50	19	52	2	5
<i>Brassicaceae</i>	10	16	0	0	32	84	4	6
<i>Budlejaceae</i>	1	2	0	0	1	8	1	3
<i>Burseraceae</i>	1	1	1	1	3	4	1	1
<i>Buxaceae</i>	1	3	2	5	2	3	1	1
<i>Cactaceae</i>	0	0	2	2	3	4	0	0
<i>Callitrichaceae</i>	1	1	1	2	1	2	0	0
<i>Campululaceae</i>	7	17	10	47	11	46	3	10
<i>Cannabaceae</i>	0	0	1	1	1	1	0	0
<i>Capparaceae</i>	0	0	4	9	4	11	0	0
<i>Caprifoliaceae</i>	2	23	4	27	5	36	4	11
<i>Cardiopteraceae</i>	0	0	0	0	1	1	0	0
<i>Caricaceae</i>	1	1	1	1	1	1	0	0
<i>Carlemannaiaceae</i>	0	0	1	1	1	2	0	0
<i>Caryophyllaceae</i>	12	36	16	77	14	56	7	10
<i>Celastraceae</i>	5	16	7	20	8	28	3	8
<i>Chenopodiaceae</i>	1	2	8	16	2	12	1	1
<i>Chloranthaceae</i>	1	1	1	1	0	0	0	0
<i>Chloranthaceae</i>	0	0	0	0	1	1	0	0
<i>Circaeasteraceae</i>	0	0	1	1	1	1	0	0
<i>Clethraceae</i>	0	0	0	0	1	1	0	0
<i>Combretaceae</i>	3	7	4	12	4	15	0	0
<i>Convolvulaceae</i>	6	21	11	41	11	39	2	3

<i>Cordiaceae</i>	0	0	2	6	0	0	0	0
<i>Coriariaceae</i>	0	0	1	2	1	2	0	0
<i>Cornaceae</i>	3	3	2	4	6	8	3	3
<i>Corylaceae</i>	0	0	2	2	0	0	0	0
<i>Crassulaceae</i>	1	6	6	40	5	34	2	4
<i>Cucurbitaceae</i>	16	22	21	31	26	39	4	4
<i>Cuscutaceae</i>	0	0	0	0	1	4	1	1
<i>Daphniphyllaceae</i>	1	1	1	1	1	2	1	1
<i>Datisceae</i>	0	0	1	1	1	1	0	0
<i>Diapensiaceae</i>	0	0	1	1	1	3	0	0
<i>Dilleniaceae</i>	1	2	1	4	2	3	0	0
<i>Dipsacaceae</i>	3	7	4	7	3	5	2	3
<i>Dipterocarpaceae</i>	1	1	1	1	2	2	0	0
<i>Droceraceae</i>	1	1	1	2	1	2	1	1
<i>Ebenaceae</i>	0	0	1	5	1	4	0	0
<i>Elaeagnaceae</i>	1	2	2	7	2	7	2	2
<i>Elaeocarpaceae</i>	1	4	2	8	1	8	2	2
<i>Elatinaceae</i>	0	0	2	2	1	1	0	0
<i>Ericaceae</i>	9	54	9	56	9	81	4	28
<i>Euphorbiaceae</i>	27	54	28	83	34	110	1	4
<i>Eupteliaceae</i>	0	0	0	0	1	1	0	0
<i>Fabaceae</i>	71	184	88	281	85	277	5	5
<i>Fagaceae</i>	3	14	3	16	4	23	4	6
<i>Flacourtiaceae</i>	1	1	0	0	4	8	1	1
<i>Fumariaceae</i>	6	17	8	59	4	47	2	12
<i>Gentianaceae</i>	8	28	14	106	15	99	4	13
<i>Geraniaceae</i>	1	9	2	14	2	8	1	3
<i>Gesneriaceae</i>	10	30	11	32	14	54	5	9
<i>Grossulariaceae</i>	0	0	1	10	1	8	1	2
<i>Clusiaceae</i>	0	0	2	2	3	8	0	0
<i>Haloragaceae</i>	0	0	1	1	2	2	0	0
<i>Hamamelidaceae</i>	1	1	1	1	3	3	0	0
<i>Hippocastanaceae</i>	2	2	1	1	1	2	0	0
<i>Hippocrateaceae</i>	0	0	0	0	2	3	0	0
<i>Hippuridaceae</i>	0	0	1	1	1	1	0	0
<i>Hydrangeaceae</i>	1	4	4	10	2	6	2	4
<i>Hydrophyllaceae</i>	0	0	1	1	0	0	0	0
<i>Hypericaceae</i>	1	8	1	15	1	17	1	5
<i>Icacinaceae</i>	1	1	1	1	4	4	0	0
<i>Illiciaceae</i>	0	0	0	0	1	1	0	0
<i>Iteaceae</i>	0	0	0	0	1	1	0	0
<i>Juglandaceae</i>	1	2	2	2	2	2	1	1
<i>Lamiaceae</i>	39	88	48	149	43	117	11	18
<i>Lardizabalaceae</i>	2	2	2	2	2	2	1	1
<i>Lauraceae</i>	10	42	12	52	14	67	7	11

<i>Leaceae</i>	0	0	1	7	1	7	1	1
<i>Lecythidaceae</i>	0	0	1	2	1	2	0	0
<i>Lentibulariaceae</i>	1	4	2	12	1	10	1	1
<i>Linaceae</i>	1	2	3	4	3	6	1	1
<i>Lithraceae</i>	4	11	6	14	6	11	0	0
<i>Lobeliaceae</i>	0	0	0	0	0	0	2	4
<i>Loganiaceae</i>	1	1	4	9	1	2	0	0
<i>Loranthaceae</i>	5	10	7	14	9	21	2	2
<i>Magnoliaceae</i>	4	11	6	15	4	11	2	4
<i>Malpighiaceae</i>	1	1	2	3	2	3	0	0
<i>Malvaceae</i>	8	18	12	31	12	34	1	1
<i>Martiniaceae</i>	1	1	0	0	0	0	0	0
<i>Melastomaceae</i>	6	13	6	16	7	19	4	6
<i>Meliaceae</i>	0	0	9	14	13	24	0	0
<i>Melanthaceae</i>	0	0	0	0	1	1	0	0
<i>Menispermaceae</i>	6	10	0	0	10	14	1	2
<i>Menyanthaceae</i>	0	0	0	0	1	1	0	0
<i>Mimosaceae</i>	0	0	0	0	10	27	2	2
<i>Monotropaceae</i>	0	0	2	3	2	3	0	0
<i>Monotropaceae</i>	1	1	2	3	2	3	1	1
<i>Moraceae</i>	6	15	5	41	7	52	2	4
<i>Morinaceae</i>	0	0	0	0	3	5	2	2
<i>Moringaceae</i>	0	0	1	1	1	1	0	0
<i>Myricaceae</i>	0	0	1	1	1	1	0	0
<i>Myristicaceae</i>	0	0	1	1	2	3	0	0
<i>Myrsinaceae</i>	4	11	4	14	7	23	2	4
<i>Myrtaceae</i>	3	3	6	12	5	18	0	0
<i>Nyctaginaceae</i>	1	1	3	5	3	5	0	0
<i>Nymphaeaceae</i>	1	1	2	2	0	0	0	0
<i>Nyssaceae</i>	0	0	0	0	1	1	1	1
<i>Ochniaceae</i>	0	0	1	1	0	0	0	0
<i>Olacaceae</i>	0	0	3	3	3	5	0	0
<i>Oleaceae</i>	5	12	7	28	8	26	3	3
<i>Onagraceae</i>	4	14	4	27	4	23	2	9
<i>Opiliaceae</i>	0	0	2	2	1	1	0	0
<i>Orobanchaceae</i>	2	2	3	7	5	8	0	0
<i>Oxalidaceae</i>	2	6	2	6	3	7	1	3
<i>Paeoniaceae</i>	0	0	1	1	0	0	0	0
<i>Papaveraceae</i>	5	10	0	0	3	19	2	3
<i>Parnasiaceae</i>	0	0	1	6	1	7	1	4
<i>Passifloraceae</i>	0	0	1	3	2	4	0	0
<i>Pedaliaceae</i>	0	0	2	2	1	1	0	0
<i>Philadelphaceae</i>	0	0	0	0	2	4	0	0
<i>Phrymaceae</i>	1	1	0	0	1	1	0	0

<i>Phytolaccaceae</i>	1	1	1	3	1	1	1	1
<i>Piperaceae</i>	2	9	2	10	2	15	2	5
<i>Pittosporaceae</i>	1	1	1	1	1	2	0	0
<i>Plantaginaceae</i>	1	2	1	5	1	4	1	2
<i>Plumbaginaceae</i>	1	1	2	2	3	4	0	0
<i>Podophyllaceae</i>	1	1	0	0	1	2	1	1
<i>Polemoniaceae</i>	0	0	1	1	0	0	0	0
<i>Podostemaceae</i>	1	1	1	1	0	0	0	0
<i>Polygalaceae</i>	0	0	3	12	3	14	0	0
<i>Polygonaceae</i>	11	41	11	72	11	63	6	21
<i>Portulacaceae</i>	1	1	2	2	1	2	0	0
<i>Primulaceae</i>	5	58	6	93	6	29	3	33
<i>Proteaceae</i>	1	1	2	2	2	2	0	0
<i>Punicaceae</i>	0	0	1	1	1	1	0	0
<i>Pyrolaceae</i>	1	2	1	1	2	3	0	0
<i>Ranunculaceae</i>	17	72	19	143	22	112	7	25
<i>Rhamnaceae</i>	6	10	0	0	7	19	1	2
<i>Rhizophoraceae</i>	0	0	1	1	1	1	0	0
<i>Rosaceae</i>	26	112	29	72	27	169	10	34
<i>Rubiaceae</i>	31	66	35	100	55	153	9	14
<i>Rutaceae</i>	11	19	12	31	14	38	4	8
<i>Sabiaceae</i>	2	5	2	7	2	9	0	0
<i>Sacospermataceae</i>	0	0	0	0	1	1	0	0
<i>Salicaceae</i>	2	7	2	33	2	29	2	4
<i>Sambucaceae</i>	0	0	2	14	0	0	1	1
<i>Santalaceae</i>	2	2	4	8	4	7	1	1
<i>Sapindaceae</i>	4	4	5	5	7	8	0	0
<i>Sapotaceae</i>	1	1	2	2	3	3	0	0
<i>Saurauiaceae</i>	0	0	1	3	0	0	0	0
<i>Saururaceae</i>	1	1	1	1	1	1	1	1
<i>Saxifragaceae</i>	8	40	6	93	6	89	3	9
<i>Schisandraceae</i>	1	3	1	3	2	3	1	1
<i>Scrophulariaceae</i>	32	95	36	165	38	176	9	18
<i>Simaroubaceae</i>	0	0	2	3	3	4	0	0
<i>Solanaceae</i>	7	25	16	45	22	50	2	2
<i>Sonneratiaceae</i>	0	0	1	1	1	1	1	1
<i>Sphenocleaceae</i>	1	1	1	1	0	0	0	0
<i>Stachyuraceae</i>	1	1	3	4	1	1	1	1
<i>Staphyllaceae</i>	1	1	0	0	1	2	1	1
<i>Sterculiaceae</i>	2	2	9	13	10	18	0	0
<i>Strychnaceae</i>	0	0	0	0	1	1	0	0
<i>Styracaceae</i>	1	2	2	2	1	2	0	0
<i>Symplocaceae</i>	1	8	1	10	1	9	1	5
<i>Tamaricaceae</i>	2	2	2	5	1	2	0	0
<i>Tetracentraceae</i>	1	1	1	1	1	1	0	0

<i>Tetramelaceae</i>	0	0	1	1	0	0	0	0
<i>Theaceae</i>	4	8	0	0	5	9	1	2
<i>Thymeliaceae</i>	3	3	4	8	4	7	2	4
<i>Tiliaceae</i>	3	8	3	18	4	15	0	0
<i>Toricelliaceae</i>	0	0	1	1	0	0	0	0
<i>Trapaceae</i>	0	0	1	1	0	0	0	0
<i>Tropaeolaceae</i>	0	0	0	0	1	1	0	0
<i>Ulmaceae</i>	4	6	4	11	4	6	0	0
<i>Urticaceae</i>	15	54	17	59	17	73	9	20
<i>Vaccinaceae</i>	1	1	0	0	0	0	2	5
<i>Valerianaceae</i>	2	3	3	5	3	5	2	2
<i>Verbanaceae</i>	9	21	16	29	16	45	0	0
<i>Violaceae</i>	1	16	1	14	2	12	1	5
<i>Vitaceae</i>	7	23	7	27	7	27	2	2
<i>Zygophyllaceae</i>	0	0	1	1	1	1	0	0
Total: [198]	776	2081	1077	3610	1233	4025	294	655
MONOCOTYLEDONS								
<i>Araceae</i>	14	37	17	37	17	44	5	12
<i>Alliaceae</i>	0	0	0	0	3	12	0	0
<i>Alismataceae</i>	1	1	3	4	1	2	0	0
<i>Agavataceae</i>	0	0	1	4	1	3	0	0
<i>Amaryllidaceae</i>	0	0	5	14	4	5	0	0
<i>Aponogetonaceae</i>	0	0	0	0	1	1	0	0
<i>Arecceae</i>	0	0	0	0	13	25	0	0
<i>Asparagaceae</i>	0	0	0	0	1	3	0	0
<i>Bromeliaceae</i>	0	0	1	1	1	1	0	0
<i>Bumotaceae</i>	0	0	1	1	1	1	0	0
<i>Burmanniaceae</i>	1	1	1	3	1	2	0	0
<i>Cannaceae</i>	1	1	1	4	1	4	0	0
<i>Colchicaceae</i>	0	0	0	0	1	1	0	0
<i>Commelinaceae</i>	9	16	9	21	11	31	3	3
<i>Convallariaceae</i>	0	0	0	0	6	28	4	8
<i>Costaceae</i>	0	0	0	0	1	2	0	0
<i>Cyperaceae</i>	10	114	19	171	73	181	9	31
<i>Dioscoraceae</i>	1	8	1	13	1	13	1	2
<i>Draconaceae</i>	0	0	0	0	2	2	0	0
<i>Eriocaulaceae</i>	1	6	0	0	1	6	0	0
<i>Hemerocallidaceae</i>	0	0	0	0	1	3	0	0
<i>Hydrocharitaceae</i>	1	1	5	7	3	3	0	0
<i>Hypoxidaceae</i>	2	3	0	0	3	8	2	2
<i>Iridaceae</i>	2	4	2	7	5	13	1	1
<i>Juncaceae</i>	2	26	2	34	2	41	1	16
<i>Juncaginaceae</i>	1	1	1	2	1	2	0	0
<i>Lemnaceae</i>	1	2	3	4	1	2	0	0
<i>Liliaceae</i>	24	50	35	65	6	16	5	5

<i>Limnorchitaceae</i>	0	0	0	0	1	1	0	0
<i>Marantiaceae</i>	1	1	1	1	2	3	0	0
<i>Melanthaceae</i>	0	0	0	0	3	5	1	1
<i>Musaceae</i>	1	1	2	4	1	4	1	1
<i>Najadaceae</i>	1	1	1	2	0	0	0	0
<i>Orchidaceae</i>	61	188	87	113	132	579	24	32
<i>Pandanaceae</i>	0	0	1	1	1	2	0	0
<i>Poaceae</i>	78	183	112	346	125	381	25	35
<i>Pontederiaceae</i>	1	2	2	3	2	3	0	0
<i>Potamogetonaceae</i>	0	0	1	8	1	6	0	0
<i>Phormiaceae</i>	0	0	0	0	1	1	0	0
<i>Smilacaceae</i>	1	15	1	15	2	14	1	6
<i>Sparganiaceae</i>	0	0	0	0	1	1	0	0
<i>Trilliaceae</i>	0	0	0	0	3	4	1	1
<i>Typhaceae</i>	1	1	1	1	1	1	0	0
<i>Uvulariaceae</i>	0	0	0	0	4	7	2	3
<i>Xyridaceae</i>	0	0	1	2	1	3	0	0
<i>Zannichelliaceae</i>	0	0	1	1	0	0	0	0
<i>Zingiberaceae</i>	8	17	11	35	14	47	3	4
Total: [47]	224	680	329	924	458	1517	89	163

Table 7.9. Numerical comparison of different ranks of taxa recorded in three previously published floras covering this region with the flora of PWS

Flora		Family		Genus	Species
		No.	%		
Fl. East. Himalaya	Dicot	134	67.68	776	2081
	Monocot	24	51.06	224	680
	TOTAL	158	64.49	1000	2761
En. Fl. Pl. Nepal	Dicot	165	83.33	1077	3610
	Monocot	30	63.83	329	924
	TOTAL	195	79.59	1406	4534
Fl. Bhutan	Dicot	180	91.84	1233	4025
	Monocot	45	95.74	458	1517
	TOTAL	225	91.84	1691	5547
Fl. PWS	Dicot	100	50.51	294	655
	Monocot	17	36.16	89	163
	TOTAL	117	47.76	383	818

Table 6.9 shows the numerical comparison of the three important floras covering this region with that of the flora of PWS (Figs. 6.5 & 6.6). In comparison to the area covered by first three floras to area of PWS is too little. Even then, PWS is hosting as much as 47.76% of the angiospermic families recorded so far from this entire region. Again, the record of a total of 818 angiospermic species is also quite high for such a small place specially when it is located in subalpine and alpine climatic zones.

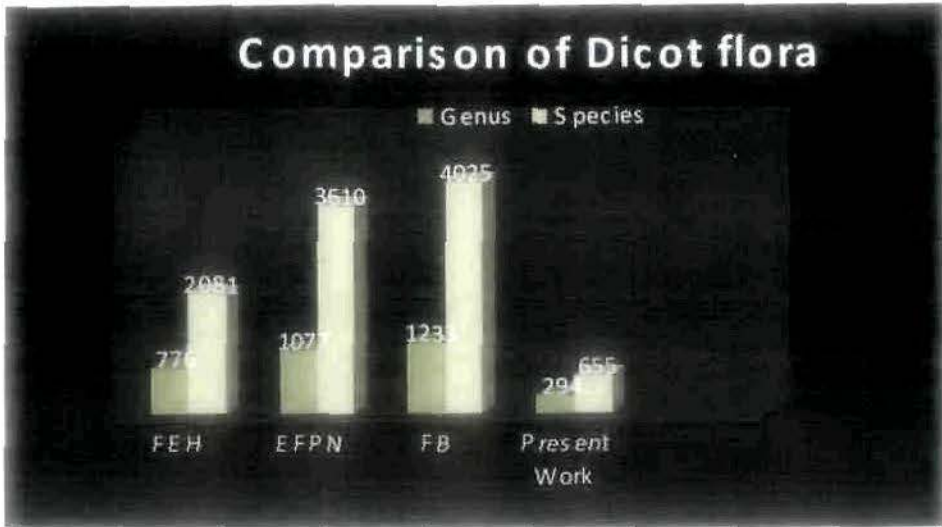


Fig. 7.5: Comparison of recorded dicotyledonous species in the present flora with that of three other floras covering this region.

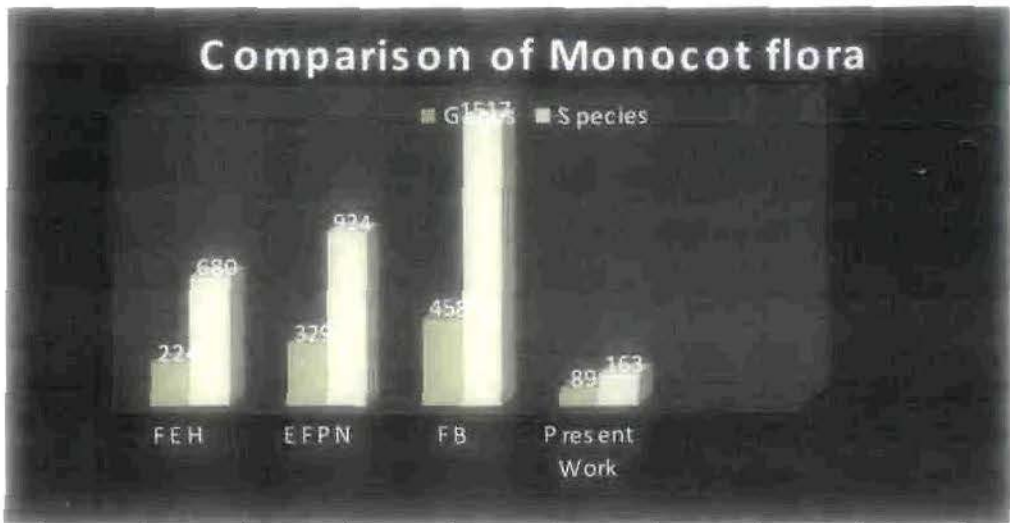


Fig. 7.6: Comparison of recorded monocotyledonous species in the present flora with that of three other floras covering this region.

7.1.2 Comparison and affinities of PWS with Neora Valley National Park.

The PWS also shared a common boundary with the Neora Valley National Park (NVNP) situated in the Darjeeling district of West Bengal. Since, the Neora valley and Pangolakha ridge shares a contiguous and an uninterrupted wide ecozone, the distribution pattern of the vegetation is also partly shares its similarities, at least upto the altitude of 3100 m, which is the highest altitude place of NVNP. However, the majority of the landmass of PWS falls above 3100 m altitude Das (1995). Rai & Das (2002) studied the flora of Neora Valley National Park revealed the presence

of 812 species and varieties, 468 genera belonging to 138 families of angiosperms, 4 genera and 4 species of gymnosperms under 3 families and a total number of 45 fern species under 26 genera belonging to 18 families. Being situated adjacent to each other, both the part of protected network area holds a diverse variation of the climatic, edaphic, altitudinal and biotic conditions along with their complex inter-relationships and species composition which have enabled the region support and sustain the rich diversity of floristic components.

As per the analysis of the floristic elements, the family *Asteraceae* represents the dominant family with largest numbers of species in both the Protected Areas (PA). Six of the ten dominant families of both of these PAs, namely Asteraceae, Cyperaceae, Poaceae, Polygonaceae, Rosaceae and Urticaceae are common. A comparative account of ten dominant families in these two PAs is proved in Table 6.10. The main reason behind the differences is probably caused by the altitudinal distribution of these two PAs. While NVNP is distributed in tropical – temperate (300 m) region, the PWS is distributed in temperate to alpine (3100 m) region.

Table 7.10: Comparative chart of 10 dominating families of the flowering plants of PWS (Sikkim) with Neora Valley National park (W.B.) situated at the adjoining to the Sanctuary.

Sl. No.	Flora of PWS	Flora of NVNP
1	Asteraceae	Asteraceae
2	Poaceae	Rosaceae
3	Rosaceae	Rubiaceae
4	Primulaceae	Cyperaceae
5	Cyperaceae	Poaceae
6	Orchidaceae	Urticaceae
7	Apiaceae	Leguminosae
8	Polygonaceae	Scrophulariaceae
9	Lamiaceae	Ericaceae
10	Urticaceae	Polygonaceae

7.1.3. Habit Groups

The PWS represents immense richness in all forms of habit groups of plants. Being an inaccessible terrain, the sanctuary area remained unexplored and undisturbed for many centuries, resulting the natural conservation of vegetation and floristic elements of the sanctuary. However, slight mislay in forest degradation is observed at some negligible portion of the sanctuary, especially for the development of camp sites for army. Significantly, the species richness and the occurrence of wide range of favorable habitats suitable for diverse habit groups of the flora

rendered uniqueness to the nature-bestowed pristine beauty to the Pangolakha Wildlife Sanctuary. It is interesting to note that the occurrence of epiphytes within flora is quite high, where as the parasites and hydrophytes represent considerably less. The Table 7.11 and Fig. 7.1 below exhibits the distribution of habit groups in the flora of PWS.

Table 7.11: Different habit groups of angiosperms recorded from PWS.

[Abbreviations used: H: Herb; US: Under-shrub; S: Shrub; T: Tree; C: Climber; E: Epiphytes; P: Parasites; Sp: Saprophyte; H: Hydrophyte; G: Geophyte]

Forms of Plant	No. of species		Total species	% of the total species
	DICOT	MONOCOT		
H	370	112	481	58.85
S	153	10	163	19.90
US	06	00	06	00.73
T	86	06	92	11.24
C	34	04	38	04.64
L	02	02	04	00.48
E	04	13	17	02.08
G	00	16	17	02.08
Total	655	163	818	

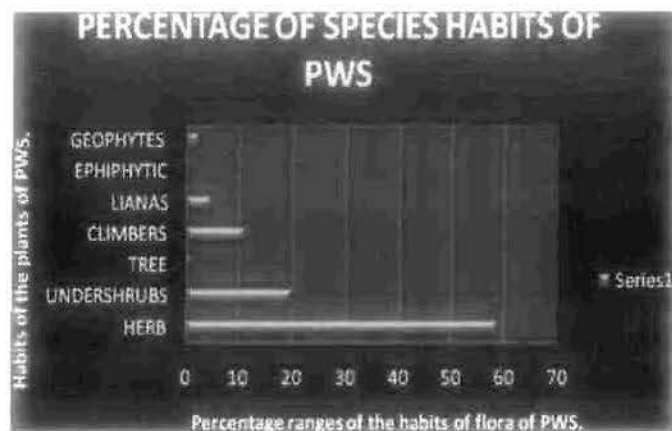


Fig. 7.1: Graphical representation of different habit groups in the flora of PWS.

7.1.3/ L. HERBS: Flora of PWS clearly reveals that the herbaceous species are comparatively in much higher percentage than any other habit groups of the plants. The number of herbaceous species is high as 481 species of angiosperms which is much higher than total number of shrubs, trees and climbers, saprophytes, hydrophytes, geophytes in the flora of the PWS. In addition, except very few all the recorded pteridophytes are herbaceous. The alpine and sub-alpine parts of

the sanctuary also support a huge number of herbaceous species. Significantly, the ground covering vegetation is chiefly constituted of herbaceous plants even in the dense forests.

Majority of the economically important plant species are herbs. Interestingly, the sizes of herbs are gradually reduced to small scrubs in alpine and sub-alpine parts. As such the most predominantly occurring herbs of both temperate and sub-alpine region are *Anaphalis contorta*, *A. triplinervis*, *A. margaritaceae*, *Ageratum conyzoides*, *Ainslea latifolia*, *Begonia gemmipara*, *Berginia ciliata*, *Cacalia chenopodiifolia*, *Carex filicina*, *Clinopodium umbrosum*, *Corydalis* spp., *Didymocarpus* spp., *Elatostema sessile*, *Erigeron* spp., *Festuca cumminsii*, *Gaultheria nummulariodes*, *Galium asperifolium*, *Geranium polyanthes*, *Geranium nepalensis*, *Hydrocotyle nepalensis*, *Impatiens* spp., *Juncus*, *allioides*, *J. grisebachii*, *J. wallichianus*, *Oxalis corniculata*, *Potentilla polyphylla*, *Pedicularis siphonantha*, *Persicaria* spp., *Pilea scripta*, *Primula sikkimensis*, *Primella vulgaris*, *Rubus nubicola*, *Rumex nepalensis*, *Ranunculus diffusus*, *Ranunculus hirtellus*, *Spiranthes sinensis*, *Stellaria patens*, *Viola biflora*, *Viola diffusa* etc.

Besides this, some of the notable and continuously occurring geophytes of PWS are *Arisaema concinnum*, *Arisaema flavum*, *Arisaema griffithii*, *Arisaema propinquum*, *Arisaema tortuosum*, *Colocasia esculenta*, *Remusatia pumila*, etc. As such, *Acorus calamus*, *R. nasturtium-aquaticum*, etc are amongst the most commonly occurring wetland plants of the sanctuary.

7.1.3 / II. SHRUBS: Shrubs are the most important constituent of vegetation in open places or in the thick forests. The distribution of shrubs is gradually decreases with the rise of elevation. The shrubs are mostly dominated at the forest fringes, cliff, crest, open forest and in deep forests of PWS. Some of the commonly occurring shrub species of the sanctuary are *Aconogonum molle*, *Aralia fragrans*, *Aralia cachemirica*, *Astilbe rivularis*, *Artemisia vulgaris*, *Berberis aristata*, *Berberis hookeri*, *Boehmeria macrophylla*, *Daphne blaiata*, *Dichroa febrifuga*, *Euonymus frigidus*, *Gaultheria fragrantissima*, *Gaultheria griffithiana*, *Girardinia diversifolia*, *Heracleum nepalensis*, *Hydrangea aspera*, *Hypericum choisianum*, *Hypericum uralum*, *Helwingia himalaica*, *Leycesteria glaucophylla*, *Leycesteria formosa*, *Leycesteria stipulata*, *Mahonia napaulensis*, *Maesa chista*, *Maesa rugosa*, *Neillia rubiflora*, *Ribes glaciale*, *Selinum wallichianum*, *Skimmia laureola*, *Rosa sericea*, *Rubus ellipticus*, *Rubus splendissimus*, *Viburnum erubescens*, *Zanthoxylum acanthopodium* etc.

It is also interesting to note that the majority of the shrubs are bushy and thorny. *Aconogonum molle* and *Viburnum mullaha* are the most dominant shrubs of the upper ridge and *Hydrangea aspera* and *Astilbe rivularis* are the common shrubs of the middle zone.

7.1.3 / III. CLIMBERS: Samanta & Das (1995, 1998) has recorded 252 species and varieties of climbers from the hills of Darjeeling & Sikkim. It is being noted that the climbers are also one of the important components of floral resource of PWS. The diversity of the climber species is exceptionally rich and varied in the sanctuary. They are normally inhabits on trees, rocks, bamboo and also on the bushy shrubs. Apart from that, the climbers also uphold the important value for medicine, food, and fodder etc. The climber of PWS also deserves a separate and comprehensive study. The angiospermic climbers of the Pangolakha ridge as a whole, can be classified as herbaceous, shrubby and lianas depending upon their habit forms and mode of climbing. However, for the convenience of classification, climbers are further categorized as root climber, twinner, tendril climber, scandent, epiphytic climbers etc. Some climbers e.g. species of *Dioscorea bulbifera*, *Dioscorea pentaphylla* are having good economical value. However, the *Clematis buchananiana*, *C. acuminata*, *C. smilacifolia*, *cuscuta reflexa*, *Hedyotis scandens*, *rubia manjith*, *Rubus ellipticus*, *Zanthoxylum oxyphyllum*, *Stephania glabra*, *Aconogonum molle*, *Bauhinia vahlii*, etc. are some of important climbers that have been used in traditional medicine by the local people residing in the periphery. In contrast, some consumption of some climbers' viz. *Codonopsis affinis*, *Trichosanthes wallichiana* are poisonous to the human being.

Where as, *Clematis montana*, *Codonopsis inflata*, *Dicentra scandens*, *Gentiana speciosa*, *Raphidophora glauca*, *Schisandra grandiflora*, *Thunbergia coccinia*, *Tripteropermum voluble* etc are of potential ornamental value.

- a. **Herbaceous climbers:** The flora of PWS also represents a rich and diverse representation of herbaceous climbers. The majority of the herbaceous climbers are perennial. Though this type of climbers are mostly seen in the temperate to sub-alpine regions. Some of the dominating climbers of the sanctuary are *Codonopsis affinis*, *C. dicentrifolia*, *Dicentra scandens*, *Gentiana speciosa*, *Hedyotis scandens*, *Tripteropermum volubile*, *Stephania elegans* *Ipomoea nil*, *I. purpurea*, *Porana grandiflora*, *Scizandra grandiflora*, *Parthenosissua semicordata*, *Tetrastigma serrulatum*, *T. obtectum*, *S. neglecta* etc.
- b. **Shrubby climbers:** The shrubby climbers are mostly recorded from the temperate hills of the PWS. The most commonly occurring shrubby climbers includes *Aconogonum molle*,

Celastrus paniculatus, *Clematis buchania*, *C. acuminata*, *C. Montana*, *C. connata*, *C. wightiana*, *Elaeagnus pyriformis*, *Hydrangea anomala*, *Rubus acuminatus*, *R. paniculatus*, *Schisandra grandiflora* and *Senecio scandens*, *Piper mulesua*, etc.

c. **Lianas:** The forest of PWS constitutes the huge population of woody climbers. The lianas are mostly occurring in between lower temperate to lower sub-alpine regions. Some of these woody climbers constitute important species for ethno-botanical point of view. The most common lianas of the sanctuary are *Mucuna macrocarpa*, *Bauhinia vahlii*, *Trichosanthes cordata*, *Thunbergia fragrans* etc.

4.1.3/ IV. TREES: Trees constitute the major component of the flora of the PWS. The forests of Pangolakha represent an immense diversity of the tree species. The dense vegetation of inaccessible canopy right from the foothills to higher hilly ridges of the Pangolakha is because of thick and extensive growth of trees. The trees of the sanctuary have also been remained as a home of numerous epiphytic and parasitic plants. Having been remained isolated and undisturbed for centuries, the trees of the sanctuary become exceptionally robust and tall. Most importantly, *Rhododendron arboreum* growing into robust trees, which is rare in other part of the state, is a common characteristic of these forests. The occurrence of this rare phenomenon is recorded from Rachel and Pangolakha ridge. The tree vegetation in the sanctuary gradually reduced with the rise in the elevations.

The commonly occurring tree species recorded from Pangolakha Wildlife Sanctuary is given in the Table 6.12.

Most importantly the occurrence of various species of *Rhododendron* are the prominent trees of upper temperate and lower sub-alpine region of the sanctuary. However, in many areas *Rhododendrons* are also growing with *Viburnum erubescens*, *Viburnum mullaha*, *Zanthoxylum alatum* and *Betula utilis*.

Table 7.12: Some common tree species of PWS. [Abbreviations used: (L) = Lepcha name; (N) = Nepali name; T= Temperate region, SA= Sub-alpine]

BOTANICAL NAME	LOCAL NAME	CLIMATIC ADOPTATION
<i>Acer campbellii</i>	Doam kung (L), Kapasey (N)	T-SA
<i>Acer oblongum</i>	Phirphiri (N).	T
<i>Acer pectinatum</i>	Yalli kung (L), Lekh Kapasey (N)	T-SA
<i>Alangium alpinum</i>	Hlo-palit kung, lasune	T
<i>Alnus nepalensis</i>	Sungdu kung (L), Utis (N)	T
<i>Betula alnoides</i>	Sunglee Kung (L), Saur (N)	T

<i>Betula utilis</i>	Sunglee kung (L)	T
<i>Brassaiopsis mitis</i>	Sungzam kung (L), Phutta	T
<i>Exbucklandia populnea</i>	Sinlyang kung (L), Pipli.	T
<i>Buddleja colvillei</i>	Choungkung (L), Bhimsenpatti.	T
<i>Castanopsis hystrix</i>	Kusyo kung (L), Katus	T
<i>Castanopsis tribuloides</i>	Sri-kusyo kung (L), Musrey katus	T
<i>Cryptomeria japonica</i>	Dhupi	T
<i>Elaeocarpus lanceaefolius</i>	Batrasey	T
<i>Erythrina arborescens</i>	Jasey kung (L), Phaledo,	ST- T
<i>Eurya acuminata</i>	Sanu jinguni	T
<i>Eurya symlocina</i>	Flotukchonkung (L), Bara jingun	T
<i>Evodia fraxinifolia</i>	Sohom kung (L), Khanakpa	T
<i>Ilex insignis</i>	Tonglong kung (L), Hare /lisey	T
<i>Ilex sikkimensis</i>	Lisey(N)	T- SA
<i>Juniperus recurva</i>	Chukboo (L)	T
<i>Leucosceptum canum</i>	Chyong kung (L), Ghurpis	T
<i>Lindera pulcherrima</i>	Nupsor kung (L), Sissi	T
<i>Litsea citrate</i>	Tanghaercher kung (L), Siltimur	T
<i>Litsea elongata</i>	Thulo Pahenle	T
<i>Lyonia villosa</i>	Hlo Tuksolkung (L), Lekh angeri	T
<i>Maesa chisia</i>	Purmu kung (L), Syano bilowney (N)	T- SA
<i>Mallotus nepalensis</i>	Numbung kung (L), Malata (N)	T
<i>Michelia campbellii</i>	Gok (L), Gogey champ (N)	T- SA
<i>Michelia excelsa</i>	Sigu rip (L), Seto champ (N)	T
<i>Michelia lanuginosa</i>	Guay champ, Phusray champ	T
<i>Myrsine semiserrecta</i>	Phalamey /Jhingni.	T
<i>Nyssa javanica</i>	Lekh chilowney	T
<i>Pentapanax leschenaultia</i>	Chindey	SA
<i>Populus camblei</i>	Pilpiley	T
<i>Prunus napaulensis</i>	Tukporinyok (L), Arupatey	T-SA
<i>Quercus lamellosa</i>	Buuk (L), Bajrant (N)	T
<i>Lithocarpus pachyphylla</i>	Sri-kung (L), Sungurey katus (N)	T
<i>Quercus lineate</i>	Phalat	T
<i>Rhododendron arboreum</i>	Etok (L), Gurans (N)	T
<i>Rhododendron barbatum</i>	Lal Chimal	T
<i>Rhododendron grande</i>	Patley kurlingo	T
<i>Rhododendron hodgsonii</i>	Kurlingo	T-SA
<i>Rhus succedanea</i>	Sukung (L), Rani Bhalayo	T
<i>Sarococca hookeriana</i>	Chile kath	T-SA
<i>Saurauia griffithii</i>	Hlo sipha kung (L), Gogun.	T
<i>Saurauia nepaulensis</i>	Kasur kung (L), Gogun	T
<i>Schefflera impressa</i>	Bhalu chindey, Bhalu Phutta	T
<i>Semecarpus anacardium</i>	Sukung (L), Kalo bhalayo	T
<i>Symplocos theifolia</i>	Kharaney	T
<i>Talauma hodgsonii</i>	Hare/ Bhalukhat	T
<i>Taxus baccata</i>	Cheongboo kung (L), Dhengre Salla	T
<i>Turpinia nepalensis</i>	Thali	T-SA
<i>Viburnum mullaha</i>	Ghora khari	AS
<i>Viburnum cordifolium</i>	Tuksol kung (L), Bara Asarey (N)	T
<i>Viburnum erubescens</i>	Naglam kung (L), Asarey	T
<i>Zanthoxylum acanthopodium</i>	Boke timur	T
<i>Zanthoxylum alatum</i>	Sungru kung (L), Baley Timur	T

7.1.4 Distribution of Floristic Elements

Migration of floras, survival of relicts, evolution of new species by an intermixing of different floras and by mutation and acclimatization of species from the lower altitudes must have all their role in determining the present day composition and distribution of the Eastern Himalayan alpine flora. One of the effects may also of glaciations and its resultant climatic changes. The well known plant geographer, Ronald Good has mentioned "by this kind of migration the movement by which independently originating floras becomes mixed so as to, consist of or show elements derived from various directions".

As such, Pangolakha range represents huge floristic compositions. The distribution of local floral elements of the sanctuary has clear dominance over others along with the rise of the altitude. The majority of the tree species of this region are quite old and huge in their size. This trees species are supported by the overwhelming growth of shrubs, herbs and epiphytes. *Leucocephalum canum*, *Oxyspora paniculata*, *Osbeckia nepalensis*, *Aconogonum molle* etc. are dominating in the partially open vegetation. The composition of the herbaceous flora is also significant in places located above 2000 m altitude.

The distribution of the floristic elements in PWS in between elevation of 1200 m to 4600 m amsl is distinctly marked by the enormous variation of habit groups i.e. herbs, shrubs, climbers, twinners and prostrate elements those are common and distinctly prevalent. The forests in this range is of marked distinction of being compact composition of the some tree species which includes *Alnus nepalensis*, *Acer campbellii*, *Quercus lamellosa*, *Lithocarpus pachyphylla*, *Q.clineata*, *Magnolia campbellii*, *Michelia doltsopa*, *Michelia cathcartii*, *Betula alnoides*, *Prunus nepalensis*, *P. cerasoides*, *Castanopsis hystrix*, *C. tribuloides*, *Symplocos glomerata*, *S. theaeifolia*, *Eurya japonica*, *Evodia fraxinifolia*, *Taxus baccata*, *Rhododendron arboreum*, *Toona ciliata* etc. The vegetation is further enriched by the following shrubs, viz. *Acuba himalaica*, *Maesa chisia*, *Neillia thirsiflorus*, *Gaultheria griffithiana*, *Elsholtzia fructicosa*, *Ilex crenata*, *Rubus lineatus*, *Leycesteria formosa*, *Viburnum erubescens* and of various species of small bamboos. All these species put together to constitute a magnificent thick layer of dense shrubs layer. Apart form this, there is predominant composition of herbaceous species which includes *Potentilla polyphylla*, *P. sundaica*, *Prunella vulgaris*, *Didymocarpus aromaticus*, *Chirita macrophylla*, *Begonia sikkimensis*, *Fragaria nubicola*, *Impatiens bracteata*, *Voila biflora*, *Cynoglossum glochidiatum*, etc.

Temperate cold forests (2400 – 2800 m) comprising of dense growth of tall trees terminate at some distance above and are replaced by grassy slopes on which trees are growing scattered. The vegetation of this type is distinguished further through the commendable

occurrence of herbs, shrubs, and sporadic appearance of numerous strangling climbers. The main components of broad-leaved trees are *Acer campbellii*, *Betula utilis*, *Engelhardtia spicata*, *Exbucklandia populnea*, *Ilex dipyrrena*, *Quercus lineata*, *Q. lamellosa*, *Lithocarpus pachyphylla*. The oak forests are the characteristic feature of this zone.

The notable shrubs of the vegetation are *Aconogonum molle*, *Dichroa febrifuga*, *Gaultheria fragrantissima*, *Helwingia himalaica*, *Daphne bholua*, *Holboellia latifolia*, *Rubus lineatus*, *Rubus paniculatus*, *Vaccinium retusum*, *Arundinaria malling*, *Dendrocalamus hamiltonii*, *Smilax glaucophylla*, *Vaccinium retusum*, *Lyonia ovalifolia*, *Piptanthus nepalensis*, *Principia utilis*, *Rhododendron grande*, *R. falconeri*, *Viburnum erubescens*, *Zanthoxylum oxyphyllum*. etc.

The herbaceous species forms the chief component of this vegetation zone in which most dominating species are *Anemone vitifolia*, *Arisaema jacquemontii*, *Ajuga lobata*, *Aster tricephalus*, *Cardamine impatiens*, *Fragaria vesca*, *Hemiphragma heterophyllum*, *Primula sikkimensis*, *Gallium mollugo*, *Valeriana wallichii*, *Gnaphalium affine*, *Fimbristylis dichotoma*, *Potentilla fulgens*, *Elsholtzia strobilifera*, *Fragaria nubicola*, *Voila pilosa*, *Hydrocotyle himalaica*, *Poa annua*, *Streptolirion volubile*, *Carex* spp. It is notable to see *Alnus nepalensis* and *Thysalonema maxima* inhibit to confine at the degraded and land slide-prone areas.

The distribution of major floristic elements of temperate or sub-alpine (2800 – 3400 m) conifer forests is characterized by a mixed forest of different species of *Rhododendron* and conifers. The initiation of sub-alpine forest from the cold temperate forests are marked by the presence of several species of trees like *Acer caudatum*, *A. campbellii*, *A. sikkimensis*, *Quercus lineata*, *Lithocarpus pachyphylla*, *Magnolia campbellii*, *Tsuga dumosa*, *Abies densa*, *Euonymus frigidus*, *Enkianthus deflexus* etc. However the *Rhododendrons* gradually dominate the forests as the elevation goes up. In between the trees *Abies densa* and *Tsuga dumosa* appeared uniformly inside *Arundinaria* sp., and mixed silver fir trees. Significantly, the forests are now symbolized with the strong under growth of *Berberis wallichiana*, *Enkianthus deflexus*, *Euonymus frigidus*, etc. followed by the species of the *Lonicera*, *Rubus*, *Ribes*, *Gaultheria*, etc. However, the most predominant shrubs are constituted by the majority species of *Rhododendron* e.g. *R. barbatum*, *R. edgeworthii*, *R. grande*, *R. arboreum*, *R. falconeri*, *R. dalhousie*, *R. griffithianum*, *R. glaucophyllum*, *R. thomsonii*, *R. lepidotum* and *R. campanulatum*. Some rare and interesting herbs found here are the *Panax pseudoginseng* var *bipinnatifolia*, *Panax pseudoginseng* var *angustifolia*, *Swertia chirayita*, *Valeriana wallichiana*, *Gallium mollugo*, *Fragaria daltoniana* and *Podophyllum hexandrum*. It is interesting to note that *Rhododendron arboreum* in Rachel

ridge is significantly attained its optimum growth with extremely huge girth *hitherto* not seen in other parts of the state.

The sub-alpine and alpine scrubs (3400 – 4600 m and above) occupies a core part of the PWS, where the shrubby habits dominate at most. The major floristic constituent of this part of the PWS are *Rhododendron anthopogon* and *R. setosum* form the dense tussocks near the sub-alpine mountain tops. The herbaceous species are however common and distributed evenly e.g. *Aconitum ferox*, *Anaphalis contorta*, *Cassiope fastigiata*, *Meconopsis paniculatus*, *Primula capitata*, *P. sikkimensis*, *Sedum multicaule*, and species of *Arenaria*, *Epilobium*, *Potentilla*, *Polygonatum*, *Rodiola*, etc. The vegetation at this zone is further enriched by the presence of plants with of great medicinal value viz. *Aconitum heterophyllum*, *Podophyllum hexandrum*, *Panax pseudoginseng*, *Picrorhiza kurroa* etc.

As the elevation rises up higher and higher, the stunted bushy growth of *Rhododendron anthopogon*, *R. lepidotum*, *Salix caliculata*, *S. lindleyana*, *Cotoneaster microphylla*, *Rosa sericea*, *Lonicera tomentella* are more regular and uninterrupted. The *Rhododendron nivale* is also observed to be distributed at altitude of 4600 m too, which is *hitherto* not seen in other part of the Sikkim. Significantly, the species like *Polygonatum campanulatum*, *Nardostachys jatamanshi*, *Rheum australe* were once common at Kupup, Nathang, Baba Mandir areas are now rarely distributed. In addition to this *Rhododendron anthopogon*, *R. campanulatum*, *R. thomsonii*, *R. setosum* and species of *Ranunculus*, *Primula*, *Aconitum*, *Voila*, *Fragaria*, *Meconopsis*, *Potentilla*, *Arisaema* are also distributed widely.

The majority of the herbs and shrubs represented themselves with more colorful and bright colored flowers which is presumed to be adapted to attract the pollinators. With the exception of *Delphinium*, *Lamiaceae*, *Asteraceae* and primroses all the species are remarkably devoid of odor. The species of alpine scrubs is also signifying with their procumbent habit e.g. *Rhododendron lanatum*, *Rhododendron lepidotum*, *Rhododendron thomsonii* etc. Species of *Carex*, *Kobresia*, *Festuca*, *Stipa*, *Poa* etc occupies among the grasses and sedges and the higher cliffs are the habitats for species of *Lonicera*, *Meconopsis*, *Saussurea*, *Saxifraga*, *Leontopodium* and *Tanacetum* etc.

7.1.5. Phytogeography of PWS

The Himalayan mountains are geologically young (Xu & Ding 2003). The rugged, and largely inaccessible landscape makes biological surveys in the Eastern Himalayan Mountains extremely difficult. Undescribed species, including some from the higher taxonomic groups including plant

species are very likely to occur in the more remote, heavily forested regions. However, despite the scant knowledge, what we know of the biodiversity indicates that the Eastern Himalayan region is amongst the biologically richest areas on the Earth.

The scale and complexity of the mountains in the Eastern Himalayan region contribute to high biological diversity in several ways. One of the important factors to contribute to the exceptional biological diversity of the Eastern Himalayas is its multiple biogeographic origins. Its location at the juncture of two continental plates places it in an ecotone represented by rich flora and as well as fauna. However, the topographic complexity normally isolates islands of habitat. Antecedent rivers and streams separated by mountain massifs may support reproductively isolated populations of low elevation species. And high ridges separated by valleys may isolate high elevation species. This can contribute to genetic differences among populations, a step toward the evolution of endemic species. On a shorter time scale, historical vicariant events isolate populations by affecting local immigration and extinction. Because the Himalayas are relatively young and the levels of endemism is low. However, the stage has been set for speciation.

Hooker (1906) attributed the floristic diversity of the Indian subcontinent " To the immigration of the plants from widely different bordering countries, notably Chinese and Malayan on the east and south, of oriental, European and African on the west and of Tibetan and Siberian on the North".

George A. Gammie in 1893 contended that the flora of Sikkim consists of elements from the tropics to the poles, and probably no other country of equal or large extent on the globe can present so many features of interest or many problems for the solution to the thoughtful materialist."

As such, the Flora of PWS also represents a mixed with numerous plants of common distribution from various biogeographic region of the world. The migration of the plants from other parts of the world has been taken place prior to the advent of Britishers during the nineteenth century. Significantly, many exotic plants have been introduced in India during British-India regime. In addition to this, the wealth of the Himalayan flora including many alpine species was also taken to England in the early part of the twentieth century. The detail analysis of the flora of PWS reveals about the following results.

A. Neotropical Elements: Th floristic elements representing Neotropical elements are mainly of tropical American region. The representing species from the study area include *Argemone mexicana*, *Chenopodium ambrosioides*, *Mimosa pudica*, *Physalis minima*, *Tridax procumbens* etc.

B. Pantropic Elements: The representing pantropical species of the study area includes *Achyranthes aspera*, *Ageratum conyzoides*, *Cleome gynandra*, *Cyperus compressus*, *Leucas aspera* etc.

C. Cosmopolitan Elements: The cosmopolitan floristic elements are widely distributed throughout the world. The representing cosmopolitan elements from the study area are *Chenopodium album*, *Cyperus rotundus*, *Gnaphalium affine*, *Eupatorium adenophorum*, *Sagina saginoides*, *Sagina procumbens*, *Prunella vulgaris*, *Drymaria diandra*, *Oxalis corniculata*, *Cerastium glomeratum*, *Poa annua*, etc.

D. Central Asiatic Elements: The floristic elements representing the Central Asiatic and commonly from Iran, Afganistan, Pakistan along with some from distant parts of Western India, Russia, and China are *Anaphalis contorta*, *Buddleja paniculata*, *Primula denticulata*, *Quercus lamellosa* etc.

E. Afro-Asiatic Elements: There are also few plants of Africa and Arabian region recorded from the sanctuary. The representing Afro-Asiatic elements are *Achyranthes bidentata*, *Conyza stricta* var. *stricta*, *Nasturtium officinale*, *Sanicula elata*, *Parochetus communis* etc.

G. American Elements: Interestingly, six American floral elements are also recorded from the sanctuary. The representing American species are *Cestrum aurantiacum*, *Drymaria villosa*, *Eupatorium adenophorum*, *Oxalis corymbosa*, etc.

H. Australian Elements: There are some common species of Australia those are also been recorded from the study area. The representing Australian species from the study area are *Celastrus paniculatus*, *Erigeron karwinskianus*, *Melastoma malabathricum*, *Siegesbeckia orientalis*, *Stellaria uliginosa*, *Toona ciliata*, etc.

I. European and North American elements

Some of the prominent species of European and American origin are *Andromeda*, *Rhamnus*, *Spiraea*, *Viburnum*, *Cotoneaster*, *Hippophae*, *Convallaria*, *Oxalis*, *Ranunculus*, *Potentilla*, *Chaerophyllum*, *Galium*, *Paris*, *Thlaspe*, *Poa* etc.

J. Eurasian Elements: Quite a few numbers of Eurasian's plant species (Europe & USSR) are also recorded from the sanctuary in insignificant proportion. The representing species of Eurasian elements are *Cardamine hirsuta*, *Persicaria hydropiper*, *Urtica dioica*, etc.

K. Euro-Siberian elements: The PWS represents wide range of altitudinal variation right from the temperate to alpine and subalpine region. As such, a number of species recorded from here

are of European and Siberian origin. The representing floristic elements of Euro-Siberian recorded from the sanctuary are *Veronica anagalis*, *Viola biflora*, etc.

L. Indian and Indian Subcontinental Elements: These are the indigenous plants species of India. The major plants under this category also represent Indo-Gangetic part of India. The representing species of Indian subcontinental origin from the study area are *Murraya koenigii*, *Erythrina stricta* etc.

M. Himalayan elements: The floristic elements of PWS also constitute many native species of Himalayan ranges. The representing Himalayan elements from the study area are *Ainslea aptera*, *Euonymus echinatus*, *Mazus* sp. *Populus ciliata*, *Rubus paniculatus*, *Stellaria patens*, *Sabia* spp. etc.

N. Eastern Himalayan Elements: The representing species of Eastern Himalayan origin from PWS are *Acer hookeri*, *Daphne sureil*, *Euonymus frigidus*, *Gaultheria fragrantissima*, *Hoya lanceolata*, *Juncus ochraceus*, *Loxostigma griffithii*, *Lonicara glabrata*, *Mucuna macrocarpa*, *Oxalis acetosella*, *Pilea terniifolia*, *Rhododendron dalhousiae*, *Rhododendron grande*, *Smilax ferox*, *Stellaria sikkimensis*, etc.

O. Sino-Himalayan Elements: Interestingly there are also few Chinese plants that have been recorded from the PWS. The common Chinese elements collected from the study area are *Aconogonum campanulatum*, *Carpesium trachelifolium*, *Polygonatum cirrhifolium*, *Pteracanthus alatus*, *Schefflera impressa*, *Thunbergia coccinea*, etc.

P. Floristic elements distributed from E.Himalaya to Japan: The representing floristic elements of eastern Himalaya extending their distribution to Japan from the study area are *Sonchus arvensis*, *Spiraea micrantha*, *Helwingia japonica*, *Lyonia ovalifolia*, *Viburnum erubences*, etc.

Q. Floristic elements distributed from Western Himalaya to Japan: The representing floristic elements of western Himalaya extending their distribution to China from study area are *Cardiocrinum giganteum*, *Houttuynia cordata*, *Rhus javanica*, *Streptolirion volubile*, etc.

R. Floristic elements distributed from western Himalaya to China: The representing floristic elements of western Himalayas to China recorded from the study area are *Acer oblongum*, *Alnus nepalensis*, *Anemone rupicola*, *Arisaema tortuosum*, *Astilbe rivularis*, *Cotonester microphylla*, *Elsholtzia fructifera*, *Fragaria nubicola*, *Gaultheria trichophylla*, *Holboellia* spp. *Juniperus*

recurva, *Nardostachys grandiflora*, *Paris polyphylla*, *Piptanthus nepalensis*, *pleione praecox*, *Podophyllum hexandrum*, *Prunus cerasoides*.

S. Floristic elements distributed throughout the Himalaya and absent from China and Japan: The representing floristic elements of Himalaya and absent from China and Japan from the study area are *Acer sterculaceum*, *Cortia depressa*, *Gypsophylla cerastioides*, *Lonicera obovata*, *Parnassia nubicola*, *Potentilla lineata*, *Rhododendron anthopogon*, *R. barbatum*, *R. campanulatum*, *Rosa microphylla*, *Rubus nepalensis*, *R. paniculatus*, *Sorbus cuspidata*, *S. microphylla* etc.

T. S.E. Asian and Indo-Malayan Elements: These are common plants of S.E. Asian and Indo-Malayan origin. The representing floristic elements of S.E. Asian and Indo-Malayan recorded from the PWS are *Aconogonum molle*, *Arisaema concinnum*, *Bischofia javanica*, *Callicarpa microphylla*, *Cinnamomum impressinervium*, *Engelhardtia spicata*, *Eria paniculata*, *Gentiana speciosa*, *Hoya linearis*, *Maesa chisia*, *Michelia cathcartii*, *Pratia montana*, *Michelia champaca*, *Rubus lineatus*, *Smilax ovalifolia*, *Toona ciliata* etc.

U. Floristic elements distributed from the eastern Himalaya to Japan: Majority of the taxa of this group do not extend to China and western Himalaya and restricted to the Eastern Himalaya to Japan area. The representing floristic genera of above category recorded from the study area are *Enkianthus*, *Helwingia*, *Rodgertia*, *stachyrus* etc.

V. Floristic elements distributed from the Eastern Himalaya to China: The representing floristic elements distributed from Eastern Himalaya to China recorded from the study area are *Betula alnoides*, *Campylandra aurantiaca*, *Coelogyne corymbosa*, *Ilex fragilis*, *Leycesteria gracilis*, *Litsea cubea*, *Meconopsis napaulensis* etc.

W. Tibetan elements: The Tibetan element is mainly xerophytic and greatly differs from that of Himalayan mainly because of low rainfall and high altitude. Some of these Tibetan elements extended into PWS are *Cortiella hookeri*, *Kobresia schoenoides*, *Phlomis spp.*, *Saussurea ovalata*, etc.

X. Arctic-alpine Elements: The species of this category are widespread in arctic regions and belong to the high mountain ranges of Europe and Asia. Most importantly, some of the representing arctic-alpine species recorded from the study area are *Juncus triglumis*, *Oxyria digyna*, *Sagina saginoides*, etc.

Y. Transition elements: The flora of PWS is characteristically unique. Being situated at adjacent to the TAR (Tibet Autonomous Region) and Bhutan, the migration of many species has

also been taken place on the course of time. Some fascinating species under this category are *Anemone vitifolia*, *Eupatorium adenophorum*, *Leptocodon gracilis* etc. (Gammie 1893).

Flora of PWS is significantly diverse and peculiar in its floristic composition. The floristic elements of the sanctuary are reasonably interesting and exceptionally rich floristic composition.

7.1.6. Floristic Elements of the Wetlands

Wetlands are important self sustained ecosystems, which also forms an important life support system for numerous plants and animals. Sikkim Himalaya is bestowed with 42 identified wetlands with an area of 1101 ha comprising 150 small and big lakes situated between 300 m to 8500 m altitudes (Shukla *et al.* 2002). Wetlands in alpine and sub-alpine region of East Sikkim occupy a significant geo-morphological proportion in landscape and play a crucial ecological and socio-economic role. Apart from that they are the centre attraction for tourists in turns, generate employment for the local people. The alpine region of east Sikkim offers a large numbers of wetlands, yet no proper documentation is available regarding their ecological status except a few scattered (Roy *et al.* 1998). Therefore, diversity of floristic composition of wetlands of Pangolakha deserves a separate study, infavour of conservation aspect. Some of the prominent lakes of those constitute the wetland system in the Alpine region of East Sikkim including Pangolakha wildlife sanctuary are Bidang tsho (Kupup lake), Memenchu lake, Lampokhri, Sherathang lake which are situated between 1670 m to 4379 m. Besides, there are several other lakes, which have no prominent individual names as such. It is noteworthy; some wetlands including lakes are now gradually becoming degraded. The area of these lakes remain frozen for about five months from November to march and become important Pasteur land, especially for domestic animals *viz.* Yak, sheep, horses etc. Haridasan *et al.* 2002, has recorded 74 species of angiospermic plants under 21 families from the wetlands of east Sikkim. As such, 32 species of plants that grows on the marshy places, along the streams, edges of lakes of PWS and other adjoining regions of alpine and sub - alpine region of east Sikkim has been collected. Some of the dominant families recorded under this category from the sanctuary are *Juncaceae*, *Polygonaceae*, *Scrophulariaceae*, *Cyperaceae*, *Primulaceae*, *Fumariaceae*, *Asteraceae*, *Poaceae*,

Ranunculaceae, *Droceraceae*, *Lamiaceae*, *Saxifragaceae*, appears to be the 10 largest dominating families of flowering plants. Some of the common floristic elements of the wetland of Pangolakha range *Bistorta amplexicaulis*, *B. microphylla*, *Caltha scaposa*, *C. palustris*, *Corydalis flicina*, *Drosera peltata*, *Epilobium tibetanum*, *E. sikkimensis*, *Juncus allioides*, *J. amplifolious*, *J. benghalensis*, *J. bufonius*, *J. duthie*, *J. effuses*, *J. inflexus*, *J. sikkimensis*, *J. thomsonii*, *J. trychphyllus*, *J. triglumis*, *J. uinflora*, *Agrostis nervosa*, *Lagotis kunawurensis*, *Parnasia cooperi*, *P. tanella*, *Primula capitata*, *P. sapphirina*, *P. sikkimensis*, *Pedicularis siphonantha*, *Ranunculus hirtellus*, *Ranunculus ficariifolius* etc. grows around lake margins and marshy places. However, it is also very interesting to record that, there are absent of any wind of floating hydrophytes.

7.1.7. Peculiar adaptation mechanism in alpine plants of Pangolkha Wildlife Sancruary:

W.W. Smith (1913) reported that the plants species of alpine and subalpine region of East Sikkim are endowed with fascinating protective mechanism, which saves them from continuous exposure to the moisture of unpredictable climate. Similar type of adaptation on plants is also observed during the present floristic survey. The majority of the shrubs and herbs of this region are of flowers with bright colors that attract enormous bees and other pollinating agent for their effective pollination leading to the seed formation. During the flowering season the *Rhododendron anthopogon* along with some other species are highly aromatic and attracts many pollinators, though occasional visitors of the region often tend to develop headache.

However, the *Asteraceae* and *Primulaceae* being the largest families of flowering plants of the region, the majority of their species are devoid of any odor. Many other species that exist in the area are mostly being transformed within themselves for adaptation. For instance, the inflorescence of the *Rheum nobile* is often hidden under densely overlapping bracts. Smith also reported that the leaf of *Eriophyton* also serves to protect its flowers from various external interferences. Similarly, it was noted that the flower head in *Saussurea obvallata* is compactly enclosed with numerous inflated papery bracts, while the *Saussurea gossypiphora* is completely enveloped in a woolly covering, therefore, it is being assumed that this natural modification in itself is a for self protection from any external injuries.

Apart from this, while studying the general aspect of flora of alpine and subalpine region it was also being noted that some species are often seen in procumbent habit that grows in dense, hard, tufts for e.g. *Rhododendron anthopogon*, *R. lepidotum* etc, which was also noted in *R. nivale* by Smith in 1913. Therefore, it is apparent that spreading in ground stature seems to save them from being broken by the continuous strong blowing of wind and such modification in habit and the composition of small spiny, harsh leaves tend to defend them from being browsed by other living organisms.

Interestingly, the pollens and seeds of Conifers being light and winged are easily carried away for long distances by wind that enables the seeds germination in the far distance from its mother plant. The trees of the subalpine region also attained extensively gregarious, that could save them from cattle and other herbivorous animals. Although these naturally protected plants are seemingly more adapted to their environment, yet they certainly do not show by numerical superiority, that they have gained any advantage for the struggle of life.

7.2. ENDEMIC FLORA OF PANGOLKHA WILDLIFE SANCTUARY

The number of endemic elements in the Himalayan region is 3165 out of 6850 in India. As such, the Himalayas has a very high percentage of Indian endemics (46 %) of the total endemic elements of the country (Chatterjee 1940, 1960). Sir J.D. Hooker in 1849 claimed that majority of the Indian floristic species are migrated from other part of the world. However, many recent workers support the contention of D. Chatterjee for his estimation of about 60 % of the Indian flora are of Indian origin, and out of which 14 % being exclusively endemic to India. According to Singh & Chauhan (1998) over 3% of the plant species are endemic to Sikkim. Bhujel & Das (2002) recorded a total of 397 dicotyledonous species are endemic to Eastern Himalaya including those extending to NE India. Some of these plants are also with extremely restricted distribution like 'Endemic to Darjeeling' of West Bengal. Hence, the PWS being situated adjoining to the Neora Valley National Park under Darjeeling district of West Bengal, shares a common representation in endemic species. Significantly, PWS being one of the important natural conservatories of the Sikkim, acts as a repository of endemic flora of Sikkim and for the country. Despite the fact that the several efforts may be essential to identify and to protect these vanishing endemic species in the state, an adequate and well designed strategy to carry out this task needs to be framed and implemented (Lama, 2001).

The floristic analysis of the PWS holds about 26.53.% of the recorded species as endemic flora. Having being PWS is not distinctly represents a distinct physico-climatic zone, assessment of the endemic taxa is categorized broadly into following three phytogeographical divisions:

- I. Endemic to Sikkim
- II. Endemic to Eastern Himalaya [240]
- III. Endemic to Himalayas [112]
- IV. Endemic to Eastern Himalaya extending to NE India
- V. Endemic to the Himalayas extending to NE India.

I. Endemic to Sikkim

Flora of PWS represents some endemic taxa which are strictly endemic to Sikkim hills. A list of such taxa presented below in Table 7.13:

Table 7.13. Plants endemic to Sikkim Himalaya recorded from PWS

Names of Plants	Family
<i>Lactuca cooperi</i>	Asteraceae
<i>Ligularia kingiana</i>	Asteraceae
<i>Rhododendron aeruginosum</i>	Ericaceae
<i>Corydalis changuensis</i>	Fumariaceae
<i>Androsace croftii</i>	Primulaceae

II. Endemic to Eastern Himalaya

Quite a large number of plants with their distribution restricted within the Eastern Himalayan region have been recorded from the PWS. This, in fact, expresses the originality of the flora of this sanctuary and deserves special attention for its proper maintenance. Recorded plants endemic to the Eastern Himalayan region are presented below in Table 7.14.

Table 7.14. Taxa recorded from PWS, endemic to Eastern Himalaya

Name of Plant	Family
<i>Actinodaphne longipes</i>	Lauraceae
<i>Agapetes hookeriana</i>	Ericaceae
<i>Agapetes serpens</i>	Ericaceae
<i>Ainsliea aptera</i>	Asteraceae
<i>Anaphalis griffithii</i>	Asteraceae
<i>Anisadenia saxatilis</i>	Lineaceae
<i>Arenaria melandrioides</i>	Caryophyllaceae
<i>Arisaema griffithii</i>	Araceae
<i>Begonia gemmipara</i>	Begoniaceae
<i>Begonia josephii</i>	Begoniaceae
<i>Begonia ovatifolia</i>	Begoniaceae
<i>Begonia satrapis</i>	Begoniaceae

<i>Begonia sikkimensis</i>	Begoniaceae
<i>Berberis angulosa</i>	Berberidaceae
<i>Berberis hookeri</i>	Berberidaceae
<i>Berberis insignis</i>	Berberidaceae
<i>Brassaiopsis hispida</i>	Araliaceae
<i>Brassaiopsis mitis</i>	Araliaceae
<i>Carex insignis</i>	Cyperaceae
<i>Cathcartia villosa</i>	Papaveraceae
<i>Circaea alpina</i> ssp. <i>angustifolia</i>	Onagraceae
<i>Codonopsis dicentrifolia</i>	Campanulaceae
<i>Codonopsis foetens</i>	Campanulaceae
<i>Codonopsis inflata</i>	Campanulaceae
<i>Codonopsis peduncularis</i>	Campanulaceae
<i>Cremanthodium cremanthoides</i>	Asteraceae
<i>Delphinium caldelabrum</i>	Ranunculaceae
<i>Didymocarpus albicalyx</i>	Gesneriaceae
<i>Didymocarpus podocarpus</i>	Gesneriaceae
<i>Dubyaea hispida</i>	Asteraceae
<i>Epilobium clarkeanum</i>	Onagraceae
<i>Euonymus echinatus</i>	Celastraceae
<i>Euphorbia himalayensis</i>	Euphorbiaceae
<i>Euphorbia luteo-viridis</i>	Euphorbiaceae
<i>Euphorbia sikkimensis</i>	Euphorbiaceae
<i>Fimbristylis stolonifera</i>	Cyperaceae
<i>Gentiana elwesii</i>	Gentianaceae
<i>Gentiana prolata</i>	Gentianaceae
<i>Heracleum nepalense</i>	Apiaceae
<i>Hoya serpens</i>	Asclepiadaceae
<i>Ilex sikkimensis</i>	Aquifoliaceae
<i>Impatiens bracteata</i>	Balsaminaceae
<i>Impatiens juripia</i>	Balsaminaceae
<i>Impatiens longipes</i>	Balsaminaceae
<i>Impatiens porrecta</i>	Balsaminaceae
<i>Impatiens pradhanii</i>	Balsaminaceae
<i>Isodon repens</i>	Lamiaceae
<i>Kobresia fragilis</i>	Cyperaceae
<i>Kobresia stiebritziana</i>	Cyperaceae
<i>Lasianthus sikkimensis</i>	Rubiaceae
<i>Ligularia hookeri</i>	Asteraceae
<i>Mahonia napaulensis</i>	Berberidaceae
<i>Mussaenda roxburghii</i>	Rubiaceae
<i>Mussaenda treautleri</i>	Rubiaceae
<i>Neanotis gracilis</i>	Rubiaceae
<i>Pedicularis flexuosus</i>	Scrophulariaceae
<i>Pedicularis furfuracence</i>	Scrophulariaceae
<i>Persea clarkeanum</i>	Lauraceae
<i>Persea gammiceana</i>	Lauraceae
<i>Pilea ternifolia</i>	Urticaceae
<i>Porana grandiflora</i>	Convolvulaceae
<i>Primula capitata</i> var. <i>capitata</i>	Primulaceae
<i>Primula geranifolia</i>	Primulaceae
<i>Primula sapphirina</i>	Primulaceae
<i>Primula soldanelloides</i>	Primulaceae

<i>Primula tibetica</i>	Primulaceae
<i>Primula walshii</i>	Primulaceae
<i>Psychotria erratica</i>	Rubiaceae
<i>Pycneus sanguinolentus</i>	Cyperaceae
<i>Rheum acuminatum</i>	Polygonaceae
<i>Rhododendron anthopogon</i>	Ericaceae
<i>Rhododendron baileyi</i>	Ericaceae
<i>Rhododendron dalhousiana</i>	Ericaceae
<i>Rhododendron falconeri</i>	Ericaceae
<i>Rhododendron glaucophyllum</i>	Ericaceae
<i>Rhododendron grande</i>	Ericaceae
<i>Rhododendron griffithiana</i>	Ericaceae
<i>Rhododendron lanatum</i>	Ericaceae
<i>Rhododendron thomsonii</i>	Ericaceae
<i>Rubia wallichina</i>	Rubiaceae
<i>Rubus hyperiginus</i>	Rosaceae
<i>Rubus treautleri</i>	Rosaceae
<i>Salix caliculata</i>	Salicaceae
<i>Salvia campanulata</i>	Lamiaceae
<i>Sarcococca hookeriana</i>	Euphorbiaceae
<i>Saxifraga latifolia</i>	Saxifragaceae
<i>Scrophularia elatior</i>	Scrophulariaceae
<i>Silene gonosperma</i>	Caryophyllaceae
<i>Sloanea desycarpa</i>	Elaeocarpaceae
<i>Sorbus foliolosa</i>	Rosaceae
<i>Soroseris hookeriana</i>	Asteraceae
<i>Spiraea canacense</i>	Rosaceae
<i>Strobilanthes echinata</i>	Acanthaceae
<i>Symplocos dryophylla</i>	Symplocaceae
<i>Symplocos glomerata</i>	Symplocaceae
<i>Tanacetum atkinsonii</i>	Asteraceae
<i>Teautlera insignis</i>	Asclepiadaceae
<i>Thunbergia lutea</i>	Acanthaceae

III. Endemic to the Himalayas

The distribution of some species of plants is extending outside the Eastern Himalayan region but remain restricted within the Himalayas. A list of some such plants has been presented below in Table 7.15.

Table 7.15. Floristic elements of PWS endemic to the Himalayan region

Plant Name	Family
<i>Acer sterculiaceum</i>	Aceraceae
<i>Aconitum bisma</i>	Ranunculaceae
<i>Agapetes saligna</i>	Ericaceae
<i>Anaphalis royleana</i>	Asteraceae
<i>Anaphalis triplinervis</i> var. <i>intermedia</i>	Asteraceae
<i>Anaphalis triplinervis</i> var. <i>monocephala</i>	Asteraceae
<i>Androsace geraniifolia</i>	Primulaceae
<i>Androsace globifera</i>	Primulaceae
<i>Androsace hookeriana</i>	Primulaceae

<i>Arisaema propinquum</i>	Araceae
<i>Arisaema utile</i>	Araceae
<i>Aristolochia griffithii</i>	Aristolochiaceae
<i>Artemisia thellungiana</i>	Asteraceae
<i>Aster stracheyi</i>	Asteraceae
<i>Asystasia macrocarpa</i>	Acanthaceae
<i>Bistorta emodi</i>	Polygonaceae
<i>Bistorta macrophylla</i>	Polygonaceae
<i>Bistorta vacciniifolia</i>	Polygonaceae
<i>Boehmeria hamiltoniana</i>	Urticaceae
<i>Boehmeria macrophylla</i>	Urticaceae
<i>Carex setosa</i>	Cyperaceae
<i>Carex daltonii</i>	Cyperaceae
<i>Carex inanis</i>	Cyperaceae
<i>Carex obscura</i>	Cyperaceae
<i>Carex pulchra</i>	Cyperaceae
<i>Codonopsis subsimplex</i>	Campanulaceae
<i>Cortiella cortioides</i>	Apiaceae
<i>Cortiella hookeri</i>	Apiaceae
<i>Cryptothladia polyphylla</i>	Dipsacaceae
<i>Cyananthus incanus</i>	Campanulaceae
<i>Cyananthus lobetus</i>	Campanulaceae
<i>Cyananthus spathulifolia</i>	Campanulaceae
<i>Cynoglossum wallichii</i>	Boraginaceae
<i>Daphne bholua</i>	Thymelaeaceae
<i>Daphne papyracea</i>	Thymelaeaceae
<i>Daphne sureil</i>	Thymelaeaceae
<i>Delphinium viscosum</i>	Ranunculaceae
<i>Didymocarpus pulchra</i>	Gesneriaceae
<i>Dipsacus atratus</i>	Dipsacaceae
<i>Edgaria darjeelingensis</i>	Cucurbitaceae
<i>Epilobium royleanum</i>	Onagraceae
<i>Epilobium sikkimensis</i>	Onagraceae
<i>Epilobium wallichianum</i>	Onagraceae
<i>Euonymus echinatus</i>	Celastraceae
<i>Euonymus vagans</i>	Celastraceae
<i>Euonymus viburnoides</i>	Celastraceae
<i>Euphorbia longifolia</i>	Euphorbiaceae
<i>Fraxinus floribunda</i>	Oleaceae
<i>Galium acutum</i>	Rubiaceae
<i>Geranium donianum</i>	Geraniaceae
<i>Geranium polyanthes</i>	Geraniaceae
<i>Hackelia bhutanica</i>	Boraginaceae
<i>Mazus dentatus</i>	Scrophulariaceae
<i>Melissa axillaris</i>	Lamiaceae
<i>Nardostachys grandiflora</i>	Valerianaceae
<i>Neillia rubiflora</i>	Rosaceae
<i>Neolitsea cuipala</i>	Lauraceae
<i>Parnassia chinensis</i>	Saxifragaceae
<i>Parnassia tenella</i>	Saxifragaceae
<i>Pedicularis siphonanthus</i>	Scrophulariaceae
<i>Peperomia heyniana</i>	Piperaceae
<i>Phlomis macrophylla</i>	Lamiaceae

<i>Physospermopsis kingdom-wardii</i>	Apiaceae
<i>Pleurospermum pilosum</i>	Apiaceae
<i>Populus ciliata</i>	Salicaceae
<i>Potentilla coriandrifolia</i>	Rosaceae
<i>Primula drummondiana</i>	Primulaceae
<i>Rhodiola fastigiata</i>	Crassulaceae
<i>Rhodiola himalayensis</i>	Crassulaceae
<i>Rhododendron barbatum</i>	Ericaceae
<i>Rubus pectinarioides</i>	Rosaceae
<i>Rubus thomsonii</i>	Rosaceae
<i>Saussurea auriculata</i>	Asteraceae
<i>Saussurea candolleana</i>	Asteraceae
<i>Saussurea eriostemon</i>	Asteraceae
<i>Saxifraga montana</i>	Saxifragaceae
<i>Scrophularia urticifolia</i>	Scrophulariaceae
<i>Sedum triactina</i>	Crassulaceae
<i>Sorbus cuspidata</i>	Rosaceae
<i>Sorbus micrphylla</i>	Rosaceae
<i>Swertia hookeri</i>	Gentianaceae
<i>Swertia speciosa</i>	Gentianaceae
<i>Synotis alata</i>	Asteraceae
<i>Synotis wallichii</i>	Asteraceae
<i>Taraxacum eriopodum</i>	Asteraceae
<i>Thalictrum elegans</i>	Ranunculaceae
<i>Tupistra nutans</i>	Convallariaceae
<i>Viburnum mullaha</i>	Caprifoliaceae

IV. Plants Endemic to Eastern Himalaya but extending to NE India

There are some plants recorded from this sanctuary those are basically endemic to the Eastern Himalayan region but their distribution is also extending in the NE Indian states. Those plants have been presented in Table 7.16 below:

Table 7.16. Plants of PWS endemic to Eastern Himalaya but extending to the NE Indian states

Name of Plant	Family
<i>Ilex crenata</i>	Aquifoliaceae
<i>Primula calderiana</i>	Primulaceae
<i>Primula bracteosa</i>	Primulaceae
<i>Tupistra aurantiaca</i>	Convallariaceae
<i>Raphidophora glauca</i>	Araceae
<i>Berberis umbellata</i>	Berberidaceae
<i>Oenanthe hookeri</i>	Apiaceae
<i>Spiraea micrantha</i>	Rosaceae
<i>Impatiens racemosa</i>	Balsaminaceae
<i>Impatiens radiata</i>	Balsaminaceae
<i>Maytenus rufa</i>	Celastraceae
<i>Rhododendron cinnabarinum</i>	Ericaceae
<i>Hypericum hookerianum</i>	Hypericaceae
<i>Aconitum lacinatedum</i>	Ranunculaceae
<i>Aconitum spicatum</i>	Ranunculaceae
<i>Parthenocissus semicordata</i>	Vitaceae
<i>Ajuga macrosperma</i> var. <i>breviflora</i>	Lamiaceae

V. Plants Endemic to Eastern Himalaya but extending to NE India

There is another group of plants in the flora of PWS those are basically endemic for the Himalayan region but their distribution is also extending in the NE Indian states. The names of these plants are presented below in Table 7.17.

Table 7.17. Plants of PWS endemic to the Himalaya but extending to the NE Indian states

Name of Plant	Family
<i>Corydalis chaerophylla</i>	Fumariaceae
<i>Swertia chirayita</i>	Gentianaceae
<i>Hypericum uratum</i>	Hypericaceae
<i>Ophiorrhiza fasciculata</i>	Rubiaceae
<i>Elatostema hookerianum</i>	Urticaceae
<i>Piper mulfesua</i>	Piperaceae
<i>Stephania elegans</i>	Menispermaceae
<i>Persea duthei</i>	Lauraceae

This analysis of the endemic status for the floristic elements of the Pangolakha Wildlife Sanctuary exposed the originality and importance of its flora once again.

Table 7.18. Numerical sum-up of the the endemic flora of PWS

Endemic category	Total Angiospermic flora of PWS	No. of endemic species	% of endemic species	% of type of endemism
Sikkim	818	5	0.61	2.3
Eastern Himalaya		98	11.98	45.16
Himalayas		88	10.76	40.55
E. Himalaya & NE India		18	2.2	8.29
Himalayas & NE India		8	0.98	3.69
TOTAL:	818	217	26.53	

Table 7.18 shows that a total of 217 (out of 818) species is endemic for different geographical regions. This is the 26.53 % of the total angiospermic flora of PWS. Out of the different categories of endemics Eastern Himalayan elements are maximum and representing 11.98 % of recorded angiosperms and 45.16 % of the total number of endemics in PWS. This is followed by Himalayan elements (10.76 %) which is 40.55 % of the recorded endemics.

7.3 EXOTICS

Numerous exotic species of plants has been introduced in consideration of their economical importance to meet the human need and desire. On the other hand, another group of foreign plants gradually reached a place though the process of natural migration. So, these exotic plants can be classified as (i) migratory and (ii) introduced exotic species, which formed one of the major components of the flora and vegetation of Eastern Himalaya. A series of studies has been undertaken by Biswas (1940), Hara (1966, 1971), Ohashi (1975), Mathew (1981), Das (2002) and Das & Chanda (1986) on exotic plant species of Eastern Himalayan region. Plants arrived here even from distant places like South East Asia, North East India and from Europe through chains of mountain ranges system and from Deccan and Peninsular India. Plants carried by human agencies are probably the most important method of arrival of exotics to this region. However, in the present context, the global extent and rapid increase in invasive species is homogenising the world's flora and fauna (Mooney & Hobbs 2000) and is recognized as a primary cause of global biodiversity loss. Bio-invasion may be considered as a form of biological pollution and significant component on global change and one of the major causes of species extinction (Mooney & Drake 1987).

The flora of PWS is also reporting a considerable number of exotic species, primarily originated from America, Australian, Chinese, European and Siberia etc. The exotic species recorded from the PWS includes *Cestrum aurantiacum* (North and central American species); *Erigeron karvinskianus* (Mexican species); *Cardamine hirsuta*, *Cardamine flexuosa* (European and temperate Eurasian species); *Hydrocotyle sibthorpioides*, West Indies), etc. The lists of some exotic species recorded from the PWS is mentioned at Table No 7.19.

Beside being the dominating and extensive growth of exotic weeds viz, *Cestrum aurantiacum*, *Eupatorium adenophorum* etc. has an adverse impact on the local ecological system. *Pinus longifolia* is also assumed to be introduced in the recent time.

Table 7.19. Lists of exotic species of PWS

[Abbreviation used: Habit; AH = Annual herb, PH= Perennial herb, S= Shrub, AC = Annual climber.]

EXOTIC SPECIES	FAMILIES	HABIT	AREA OF ORIGIN
<i>Cestrum auratiacum</i>	Solanaceae	S	N & C America
<i>Chenopodium ambrosoides</i>	Chenopodiaceae	AH	C. America
<i>Drymaria villosa</i>	Caryophyllaceae	AH	S. America
<i>Erigeron karvinskianus</i>	Asteraceae	PH	Australia
<i>Hydrocotyle sibthorpioides</i>	Apiaceae	AH	West Indies
<i>Eupatorium adenophorum</i>	Asteraceae	S	C. America
<i>Galinsoga parviflora</i>	Asteraceae	AH	C. America

<i>Hydrangea macrophylla</i>	Hydrangeaceae	S	Sino- Japanese
<i>Ipomoea purpurea</i>	Cucurbitaceae	AC	S. America
<i>Oxalis corymbosa</i>	Oxalidaceae	AH	S. America
<i>Pilea microphylla</i>	Urticaceae	PH	S. America
<i>Rorippa nasturtium aquiticum</i>	Brassicaceae	PH	Eurasia
<i>Cardamine hirsuta</i>	Brassicaceae	AH	Europe

7.4. RARE AND THREATENED PLANTS OF PANGOLAKHA WILDLIFE SANCTUARY

The PWS is one of the important conservatories for rare and threatened species of plants. During the study, some of the threatened species of India, under Red Data Books of Indian Plants (Nayar & Shastri 1987, 1988, 1990) is also being recorded. This species seems to be widely distributed inside the sanctuary in different altitudinal zones. The rarity of or threat to a majority of them could be of several reasons, but it could also be due to several frequent anthropogenic factors like habitat destruction due to grazing, transborder species trafficking etc. Unskilled and unscientific collection of species by local plant-traders for several identical purposes, are attributing directly or indirectly in the loss of species population.

The knowledge of plants being used in medicine is maximum in the Indian Himalayan region (Samant & Dhar 1997). There are major gaps in the knowledge of biological resources and the means by which biological diversity is maintained (Heywood & Baste 1995). The very survival of these resources is now under threat from rapidly expanding human population and concomitant environmental degradation occurring at a fast pace. During the study, 10 species of plants, which falls under the category of rare and threatened species according to the Red Data Book of Indian plants (Nayar & Shastri 1987, 1988, 1990) has also been recorded for the first time from east Sikkim. The lists of rare and threatened species of India, from PWS are presented in Table 7.20.

The orchids are the important component of the Flora of PWS. They are widely distributed as geophytes to epiphytes. The PWS hold not less than 55 wild orchids, which is rare in its distribution across the east Himalayan region (Lucksom, 2007).

Table 7.20. The lists of the threatened species of India recorded from PWS.

FAMILY	SPECIES	STATUS
Aceraceae	<i>Acer hookeri</i>	Endangered
Ranunculaceae	<i>Aconitum ferox</i>	Vulnerable
Begoniaceae	<i>Begonia satrapis</i>	Rare
Campanulaceae	<i>Codonopsis affinis</i>	Rare
Juncaceae	<i>Juncus sikkimensis</i>	Rare
Asteraceae	<i>Lactuca cooperi</i>	Endangered

Valerianaceae	<i>Nardostachys grandiflora</i>	Vulnerable
Scrophulariaceae	<i>Picrorhiza kurrooa</i>	Vulnerable
Podophyllaceae	<i>Podophyllum hexandrum</i>	Threatened
Apiaceae	<i>Pimpinella tongloensis</i>	Endangered

Source: Red Data book of Indian Plants (Nayer & Shastry, 1987-88)

7.5. ECONOMIC ASSESSMENT

The PWS is housing a large number of floristic elements, which are economically significant. Many of those are holding precious medicinal, ornamental and aromatic values. However, a large numbers of species are having incredible ethnobotanical importance. The tribal people living in the proximity of the sanctuary have been using many species for various purposes in sustainable manner. Many species of plant belongs to the sanctuary are also alternative for wild edibles. The PWS is also a rich depository of the plants used by the local folk healers, faith healers viz, *Vaidyas*, *Bongthing*, *Phedangba* and others.

The sanctuary also inhabited by a good number of high quality timber yielding trees, which has been used for various construction works, furniture, agricultural implements etc. Some of the species of this category are *Alnus nepalensis*, *Alcimandra cathcartii*, *Tsuga dumosa*, *Mangnolia campbellii* etc.

Significantly, the forest of PWS has also been identified as a repository of trees, shrubs, herbs and climbers of immense ornamental value. The sanctuary is also known for being a plethora of economically important species including wild edible and medicinal species, which may also have enormous importance of economical value.

7.5.1. Medicinal Plants Resources

PWS is an immensely rich repository of medicinal plants, which can be used in various upcoming pharmaceutical industries of state and its adjoining region for the preparation of several life saving drugs. The plants are either illegally transported to the various medicinal plant base industries. Some of the important potential medicinal plants of the PWS are *Achyranthes bidentata*, *Aconitum ferox*, *Astilbe rivularis*, *Berginia ciliata*, *Clematis acuminata*, *Dioscorea deltoidea*, *Elaeocarpus lancaefolius*, *Heracleum wallichii*, *Hemiphragma heterophyllum*, *Lycopodium clavatum*, *Mahonia napaulensis*, *Neopicrorhiza scrophulariiflora*, *Panax pseudoginseng*, *Podophyllum hexandrum*, *Polygala arillata*, *Rubia manjith*, *Swertia chirayita*, *Taxus baccata*, *Zanthoxylum oxyphyllum* etc.

Interestingly, many such other species are traditionally used by the local folk healers for the treatment of various common diseases in both human and cattle. The allopathic system medicines are practically unavailable in the vicinity of sanctuary, the herbal healers treats the

minor ailment using some selected herbs during the accident or in emergency. The details of this category of plants are also discussed in detail below under sub- heading ethno-medicinal plants of PWS.

7.5.2. Ornamental Plants of the Sanctuary

Das & Chanda (1990) has analyzed the ornamental potentiality of the flora of adjacent Darjiling Hills. The PWS is also identified as a home for a large numbers of plant species of an immense ornamental significance. Interestingly, some species of wild flowers are now domesticated by the people living in the vicinity for the beautification of their houses and gardens. One of the important components of flora of sanctuary is its wild Orchids, which is immensely rich and widely distributed. These orchids of great ornamental values includes the species of *Calanthe*, *Dendrobium*, *Vanda*, *Cymbidium*, *Paphiopedilum* etc and having huge potential for export market if propagated artificially in large scale. The beautiful flowers of numerous species of *Primula*, *Pedicularis*, *Potentilla*, and *Rhododendrons* are also noteworthy potential ornamentals for the future. However, the flowers of many of these plants are very short lived. Some selected species of *Acer* can also be introduced in parks and garden. The flora of PWS is also having eight small and beautiful bamboos; those can be utilized as ornamental in near future. However, more comprehensive studies are essential in near future to identify other major species with potential ornamental value. The lists of some plants recorded potential ornamental plants from the sanctuary are listed below in Table 7.21.

Table 7.21. Some plants of ornamental potential growing in PWS and their climatic suitability. [Abbreviations used: USE: AT = Avenue Tree; EFH = Epiphytic Flowering Herb; EFS = Epiphytic Flowering Shrub; FC = Flowering Climber; FH = Flowering Herb; FIC = Foliage Climber; FIS = Foliage Shrub; FS = Flowering Shrub; FT = Flowering Tree; AVAILIBILTY; C; = Common; LC; Less Common. CLIMATIC ZONE: Alp = Alpine; Salp = Subalpine; Strp = Subtropical; Tem = Temperate; Trp = Tropical]

Name of Species	Use	Avaibility	Climatic suitability
<i>Aconogonum campanulatum</i>	FS	C	Tem – Salp
<i>Aeschynanthus hookeri</i>	EFS	C	Tem
<i>Agapetes serpens</i>	EFS	C	Tem
<i>Ajuga lobata</i>	FH	C	Tem – Salp
<i>Anaphalis triplinervis</i>	FH	C	Tem – Salp
<i>Androsace geraniifolia</i>	FH	C	Salp – Alp
<i>Androsace globifera</i>	FH	C	Salp – Alp
<i>Arisaema griffithii</i>	FH	C	Tem
<i>Arisaema speciosum</i>	FH	LC	Tem
<i>Asystasia macrocarpa</i>	FS	C	Strp – Tem
<i>Begonia flaviflora</i>	FH	LC	Tem

<i>Begonia ovatifolia</i>	FH	C	Tem
<i>Begonia picta</i>	FH	C	Strp - Tem
<i>Berberis insignis</i>	FS	C	Tem - Salp
<i>Berginia purpuracens</i>	FH	LC	Tem - Salp
<i>Brassaiopsis mitis</i>	FS	C	Tem
<i>Caltha palustris</i>	FH	C	Tem - Salp
<i>Cardamine macrophylla</i>	FH	C	Salp
<i>Cardiocrinum giganteum</i>	FH	LC	Tem - Salp
<i>Caulleya spicata</i>	FH	LC	Strp - Tem
<i>Chirita macrophylla</i>	FH	C	Tem
<i>Clematis montana</i>	FC	C	Tem - Salp
<i>Corydalis geraniifolia</i>	FH	C	Salp - Alp
<i>Dendrocalamus sikkimensis</i>	FIS	LC	Strp - Tem
<i>Dichroa febrifuga</i>	FS	C	Tem
<i>Didymocarpus albicalyx</i>	FH	C	Tem - Salp
<i>Didymocarpus pulcher</i>	FH	LC	Tem - Salp
<i>Dipsacus atratus</i>	FH	C	Salp - Alp
<i>Disporum calcaratum</i>	FH	LC	Tem - Salp
<i>Disporum cantoniense</i>	FH	LC	Tem - Salp
<i>Dobinea vulgaris</i>	FS	C	Strp - Tem
<i>Euonymus frigidus</i>	FIS	C	Strp - Tem
<i>Euonymus vagans</i>	FIS	C	Strp - Tem
<i>Fragaria rubicola</i>	FH	C	Tem - Salp
<i>Gaultheria griffithiana</i>	FS	C	Salp - Alp
<i>Gentiana speciosa</i>	FC	C	Tem - Salp
<i>Geranium nepalense</i>	FH	C	Tem - Salp
<i>Globba racemosa</i>	FH	C	Trp - Tem
<i>Gynura cusimbua</i>	FH	C	Strp - Salp
<i>Helwingia himalaica</i>	FS	C	Tem
<i>Hippophaea rhamnoides</i>	FT	Rare	Salp - Alp
<i>Holboellia latifolia</i>	FC	C	Tem
<i>Hoya linearis</i>	EFH	C	Tem
<i>Hydrangea macrophylla</i>	FS	C	Strp - Tem
<i>Hypericum hookerianum</i>	FS	C	Tem - Salp
<i>Impatiens. cathcartii</i>	FH	C	Tem - Salp
<i>I. pulchra</i>	FH	C	Tem
<i>I. stenantha</i>	FS	C	Tem
<i>I. porrecta</i>	FH	C	Tem
<i>Ipomoea purpurea</i>	FC	C	Strp - Tem
<i>Jasminum dispernum</i>	FS	C	Strp - Tem
<i>Leycesteria formosa</i>	FS	LC	Tem - Salp
<i>Ligustrum lucidum</i>	FS	LC	Tem
<i>Lobelia pyramidalis</i>	FH	C	Strp - Salp
<i>Lonicera macrantha</i>	FC	C	Tem - Salp
<i>Loxostigma griffithii</i>	FH	C	Tem
<i>Meconopsis paniculata</i>	FH	C	Tem - Salp
<i>Melastoma malabathricum</i>	FS	C	Trp - Tem
<i>Merrillioanax alpinus</i>	FS	C	Tem - Salp
<i>Michelia doltisopa</i>	AT	C	Strp - Tem
<i>Neillia thyrsoiflora</i>	FS	C	Tem - Salp
<i>Osbeckia nepalensis</i>	FS	C	Trp - strp
<i>Osbeckia stellata</i>	FS	C	Tem
<i>Oxyspora paniculata</i>	FS	C	Strp - Tem

<i>Paris polyphylla</i>	FH	LC	Tem – Salp
<i>Pedicularis microcalyx</i>	FH	C	Salp – Alp
<i>Pimpinella diversifolia</i>	FH	LC	Strp – Tem
<i>Pleione praecox</i>	EFH	C	Strp – Tem
<i>Polygonatum cirrhifolium</i>	FH	C	Tem – Salp
<i>Polygonatum oppositifolium</i>	FH	C	Tem – Salp
<i>Porana grandiflora</i>	FC	LC	Tem
<i>Potentilla fulgens</i>	FH	C	Strp- Salp
<i>Pratia montana</i>	FH	C	Tem
<i>Pratia nummularia</i>	FH	C	Strp – Tem
<i>Primula denticulata</i>	FH	C	Salp – Alp
<i>Primula kingii</i>	FH	C	Salp – Alp
<i>Primula sikkimensis</i>	FH	C	Salp – Alp
<i>Prunella vulgaris</i>	FH	C	Strp – Tem
<i>Raphidophora glauca</i>	FIC	C	Strp – Tem
<i>Rheum nobile</i>	FH	Rare	Salp – Alp
<i>Rhododendron dalhousiae</i>	FS	LC	Tem – Salp
<i>Rhododendron anthopogon</i>	FS	LC	Salp – Alp
<i>Rhododendron arboreum</i>	FT	C	Tem – Salp
<i>Rhododendron glaucophyllum</i>	FS	C	Tem – Salp
<i>Rhynchoglossum obliquum</i>	FH	LC	Strp – Tem
<i>Ribes glaciale</i>	FS	C	Tem – Salp
<i>Rosa sericea</i>	FS	C	Salp
<i>Rubus calycianus</i>	FH	C	Tem
<i>Satyrium nepalense</i>	FH	C	Strp – Salp
<i>Schefflera venulosa</i>	FIC	C	Tem
<i>Schisandra grandiflora</i>	FC	C	Tem
<i>Senecio scandens</i>	FC	C	Tem – Salp
<i>Smilax rigida</i>	FIS	C	Salp
<i>Swertia bimuculata</i>	FH	C	Strp – Salp
<i>Treutlera insignis</i>	FC	LC	Salp
<i>Vaccinium vacciniaceum</i>	EFH	C	Tem
<i>Viola canescence</i>	FH	C	Tem

7.5.3. Wild Edible Species of PWS

The rich and diverse plant wealth of PWS is a rich source of food for the local people. The edibles resource of PWS can be classified into five categories, wild edibles plants, leafy vegetables, edibles fruits, edibles seeds and seeds as source of edible oil. Interestingly, some edible species has now found prominent place in the local market. As from the time immemorial, some species are the alternative food for tribal living in the vicinity of the PWS, during food crisis. The people living in local areas like Prem lakha, Padamchen, Rigu and Hathicherey are more or less depended on the Pangolakha forests for their day-to-day vegetables requirement. The prominent edible parts of these wild vegetables are young buds, young shoots, climbing shoot and young leaves. The most widely collected edible plants and readily available in local market are *Urtica dioica*, *Aconogonum molle*, *Laportea terminalis* and young shoot bamboos and ferns. However, some of the important animals of the sanctuary including bears, deer, squirrels etc. are

mostly depended on these wild edible plants. Some of the common edible plants recorded from the PWS are given below in Table 7.22.

Table 7.22. Some wild-edible plants from PWS along with their local names and edible parts.

Species	Local name (Lepcha)	Edible parts	Marketing Prospect
<i>Aconogonum molle</i>	<i>Kundyam dung</i>	Young shoot	√
<i>Actinidia strigosa</i>	<i>Tusking rik</i>	Ripe fruit	×
<i>Allium wallichii</i>	<i>Lho sungo</i>	Flower	×
<i>Bauhinia vahlii</i>	<i>Ra kung</i>	Stem & leaves	×
<i>Cardamine macrophylla</i>	-	Fruits	×
<i>Castanea sativa</i>	-	Fruits	×
<i>Cinnamomum bejolghota</i>	<i>Sumsor</i>	Bark	√
<i>Corylus ferox</i>	-	Fruits	×
<i>Dendrocalamus hamiltonii</i>	<i>Ruveet</i>	Young shoot	√
<i>Dioscorea bulbifera</i>	<i>Kusok</i>	Tuberous root	√
<i>Dioscorea pentaphylla</i>	<i>Kaching</i>	Tuberous root	√
<i>Elaeocarpus lanceifolius</i>	-	Fruits	
<i>Evodia fraxinifolia</i>	<i>Kunda</i>	Fruits	√
<i>Fagopyrum debotrys</i>	<i>Palop bee</i>	Young shoot	√
<i>Fragaria vesca</i>	<i>Hublong muuk</i>	Fruits	√
<i>Hemiphragma heterophyllum</i>	-	Ripe Fruits	
<i>Heracleum wallichii</i>	<i>Syamben</i>	Seeds	
<i>Holboellia latifolia</i>	<i>Kaol rik</i>	Fruits	×
<i>Juglans regia</i>	<i>Koelkung</i>	Kernel	√
<i>Laportea terminalis</i>	<i>Kuju sorong</i>	Leaves and Flower	√
<i>Machilus edulis</i>	<i>Fam kung</i>	Fruits	√
<i>Morus australis</i>	<i>Sano Kimbu</i>	Fruits	×
<i>Mussaenda roxburghii</i>	<i>Tungbub</i>	Young leave	×
<i>Nasturtium officinale</i>	<i>Sim bee</i>	Young shoot	√
<i>Pentapanax fragrans</i>	-	Fruits , leaves	
<i>Phytolacca acinosa</i>	<i>Zaringo</i>	Leaves.	
<i>Piper mullesua</i>	<i>Kunten</i>	Ripe Fruits	×
<i>Rhododendron</i> □ arboretum	<i>EE-tok kung</i>	Flowers	×
<i>Rosa sericea</i>	<i>Chung-chung sisi</i>	Ripe Fruits	×
<i>Rubus acuminatus</i>	<i>Biralay lahara</i>	Ripe Fruits	×
<i>Rubus calycinus</i>	-	Fruits	
<i>Rubus ellipticus</i>	<i>Ka'syim</i>	Ripe Fruits	×
<i>Rubus niveus</i>	<i>Kalo aisaylo</i>	Ripe Fruits	×
<i>Rubus paniculatus</i>	<i>Domaytsalu</i>	Ripe fruits	√
<i>Schizandra grandiflora</i>	<i>Singhghatta lahara</i>	Ripe fruits	×
<i>Schizandra neglecta</i>	<i>Singhghatta lahara</i>	Ripe fruits	×
<i>Sloanea dasycarpa</i>	-	Fruits	
<i>Smilacina oleraceae</i>	<i>Choklee bee.</i>	shoot/ flower buds	×
<i>Smilax aspericaulis</i> Wall.	-	Fruits	
<i>Tetradium fraxinifolium</i>	<i>Bokey timber</i>	Fruits	
<i>Tupistra natans</i>	<i>Purfek-dung</i>	Flowers	√
<i>Urtica dioica</i>	<i>Surong nok bee</i>	Leaves and flower	√
<i>Viburnum erubescens</i>	<i>Purmu kung</i>	Ripe Fruits	√

7.5.4. Important Timber Yielding Plants of PWS.

One of the important assets of the PWS is its timber yielding plants. Some wooden plank that derived from various trees species is of great demand in the market. Some of the trees of this category are as old as 150 years or more. The total girth recorded is upto 200 cm. The making of furniture through the wood of *Michelia doltsopa* is considered as most durable and expensive. However, in the present context and prices the values of the timber which is being produce by other trees are also gradually rising up in local markets. Therefore, the sanctuary is now one important Genepool of timber yielding plants for the future. Though Department of Forests in their part also has banned the felling of some of rare trees for future conservation, the illegal trafficking of woods is occasionally being done by the trans-border businessman. During the survey, 22 species that has been being used for the timber yielding has been collected from PWS, including *Taxus baccata*, *Michelia doltsopa*, *Michelia cathcartii*, *Magnolia globosa*, *Magnolia campbellii* etc. the cutting down of this species is already being banned in state. Some of the notable timber species of the PWS is mentioned in the Table 7.23.

Table 7.23. Important timber yielding plants of PWS.

Timber yielding species	Lepcha name
<i>Albizia lebbek</i>	Sundayong kung
<i>Alnus nepalensis</i>	Sungru kung
<i>Betula alnoides</i>	Sunglee kung
<i>Betula utilis</i>	Bhojpatra
<i>Castanopsis indica</i>	Serol kung
<i>Castanopsis tribuloides</i>	Kusyo kung
<i>Castanopsis indica</i>	Aulay Katus
<i>Cryptomeria japonica</i>	Chunden kung
<i>Duabanga grandiflora</i>	Nyomhren kung
<i>Lithocarpus pachyphylla</i>	Sunguray Katus
<i>Magnolia campbellii</i>	Pandey or Gok
<i>Magnolia globosa</i>	Kok pandey
<i>Michelia cathcartii</i>	Gokdum
<i>Michelia doltsopa</i>	Pandey kung
<i>Pinus roxburghii</i>	Chunden kung
<i>Prunus napaulensis</i>	Kongki
<i>Quercus lamellosa</i>	Buk kung
<i>Quercus lineata</i>	Sri- kung
<i>Rhododendron arboreum</i>	Etok kung
<i>Taxus baccata</i>	Cheongbu kung
<i>Terminalia myriocarpa</i>	Sunglyok kung
<i>Tsuga dumosa</i>	Tungsyng kung

7.5.5. Important Dye Yielding Plants

The PWS houses numerous plant species of potential natural dye. Plants mentioned in the Table 7.24 are the most prominent ones and are used by the local people for obtaining various dyes

since long. These dyes are usually a color substance for local artifacts especially, bamboo art, wood craft etc. *Rubia manjith* is the most widely used dye yielding plants. Therefore the sustainable use of locally derived natural dyes may partly ease the demand of the natural dye in the local markets. Some of the plants mentioned below are also being used by the Government Institute of Cottage Industry or Directorate of Handicraft and Handloom, Govt of Sikkim especially in Lepcha traditional hat, cane and bamboo arti-crafts.

Table 7.24. Some important dye yielding plants of PWS. [N = Nepali; L = Lepcha]

Dye yielding species	Local name	Part used	Colour
<i>Bischofia javanica</i>	Kainjal (N)	Leaves	Yellow
<i>Jasminum dispernum</i>		Fruits	Black
<i>Juglan regia</i>	Kolkung (L)	Bark	Yellow
<i>Mahonia napaulensis</i>	Chutro/Kesari(N)	Stem bark	Yellow
<i>Rheum acuminatum</i>	Khokim (N)	Roots	Yellow
<i>Rubia manjith</i>	Vyem (L), Majito (N)	Fruits, roots	Red, blue, purple, yellow
<i>Rubia wallichiana</i>	Vyem (L)	Fruits	Purple
<i>Symplocos paniculata</i>	Kagatey (L)	Fruits	Violet

7.5.6. Fodder plants of PWS

One of the important aspects of flora of PWS is of its rich composition of fodder plants. Large number of trees, shrubs, climbers, herbs, epiphytes has been recorded for their fodder value from the sanctuary and some alpine species are also been identified as potential fodder plants for the future. Due to the abundant availability of fodder, the practice of cattle rearing and grazing was quite common before the declaration of area as sanctuary. Therefore, the complete removal of the cattle from the sanctuary area was a Herculean task to the forest department. It has taken over 10 years for the Forest Department people to remove all the cattle herds from the sanctuary area. Though some "Goth" are still present in nearby places of the sanctuary. The lists of some potential fodder plants recorded from the PWS has been given below (Table 7.25 and Table 7.26)

Table 7.25. List of some fodder plants recorded from the grasslands of alpine and sub-alpine region of PWS. [C = Common; LC = Less Common].

PLANT NAME	FAMILY	AVAILABILITY
<i>Arundinaria hookeriana</i>	POACEAE	C
<i>Anaphalis triplinervis</i>	ASTERACEAE	C
<i>Anaphalis contorta</i>	ASTERACEAE	C
<i>Anaphalis royleana</i>	ASTERACEAE	C
<i>Anaphalis subumbellata</i>	ASTERACEAE	LC
<i>Acer campbellii</i>	ACERACEAE	C
<i>Carex cruciata</i>	CYPERACEAE	LC
<i>Commenila paludosa</i>	COMMENILACEAE	C
<i>Dipsacus inermis</i>	DIPSACEAE	C
<i>Elsholtzia strobilifera</i>	LAMIACEAE	C
<i>Epilobium roseum</i>	ONAGRACEAE	C
<i>Fagopyrum esculentum</i>	POLYGONACEAE	C
<i>Fragaria vesca</i>	ROSACEAE	C
<i>Gallium asperifolium</i>	RUBIACEAE	C

<i>Geranium donianum</i>	GERANIACEAE	C
<i>Hemiphragma heterophyllum</i>	SCROPHULARIACEAE	C
<i>Impatiens falcifer</i>	BALSAMINACEAE	C
<i>Iris clarkia</i>	IRIDACEAE	C
<i>Juncus effuses</i>	JUNCACEAE	C
<i>Juncus membraneous</i>	JUNCACEAE	C
<i>Juncus allioides</i>	JUNCACEAE	C
<i>Juncus amplifolius</i>	JUNCACEAE	C
<i>Juncus bufonius</i>	JUNCACEAE	C
<i>Juncus clarkei</i>	JUNCACEAE	C
<i>Juncus grisebachii</i>	JUNCACEAE	C
<i>Juncus himalensis</i>	JUNCACEAE	LC
<i>Juncus khasiensis</i>	JUNCACEAE	LC
<i>Juncus ochraceus</i>	JUNCACEAE	C
<i>Kyllinga brevifolia</i>	CYPERACEAE	C
<i>Myriactis nepalensis</i>	ASTERACEAE	C
<i>Persicaria alata</i>	POLYGONACEAE	C
<i>Persicaria capitata</i>	POLYGONACEAE	C
<i>Persicaria runcinata</i>	POLYGONACEAE	C
<i>Potentilla fulgens</i>	ROSACEAE	C
<i>Potentilla peduncularis</i>	ROSACEAE	C
<i>Potentilla polyphylla</i>	ROSACEAE	C
<i>Primula capitata</i>	PRIMULACEAE	C
<i>Selinum tenuifolium</i>	APIACEAE	C
<i>Senecio graciliflorus</i>	ASTERACEAE	C
<i>Setaria palmifolia</i>	POACEAE	C
<i>Thysanolaena maxima</i>	POACEAE	C

Table 7.26. Lists of some common fodder plants recorded from the upper and lower temperate region of PWS. [C = Common; LC = Less Common]

Fodder plant	Local name		Availability
	Lepcha name	Nepali name	
<i>Acer lavigatum</i>	Yarli kung	Kapasi	LC
<i>Acer hookeri</i>	-	Kapasi	Rare
<i>Ageratum conyzoides</i>	Numyu muuk	Elame	C
<i>Albizia lebbek</i>	Sree kung	Sirish	C
<i>Axonopus compressus</i>	-	Ghans	C
<i>Amoora walltchi</i>	Leet kung	Lali / Ball	C
<i>Artemisia vulgaris</i>	Tuknyil	Tithepathi	C
<i>Boehmeria hamiltoniana</i>	Ka'yan	Chiplay	C
<i>Boehmeria macrophylla</i>	Ka-yaun	Kamle	C
<i>Brassaiopsis mitis</i>	Sungjam Kung	Chuletro	C
<i>Castanopsis tribuloides</i>	Kusyo kung	Katush	C
<i>Cynodon dactylon</i>	Pong muuk	Dhubo	C
<i>Dendrocalamus sikkimensis</i>	Po-dyang	Bhalu bans	LC
<i>Dendrocalamus hamiltonii</i>	Po	Choya bans	LC
<i>Drymaria cordata</i>	-	Abhijalo	C
<i>Eupatorium aderophorum</i>	Vongnokbu	Banmara	C
<i>Eurya japonica</i>	Tukzyel kung	Jhingani	C
<i>Exbucklandia populnea</i>	Sunklyang kung	Pipli	C
<i>Ficus auriculata</i>	Kundong kung	Nabhara	C
<i>Ficus benjamina</i>	Lungzyi kung	Kabra	C

<i>Ficus neriifolia</i>	Syit kung	Dudhilo	C
<i>Garuga pinnata</i>	Mul-dit kung	Dabdaba	C
<i>Girardinia diversifolia</i>	Kuju	Bhangrey	C
<i>Glochidion acuminatum</i>	-	Lalikaath	C
<i>Hedyotis scandens</i>	-	Kane	C
<i>Litsea polyantha</i>	Sumpuk kung	Kutmiro	C
<i>Macaranga nepalensis</i>	Numbung kung	Malato	C
<i>Morus alba</i>	Numbyong	Kimbu	C
<i>Persicaria nepalensis</i>	Rungyi muk	Ratnavlu	C
<i>Parthenocissus semicordata</i>	Tundonok rik	Charchare	LC
<i>Prunus cerasoides</i>	Kangki kung	Cherry	C
<i>Saurauja napaulensis</i>	Kasur kung	Gogun	C
<i>Sonchus wightianus</i>	-	-	LC
<i>Setaria palmifolia</i>	Ka'rhem	Dhutesaro	C
<i>Tetrastigma serrulatum</i>	Tundo rik	Charcharey	C
<i>Tetrastigma obtectum</i>	-	-	LC
<i>Rhaphidophora grandis</i>	Tungkling	Thulo kanchirna	C
<i>Thysaenolaena maxima</i>	Pusyur	Amliso	C
<i>Turpinia nepalensis</i>	Margok kung	Thali	LC
<i>Urtica dioica</i>	Surong	Sisnu	C

7.5.7 . NTFP Resource of PWS:

PWS holds enormous resource of Non-Timber Forests Produces (NTFP). The people living in the vicinity of the sanctuary are directly or indirectly depended on it. The NTFP means food, shelter and other necessity essential life supporting system for them. While surveying, 46 species including 15 species of bamboos that falls under this category has been collected. The lists of some important NTFP are given at Table 7.27. Apart from that the bamboos are one of the important components of PWS, which are being used in multipurpose manner by the people residing nearby. The lists of bamboos that grow in PWS and their usages are mentioned at Table 7.28.

Table 7.27. Lists of NTFP plants of PWS other than bamboos.

NTFP Plants	Local Name	Uses
<i>Aconogonum molle</i>	Kundyamdung	The young shoots are used for making pickles.
<i>Albizia lebbeck</i>	Sungdyong	Used for fuel-wood and planted for shades.
<i>Allium wallichii</i>	Ree- sungu	Young shoots are used for making pickles.
<i>Arisaema griffithii</i>	Sungtuk	Bread can be prepared from its tuber paste after processing in running water.
<i>Arisaema utile</i>	Sungtuk	Tubers of this species are locally eaten.
<i>Artemisia indica</i>	Tuknil	It acts as a mosquito and insect repellent.
<i>Betula utilis</i>	Sunli kung	Used in making papers
<i>Colocasia esculenta</i>	Sungtee	Young petioles and rhizomes are eaten as vegetable. The plant is also an ideal fodder for pig.
<i>Cortiella hookeri</i>	-	Matured seeds are eaten as spices.
<i>Dichroa febrifuga</i>	Geybu khanong	Shoot and Bark of the roots are used in preparing febrifuge.
<i>Didymocarpus aromaticus</i>		Used traditionally as incense in religious offerings.

<i>Elaeagnus conferta</i>		Use in making pickle.
<i>Elaeagnus conferta</i>		Use in making pickle.
<i>Engelhardtia spicata</i>		Used as a fish intoxicant and also a good firewood.
<i>Erythrina arborescens</i>	Jasey	Planted near field for fencing.
<i>Eupatorium adenophorum</i>		Dried leaves used extensively as potent manure in the cultivation of ginger
<i>Eurya acuminata</i>	Purmu	Used as firewood.
<i>Girardinia diversifolia</i>	Kuzu sorong	Young shoots are eaten as vegetable and the fiber derived from the matured plants are being used in making traditional dresses, bow strings and ropes by the Lepchas.
<i>Glochidion acuminatum</i>		Table plates and cups are made by pinning up the leaves and used in festive occasions especially during puja offerings
<i>Prunus cerasoides</i>	Kongki	The twigs and branches are used for making many household tools.
<i>Rhododendron anthopogon</i>	Balu-salo	The dried leaves are used as incense in Buddhists monasteries in Sikkim, Tibet and Bhutan
<i>Rhododendron arboretum</i>	Etok kung	The wood is used for making handle of Banphok or Khukri's (traditional knife of Sikkim) The wine prepared by the fermentation of the flower by Sherpa tribe is the remedies for antidote and altitude sickne
<i>Rhododendron dalhousiae</i>	Re-etok	Sometime grown in the garden for its asthetic value.
<i>Rhododendron lanatum</i>	Re-etok	The wooly fawn of underside of the leaves is used in oil lamp.
<i>Sarcococca hookeriana</i>		Wood used to make walking sticks.
<i>Spondias pinnata</i>		Shoot yields a gum called "Chop"
<i>Tetradium fraxinifolium</i>		Fruit is used for making pickle
<i>Turpinia nepalensis</i>		A good fire wood.
<i>Turpinia nepalensis</i>		A good firewood.
<i>Urena lobata</i> L		Yield natural fibre

Table 7.28. The lists of some common bamboos of PWS and its usages

BAMBOO SPECIES	LOCAL NAME	USAGES
<i>Arundinaria falconeri</i>	<i>Phusray Nigalo(N)</i>	For Fencing, walking sticks
<i>Bambusa nutans</i>	<i>Matlu (L) Mala bans(N)</i>	Fencing, house construction, Local bridges, fodder, alternative nails, prayer flags
<i>Cephalostachyum capitatum</i>	<i>Po-young(L) Gopay bans(N)</i>	Flute & other folk musical instruments, walking stick, Bows and arrows. Lepcha hat, fodder, local straw for drinking brewed-millet.
<i>Dendrocalamus hamiltonii</i>	<i>Ruveet (L) Choya bans(N)</i>	Knitting, mats, roofs, containers, water vessels, house construction, pickles, vegetables.
<i>Dendrocalamus hookeri</i>	<i>Patu (L), Dungray bans (N),</i>	Fencing, houseposts,
<i>Dendrocalamus patellaris</i>	<i>Niba(N)</i>	Fencing, house construction,
<i>Dendrocalamus sikkimensis</i>	<i>Po-dyang(L) Bhalu bans(N)</i>	construction of house, bridges, fences, water vessels, bamboo vessel (Dungro)
<i>Himalaya calamus falconeri</i>		Food & fodder
<i>H. hookerianus</i>		Basket, roofmaking & vegetables.
<i>Neohouzeana dullooa</i>	<i>Tokri bans(N)</i>	Vessel making, fodder
<i>Himalayacalamus</i>	<i>Prong (L) Paryang (N)</i>	Roof making, fodder, fencing, basket making

<i>hookerianus</i>		etc.
<i>Drepanostachyum intermedium</i>	<i>Singhaney bans(N)</i>	Roof making, walking stick, fodder, vegetables,
<i>Yushania maling</i>	<i>Fyung (L)Malingo (N)</i>	Roofing, mats, floors mats, other household articles, fodders
<i>Yushania pantlingii</i>	<i>Rani Malingo(N)</i>	Fencing, fodder etc.
<i>Thamnocalamus aristatus</i>	<i>Pumom (L) Rato Nigalo (N).</i>	Fencing, fodder etc.

7. 6 ETHNOBOTANICAL OBSERVATION

Ethnobotany is a total natural and traditional relationship and the interrelations between man and his surrounding plants wealth (Jain 1987). Sikkim is inhabited by three major ethnic communities viz. Lepcha (*indigenous tribe*), Bhutia and Nepali. Among them the Lepcha indigenous primitive tribe of Sikkim is bestowed with very rich culture and having an incredible knowledge on traditional use of the plants (Jana & Das 2000, Maity *et al.* 2003a,b, 2004).

Wild plants are the significantly used as a food, medicine, daily domestic activities, religious-rituals, marriage ceremonies; ethnic cultures etc. form the basis of ethnobotany. The vicinity of the Pangolakha Wildlife Sanctuary is inhabited by the different ethnic communities, viz. Lepcha, Bhutia, Sherpa, Rai, Limboo, Manger, Gurung and others. They have been strongly associated with the plants and significantly, inherited enormous knowledge of traditional uses of plants. However, this knowledge is chiefly confined with the folk healers e.g. *Bongthing*, *Vaidyas*, *Phedangba*, *Amji* etc. and also with the older generations of these communities. In the process of modernization, there are absolute chances of losing this epitome of knowledge from them. Hence, the essential attempt has been made to record this knowledge for conservation so that in future such knowledge can be scientifically evaluated and used for the betterment of mankind. The ethnic uses of plants by the tribal people living in the far-flung areas of the sanctuary deserves a separate study on extensive documentation and the codification of potential ethnomedicines and wild edible plants for their future sustainable use.

However, the information generated during the field visits through interactions with the folk healers, elderly people and observation of their house-holds and life-style, following ethnobotanical information has been recorded.

7.6.1. Ethnomedicinal Plants

The plethora of knowledge of plant species used in medicine is maximum in the Indian Himalayan region (Samant & Dhar 1997). Interestingly, the minor ailments like cough, cold, fever or minor wounds are treated locally by some locally reputed folk healers. It is agreeable that despite the vast scientific progress and achievements in the field of medicines, these therapeutic plants, still now, are to be recognized as valuable source of health care which are providing



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LEGEND OF PHOTOS

Plate XVI

93. The boiled bamboo shoots ready for sale
94. The basket full of *Ficus auriculata*'s fruits collected for pig fodder
95. The local folks carrying firewood way back to home.
96. The bamboo vessel being traditionally used for serving brewed millet (Chee/C hang).
97. Remains of *Yushania*'s culm sheath after being young shoot eaten by Beer
98. A bamboo's lamp
99. A folk healer while offering to the guardian deity.
100. The people still depended on forest for fodder.

incredible health services to the rural people in the remotest and far-flung areas around the sanctuary. The folk healers are recognized equivalent to the doctor in their settlement. They have proved in a several instances for their successful treatment of patients through the use of one or more plants. However, doses and the mode of administration may vary from place to place and community wise. Some species being medicinal can also equally poisonous or even fatal if not administered properly and in appropriate dose. The plants used in such practice include small herbs of 10 cm to the tall trees of 20 m. Table 7.29 is presenting a list of plants used by ethnic folk-healers of the region. Leaves, roots, stems, flowers or fruits are the major parts of plants used during the formulation of these local medicines. The plants those are being used by the healers are also sometimes sold in the local market at Aritar, Rhenock, and Padamchen during *Haat* (market day). However, many of these are also found on sale in Gangtok and Singtam bazaar. Therefore, a separate and extensive study or documentation of the potential ethno-medicinal plants must be taken up in near future.

Table 7.29. List of some important ethnomedicinal plants and their uses of PWS

Ethno-medicinal plants	Lepcha (L)/ Nepali (N) names	Ailments	Parts in use
<i>Achyranthes bidentata</i>	<i>Ankhlai Jhar(N)</i>	Diuretic Rheumatism,	Roots & stems
<i>Aconitum bisma</i>	<i>Lungzee nyin(L)</i> <i>Bikhuma(N)</i>	Fever, Rheumatism	Tubers
<i>Aconitum spicatum</i>	<i>Nying (L) Bikh.</i>	Rheumatism	Tuber s
<i>Acorus calamus</i>	<i>Ruklop (L) Bojo(N)</i>	Expel intestinal worms	Root , rhizome
<i>Albizia lebbeck</i>	<i>Harasisirs(N)</i>	Boils, piles, diarrhea,	Flower, Leaves
<i>Allium wallichii</i>	<i>Ban lasun(N)</i>	Gastric disorder	Flower , roots
<i>Artemisia indica</i>	<i>Tuknil (L) Titepati(N)</i>	Injury, bleeding	Leaf & flower
<i>Astilbe rivularis</i>	<i>Buro-okhati(N)</i>	Tonic for post-natal women	Roots
<i>Bauhinia vahlii</i>	<i>Makrik (L), Varla(N)</i>	Dysentery, laxative	Seeds & leaves
<i>Berberis aristata</i>	<i>Kyarbu kung(L)</i>	Rabbies	Fruits
<i>Bergenia ciliata</i>	<i>Pakhan-bet(N)</i>	Diarrhoea, fever,	Roots
<i>Berginia purpurascens</i>	<i>Pakhanbed</i>	Fever, diarrhoea	Roots
<i>Betula alnoides</i>	<i>Saur (N)</i>	Snake-bite	Bark paste
<i>Boenninghausenia albiflora</i>		Lice problems	Young shoot
<i>Buddleja asiatica</i>	<i>Pondam (L),</i> <i>Bhimsenpati(N)</i>	Skin, abortificant	Leaves , flower,
<i>Cardamine hirsuta</i>	<i>Simrayo(N)</i>	Low BP & cardiac problem	Shoot extract
<i>Centella asiatica</i>	<i>Goltaprey (N)</i>	Penumonia, fever	Shoot
<i>Chenopodium ambrosoides</i>	<i>Bethu saag (N)</i>	Aphrodisiacs, anthelmintic	Whole plant
<i>Clematis acuminata</i>	<i>Pinasay lahara(N)</i>	Sinus pain	Roots
<i>Clematis buchanania</i>	<i>Pinasey lahara(N)</i>	Sinocytis, antiviral,	Roots, shoots
<i>Clematis smilacifolia</i>	<i>Pinasay (N)</i>	Sinosytis	Roots, shoots
<i>Corydalis chaerophylla</i>	-	Stomach-ache	Fruits
<i>Cotoneaster microphyllus</i>	-	Used as stringent	Stolons
<i>Cuscuta reflexa</i>	<i>Akashvel i(N)</i>	Jaundice, cough	Shots, seeds
<i>Dioscorea pentaphylla</i>	<i>Kassok(L)bantarul(N)</i>	Tonic, swelling	Tuber, shoots

<i>Dioscorea bulbifera</i>	<i>Kaching(L), Gittha(N)</i>	Tonic, aphrodisiac, ulcer	Tuber
<i>Drymaria villosa</i>	<i>Abijalo(N)</i>	Pneumonia, sinusitis	Shoots
<i>Dufrenoya platyphylla</i>	<i>Aijenro(N)</i>	-	Fruits
<i>Elsholtzia blanda</i>	<i>Lhasilam(N), Banshilam(N)</i>	Gastritis	Shoot
<i>Erithrina arborescens</i>	<i>Gyesey kung(L), Phaledo (N)</i>	Skin diseases	Leaves, barks
<i>Euodia fraxinifolium</i>	<i>Tungrhul kung (L), Khanak-pa</i>	Typhoid, indigestion	Fruits
<i>Eupatorium adeno-phorum</i>	<i>Vongnokbu (L)Kalijhar</i>	External injuries	Leaf extract
<i>Evodia fraxinifolia</i>	<i>Ka'mu(L), Khanakpa(N)</i>	Antipyretic, diuretic	Fruits & Plants
<i>Fraxinus floribunda</i>	<i>Payjew(L), Lankuri(N)</i>	Bone fracture	Bark
<i>Fritellaria cirrhosa</i>	<i>Kakoli (N)</i>	Tuberculosis, Asthma	Bulbs
<i>Gaultheria fragmatissima</i>	<i>Kalomba (L), Machino(N)</i>	Antiseptic, rheumatism	Leaves
<i>Geranium nepalensis</i>	<i>Bhanda (N)</i>	Astringent	Whole plant
<i>Girardinia diversifolia</i>	<i>Kuju (L) Bangrey (N)</i>	Blood pressure	Flowers
<i>Gynocardia odorata</i>	<i>Gantay(N)</i>	Skin disease & Leprosy	Seeds oil
<i>Hedyotis scandens</i>	<i>Kalhya (L), Bokre lahaha(N)</i>	Eye diseases, sprain, boils	Roots & plant.
<i>Hedychium spicatum</i>	<i>Pankha phool, Sara(N)</i>	Diarrhea, vomiting, asthma	Roots & rhizome
<i>Heracleum nepalensis</i>	<i>Samben (L)Chimphi-ng</i>	Influenza, bodyache	Flower & fruits
<i>Hydrocotyle himalaica</i>	<i>Golpata(N)</i>	Pneumonia, throat infection	Whole plant
<i>Hydrocotyle nepalensis</i>	<i>Golpatta (N)</i>	Throat problems	Whole plant
<i>Hypericum uralum</i>	<i>Urillo (N)</i>	Wounds & bruises	Bark-juice
<i>Laportea terminalis</i>	<i>Sorong (L), Sishmu(N)</i>	Blood pressure	Flower & leaves
<i>Leucocephalum canum</i>	<i>Cheeong kung (L).</i>	Epilepsy, wounds	Roots, leaves
<i>Listea cubeba</i>	<i>Siltimur (N)</i>	Stomach disorders	Flowers
<i>Lobelia pyramidalis</i>	<i>Eklebir (N)</i>	antispasmodic	Leaves, flowers
<i>Lycopodium clavatum</i>	<i>Dermusungfon (L), aagbeli (N)</i>	Rheumatism, pulmonary	Plants & spores
<i>M.ussaenda treutleri</i>	<i>Tungbub (L)</i>	Jaundice	Root stock
<i>Maesa chisia</i>	<i>Purmu kung (L), Billaune (N)</i>	Insecticide, anthelmintic	Roots, leaves
<i>Mussaenda macrophylla</i>	<i>Tungbub (L)</i>	Jaundice	Root extracts
<i>Nardostachys jatamanshi</i>	<i>Jatamanshi(L)</i>	Tonic, leprosy, skin disease	plant & root stock
<i>Panax pseudogin-seng var. angustifolius</i>	<i>Paanch pattay(N)</i>	Potent vitaliser	Rhizomes
<i>Panax pseudogin-seng var bipinnatifidus</i>	<i>Panch pattey (N)</i>	Potent vitaliser	Rhizomes
<i>Paris polyphylla</i>	<i>Satuwa (N)</i>	Antidots, fever	Rhizome
<i>Phytolacca acinosa</i>	<i>Jaringo(N)</i>	High blood pressure	Leaves
<i>Picrohiza kurrooa</i>	<i>Kutki</i>	Jaundice, epilepsy liver	Roots
<i>Plantago erosa</i>	<i>Isagbul (N)</i>	Tooth-ache	Leaves
<i>Podophyllum hexandrum</i>	<i>Ban kakhri(N)</i>	Fever, diarrhoea, anticancer	Roots, fruits
<i>Potentilla fructicosa</i>	<i>Chiniya phal(N)</i>	Astringent	Leaves
<i>Potentilla fulgens</i>	<i>Bajra danti (N)</i>	Diarrhea, toothach	Roots
<i>Prunus cerasoides</i>	<i>Arupatay (N)</i>	Bone-fracture & tooth-ache	Bark, stem
<i>Rhamnus napalensis</i>	<i>Phatnok kung (L), Archal(N)</i>	Used as purgative	Roots
<i>Rheum nobile</i>	<i>Kenjo (N)</i>	Ulcers, bronchitis, fever	Roots
<i>Rhododendron arboreum</i>	<i>Ee-tok reep (L) Lali Gurans(N)</i>	Blood □ Dysentery	Flower

<i>Rhus succedanea</i>	Su-kung(L), Rani balayo (N)	thisis	Fruit, leaves
<i>Rubia manjith</i>	Vyem (L), Majito	Menstrual disorder, skin	Roots & fruits
<i>Rubia wallichiana</i>	Vyem (L),	Jaundice, paralysis	Shoots
<i>Rubus ellipticus</i>	Kusyim (L) Ainselu(N)	Fever	Roots
<i>Rubus lineatus</i>	Suvuk (L)	Food poisoning	Roots
<i>Rumex nepalensis</i>	Halhalay(N)	Skin diseases	Shoots
<i>Scoparia dulcis</i>	-	Diabetes	Young leaves
<i>Sonchus wightianus</i>	-	Jaundice	Roots
<i>Skimmia laureola</i>	Timburyok (L), chumalani (N)	Aromatic	Leaves
<i>Stephania glandulifera</i>	Tamarkay (N)	Liver, Jaundice, Poultry	Root tuber
<i>Swertia chirayita</i>	Rungken (L) Chireto (N)	Dyspepsia, fever, headache	Shoots
<i>Symplocos lucida</i>	Kharane y(N)	Seeds powder	Spider sting
<i>Thalictrum foliolosum</i>	Dampatey (N)	Used as tonic and purgative	Roots
<i>Thalictrum javanicum</i>	Dampatey (N)	Tonic, Purgative	Roots
<i>Valeriana hardwickii</i>	Nakali jatamanshi (N)	Epilepsy neurosis, colic	Roots
<i>Viola biflora</i>	Ghattey gans (N)	Used as emetic, antiseptic	Roots & Flowers
<i>Viola diffusa</i>	Ghattey gans (N)	Chest pain	Flowers
<i>Viscum nepalense</i>	Dag sumthet, Harchur (N)	Body-pain, fracture, fever	Stem

7.6.2. Poisonous Plants of PWS.

The PWS also do possess a very good numbers of poisonous plants. The poisonous plants are mostly in the form of roots, leaves, stems etc. The *Aconitum laciniatum* is poisonous to the human being. The local people (Lepchas) use its extract on the arrowhead as poison. Therefore, a separate intensive study is also required for better understanding of this category of plants. Some of the important poisonous plants recorded from the PWS in Table 7.30.

Table 7.30. List of common Poisonous Plants of PWS.

Name of the Plant	Family	Poisoinous Parts	Poisonous for
<i>Acontum lacinatum</i>	Ranunculaceae	Roots	Human being
<i>Berberis insignis</i>	Berberidaceae	Stem juice	Fishes
<i>Caltha palustris</i>	Ranunculaceae	Stem juice	Animals
<i>Cestrum aurantiacum</i>	Solanaceae	Shoots	Goat & cattle
<i>Clematis gouriana</i>	Ranunculaceae	Stem& leaves juice	Human beig & Cattles
<i>Codonopsis affinis</i>	Campamulaceae	Shoots	Human being
<i>Dendrocnide sinuata</i>	Urticaceae	Leaves	Human being
<i>Girardinia diversifolia</i>	Urticaceae	Stinging hairs	Animals
<i>Gnaphalium affine</i>	Compositae	Shoots	Cattle
<i>Laportea terminalis</i>	Urticaceae	Stinging hairs	Human being
<i>Lyonia ovalifolia</i>	Ericaceae	Leaves	cattle
<i>Meconopsis napaulensis</i>	Papaveraceae	Roots	Human being
<i>Ranunculus diffusus</i>	Ranunculaceae	Leaf juice	Human being
<i>Rhododendron barbatum</i>	Ericaceae	Stem bark, leaves	Fish

<i>Rhododendron cinnabarinum</i>	Ericaceae	Leaves	Human being
<i>Rhododendron falconeri</i>	Ericaceae	Bark & leaves	Cattles
<i>Rhus succedanea</i>	Anacardiaceae	Stem & leaf juice	Human being
<i>Rumex nepaulesis</i>	Polygonaceae	Root, leaves	
<i>Schima wallichii</i>	Theaceae	Bark	Human being
<i>Semecarpus anacardium</i>	Anacardiaceae	Bark & leaf juice	Human being
<i>Trichosanthes lepiniana</i>	Cucurbitaceae	Seeds	Human being
<i>Urtica ardens</i>	Urticaceae	Stinging hairs	Human being
<i>Semecarpus anacardium</i>	Anacardiaceae	Bark & leaf juice	Human being
<i>Lobelia pyramidalis</i>	Lobeliaceae	Seeds	Human being & Cattles
<i>Maesa chisia</i>	Myrsinaceae	Leaves	Fish

6.6.3. Plants of Other Assorted Use

PWS holds a huge number of plant species (Table 7.31) those have been incredibly used for the assorted ethnic importance. Most of the species belongs to this category are either domesticated or conserved or grown somewhere nearby their home. These species are used in making several useful commodities. During the religious rituals, marriage ceremony, festivals, worshipping etc. these are extensively used as a part of culture and tradition in the region. Several significant commodities like traditional wooden containers, milk-curd pots, flower-vase etc, wooden plates, base of the gun, cover of knife (*Banpok*), curry spoon, bows and arrows, bamboo vase (*Chee puthyut /Dungro*) for brewed millet are prepared through various plant species by Lepcha Bhutia, Limboo and Sherpa tribes' community. Some of the plants are also been used in preparation of natural dye, however, some other species are deployed for making traditional drinks "*Chee/Jhaar/ Chang*" (brewed millet). The knowledge related to the plants in traditional assorted uses is presently mostly confined to the older generation rather than with the youth. Hence, the continuity of this knowledge seems to be the only means to save the tribe from vanishing. Therefore, PWS represents an enormous resource of plant species having significant values for the tribal people living in the vicinity of the sanctuary.

Table 7.31. Plants of other assorted traditional /ethnic use

PLANTS	LOCAL NAME	ETHNIC USES
<i>Dioscorea hamiltonii</i>	<i>Pumbuk</i> (L) <i>Ban Tarul</i> (N)	Tuberous root traditionally used during Namsung Tendong Lho ruumfaat or Maghay sankranti festival
<i>Arundinaria</i> spp.	<i>Prong</i> (L)	The matured stem is good for walking stick.
<i>Mahonia napaulensis</i>	<i>Keshari</i> (N)	Handle of Banpok, Sickles & khukuri are made from it.
<i>Polygala arillata</i>	<i>Guliyu jara</i> (N)	Mungmik, Pho, or Marcha a starter culture is being prepared from it for the fermentation of local brewed millet.

<i>Rubia manjith</i>	<i>Vyem</i> (L), <i>Majito</i> (N)	Yellowish red dye can be extracted from the matured fruits, which is being, used as traditional dyes.
<i>Stephania glandulifera</i>	<i>Tamarkay</i> (N)	The Root-bulb is used as a drinking pot for poultry to prevent from various diseases.
<i>Plagiogyra euphleba</i>	<i>Tungtok</i> (L)	The leaves & the spores are eaten by blood pheasant
<i>Amomum subulatum</i>	<i>Alaichi</i>	Natural dye
<i>Rheum nobile</i>	<i>Chutchra</i>	Natural dye
<i>Rumex nepalensis</i>	<i>Halhaley</i>	Natural dye
<i>Calamas erectus</i>	<i>Bet</i>	Stem used in walking stick, young shoot eaten, string derived making cane and bamboo artifacts.

7.7. IMPORTANCE OF THE FLORA

The flora of PWS is huge diverse and includes large proportion of economically significant plants. Those may be either timber-yielding trees or plants of medicinal or ornamental or food or fodder or of ethnic values. However, the people residing in the vicinity of the PWS have been sustainably using those plants prior to the declaration of the sanctuary.

The rich vegetation and its immensely rich taxa of diverse plant groups also has enormous scope of scientific research around the world. The flora of PWS holds many of the plant species of endangered, threatened, highly rare or nearing extinction status (e.g. *Podophyllum hexandrum*, *Rheum nobile*, *Aristolochia griffithii*, *Panax pseudoginseng* etc.) Where as, it thrive well in part of the nation and that deserves for conservation, the importance of Flora of PWS is also because of its significant representation of many endemic orchids (Luckson 2007). However, the diverse vegetation and natural beauty of the sanctuary has attracted a huge or innumerable tourists from across the nation/world.

A large number of economically important plants of both the indigenous and exotic origin exist in the sanctuary reveals about the significance of the flora of PWS. The checklist of the angiospermic flora of the sanctuary prepared through present floristic work will be useful for policy makers, administrators, and planners to frame proper strategies for their future exploitation and/or conservation related actions of Pangolakha Wildlife Sanctuary. The enumeration of various economically important plant species will further simplify the process for sanctuary management. There are also the possibilities of existence of various indispensable plants those could be exploited for formulation of useful medicines, against various diseases, etc.

Significantly, the PWS comprises of uninterrupted vegetation, presence of distinct climatic bands for migration, suitable climatic conditions and diversity in habitat condition might have supported for evolution.

7.8 NEW RECORDS OF DISTRIBUTION

Analysis of the recorded flora of Pangolakha Wildlife Sanctuary revealed the record of the occurrence of some plants first time from Sikkim as follows:

***Anaphalis wightiana* (DC.) DC.**

The species is earlier recorded by J.D. Hooker from Nilgiri hills South India, and the present collection is the new distribution record for Sikkim and North East India.

***Senecio wightianus* DC.**

The species is earlier known to be distributed in Himachal Pradesh, Meghalaya, Tamil Nadu, Nepal, Bhutan, Myanmar, China, Thailand, Japan and Phillipines. The present collection is the new distribution record for Sikkim.

***Vicatia conifolia* DC.**

The species is earlier recorded from Afghanistan, Balistan, and Himalaya India (Kashmir)-Nepal and Bhutan. The present collection is the new distribution record for Sikkim.

***Pimpenilla tonglensis* P.K. Mukherjee**

The species is one of the rare plant species of INDIA, and only recorded from (Labha, Rissisum, Tanglu) Darjeeling, West Bengal, INDIA and the present collection is the new distribution record from Sikkim.

***Sinocarum minusum* M.F. Watson**

The species is earlier only known from Eastern Nepal and Eastern Bhutan. The present collection is the new distribution record for Sikkim

***Impatiens bracteata* Colebrook ex Roxburgh**

The species is earlier recorded from Khasia Mts (Assam, INDIA) and believes to be later introduced and naturalized at Mongpo, Darjeeling and the present collection is the new distribution record for Sikkim.

***Dicentra lichiangensis* (D. Don) Walpers**

The species is earlier recorded from Bhutan. The present collection is the new distribution record for Sikkim.

7.9. REDISCOVERY OF PLANTS [AFTER 100 YEARS]

Quite a few species of plants have been reported in the flora those were known to us from their very old collections are recollected during the present survey in Pangolakha Wildlife Sanctuary. These include the following plant species.

Lactuca cooperi Anthony

The species is an endemic taxon which is collected after the lapse of 100 years, which is equivalent to its rediscovery.

Primula kingii Watt

Earlier, the species was collected by Nathang by J.D. Hooker in the year 1882. As such, the present collection of this species is more than 100 years after its previous collection from the same region, which is equivalent to its rediscovery.

Sausurea biligulatus W.W. Smith

The species was reported from alpine – subalpine region of east Sikkim by W.W. Smith in the year 1913 and the present collection is collected after laps of 100 years from the same region.

Though recorded recently, but the population of none of these plants is satisfactory. In other words, these are mostly chance collection and never seen again. It appears that all these three species are on the verge of extinction.

7.10. THREATS TO THE FLORA AND CONSERVATION MEASURES

Pangolakha Wildlife Sanctuary holds a significant status for floristic diversity of Eastern Himalaya. However, there is a partial indication of the depletion of vegetation through various means, which deserves immediate attention for ensuring the conservation status of the sanctuary. The following are some of the key factors those control the depletion of forests vegetation.

1. Grazing by domestic livestock

The grazing of cattle is a customary practice for the people residing in the periphery of the sanctuary. However, sometime it does exceed the carrying capacity of the alpine and sub-alpine meadows and forests. At present, the forests department is quite successful to control this practice. The summer and winter are two main seasons for migratory grazing in this

area. In summer the cattle move gradually in high elevation zones camp by camp spending 20 - 45 days in till they reach the alpine pastures in case of yak and sheep. But cows remain fairly below yak and sheep camps within the altitudinal range of 227 m – 3500 m. The summer migration starts from the month of April and reaches alpine pastureland in the middle of June and remains there upto the first week of October.

The movements of cattle normally depend on the extent of availability of grasses. However, availability of fodders is usually influenced by various abiotic factors, such as snow, frost, hailstorm and rain. Occasionally, the summer migrations are delayed due to prolonged snowfall in the upper reaches of the rangeland. The downward migration is also depending on early snowfall or hailstorm. Therefore, the shifting of livestock camps is normally controlled by the prevailing weather conditions in the area. The population of livestock in the sanctuary area is mainly consisting of yak, sheep, goat, pony and cows. The cattle comprised of 55 %, yak 30 % and rest 15 % of the total population of domestic livestock (Anonymous 2000)

However, some local herders believe that the pellet of sheep and goat content high degree of nutrients which enriches the productivity of the rangeland. The majority of local villagers residing in vicinity of the sanctuary own the livestock, and the awareness generation amongst the local herders is essential for the better management of the sanctuary. After eight years of official declaration of the sanctuary, the concerned officials of Forest department, Government of Sikkim also now realized for much improvement that has been taken place in the sanctuary.

2. Defense Activities

The part of the PWS falls under international border area to TAR and Bhutan, therefore, numerous prolong defense activities including establishment and shifting of camps, extension of bunkers, maintenance of line of control and other allied activities are taking place time to time inside the sanctuary area. The northern part of the sanctuary falls under the alpine zone, bordering to TAR region, it is manned by the National Army who occupy the area in short shifts of about six months to a year. Any biodiversity sensitization program is hence short-lived. Most camps are around or near water bodies with resultant pollution, especially of non-biodegradable garbage and spread of stray dogs around these settlements. In addition to preying on wildlife such as *Brahminy Shelduck Tadorna ferruginea*, there have been reports of human casualties due to these dogs (Lachungpa *et al.* 2003). Such scientifically unorganized activities have been resulted recognizable negative impact on the

vegetation and flora of the sanctuary in the long run. Slaughtering of trees, rhododendron scrubs, and absolute clearance of forests for aforementioned reasons must be having some negative impact on the climate change and global warming.

3. Bamboo Breaks

The vegetation composition of the lower belt of the PWS is remarkably rich in species diversity; however, the rapid and dominating expansion of bamboo breaks inside the sanctuary has become a menace to other species. The *Yushania maling* is the most dominating and its population is quickly proliferating in the recent years. The other bamboos steadily emerging for the expansion are *Himalayacalamus falconeri*, *H. hookeriana*, etc. The expansion of population these bamboos not only inhibits the growth of all types of smaller plants but also became threat to the taller plants including trees.

4. Hunters:

The poaching and the hunting is a quite common activities in the vicinity of the PWS. The tribal people residing nearby the sanctuary have been practicing it since time immemorial. Due to inaccessibility, many pockets of the PWS remain out of reach of the forest security personnel or forest officials and such areas are prone to such activities. This illegal poaching and hunting activities forced several species of animals driven out of the sanctuary. Many animal species are assumed to become extinct, due to such undesirable activities.

5. Impact of Tourism and Related Activities

The adjoining part of the PWS viz. Nathula, Nathang, Jalepla, Kupup, Rachela including Changu Lake are now among the places for established tourist hub. As such, the increase in movement of tourists towards this pocket could certainly have negative impact on the ecology of its surroundings in the long run. The impact on vegetation are equally being felt through the camping by hunters, travelers, authorized or unauthorized tourists, which ultimately enforce the inevitable threats to the biodiversity of the sanctuary.

6. Illegal Collection of NTFP

The practice of illegal collection of Non-Timber Forest Produces (NTFP) including medicinal plants, orchids, and uprooting of valuable tree sapling from the forest are often being done in the area prior to the declaration of the area as protected. Some of the high altitude medicinal plants of Sikkim including *Aconitum ferox* (Bikh) and *Picrorhiza scrophulariiflora* (Kurki) were in high demand and were collected during 1970s to 1990s in truckloads with dried tubers of these species fetching USD 0.330 per kg and dried stems of *Kurki* fetching USD 0.44 per kg (Tambey & Rawat 2007). The state government banned the commercial collection of medicinal plants for ten years since 2001 onwards. Aromatic

plants like *Juniperus recurva* (Sikpa) and were in high demand for incense making and large scale commercial collection was done by the yak and dzo herders between 1970s and 1990s. The collection of cane and bamboo shoots, Rhododendrons, ferns etc. and selling those in local markets are common. Such activities is still prevailing in the vicinity of the sanctuary, which may ultimately lead to the gradual depletion of valuable plant resources of the PWS.

7. Climate Change & its Impact on Flora

Himalayan glaciers have been in a state of general retreat since 1850 and the rate of retreat is accelerating. Jangpang & Vohra (1962), Kurien & Munshi (1972), Srikanta & Pandit (1972), Vohra (1981), and many others have made significant studies on the glacier snout fluctuations of the Himalayan glaciers.

Such retreats among glaciers are directly or indirectly responsible for climate change. The impact of change in the climate is also being observed in the distribution of many plants. According to the recent reports the plants are the most affected living being in the planet (Anonymous 2001).

The present study though confined with the exploration of floristic elements, but, this has been observed that many species once reported to be commonly occurring in the sub-alpine to alpine region are now sparsely distributed. W.W. Smith in 1913, reported 26 species of *Primula* occurring in the region. However, now it is after 100 years, only 10 species has been recorded from nearby the area. The reason for such, scattered distribution and becoming rare among species population is not known. Therefore, a separate extensive survey and study on such indispensable issue must be carried out very carefully for the conservation of such species.

7.11. CONSERVATION STATUS

Pangolakha Wildlife Sanctuary holds a significant status for floristic diversity and its conservation in this part of the world. It is one Protected Area (PA) and its importance will increase manifold when one think of the matter along with its strategic location within the IUCN recognized 'Himalaya Conservation Hotspot' (IUCN 2010). We know, this is one of the worst affected Hotspots and the area of natural habitat is rapidly decreasing there. PWS is one PA which is extending over wide temperature gradient and housing subtropical as well as alpine elements. Its location is well inside the Himalayan ranges and the degradation is still under control. However, there is a partial indication of the depletion of vegetation through various means, which deserves immediate attention for ensuring the conservation status of the sanctuary. The following are some of the key factors that control the depletion of forests vegetation.

7.11.1. Unsustainable NTFP extraction

Open borders encourage unregulated commercial trade for medicinal plants, plants of horticultural value; demand from large and increasing population; a form of livelihood for poor.

A. PWS is a home of numerous potential medicinal herbs and NTFPs. The collection of the medicinal plants and their illegal transborder trafficking through networking was once very common. However, such activities were not apparent visible during the survey. The common people residing nearby the sanctuary reveals that the practice is now much reduced after the declaration of the Sanctuary. Some notable medicinal plants extensively collected for such purposes are *Aconitum heterophyllum*, *Aconitum spicatum*, *Berginia ciliata*, *Rheum acuminatum*, *Lycopodium clavatum*, *Swertia chirayita*, *Rubia manjith*, *Heracleum nepalenses*, *Dioscorea spp*s etc. It is therefore, those potential species deserves utmost preservation.

B. Often being aromatic, the twigs and leaves of *Rhododendron anthopogon* and *Juniperus* sp. are traditionally burn as incense in Sikkim, Bhutan and parts of West Bengal. The mixed dried twigs of these species are sold in Rs 10- 20/ Pkt. at local market of Gangtok, Mangan, Gyalzing, Namchi etc. Many tourists from places like Gangtok, Kolkata, Siliguri, Gangtok frequently visits sanctuary for trekking and as pleasure tourists. As such, uprooting of small plants including orchids and taking those to their native places without the information of sanctuary's authority is often observed. Such, undesirable activities will certainly have negative impact on the sanctuary in long run, which needs to be tackle very carefully.

7.11.2. Tree-felling:

One of the important threats identified for the forests of PWS is illegal tree-felling activities for timber and planks. Prior to the declaration of the sanctuary, the practice of illegal felling of rare trees for timber in the area such as *Alcimendra cathartii*, *Tsuga dumosa*, *Magnolia campbellii*, is quite usual. However, such activities are much reduced at present. It is also being observed that the population of many other trees is also noted for potential in timber yielding, such as *Castanopsis tribuloides*, *Betula alnoides*, *Prunus dumosa*, etc are now very scattered in their distribution.

7.11.3. Fishing practices:

The practice of illegal and legal fishing is taking place as a regular phenomenon of the people living near the PWS. Several methods of fishing practices are being adopted by them. Hence, it is being reported that various fish poisoning items including gelatin candles (*Blasten*) has been

used for killing fishes. The other common method such as closing of Duwali (diversion of water flows), Bamboo made net (*Knu Tuksyor*) are also being adopted during fishing practice inside the PWS. Hence, such uncontrolled fishing activities may also tend to have an adverse impact on vegetation.

7.11.4. Poaching:

Poaching is one of most common leisure of the people residing nearby the PWS. The local people residing nearby the sanctuary's boarder at Premlakha, Subaney Dara, and Talkharkha are actually associated for such practice since long. Occasionally some hunters from the adjoining areas such as Bhutan, West Bengal (Terai and Duars region) also visit the area. These hunters are entering through numerous illegal passes those exist in the North Eastern and South Eastern borders of PWS. However, such activities are now seemingly reduced to large extent.

7.11.5. Collection of ornamental Plants

The PWS being bestowed with beautiful orchids, other flowering plants of ornamental values, the local people from Renock, Rongli, Aritaar and also from other adjoining areas are sometime engross in collections of these plants for their domestic or local use. However, there are some

7.11.6. Fuel-wood collection

Lack of alternative energy sources for cooking and heating forcing the local people to fell trees illegally that imposes tremendous pressure on plant population in the forests. Despites of imposing ban on fire-wood collection by the Government Forest Department, numerous trees are cut down and transported to the nearby areas, and exported through the open borders with Bhutan

7.11.7. Overgrazing by domestic livestock

The grazing of cattle is customary with the people residing in the periphery of PWS. However, sometimes it does exceed the carrying capacity of the alpine and subalpine meadows and forests. However, in the present juncture, the forests department is successful enough to control such practices.

7.11.8. Customs, tradition, and subsistence

The tribal people residing near the PWS are dependant on food and medicine for local consumption. These tribal communities consume the leaves, young twigs, buds etc. of trees as vegetable. As such, some of the rare plants are also being collected and sold in the market. Being unaware of the global status of populations, sometime such activities imposed threats to the population structure of some rare species of PWS.

7.11.9. Forest and Grassland Fires

Quite often, specially during the dry season, fires set by herders and hunters to facilitate grazing and hunting cause great loss to the vegetation and biodiversity of the sanctuary. This is mainly due to the lack of awareness of consequences of the concerned people. Poor forest and fire management facilities available in the area are causing damages far beyond the expectation.

7.11.10. Lack of Information and Awareness

People do not know about the endangered species as the scientific knowledge and the conservation have remained exclusively with the scientist and forest officials (Anonymous 2007). The comprehensive and intensive scientific exploration in regards to the species diversity of the sanctuary also is *hitherto* not been taken up officially by the government of Sikkim in the past. Due to which, the actual and detailed information about this sanctuary is unavailable. As such, the data management and sharing, in regards to the sanctuary is not been possible up till now. Field workers have been less exposed to modern techniques and technologies in term of forest related activities (Lama 2001). In addition, the capacity building of the concerned departmental personal is essential for the adoption of suitable conservation methodology.

7.11.11. Military operations

Beside this, the frequent flow of tourists, military exercise in the TAR and Bhutan border, extension of infrastructures for international trade route, monoculture plantation practiced by the Forest Department, massive invasion of bamboo against other species, undesirable and unecofriendly human activities inside the sanctuary, needs to be looked after closely and seriously and given priority for the development of proper strategies of conservation and management of PWS.

7.12 PROPOSED METHODS OF CONSERVATION

By many measures of biodiversity, the Eastern Himalayan region stands out as being globally important. It has been included in the 13 biodiversity hotspots on Earth (Myers *et al.* 2000) when the first set of Hotspots were declared and is also categorized as several Global 200 ecoregions (Olson & Dinerstein 1998), two Endemic Bird Areas (Stattersfield *et al.* 1998), and several centers for plant diversity (IUCN 1995). An understanding of why the Eastern Himalaya is so exceptionally rich in biodiversity requires a brief overview and analysis of its geological history and ensuing biogeographic patterns.

Protected areas are, and have been, the cornerstones of biodiversity conservation. South Asia has a long history of biodiversity conservation in protected areas, dating back to several centuries. For instance, sanctuaries for wildlife conservation were established in India over two thousand years ago by Royal Decree (Singh 1986). In the northeastern region of India, many

tribal groups have traditionally recognized and protected sacred groves, which have been effective refuges for biodiversity for millennia (Gadgil 1985).

A notable feature of the protected areas systems of Bhutan, Nepal, and northeastern India is that those are located adjacent to each other across the national borders, and provide opportunities for transboundary conservation. Adjacent to the Pangolakha Wildlife Sanctuary, the Kanchandzonga National Park in Sikkim and Kangchenjunga Conservation Area in eastern Nepal, and Manas National Park in Bhutan and Manas Tiger Reserve in Assam are two such complexes.

However, the world's highest mountain range has not been spared from the threats to biodiversity loss that pervade this planet. Historically, the human population densities in the region were relatively low, suppressed by disease, low productivity of the land, and inaccessibility. Since development and access is still variable across the region, the severity of threats and consequent rates of biodiversity loss is variable, which has to be considered when assessing conservation opportunities and actions.

Significantly, the Govt. of India has recently taken up some serious measures for the conservation of biodiversity by declaring many biodiversity rich areas as Protected or Reserve Areas for the *in situ* conservation. As such, the proper management of these Reserve Areas with effective monitoring and strong enforcement of laws should be made in order to achieve the target. Considering this fact, Govt of Sikkim has declared some (1) National Parks, (1) Biosphere Reserve and (6) Wildlife Sanctuaries. Apart from that, many small pockets of forests nearby monasteries, herbal garden of Bongthing in a village have been a part of traditional conservation of forest in Sikkim.

However, the People do not know about the endangered species as the scientific knowledge and the conservation have remained exclusively with the scientists and forest officials (Anonymous 2007).

Considering the above facts, few proposals, or recommendations in regard to the management and conservation strategies of the PWS is mentioned below:

1. The PWS authority should enforce the existing wildlife regulation and conservation laws very strictly
2. The visitors, researcher, trekkers should be properly guided by the sanctuary management committee. Rule and regulation in regards to sanctuary must be clearly conveyed to them prior to entering the sanctuary
3. The a part of Prem-lakha and few other villages are falling under the sanctuary's jurisdiction, therefore the encroachment and settlement of people in this village and its

periphery and fringe areas of the Sanctuary must be discouraged and the existing settlements are to be shifted to other feasible areas.

4. A part of PWS being falls under international border areas. Therefore, frequent military operations or training programs are taking place inside the sanctuary area.
5. Unauthorized persons should be strictly prohibited from entering into the sanctuary.
6. Felling of trees for any purpose must be discouraged and the logs of dead and/damaged trees should not be removed from the sanctuary area
7. Deployment of more manpower shall have advantages to check over the activities of hunters, poachers and plant collectors within the sanctuary
8. The concerned sanctuary authority should be very strict in regulation of laws in regards to collection of rare ornamental plants like orchids, medicinal plants, and wild edibles.
9. Nathang, Kupup, Padamchen, Rachela, Pangolakha etc. are some of the popular hubs for tourists. Therefore infrastructure extensions for tourism development in these areas have to be carefully planned. The Tours & Travel Association of Sikkim (TAAS) may be involved in such initiatives and also for efficient management of tourism in this ecologically vulnerable corner of the state. Trekking and mountaineering /scientific expedition activities should have to be made completely in eco-friendly manner
10. The invasion of Bamboos (*Sinarundinaria maling*) has been presently become menace to the PWS. The rapid proliferation of this species has inhibited the growth of all other species and may have negative impact on biodiversity in long run. Therefore, the intensive study on the impact on such massive invasion of this species must be taken up for future sustenance
11. There are some rituals being conducted at Rachela and Pangolakha on Magey Sangrati. However, massive gathering inside the sanctuary and spending 1-2 days should either be well manage or should be minimized. As a result, the visitors' often leave behind a pile of litters including plastics, bottles and other wastes which is unpleasant and derogative for the surrounding environment
12. **Creation of Interpretation Centre:** The defense personnel stationed at the border area of PWS need to be properly imparted the awareness on environment, and biodiversity of the area. As such, a Wildlife Interpretation Center can be established at the entry point of the area with proper facilities for dissemination of information on generation of awareness to the jawans entering the border. Further, the development of eco-friendly infrastructure to provide regular program to the jawans as well as other categories of

defense personnel, concern sanctuary authority and local inhabitants of Phandanchem, Nathag, Kupup and Rigu south, Rigu North, Rongli etc.

13. The detail survey of for mapping of quantitative analysis of bioresource of the sanctuary will also have to be taken up for faunal species and for lower groups of plants e.g. bryophytes, fungi, microbes etc, in regard to their distribution patterns, population size, physiological tolerance, breeding system, reproduction, food-web, ecological needs, pollination and/or dispersal systems, germination, phenology, competition, etc. Further, a comprehensive and extensive study of lower groups of plants to have complete knowledge and understanding of these groups shall have to be done for the improvement of better conservation strategies of the PWS.
14. Buffer zone of Indian boarder to the TAR region and Bhutan including the PWS can be jointly propose for the declaration of transboundary international park for further conservation of bioresources, considering this fact, a high level committee for conservation of genepool of the buffer zone of border area a joint approach can be taken up among three nations. This step will ensure long term sustainability of natural resources not only in parts of Indian Territory (Sikkim) but also build a chain of protected areas for biological resources in the adjoining countries.
15. The inventory cum pilot study of carrying capacity of the grassland of alpine east Sikkim is rationally essential. The alpine and sub-alpine grasslands including alpine east Sikkim covers about 14 % of the total land area of Sikkim. There are unspecified numbers of upland cattle and goats about 11000 sheep and over 5300 yaks are directly or indirectly depended on this vegetation. Having being the poor quality of land, the alpine and sub-alpine grassland of alpine east Sikkim sustains the low grazing and low deterioration intensity as compared to the *Goucharan land* (rangeland). The majority of tree covers are now found stripped. The most important measures for improving the deteriorating grassland are to prepare an inventory of grasses for the entire alpine and sub-alpine.

Further, PWS is a home of many rare and endemic orchids of Sikkim. It is also a centre of diversity of many potential plants in regards to food, medicine, house constructions etc. However, the present study also reveal that some of the species once very common in the hills of Sikkim as noted by famous botanists like D. Don (1825), Sir George King (1898), Gammie (1894), Smith & Cave (1911), W.W. Smith (1913), Mizoshima (1967), H. Ohashi (1975), including Sir J.D. Hooker (1906) are now gradually becoming rare and endangered. Therefore, the Pangolakha wildlife sanctuary authourity and PWS management committee should consider the aforementioned facts with proper priority for sustainable conservation of Biodiversity.

Conclusion

Interest and concern about the environment have stimulated increased efforts to inventorying and document the plants of the world. The growing realization about conservation of rapidly dwindling resources and use those more wisely provides an added urgency to these efforts. Thus, the amount of time and money needed for floristic work is increasing, as are the diversity and importance of ways in which floristic information is being used and the number of people who have a direct interest in floristic data (Anonymous 2004).

Therefore, the PWS being one of the extremely inaccessible Protected Areas, the survey and the mapping of its floristic components has not been possible and remained unexplored for many years. Therefore, the data presented here is the 1st and pilot studies exclusively taken into consideration of this isolated and terrain during past seven years.

The PWS, with an area of 128 sq km is the biggest sanctuary of Sikkim holds tremendously rich floral component Lepcha *et al.* (2007, 2009). Significantly, the thick and compact forest of PWS has been recorded as the rare habitat of numerous rare and endangered species of plants including the *Podophyllum hexandrum*, *Rheum nobile*, *Aconitum bisma*, *Balanophora polyandra*, *Aristolochia griffithii*, *Clematis montana*, *Panax pseudo-ginseng* etc.

The floristic study of the PWS also reveals that there are numerous plants species are in the verge of threatened and gradually becoming rare. Their population is also gradually decreasing. However, there are still enough indications of migration of many species into the sanctuary particularly across the international boundaries of TAR region of China and Bhutan.

It is a matter of fact that the interference of the PWS through various undesirable means is identified as a major issue in regards to conservation in the sanctuary at present context. These factors were perceived to be the great threats to the existence of the park, its ecology and its bioresources as a whole.

The flora of Sikkim is largely subjected to ecological and climatic variations (Chauhan & Singh 1996). The varied climatic, physiographic and the edaphic factors have enabled the PWS area to evolve the rich diversity of its own in a small stretch of land mass. The different conditions of slopes, hill ridges, crests, furs, valleys, formations, and the diversity of habitat conditions, sharp altitudinal ranges of 6000 – 3100 m and the nature of diverse type of vegetation

formations have altogether contributed to Phagolkha Wildlife Sanctuary to acquire its unique and diverse flora and vegetation.

PWS is surrounded by the TAR region of China in the north and Bhutan in the east, Darjeeling district of West Bengal in the south-east. The present floristic studies of the sanctuary had some advantages in enumerating the flora as some of the components of flora of adjoining parts of Bhutan and the areas of Neora Valley National Park are extended sharing their common international boundaries and the floras of both of these regions are in hand. This work of botanical explorations of PWS has enabled to amass over 3000 herbarium specimens, now stored in the NBU-Herbarium, Department of Botany, North Bengal University and at BSHC, Botanical Survey of India, Sikkim Himalayan Circle, Gangtok.

The present field study of *hitherto* unexplored forests of PWS recorded a total of 892 species of angiosperms belonging to 140 families which is remarkably a high figure in a small geographical land mass of only 128 sq km. In addition to angiosperms, 68 species of ferns and fern allies belonging to 20 families, and 6 species of gymnosperms were also recorded. However, a separate comprehensive study of the fern flora of the PWS is required to get the actual picture.

Out of eight natural reserves (6 Wildlife Sanctuaries, 1 National Park, and 1 Biosphere Reserve) in Sikkim, PWS is the one with very rich gene-pool of floristic elements. The forests of the PWS not only rich in the Himalayan floristic elements, but also represents the rich Sino-Himalayan, Japanese, South-East Asian and Malaysian elements. Apart from these, other floristic elements of the valley also include Indian subcontinent, Australian, Eurasian, Central Asiatic and American elements as well. Some species in the valley are found to be naturalized exotic elements.

Above all, PWS holds huge store-house of species for medicinal values with tremendous scope for future use. Besides, it also holds extremely important resource species with economic values in the form of wild edibles, fodder, costly timber yielding, etc. The actual status of PWS as a source of NTFP needs further detailed inventorying.

Significantly, having being enormously rich in floristic diversity, the sanctuary could be considered as a *state-of-art* site for determination of taxonomic rank especially in the *species*, *varieties* level including *ecotypes* and *species novo* in the future. Therefore it is being assumed that more *taxa*, *varieties*, *ecotypes* and the *species novo* shall be certainly evolved in the future course. Most importantly, PWS is housing numerous endemic species of Himalayan, particularly of Eastern Himalayan region.

Considering all these facts, the floristic wealth of PWS needs to be conserved with topmost priority. It is the matter of fact, that the sanctuary with tremendous diversity in species level is a part of the *Himalaya Biodiversity Hotspot*. Hence, the safeguard of sanctuary through effective enforcement of the laws and implementation of advance and cost effective conservation methodology is a need of the hour for better and effective approach for the conservation and promotion of the rich "*Gene-pool*". The state Department of Forest and its personnel needs to play key roles in exercising their powers and duties with utmost sincerity, accountability and the credibility to ensure the sanctuary a safe and secure home for all its biodiversity. Also, the state Department of Science & Technology and other allied research based departments must take up intensive study in regards to the status of useful and RET species of plants for conserving and/ or improving their population structure as well as developing proper methods of their sustainable utilization through the cultivation of some such plants involving local people. The entire area can be declared as a **Transboundary International Park** for further and/or better conservation of the area's bioresources. This will ensure long term sustainability of natural resources not only in parts of Indian Territory but also develop a contiguous chain of protected areas for biological resources in the adjoining countries too.

Summary

PWS is the largest wildlife sanctuary of Sikkim. It falls under the Himalayan biogeographical region under the IBA Site Code no IN-SK-09 and is located in the eastern flank of East district of Sikkim. The total area of the sanctuary is 128 sq km (29,424.53 Hectares) and it belongs to the bio-geographical zone 2C (Central Himalayas) as recognized by Rodgers and Panwar (1988) and is situated in between 27° 08' 03" N and 27° 21' 59" N latitudes from and 88° 55' 23" E to 88° 41' 28" E longitudes. The PWS has vast extensive forests; shares its boundary with Tibetan Autonomous Region (TAR), Bhutan and part of Darjeeling district of West Bengal.

The PWS is one of the locally recognized biodiversity hotspots Lepcha *et al.* (2006,2007,2009). The forests of Pangolakha range being situated in the most difficult Himalayan terrain are virgin and botanically unexplored. Being remain isolated and undisturbed for many centuries, the sanctuary holds tremendous richness in floristic diversity in comparison to the other areas of Sikkim. Significantly, it also holds greater values, in respect to scientific, environmental, and cultural aspects. Most importantly, the sanctuary holds it wide range of habitats representing all forms of habit pertaining to plant resources. The PWS is also a unique natural conservatory for the state and also for the country.

The rich bioresource of the sanctuary are of great values to the researchers, scientists, botanists and environmentalists across the globe. The sanctuary is unique from its counterparts because of its distinct geographical orientation, sharp altitudinal variations with diverse climatic conditions resulting in the tremendously rich diversity of flora and fauna. The present study has clearly indicated that the sanctuary represents a comparatively higher percentage of unique floras. Not only this, the flora of the sanctuary also reveals of its representation of major groups of plants from lower temperate region to the highest alpine region.

Significantly, the flora of the PWS also hold a vital meaning in respect of rich, traditional knowledge especially ethnobotany and traditional medicine. The people residing in the vicinity sustained themselves living upto the close and symbiotic association with these forests. Their close association with forests determines the greater aspects of the man and environmental

relationship. The sanctuary is a huge store-house of non-timber forest produces (NTFPs) that can be brought into sustainable use for scientific utilities as well for the economic upliftment of local forest-dependent people.

In comparison of the floras of PWS (128 sq km.) with the other prominent floras of Eastern Himalayan region including *Flora of Eastern Himalaya* (Hara 1966, 1971; Ohashi 1975), *Enumeration of Flowering Plants of Nepal* (Hara et al 1978, 1979, 1982) and *Flora of Sikkim – Monocot* (Hajra & Verma 1996). The flora of the PWS represents 140 Families, 421 Genera and 892 species of the total families, genera and species, respectively of that of the entire Flora of Eastern Himalaya. While comparing the flora of PWS with the *Enumeration of Flowering Plants of Nepal*, the flora of PWS comprises of 60 % of families, 27.24 % of genera and 18.04 % of species of the entire angiospermic flora of Nepal.

The PWS being remained less disturbed and of constant presence of the pioneer habitats consequently exhibits appreciable number of endemic taxa. The flora of the sanctuary also reveals that the single family in the flora Asteraceae holds 21 endemic species. Apart from that out of 818 species of angiosperms, over 26.53 % are endemic.

Many threatened or endangered species have been recorded from the PWS and many other species are now becoming rarer in their own natural habitat.

The PWS also holds a wide range of vegetation types and several phytogeographically significant areas with varying of vegetation types at different altitudes. Conspicuously, besides its rich flora, the PWS equally supports a rich fauna, specifically a diverse population of avifauna. Wide distribution of significant wetlands including lakes and rivers are the noted regulators of both climate and the hydrological cycle, which are the major sources drinking water for the adjoining villages like *Rongli, Rigu, Kupup, Padamchen, Subany Dara* etc, and act as ultimate reservoir of water sources and its conservation in future. Significantly, the PWS also contributes a diverse form of species that has been source of wild food plants, medicinal plants, and sources of wide range of species of traditional and social values, which is of tremendous economic potential for future sustenance. Therefore, considering all these facts, the bioresources of Pangolakha range has immense potential in regard to the services of the increasing human needs. This resource has potential to restrain from numerous dreadful diseases from the world, and which can be added with values as per the need basis in days to come. The PWS has been a part of *in situ* conservation of both the flora and fauna for many centuries. Many of the faunal elements of the sanctuary are already known to be with rare and endangered status. The PWS is also reported to have highest density of tiger (*Panthera tigris*) population in any national parks and sanctuaries of Sikkim (Forest Department Report). It is also an ideal home to many species of

mammals which are reported to be in *Schedule I of Indian Wildlife (Protection) Act, 1972*. The forest of the sanctuary is also the home of the state's animal "Red Panda (*Ailurus fulgens*). (Anonymous 2009).

Interestingly, the rich floristic resource of the PWS also supports a considerable number of species of foreign origin. They must have been established themselves in the area through a long drawn different processes of migration and naturalization. The species of foreign origin those were recorded from the sanctuary are from America, Australia, Africa, Afghanistan, China, Iran, Pakistan, Russia, E Asia, Malaysia, etc.

The intact belt of Pangolakha range and Neora valley under Darjeeling district of West Bengal has been remained unexplored and undisturbed for hundreds of years, which ultimately could be an excellent model of *cradle for evolution* of species for floristic diversity in the Eastern Himalayan region (Rai & Das 2002). Hence, due to long biological isolation and continues evolutionary process in the local biota, the flora of the PWS uphold an invaluable resource for the scientific researchers in days to come.

The task of assembling available information about the plants of PWS is both vital and formidable. It is because except Khangchendonga National Park (KNP) a comprehensive floristic inventory works for other Protected Areas are yet to be undertaken. Although sporadic collection have been made by different scientists after the visits of Sir J.D. Hooker and W.W. Smith in last two hundred years. Therefore, the task of recording the information of native plants and their cataloging turns out to be immensely important. As a result, the flora holds tremendous potential for those wishing to study the medicinal value of a given species or for searching the relatives of commercially valuable plants that are more resistant to diseases or drought.

Considering these facts, bioresources of the PWS shall be of immense potential for *growing needs of human population if exploited in sustainable and scientific manner*.

Therefore, the intensive scientific documentation of this gene-pool and framing the future policy for the conservation of these resources is the need of the hour. The biotic disturbing elements including grazing, illegal orchid collectors, and transboundary medicinal plant trafficker etc. are the major causes for the eventual loss of vegetation. Eventually the abiotic factors that ultimately disturbed the ecology of sanctuary are landslide, soil erosion and other ecological degradation.

The entire area can be declared as a Transboundary International Park for further conservation of the bioresources. Considering these facts, a high level committee for conservation of gene-pool of the buffer zone of boarder area, a joint approach can be taken up among three nations – India, TAR region of China and Bhutanese. This step will ensure long-term

sustainability of natural resources in not only parts of Indian Territory but also develop a contiguous chain of protected areas for biological resources in the adjoining countries too.

Hence, the entire area of study, located completely within the Himalaya Biodiversity Hotspot, may be identified as an important hotspot corner for the biodiversity richness jointly with the Neora Valley National Park under government of West Bengal and the governments of Bhutan

The PWS deserves to be taken up in the top priority for conservation aspect. As such, an effective and substantial conservation program considering the total genetic assets needs to be laid down to facilitate the process of natural regeneration. Being one of the immensely rich in biological diversity, the PWS also needs to be recognized as an area of prime biodiversity importance for holistic approach to allocate substantial and adequate funds for its conservation.

Publications & Research experience

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POPULAR ARTICLES

Lepcha S.R. *The Green Gold of Sikkim* (Now Daily – a news paper).

Lepcha S.R. *Possibilities of natural dye extraction from three exotic weeds of Sikkim* (Now Daily - a news paper).

RADIO TALK

Biodiversity of Sikkim Himalaya (*All India Radio*, Gangtok, Sikkim)

SCIENTIFIC PROJECTS UNDERTAKING

Mapping of Plant resources of Sikkim Himalaya (DBT, Gov. of India)

Cane/Rattan conservation and propagation through seeds in Sikkim (DST, Gov. of India)

Ethno-veterinary documentation of Sikkim Himalaya (DST, Gov. of India)

RESEARCH EXPERIENCE

Since 1998 in different capacities at North Bengal University and at the Department of Science & Technology, Gov. of Sikkim.

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ANNEXURE - I



GOVERNMENT OF SIKKIM
OFFICE OF THE PR. CHIEF CONSERVATOR OF FORESTS-CUM- SECRETARY
DEPARTMENT OF FOREST, ENVIRONMENT AND WILDLIFE
DEORALI, GANGTOK

No.10/9/WLC/02/127

Date : 05.09.2002

NOTIFICATION

Whereas the state government is satisfied with the proclamation issued by the District Collector (East) under section 21 of the Wildlife (Protection) Act 1972 with regard to the boundaries of the Pangolakha Wildlife Sanctuary declared vide notification no.26/WL/F/89 dated 7.11.2000 under section 18 of the Wildlife (Protection) Act 1972 and therefore confirms that there is no change in the boundaries of the sanctuary.

Hence in exercise of power conferred under section 26(A), clause-1 of the Wildlife (Protection) Act 1972, the state government hereby declares the following area comprising of Chandey reserve forest, Gunibay reserve forest, Dorok reserve forest, Panikharka reserve forest, Bichkharka reserve forest, Pangolakha reserve forest, Singaneybans reserve forest, Tungsey reserve forest, Keohyaklo reserve forest, Salami reserve forest and Pangola reserve forest having a total geographical area of 128 square kilometers as PANGOLAKHA WILDLIFE SANCTUARY for the protection of wildlife and its environment.

NORTH: The northern boundary starts at the point below Zaluk on the reserve forest boundary and runs below Zaluk, Gashang, Tukla, Neola and Kupup along the reserve forest boundary till it reaches at Jelepia

EAST: The eastern boundary starts from Jelepia, runs along the international boundary with China and then with Bhutan up to the point where it meets Dichu.

SOUTH: The southern boundary starts from the point where Dichu meets the international boundary with Bhutan, runs along the international boundary with Bhutan up to Rachela and further along the state boundary with West Bengal up to the point where the boundary of Chandey reserve forest meets the state boundary with West Bengal.

WEST: The western boundary starts from the point where the boundary of Chandey reserve forest meets the state boundary with West Bengal and runs along the boundaries of Chandey reserve forest, Gunibay reserve forest, Dorok reserve forest, Panikharka reserve forest, Bichkharka reserve forest, Pangolakha reserve forest, Singaneybans reserve forest and Tungsey reserve forest, above the villages of North Regu, South Regu, Premlakha, Phadamchen till the point below Zaluk on the reserve forest boundary.

(T.R.Sharma, IFS)
PCCF-cum-Secretary
Deptt. of Forest, Env. And Wildlife
Govt. of Sikkim
(File No: 10/9/WLC/02)

ANNEXURE -II

Some important places of the Pangolakha Wildlife Sanctuary

Names of the places	Elevation (in m)	Importance in nature	Part of Sanctuary
<i>Phusrey dara</i>	2300	Forest barrack, natural lake	South
<i>Bara Ramitey dara</i>	2500	View point	South-east
<i>Premlakha</i>	2000	Village, river	South-west
<i>Singhaney dara</i>	2500	Natural lake	South-west
<i>Mulkharka</i>	2100	Village, forest	South west
<i>Sokpa pokhri</i>	2200	Natural Lake	South
<i>Tungya</i>	2106	Forest	South west
<i>Jore pokhri</i>	2800	Natural lake	South east
<i>Lower Padamchen</i>	2600	Bamboo forest	South west
<i>Neora phatak</i>	2300	Forest barrack NNP, Tourist view point	South east
<i>Rachela trijunction</i>	3126	Forest, tourist viewpoint, Barrack.	South east
<i>Panglakha</i>	3062	Forest barrack, view point..	Middle
<i>Lungthung</i>	3885	Deserted army cantonment.	North-west
<i>Nathang</i>	3880	Army cantonment area, village	North west
<i>Kupup</i>	3900	Army cantonment area, Lakes, village	North- west
<i>Bidang tsho</i>	3896	Lake	North west
<i>Jalepla</i>	4386	Old trade route, Army cantonment area.	North west
<i>Batangla (Gipmochi)</i>	3500	Pass, Triagection	North east
<i>Gyemochen</i>	4428	Glacier	North
<i>Dokala</i>	4100	Pass	North east
<i>Lampokhri</i>	4200	Lake	North
<i>Pongchula</i>	4590	Pass	North
<i>Hanuman hill</i>	4514	Restricted border area	North
<i>Tiger hill</i>	4869	Restricted border area	North west
<i>Haldi gate</i>	4100	Restricted border area	North
<i>Arjun hill</i>	4576	Restricted border area	North
<i>Danchula</i>	4418	Pass, Restricted border area	North
<i>Amber hill</i>	4200	Restricted border area	North
<i>Yakla</i>	4389	Restricted border area	North

ANNEXURE-III

Lists of the infrastructure and other basic facilities of sanctuary

S N	Location	Type of Infrastructure	No	Remarks
1	Phadamchen	Forest Rest House	1	Water & electricity connectivity unavailable
2	Pangolakha	FG barrack	1	- do-
3	Richefa	-do-	1	- do-
4	Phusrey	-do-	1	- do-
5	Hatthicheray	Check Post	1	Water & Electricity both available.
6	Phusrey	RCC Watch tower	1	Water connectivity available but no electricity connectivity.

List of Eco-Development Committees (EDC) in the study area

Sl.No	Name of EDC	Government order no.& dated
1.	Singaney bans EDC	04/EDC/PAN/WLC dt:5.9.2002
2.	Dalapchen EDC	01/EDC/ PAN/WLC dt:5.9.2002
3.	Regu EDC	02/EDC/ PAN/WLC dt:5.9.2002
4.	Phadamchen EDC	03/EDC/ PAN/WLC dt:5.9.2002

Lists of the villages situated nearby the sanctuary and their details

SN	Panchayat ward	Panchayat Block	Gram Panchayat	Assembly constituency
1	Ganchung	Upper Taza	Taza	Rhenock
2	Dugalakha			
3	Kaputhang			
4	Ruchalgaon	Lower Taza		
5	Titribotey	Kyongsa	Rhenock Tarpin	
6	Kyongsa			
7	Chalisay			
8	Navadaya			
9	Reshi			
10	Lower Tarpin	Tarpin		
11	Gumpa Simanagaon	Aritar	Aritar	Sangha
12	Aritar Maneydara			
13	Pradhan Gaon			
14	Kingstone			
15	Khamdong			
16	Kutitar			
17	Suntaley Darpaney	Mulukey		
18	Mulukey			

19	Sudunglakha	Sudunglakha	Sudunglakha	Rhenock	
20	Kopchey				
21	Gairi Gaon				
22	Mangkhim	Dholepchen	Dholepchen	Rhegoh	
23	Sadhu Gaon				
24	Kataharotey				
25	Dara Gaon				
26	Mandir Gaon				
27	Deoling				Changeylakha
28	Bimbirey				South Rhegoh
29	Talkharga	North Rhegoh	Rhegoh	Rhegoh	
30	Thokar				
31	Sisney				
32	Dokchin				
33	Agam Lok	Subaneydara	Premlakha Subaneydara		
34	Maney Sisney				
35	Subaneydara				
36	Siganeybas	Siganeybas	Premlakha		
37	Premlakha	Premlakha			
38	Kupup	Gnathang	Gnathang	Pathing	
39	Gnathang				
40	Zoluk				
41	Upper Lingtam	Lingtam	Lingtam Phadamche n	Pathing	
42	Middle Lingtam				
43	Lower Lingtam				
44	Nimachen	Phadamcehn	Rolep Lamaten		
45	Phadamchen	Rolep			
46	Rolep	Lamaten			
47	Chongthang				
48	Upper Lamaten				
49	Middle Lamaten				
50	Lower Lamaten				

Source; Forest department, Government of Sikkim.

ANNEXURE – IV

List of common fishes of alpine & sub-alpine east Sikkim (PWS)

Sl. No.	COMMON NAME	SPECIES RECORDED
1.	Asala	<i>Schizopyge pragastus</i>
2.	Buduna	<i>Garra annandalei</i>
3.	Balm	<i>Anguilla bengalensis</i>
4.	Chepti	<i>Semiplotus semiplotus</i>
5.	Gadela	<i>Noemacheilus beavani</i>
6.	Katlay	<i>Acrossocheilus hexagonolepis</i>
7.	Kabray	<i>Pseudecheneis sulcatus</i>
8.	Nakatua	<i>Garra gotyla gotyla</i>
9.	Sahar	<i>Tor putitora</i>
10.	Trout	<i>Salmo trutta fario</i>

Source : Forest Department, Govt of Sikkim.

List of some common amphibian of PWS

Sl. No.	COMMON NAME	SPECIES RECORDED
1.	Da-ri tulug / Sawaney Paha	<i>Amolops formosus</i>
2.	Lukpok tulug/Khaney Paha	<i>Paa liebigii</i>
3.	Lhak-chek tulug / Paha	<i>Rana livida</i>
4.	Pongpey tulug / Paha	<i>Euphlyctis cyanophlyctis</i>
5.	Luknyi tulug	<i>Philautus jerdonii</i>
6.	Kung tulug/ Rukh Paha	<i>Polypedatus leucomystax</i>

Source : Forest Department, Govt of Sikkim.

List of some common reptiles of PWS

Sl. No.	COMMON NAME	SPECIES RECORDED
1.	Pa'-nit bu (Lep.) Anda saamp (Nep.)	<i>Typhlops oligolepis</i>
2.	Chu-sung (Lep.) Tiktikey or Baley mungro)	<i>Calotes versicolor</i>
3.	Lho chu-sung	<i>Japalura tricarinata</i>
4.	Publyok bu/ Gurbey saamp	<i>Hemibungaris maclellandi</i>
5.	Pu-fong bu / Hariayo saamp	<i>Trimeresurus gramineus</i>
6.	Rato sanp	<i>Plyas mucosus</i>
7.	Pu-pyong bu / Sano -sirisey sanp	<i>Dendrelapis pictus</i>
8.	Tug-gloth (Lep.) Matsutlo	<i>Sphenomorphus indicus</i>
9.	Tug-gloth (Lep.)	<i>Leiolopsis sikkimensis</i>
10.	Pahyok bu (Lep.) Kalo goman (Nep.)	<i>Bungarus caeruleus</i>

Source : Forest Department, Govt of Sikkim.

List of rare and endangered animals of PWS.

Sl. No.	COMMON NAME	SPECIES RECORDED	WPA, 1972
1.	Chinese Pangolin (Salik)	<i>Manis pentadactyla</i>	Schedule I
2.	Takin	<i>Budorcas taxicolor</i>	Schedule I
3.	Serow	<i>Capricornis sumatraensis</i>	Schedule I
4.	Musk deer (Kasturi)	<i>Moschus moscgiferus</i>	Schedule I
5.	Red panda	<i>Ailurus fulgen</i>	Schedule I
6.	Tibetan fox	<i>Vulpes montanus</i>	Schedule I
7.	Clouded Leopard	<i>Neofelis nebulosa</i>	Schedule I
8.	Leopard cat	<i>Felis bengalensis</i>	Schedule I
9.	Marbled cat	<i>Felis marmorata</i>	Schedule I
10.	Indian Bison	<i>Bos gaurus</i>	Schedule I
11.	Tiger	<i>Panthera tigris</i>	Schedule I
12.	Sikkim Stag	<i>Cervus elaphus</i>	Schedule I
13.	Himalayan black bear	<i>Selenarctos thibetanus</i>	Schedule II, Part I

Source : Forest Department, Govt of Sikkim.

List of other common wild animals of the PWS

Sl. No	COMMON NAME	SPECIES RECORDED (PWS)
1.	Common Leopard	<i>Panthera pardus</i>
2.	Leopard Cat	<i>Felis bangalensis</i>
3.	Himalayan Palm Civet	<i>Paguma larvata</i>
4.	Large Indian Civet	<i>Viverra zebetha</i>
5.	Indian parcupine	<i>Hystrix indica</i>
6.	Himalayan Yellow Throated Marten	<i>Ochotona roylee</i>
7.	Gaur (Reported)	<i>Bos gaurus</i>
8.	Bharal (Blue Sheep)	<i>Pseudois nayaur</i>
9.	Goral	<i>Nomorhaedus goral</i>
10.	Barking Deer	<i>Mentiacus muntijak</i>
11.	Wild Boar	<i>Sus scrofa</i>
12.	Himalayan Langur	<i>Presbytes entellus</i>
13.	Assamese Macque	<i>Macaca assamensis</i>
14.	Wolf	<i>Canis lupus chanku</i>
15.	Himalayan Yellow Throated Marten	<i>Mortas flavigula</i>
16.	Jackal	<i>Canis aureus</i>

Source : Forest Department, Govt of Sikkim.

List of common bird's prey of PWS.

Sl.No.	COMMON NAME	SPECIES RECORDED
1.	Black Eagle	<i>Ictinaetus malagensis.</i>
2.	Forest Eagle Owl.	<i>Bubo nepalensis.</i>
3.	Goshawk	<i>Accipiter gentiles.</i>
4.	Grey Headed Fishing Eagle.	<i>Ichthyophaga nana.</i>
5.	Long Legged Buzzard.	<i>Buteo rufinus</i>
6.	Feathertoed Eagle	<i>Spizaetus nipalensis</i>
7.	Crested Serpent Eagle	<i>Spilornis cheela.</i>
8.	Boy Owl.	<i>Phodilus badius</i>
9.	Clouded Scops Owl	<i>Otus bakkamoena</i>

Source : Forest Department, Govt of Sikkim.

List of common birds recorded from PWS.

Sl.No.	COMMON NAME	SPECIES RECORDED
1.	Satyr Tragopan (Monal)	<i>Tragopan satyra</i>
2.	Common Hill Partridge.	<i>Arborophila torquena.</i>
3.	Satyr Tragopan (Monal)	<i>Tragopan satyra</i>
4.	Himalayan Monal (Dafe)	<i>Lophophorus impejanus</i>
5.	Blood Pheasant (Chilmey)	<i>Ithaginus cruentus</i>
6.	Kaleej	<i>Lophura leucomelana</i>
7.	Green Magpie	<i>Cissa chinensis</i>
8.	Blue Magpie	<i>Cissa flavirostris</i>
9.	Prece Pie	<i>Dendrocitta frontalis</i>
10.	Red Crowned Jay	<i>Garrulus glandarius</i>
11.	Red Bulbul	<i>Pyconotus jocosus</i>
12.	Scarlet Minivet	<i>Pericrocotus flammens</i>
13.	Redbreasted Flycatcher	<i>Muscicapa parva</i>
14.	Little Pied Flycatcher	<i>Muscicapa westermanni</i>
15.	Grey Headed Flycatcher	<i>Culicicapa laybensis</i>
16.	Tailor Bird	<i>Orthotomus sutorius</i>
17.	Firetailed Yellowbacked Sunbird	<i>Aethopyga igricanda</i>
18.	Smallbilled Mt. Thrush	<i>Zoothera couma</i>
19.	Grandala	<i>Grandala coelicolor</i>
20.	Whitecaped Redstart	<i>Chaimarronis leupophalus</i>
21.	Scarlet Finch	<i>Haematospiza sipani</i>
22.	Tibetan siskin	<i>Carduelis tibetana</i>
23.	Sultan Tit	<i>Maenochlora sultanea</i>
24.	Coal Tie	<i>Parus ater</i>
25.	Large Wagtail	<i>Motacilla maderaspatensis</i>

26.	Forest Wagtail	<i>Motacilla indica</i>
27.	Dungo Cuckoo	<i>Surniculus ungubris</i>
28.	Grey Dringo	<i>Dicrurus leucophaeus</i>
29.	Mag Pie Robin	<i>Coppychus saularis</i>
30.	Brown Wren Babler	<i>Præpyga pusilla</i>

Source : Forest Department, GOS.

List of goths (near Rachela R.F. & surroundings) prior to the declaration of the sanctuary

1. Jaiman Rai, at Rachila numeration of Goths Chhingu Bhutia: Goth-Balautey Pokhri: Cattle - 10 nos.
2. Mr. Tamang (could not meet): Tangta, West Bengal, Goths along Sikkim-Bhutan border: Cattle about 15 nos.
3. Saila Majan Tamang, Tangta, West Bengal: Goth along Sikkim-Bhutan border: Cattle about 15 nos.
4. Pem Ongey Bhutia, Tangta, West Bengal: Goth along Sikkim-Bhutan border: Cattle about 15 nos.
5. Chhimi Bhutia, Tangta, West Bengal: Goth along Sikkim-Bhutan border: Cattle about 12 nos.
6. Khikya Bhutia, Tangta, West Bengal: Goth along Sikkim-Bhutan border: Cattle about 13 nos.
7. Nupu Tshering Bhutia, Tangta, West Bengal: Goth along Sikkim-Bhutan border: Cattle about 15 nos.
8. Duk Tshering Bhutia, Tangta, West Bengal: Goth along Sikkim-Bhutan border: Cattle about 15 nos.

Source : Forest & Wild conservation Department, Govt of Sikkim.

Title of the Thesis: STUDIES OF THE ANGIOSPERMIC FLORA OF ALPINE EAST SIKKIM WITH SPECIAL REFERENCE TO PANGOLAKHA WILD LIFE SANCTUARY

Candidate: Sonam Rinchen Lepcha

CORRINGENDUM

This is in reference to the letter No Ph.D./Bot./1325/R-11, dated 06/09/2011 the following necessary addendum and corrigendum is being attached to the thesis.

Typographic Mistakes:

There are few typological mistakes as suggested by the examiner for some *Generic* names and *Species* epithets. These are, accordingly, corrected and mentioned below:

1. The sp. *Tetrastigma objectum* is corrected as *Tetrastigma obtectum*
2. The sp. *Acer coppadocium* is corrected as *Acer cappadocicum*
3. The sp. *Acer sterculaiaceum* is corrected as *Acer sterculiaceum*
4. The genus *Zeuzine* is corrected as *Zeuxine*

Mistakes in referring Tables & Figures:

Page No.445: Within the text part Figure Nos. 6.1 & 6.2 and Table No. 6.5 are to be read as **Fig. 7.1, Fig. 7.2 and Table 7.5.**

Page No.448: Last line in the text part, Table 6.8 is to be read as **Table 7.8.**

Page No.458: There is no such mistake in this page. But, similar mistake detected in Page No.454. In the last paragraph, Table 6.9 is to be read as **Table 7.9** and Figs. 6.5 & 6.6 are to be read as **Figs. 7.5 & 7.6.**

Enumeration of the Pteridophytes and Gymnosperms

Although the present thesis is designed mainly on Angiospermic flora but during the survey a good number of Pteridophytes and Gymnosperms were also collected. It was then realised that *Pteridophytes and Gymnosperms constitute an important part of the Pangolakha Wildlife Sanctuary's* flora. I provided this additional data in the thesis considering that such information will be of much help for the readers to understand and to evaluate the resources in the Pangolakha vegetation. I, therefore, request the authority to accept the presented data on 'Pteridophytes and Gymnosperms' as 'Additional Information' as has kindly suggested by the Honb'le examiner.

Referring Photo plates:

I have provided proper legends for all the photographs presented through 'XVI' Photo Plates. Different Photo plates were placed in or just after the relevant sections in the thesis. However, the examiner desired that all those photos are to be referred in the text. I am now referring relevant page numbers along with sections / paragraphs to which a particular photograph is referred. This has been presented in ANNEXURE – I.

Photoplate description

Plate I

1. Himalaya Conservation Hotspot area (cited in Page-6)

Plate II

1. Location map of PWS (Page-10; Section 2.3)

Plate III

1. Drainage & elevation map of PWS (Page-14; Section 2.5)

Plate IV

1. Vegetation & Landuse map of PWS (Page-20; Section 2.10)

Plate V

1. Dense canopy of forest of Pangolakha range (page-4; Section 1.2)
2. The undisturbed forest of PWS (Page-4; Section 1.2)
3. Alpine meadows near Bhimbase (Page-4; Section 1.2)
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6. An en-route to Rachela trijunction (Page-12; Section 2.3)
7. View of a pristine Rachela lake, a permanent source of water for numerous wild animals. (Page-15; V 2.7)
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4. A spreading patch of *Juncus* (Page-372)
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Photoplate description

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1. The boiled bamboo shoots ready for sale (Page-489; Section 7.5.7)
2. The basket full of *Ficus auriculata*'s fruits collected for pig fodder (Page-484; Section 7.5.3)
3. The local folks carrying firewood way back to home. (Page-494; Section 7.6.3)
4. The bamboo vessel being traditionally used for serving brewed millet (Chee/C hang). (Page-489; 7.5.7)
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