Study on the Bryofloral Diversity, Their Current Status and Conservation Issues in Central and South-eastern Region of Sindhupalchok District, Central Nepal

Final Report

Submitted to Rufford Small Grant Foundation, U.K.

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Kathmandu

Nepal

February, 2015

Summary

First and Second Rufford Small Grant Programs (Ref. Id: 10.09.07 and ID: 10111-2) were implemented at the northern parts of Sindhupalchok district of central Nepal within the elevation range of 1400 – 4000 m which were highly successful to bring a long list of diverse species of bryophytes of the midland and highland areas. These two studies covered the elevation of 1400 to 4000 m where different habitat types were noted and 16 new records of this plant were also made that updated the country's overall list. Tourism prospect in northern parts of this district was also assessed in these studies.

The current study under the Booster Grant (ID:12663-B) was to give continuity to the previous works so was emphasized mostly to unexplored vast areas of the south, east and central parts of this district. This study came up with many interesting findings which revealed out a list of 160 species of bryophytes categorized into 13 orders, 42 families and 75 genera. All the three classes of Bryophytes were represented in this study with new records of 22 species. Rich diversity of the newly recorded species has been noticed at 800 -1400 m of elevations. Of them 14 species belonged to the class Hepaticae and rest 8 species to Musci. Of the recorded species, the class Anthocerotae represented 4 species, Hepaticae 61 and Musci 95 species. Varying habitat types of tropical and subtropical bioclimatic zones at 780 to 1600 m were explored in this study.

Pteridophytes and Floral vegetations observed in and around the habitats of bryophyte were well documented which included 25 species of ferns, 40 species herbs, 43 species shrubs, 9 species climbers and 58 species of trees including 2 species of Gymnosperms. Investigation of the faunal species which are associated to the bryophyte habitats was also an important aspect in this work. This revealed out that the diversity in different seasons varied as per climatic conditions. Study made in May to August indcated a list of 33 species of faunal components. In the study made in September to November end brought a list of 28 species of birds and 49 species of macro fauna and invertebrates and majority of them were the insects. Similarly, the month of December brought a list of 53 species of faunal components associated to bryophyte habitats.

Many local peoples at different village communities were made aware under Door to Door Awareness Program. Community gathering awareness program were implemented in three village communities which was highly successful to create local people's interest in conserving this plant by adopting sustainable way of harvesting of forest resources.

General View of the Work

Various types of habitats were observed in this district at the altitudinal range of 750 - 1500 m. Tropical and subtropical mixed forests were mostly prevalent in studied areas. Below 1000 m of elevation, this plant was uniformly distributed but was found more diverse within the altitudinal range of 1000 to 1400 m. *Shorea robusta* forest was predominant at the lower part of this region. *Alnus nepalensis* and *Castanopsis indica* were noted *dominant* above 1000 m of elevation.

High diversity richness of bryophyte species was noticed at the elevation range of 1400 to 1600 m while low diversity was recorded at 750 to 850 m.

Maintenance of good forests and presence of moist forest habitats favoring diverse species of bryophytes and faunal components was observed at 1200- 1400 m. This forest provided canopy to many shade loving species of bryophytes. Small streams, moist and shaded conditions with favorable physical gradients all jointly represented a good growth of bryophytes in this altitudinal range.

Of the visited three seasons like summer, autumn and winter, the diversity of bryophytes was recorded high in autumn season. This covered various altitudes and different forests and habitat types. Total records made during the entire work are 159 species. Of them, 14 species have been confirmed new to the country's list of this plant.

Considering First RSG (Ref. 10.09.07) conducted at the temperate and alpine northern and eastern parts of this district (850- 4300 m of elevation), the total diversity record of this plant was 77 species of genera and 33 families. The Second RSG (Application ID: 10111-2) which was conducted at the northwest parts of this district was successful to document141 species under 75 genera and 41 families of bryofloral species.

Publication on the findings of the First and Second RSGs has already been done in a peer reviewed and pioneer journal called the Journal of Natural History Museum of Tribhuvan University of Nepal. This has become a good source of reference to all the botany students and researchers who are engaged in bryophyte research.

Study and documentation of the faunal diversity associated to bryophyte habitats was also an important aspect of this study. Faunal components found in and around the bryophyte habitats were extensively studied by an expert Zoologist who was involved as a team member in this work. In the entire study from May (2014) to January (2015), a total of 88 species of

invertebrates, 29 species of birds, 2 species of mammals, 2 species of herpetofauna and Amphibia 1 species were documented which were associated to bryophyte habitats at different elevation level. Many invertebrate species were found sheltered in the thallus of different species of bryophytes. This is a new topic of study in country's context.

Mostly walking and stopping methods for this study at different villages and communities was adopted. Hired vehicle was also used in some areas which were far off from the main station where we initiated our study. Two botany students besides bryologist who is the coordinator, one zoologist, one local guide and two porters were employed during entire period of this work.

Unidentified specimens of this plant were studied in the laboratory of the Natural History Museum in Kathmandu. Tallying such specimens with the reference specimens in this museum was also done for identification upto the species level. The collected specimens of this work have also been deposited in this museum's reference and display sections with well labeled data and entry numbers. Specimens collected in First and Second RSGs have already been deposited in this museum.

Awareness Program

This is one of the significant aspects of this work and was run successfully in three potential communities of this district. The community people's responses were very positive; they also learned many things on conservation issues of this plant including its uses in their society. At the end of the program, participating peoples were taken to nearby forests so to make them familiar with species of bryophytes concerned. This has been expected to bring effectiveness in conservation programme. Questionnaire survey was also done in order to get their ideas in conservation which was very positive and they demanded to run this type of program next time as well. Participation to this program was significant with total of 30-40 individuals of the community in each program organized places. Community leaders and school teachers of these communities were also consulted and convinced them to run sustainable harvesting practices of forest resources and to conserve potential habitats of rare and endangered bryophyte flora.

The participating peoples were trained in classes and field as well on how to run sustainable harvestings and protect habitats of bryophyte species found in their areas. This program was run in Tatopani Village Development Committee near Tibetan border where mostly women participants of "Shrijansheel Ama Samuha" (Mother's Group) were invited for participation. Community leaders were also consulted to bring their participations in bryophyte conservation in their areas. Similarly, the next two programs launched at the end of January, 2015 at

Chimling and Sahel Village Development Committees where interesting with good participations of the local peoples. This was highly effective program in both the areas. Besides community leaders, school teachers were also consulted for bryophyte conservation in their areas.

Door to door and people to people awareness was also carried out in various places during this study period. Different households were visited and familiarized them on significant values of this plant in their areas. They also made significant inputs on traditional uses of this plant in their society.

Awareness program was also conducted First and RSGs. These Grants were implemented middle to higher elevations where living styles of peoples in these areas were different than the peoples of the present study. Their commitment on conserving bryophytes was indeed very impressive. They were also made familiar with Rufford Small Grants Foundation and how this prestigious organization is helping to study and conservation of biodiversity in Nepal.

Analyzing the filled out questionnaires in this program indicated that 20 % of the community peoples emphasized mostly on uses of this plant in their society, 15 % emphasized on conservation issues, 35% of emphasized on medicinal value and 20 % showed least under standing with this plant.

Exhibition

An exhibition of the bryophytes resulted in this study (May to September) was conducted in October at the newly constructed National Science Museum at Tribhuvan University Complex, Kathmandu. Collected specimens of bryophytes, informative charts, posters and flex prints reflecting bryophytes of Sindhupalchok, habitat conditions and conservation issues all were on display. Honorable Prime minister of Nepal inaugurated this exhibition where high ranking dignitaries, university professors and researchers were present. They put many significant questions regarding conservation issues of this plant in Sindhupalchok district.

Presentation

Coordinator of this work Nirmala Pradhan was invited as a Resource Person to deliver her presentation on the Significant Bryophytes of Sindhupalchok District and Conservation Issues. This program was organized by a Conservation Organization on the 8th of February in Kathmandu. Students, teachers and researchers were the main participants to this program.

They were very curious to know more about the bryophytes and put many questions on conservation issues and current status of this plant in Sindhupalchok.

Permanent Display

Informative flex prints on bryophytes of Sindhupalchok District acknowledging prestigious Rufford Small Grant Foundation have been provided to the only Natural History Museum of Nepal based in Kathmandu. These are now on display in the permanent exhibition gallery of this museum. Many students and visiting researcher are getting benefits from this information. Some specimens collected at different areas of the Sindhupalchok are also on display in this museum gallery.

Conservation Issues

Conservation of bryophytes including other floral and faunal species is a big challenge in this district. Besides urbanization and road networking, this district is extremely sensitive to landslides due to its complex geography with many mountain folds and high rate of deforestations. So landslides and erosions are the frequently occurring phenomena in this part of the country. This has been felt an urgent issue to document all the existing bryophyte species in this district before they are being lost due to increasing human encroachment.

In last September, 2014, a heart shocking incident of landslide occurred in this district which took the life of about 50 peoples, many villages were buried when a huge mountain area slided down suddenly at Mankha Village Development Area. This shocking incident occurred after our work on the documentation of bryofloral species conducted in May to August was completed. Now these habitats are completely been destroyed with no signs of greenery.

Many rare and endangered species of bryophytes have been recorded during our study on this Booster Grant Program held from May, 2014 to the end of January, 2015. Many significant additions of species to country's list have also been made during this study pe**riod.**

Outcome of First and Second RSGs at Northeast and Northwest Sindhupalchok

No study on bryophyte was carried out in this district till the First Rufford Grant (Our Ref.10.09.07) was implemented at 1400 m to 4300 m of the northern zone in 2008-2009 . This study explored out 77 species of bryophytes, of them 4 species resulted new records to the country and 25 species under the threat category. Of the recorded 15 genera of Lichens, *Peltigera leucophlebia* (Nyl.) Gyeln was a new record. This also brought a list of 21 species of ferns and 244 species of flowering plants. Other species of this study included 123 herbs, 32

species of shrubs and 29 tree species. Faunal components included 86 species of butterflies, 20 species of insects, 4 species of amphibians, 10 species of reptiles and 26 species of mammals. This included Musk Deer (*Moschus moschiferous*) and Red Panda (*Ailurus fulgens*) which are protected by CITES Appendix I. Prospects for tourism in this region was also explored besides implementing community based awareness program for conservation.

The Second RSG (Application ID: 10111-02) was implemented in 2011-2012 at 1400 – 2900 m of elevation at the north-west side and brought a record of 141 species of bryophytes which included 11 new records and 56 threatened species. This also explored 29 species of Pteridophytes, 5 species of Gymnospermae and 117 species of Angiospermae. Faunal species included 42 species of invertebrates, 11 species of birds and 2 species of Mammals.

The results of the current study with findings of the First and Second RSGs have been expected to provide a complete diversity data and status information of this lower plant occurring at 800 to 4300 m of the district. This may help to develop suitable conservation scheme based on local environment condition.

General Information on Bryophytes

Bryophytes traditionally were considered as a natural plant group, being small in stature, they share a number of similarities such as ‘alternation of generation’ which in the past were considered collectively to be evidence of evolution as a single lineage.

Bryophytes show diverse distribution patterns than the vascular plants, perhaps of their greater dispersal capacity through minute spores. The high humidity and predominating rain are the important factors to create suitable environment for the luxuriant growth of bryophytes. The decrease in precipitation is directly associated to the decrease in the growth and distribution. Some bryophytes can tolerate high temperature, extreme desiccation and some can survive prolonged freezing under wet or dry conditions.

Bryophytes are found growing plentiful on tree trunks, stones, walls, caves, canals and exposed areas. The epiphytic mosses are more abundant in the lower portion of trees but gradually decrease towards the top. The moss population is higher in the eastern belt than the central and

western zones of Nepal. This is due to the fact that the monsoon rain in June and August gradually retards from the eastern to the western regions. The physiography plays vital role in the richness of moss species in a particular place. The dominance of broad leaved forest of *Schima-Castanopsis* in upper limit of subtropical zone and *Quercus-Rhododendron* in temperate zone provide luxuriant growth of bryoflora.

Total species of bryophytes recorded in Nepal so far is 1205 species that include mosses, liverworts and hornworts.

Acknowledgements

Without generous support of this prestigious Rufford Grant this work was not possible to launch extensively in different areas of the Sindhupalchok District of central Nepal. Many parts of this district still remain to explore and has been targeted to complete by the end of this study program. So, I am highly grateful to the Rufford Small Grant Foundation for this generous support in the form of Booster Grant. Mr. Jane Raymond of the Rufford Small Grant Foundation who provided us timely information regarding this project is highly appreciated. I am equally thankful to my honourable Referees Prof. Dr. Krishna Kumar Shrestha of the Central Department of Botany, Tribhuvan University (Nepal), Dr. Bhuvan Keshar Sharma, Senior Resource Specialist at the Forest Resource Assessment Project, Kathmandu, Prof. Dr. David G. Long, reputed Bryologist of UK and Prof. Dr. Bhaiya Khanal of the Natural History Museum, Nepal for their kind support, recommendation and suggestions to this work. Our driver, Mr. Surendra Parajuli who made his excellent driving during this field trip is acknowledged well. Ms. Goma Timilsina of Ramche VDC who coordinated to the village community to run our Awarenss program is highly acknowledged.

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Acronyms and Abbreviations

BPP	Biodiversity Profile Project
C	Common
CITES	Convention on International Trades of Endangered Species of Flora and Fauna
DNPWC	Department of National Park and Wildlife Conservation
DoF	Department of Forest
E	East
FC	Fairly Common
GPS	Geographical Position System
GoN (HMGN)	Government of Nepal
IEE	Initial Environment Examination
IUCN	International Union of Conservation of Nation
MC	Most Common
MFSC	Ministry of Forest and Soil Conservation
N	North
NBS	Nepal Biodiversity Strategy
NHM	Natural History Museum
NRDB	Nepal Red Data Book
R	Rare
RRRSDP	Rural Reconstruction and Rehabilitation Sector Development Programme
RSG	Rufford Small Grants
SPTDMC	Sindhupalchok Panch Pokhari Tourism Development and Management Committee
UK	United Kingdom
VDC	Village District Committee

S. No.	Serial Number
%	percent
*	New records
cf.	close to
Eds.	Editors
et al.	and all
m	meter
spp.	Species (plural)
Sq. Km.	Square Kilometer
Sq. mi	Square mile
viz.	namely

1. Introduction

1.1. Background Information

Nepal occupies an area of 147,181 km² and is located to the southern slope of central Himalayas. This country stands at the latitudes of 26º 22' to 30º 27' N and longitudes of 80 º 40' to 88 º 12' E. The average east-west length of the country is 885 km and the south-north width varies from 145 km to 241 km. Hills and high mountains cover about 86% of the total land mass and the remaining 14% are the flatlands of Tarai, which are less than 100 m in elevation. Altitude varies from 62 m above in east Tarai (lowland) to the Mount Everest at 8,848 m, the highest point in the world. Nepal's location in the central portion of the Himalayas places it in the transitional zone between the eastern and western Himalayas. It includes the Palaearctic and the Indo-Australian biogeographical regions and the major floristic provinces of Asia (the Sino-Japanese, Indian, western and central Asiatic, Southeast Asiatic, and African Indian desert) creating a unique and rich terrestrial biodiversity (Nepal Biodiversity Strategy, 2002).

1.2. Sindhupalchok District

Sindhupalchok is a geographically complex district which is located at 27° 36' N to 28° 13' N and 85° 27' E to 85º 85'E, and covers an area of 2542 km^2 equaling 1.73 % of land mass of the entire nation. The elevation in this district varies from 750 m at the southern extremity to the highest of 7083 m, the snow capped peak of Langpo Gang. This district borders Rasuwa district to the west and Kavrepalanchok district to the south which is indirectly connected to the Kathmandu district through Sankhu of Bhaktapur district (Department of Information 1971). Located at the north-east side of Kathmandu it is on borderline to China to its eastern part.

Chautara is the District Headquarter of Sindhupalchok District. The municipality stands at the elevation of approximately 1,600m above sea level. People practicing different religions like Hinduisim, Buddhism, and Christianity reside here.

1.2.1. Physiography

The mid-hill generally has complicated physiography with stepwise rise in altitudes from south to the north directions. This has led to the formation of deep river valleys below the elevation of 1000 m. The distribution of vegetation is remarkably displayed across south to the northern regions.

1.2.2. Ethnic Tribes

This district has mixed ethnic culture though Tamang tribes are in majority in south-central to the mid hills of this district. The other groups in this district are the Brahmins, Chhetris, Newars, Danuwars, Magars and Gurungs who came down to this district in the late eighteen to early nineteenth centuries (Graner, 1997; Pokharel, 2010). The Yolmos of the highland migrated from Tibet over more than 250 years ago.

The major ethnic tribe of this district is Tamang with an average population of 38.54 %. They are said to be the first settlers in this district. Brahmins and Chhetris live mostly in the western part of Sindhupalchok; yet they predominantly inhabit the lower bank of Indrawati and Melamchi Rivers. In the northern regions, they only account for less than 10% of the population (Graner, 1997). Sherpas are the next tribe who are scattered mostly in the highland areas of this district.

1.2.3. Agriculture

Majority of peoples of this district rely on agriculture. Being a hilly district, the northern part is non fertile with lesser yield. The central and southern parts at lower elevation represent good fertile land for farming of rice, maize, wheat, mustard and other vegetable crops including horticultural products. The local peoples are mostly attracted to cultivate cash crops and vegetables like Cardamom, Potatao, Cauli flower, Ginger etc.

Of the total area of this district only 1300 hectares are favourable for agriculture while remaining 2, 39, 000, ha are non usable and waste land.

Potato is the main cash crop in higher parts and has gained wide market up to Kathmandu city. Other common vegetables include soybeans, beans and tomatoes which are grown mainly in rainy season. Cereal crops like wheat and maize grow up to the elevation of 1600 m. They also harvest wild edible mushrooms for their food but use their own system to differentiate a poisonous mushroom from a non poisonous one. Among fruits, apple and berries grow well in higher parts especially above the Bhotang and Helambu areas. These apples get wide market in Kathmandu and adjoining cities.

Dairy production is another source of income for local farmers. Over 80 percent of total population is dependent on agricultural activities for their livelihood. Chauri (cow) farming is common in higher part of this district. The crosses of yak (*Bos grunniens*) and local hill cow (*Bos indicus*) and vice versa are called Chauri (Joshi 1982). Chauri farming is a main source of households' income in the upper slope areas of Sindhupalchok. The Chauris are reared under

migratory systems, grazing around the Bhairabkund lake areas during summer and feeding oak forest leaves during winter (Pande 2004).

The availability of pastures and fodder is becoming scarce. The Chauris are transferred to the alpine pastures (3000-4500 m) for two months of July and August and rest of the year they are placed at the lower altitude (2500-3000 m). The oak forest has been seriously lopped out and threatened to its existence. Due to the shortage of pastures, the productivity of the Chauris has been decreased significantly and the Chauri farming business is no more beneficial in present context (Pande 2004).

1.2.4. Economy

The economy of this district is based on employment of the local peoples in various sectors. Many peoples are engaged in business activities especially in Kathmandu and other potential towns of the country. Seasonal migration to Kathmandu and different parts of India to earn money is also a common phenomenon which has contributed significantly to develop their socio economy status. Many peoples of this district are also employed in Gulf countries, Malaysia and other Asian countries. The remittance that comes from their earnings is also contributing to the nation's economy. Chinese goods, clothes etc are the popular selling items in towns like Barahbise and Khadichur where peoples from other parts of the country visit here for buying such items.

Some local people are engaged in cottage industries like weaving bamboo products and making furniture. This district has many items to export to other cities of Nepal. This includes, milk, vegetables, fruits and bamboo products etc.

1.3. Climate

The rainy season starts here from June till September. South-west monsoon wind that emerges from the Bay of Bengal is the carrier of major rain during June to August. The winter rain is due to the Mediterranean wind that brings rain from the west.The meteorological record shows the total average annual rainfall is 1,615 mm. The average minimum temperature of this district is 5°C and average maximum temperature is 25°C (District Profile of Sindhupalchowk 2014). This district has complex physiographic feature like the warm and dry tropical belt to the alpine region where harsh and cold weather prevails.

1.3.1. Bio-climatic Zones

There are 38 major ecosystems in the Mountains and relatively show less diversity of flora and fauna than the Mid-hills and lowlands because of harsh environmental conditions, they are nevertheless characterized by a large number of endemic species (Nepal Biodiversity Strategy 2002).

Dobremez (1996) has described an altitudinal distribution of flora of central Nepal. He has mentioned the representation of the eleven ecological zones from the lower tropical level (below 500 m) to the highest level (above 5,000 m).

The BPP (1995a) has shown the distribution of flowering plants which indicates its high diversity in the mid-hills. This has been stated the records of 283 species of bryophytes and 97 species of pteridophytes from the Central Nepal (BPP 1995a).

The bioclimate of this district varies as per geographical features. Major areas of the central, southern and eastern parts of this district are under direct influence of the tropical and subtropical climatic types. The tropical zone which goes upto 1000 m of elevation is very hot in summer showing maximum temperature range of 33° C which drops to the lowest of 5° C in winter. The subtropical zone starts at 1000 m upto 2000 m is warm and humid with good forest condition. The average maximum temperature in this part usually ranges from 30°-32° C and lowest below 5° C in winter. Temperate climatic zone starts at 2000 m upto 3000 m. This part features mild climate than the subtropical zone. The temperature in this zone ranges between 28° to 30° C and lowest to 1° C. Rest of bio-climatic zones above 3000 m to the alpine zone features cold climatic types and the coldness increases as per altitudinal rise which causes decline in the floral and faunal diversity. Diverse moss species can be found in the upper temperate (3000-4000 m) zone where wet moss forests can be observed.

1.3.2. Outline of Bioclimatic Zone

Bio-climate Zone	Elevation Range	% of Area
Upper Tropical	300 to 1,000 meters 1,000 to 3,300 ft.	6.0%
Subtropical	1,000 to 2,000 meters 3,300 to 6,600 ft.	37.2%
Temperate	2,000 to 3,000 meters 6,400 to 9,800 ft.	24.5%

Subalpine	3,000 to 4,000 meters 9,800 to 13,100 ft.	15.1%
Alpine	4,000 to 5,000 meters 13,100 to 16,400 ft.	7.8%
Nival	above 5,000 meters	9.1%

1.4. Tourism Prospects in Sindhupalchowk District

The northern part of this district which includes Helambu and Melamchi Ghyang are well known destinations both for internal and external tourism. However, the central and eastern Sindhupalchok has not yet been fully developed as one of the pioneer tourism destination of Nepal. Now the start of the Bungee Jumping at Bhote Koshi area and white water rafting at Sunkoshi River have attracted external and mostly domestic tourists where they also can find good physical facilities and resorts for accommodations. This is a most popular route for the Chinese tourists who enter here from the eastern border at Kodari. Tatopani (hot water) which is a well known geyser has been believed to carry high religious valley if someone takes shower in this water. Thousands of religious peoples visit this place for showering every year. Business tourism is also well flourished in this part. Many native peoples from different parts of the country visit Chinese border to buy different goods and items for their daily uses.

Due to scenic beauty, incredible landscape, diverse cultural and natural diversity, Panch Pokhari can be expected to attract many tourists of different interests. For tourism promotion, this destination still needs sound management of physical facilities like good camping areas, restaurants and trained guides. Other interesting spots like Bhairab Kund, a popular high altitude lake is also located in this region at 4270 m. The next beautiful lake called Suraj Kund lies at the junction of Sindhupalchok, Nuwakot and Rasuwa districts. Some well known waterfalls of this district are Bhairav Kunda Fall of 198 m, Lidhi falls of 107 m, Gumchhyal a west Balefi falls of 117 m etc (Department of Information 1971)

Sindhupalchok Panch Pokhari Tourism Development and Management Committee (SPTDMC) a nonprofit Organization is supporting local peoples who are engaged to promote tourism in this place. This organization is located in Chautara, the head quarter of the district.

This organization assists in different sectors such as health, education, eco-tourism, social mobilization and social empowerment. Next to natural tourism this district also has many

cultural and historical sites which can attract many tourists annually if managed and publicized well. Because of all these atractive touristic spots, it can proudly be said that tourism has high potential in this district. Some parts of the districts that fall within Helambu region are very popular for tourism activities as Langtang - Helambu area is ranked third among facilitated tourist's destination in Nepal. Some of the well known and highly possible tourism sites within the district are Helambu area, Tatopani, Ama Yangri, Bhote Koshi, Panch Pokhari, Duganagadi, etc.

1.5. Biodiversity

Biodiversity in Nepal varies with physiographic zone. Mid-hills, characterized with subtropical to temperate climate, represents high species diversity of the floral and faunal components. The species diversity decreases with altitudinal rise, but it is important to note that the large numbers of endemic species occur in the high mountain zone, where the topography and cold climate have facilitated floral and faunal endemism (HMGN/MFSC. 2002).

The Mid-hills have the highest diversity of ecosystems mainly due to the great variety of terrain types and altitudinal changes from the subtropical to the temperate climatic zones, this comprise a rich flora and fauna. Nearly 32% of Nepal's forests occur in the Mid-hills.

The Mountains are the meeting place of the Palaearctic region to the north and the Indo-Malayan

Region to the south. There are 38 major ecosystems in the Mountains but are less diverse in floral and faunal species as compared to the Mid-hills and lowlands because of harsh environmental conditions and unfavorable bio-physical gradients that controls diversity and distribution.

Besides predomination of *Shorea robusta,* this zone also representations *Adina cordifolia, Aegle marmelos, Albizia* spp., *Anthocephalus chinensis, Anogeissus latifolia, Butea frondosa, Dillenia pentagyna, Dillenia indica*, etc.

Among the prominent fauna of this part are the Common Leopard *(Panthera pardus),* Barking Deer *(Muntiacus muntijak),* Wild Cat (*Felis chaus),* Jackle (*Canis aurieus),* Procupine *(Hystrix indica*), Rhesus Monkey (*Macaca mulatta*), *etc.* Common birds found here are Dove (*Streptopella senegalensis),* Common Kingfisher (*Alcedo atthis*), Black kite (*Milvus migrans),* etc.

1.6. Transitory Route for Illegal Trade of Wildlife And Parts

Kathmandu to Kodari is a transitory route for the illegal trade of wildlife and their organs which they smuggle out to the Tibet. Most of the caught items are the skins and bones of the Common Leopard (*Panthera pardus*), scales of Pangolins (*Manis crassicaudata* and *Manis pantadactyla*) and other mammalian skins and their parts. Sometimes a huge number of the dead and dried Sea Horses (*Hippocampus* sp.) brought from India is smuggled through this route. Likewise, Red Sandle Wood which has a high demand in Tibet is also carried illegally through this district. Most of these items are caught enroute at different check posts before they reach to their destination. Nepal so far has included 28 species of mammals in CITES I, 83 in CITES II and 1 under CITES III Appendices. Likewise 9 species flora are in CITES II and 5 under CITES III. Three species of butterflies also are included in CITES II. There are many other reptile and Amphibians which are placed under different appendices of CITES (DNPWC 2003).

1.7. Conservation Area

Gaurishankar Conservation Area is a protected area network which was established in January of 2010. This covers an area of 2,179 km^2 (841 sq.m) of the Ramechhap, Dolakha and Sindhupalchok districts. Some eastern parts of the Sindhupalchok like Ghorthali, Maming, Listikot, Tatopani, Fulkimpatti and Gumba are now included into this area.

This Conservation Area is rich for bio-diversity components. A total of 16 varieties of vegetation have been identified in the area, including forests of *Pinus roxburghii*, *Schima-Castanopsis*, *Alnus*, *Pinus wallichiana*, *Pinus patula*, *Rhododendron*, *Quercus lanata*, and temperate mountain oak forest.

1.8. Landslide in Sindhupalchowk

Massive landslide occurred here suddenly in August 2, 2014 in Mangkha Village Development Area near Barhabise town of this district. This landslide blocked the Sunkoshi River forming it a large lake. This disaster area lies 1.5 km below the meeting point of Sunkoshi and Bhotekoshi Rivers. Sun Koshi River is one of Nepal's longest rafting trips. The death toll due to this landslide had reached 34 individuals.

1.9. General Distribution of Bryophytes in South, Central and Eastern Sindhupalchok District

1.9.1. Tropical Region

Species richness of bryophytes was recorded below 1000 m of elevation influenced with tropical climatic type. Most of the species recorded here have the affinity to Indo-Australian eco-regions. Commonly distributed species of bryophytes in this part are *Asterella wallichiana, Plagiochasma pterospermum, Cyathodium tuberosum Marchantia polymorpha, Frullania muscicola, Jungermannia truncata,* etc. Among mosses, *Bryum coronatum, Trematodon longicolis, Octoblepharum albidum, Philonotis thwaitsii, Hyophila involuta, Fissidens sylvaticus, F. zippeliannus, Phycomitrium eurystomum, Hypnum pleumaformae, Entodontopsis tavayense,* etc *Anthoceros punctatus* is a hornwort (Anthocerotae) which is less diversified in Nepal and is recorded at the altitudinal limits of 200-1000 m only.

1.9.2. Subtropical region

The subtropical region which covers the vertical range of 1000 - 2000 m also represents good diversity of the bryofloral species. This region accommodates popular species like *Asterella wallichiana, Asterella multiflora, Targionia hypophylla, Plagiochasma pterospermum, Marchantia emarginata, Dumortiera hirsuta, Bryum argenteum, Anomobryum julaceum, Pholia flexuosa, Rhodobryum giganteum, Fissidens taxifolius, Fissidens plagiochiloides, Brachythecium, Barbule constricta, Funaria hygrometrica, Hypnum pleumaforme, Thuidium cambifolium, Pogonatum microstomum, Polytrichum commune,* etc.

Anthoceros punctatus, Marchantis emarginata, Riccia himalayensis, Frullania delatata, Jungermannia spp., *Mylia taylorii, Hypnum pleumaformae, Pogonatum microstomum, Fissidens* spp. and *Thuidium s*pp. are distributed mostly in the Barahbise to Tatopani belt of this study.

1.10. Significance of this Study

Being one of the largest districts, Sindhupalchok has been explored extensively for bryophytes at its northeastern, northwestern, central, eastern and some parts of the southern sides. A vast area of the western and many southern parts still remain to explore out. With this generous support of the Rufford Small Grant Foundation many significant additions were made to country's list of this plant besides documentation of many rare species. Conservation awareness

programs launched in different places have been expected to bring effectiveness in conserving this plant on community level. Likewise, consultations to the community leaders and local school teachers also helped to make their commitment in conservation. Participation in exhibition and delivering presentation in the gatherings of students and conservationists also helped to familiarizing bryophytes and related conservation issues. Publication of the research findings of the First and second RSGs also reflected the diversity and conservation issues of this plant in Sindhupalchok district.

Permanent displays of the collected and identified specimens and informative flex prints on this plant of Sindhupalchok district have also been done at the only Natural History Museum of Nepal located in Kathmandu. This has been expected to provide significant information to all the visiting students, researchers and others to this museum. Two research papers on the Diversity of Bryopflora of Panch Pokhari Region of Sindhupalchok district have already been published based on the findings of the First and Second RSGs (Pradhan *et al*., 2012 & 2013). In every of the activities, high emphasis has been made to the Rufford Small Grant Foundation for the generous support.

No information was available on Bryophyte- faunal relationship before this work was initiated in Nepal. This study helped to explore species of invertebrates and vertebrates which are sheltered or associated to bryophyte habitats and adjacent areas.

This district was least known for bryoflora and existing biodiversity till the first RSG study was initiated in 2008-2009. The second RSG extensively explored the bryophytes of the western Sindhupalchok district which was not done before. Both of these studies summing up with the current study came up with extensive diversity data and interesting information related to this plant. Traditional use of bryophytes is an unfamiliar topic among the village communities though is quite popular in Indian villages. Peoples of remote areas are still unknown on conservation aspects and associated laws. So this study was very significant as it emphasized on bryophyte diversity, conservation issues, uses and its relationship to faunal components. This study keeps high value as it provided a baseline data for future researchers as well. The outcome of this work has also been planned to publish in the forms of book and research papers.

Once species diversity is documented, the future monitoring can be made easy to determine the degree of habitat alteration. If any impact is found in future, the village communities, local leaders and government organizations will be reported to add effectiveness in their conservation policies

2. Fulfillment of Objectives

- This work made an extensive documentation of bryophyte diversity in the central and southern parts of Sindhupalchok District of central Nepal within the elevation range of 700 to 1400 m.
- Status of every recorded species was assessed on local level.
- Prevailing threats was assessed minutely that might help to develop effective conservation policy for bryophytes.
- Awareness program which is one of the important aspects of this work was launched at three different communities to familiarize the local peoples on the significant value of this plant.
- This work also investigated the faunal species which were associated to the habitats of bryophyte species.
- Diversity record and prevailing threats resulted from this study can be used to design locally sound measures for conservation and update country's list of bryophytes.

3. Methodology

Best effort was carried out to identify all the observed species of bryophytes in the field. This was done with the help of magnifying hand lens and consulting books of Gangulee (1969-1980) and Eddy (1988, 1990 & 1996) and Smith (1996). Unidentified species in the field were collected and placed in paper packets and brought to the laboratory in Kathmandu to confirm their identification. The higher plants, shrubs and herbs found in and around the habitats of bryophyte were also identified while unidentified species of plants were brought to Kathmandu based Natural History Museum for identification. Polunin and Stainton (1984), Stainton (1988) and Sharma (2014) were also consulted for identification. The association of fauna to bryophyte

habitats was also studied in this phase. Unidentified invertebrate species were brought and identified at the Natural History Museum. Observed bird species was identified using binocular and the field guides by Fleming and Fleming (1976). Field identification of butterflies and moths was done with the help of Khanal and Smith (1997) and Haruta (1995) respectively. The Reddata book of the Fauna of Nepal (NRDB, 1995) was consulted for status study of the rare, endangered and threatened faunal species.

One of the aspects of this study was also to find out the traditional uses of bryophytes in village society. Interviews were taken with local peoples of the visited sites to determine how they take bryophytes in their society. They were also provided basic knowledge on the uses of bryophytes practicing sustainable way of harvestings. Community based Awareness program were launched at three different communities during December, 2014 to January, 2015. Door to door awareness program which was considered an important part of this work was conducted at different visited places in this study program. Questionnaires were developed and random survey was made to provide them knowledge on uses and conservation value of bryophytes and other biodiversity components of the nature.

3.1. Status Categorization

The status of different species of bryophytes was based on the percentage of occurrence of a species on local scale. Those species which were recorded in less than 10 percent of the entire species in a particular area were placed under the Rare Status. The presence of a species under the level of 30 % of the entire record in a particular area was categorized under Uncommon or Moderately Common Status. The Common Status included the level of 70% record of a species in a particular area. Above 70 % record of a species in a particular was designated under Fairly Common Status.

3.2. Schedules of Field Visits

Initiation of field study was done from the month of May, 2014, when the environment condition for bryophyte diversity was suitable in tropical to subtropical zones at the southern, central and eastern parts of this district. The field study was continued till January end (2015) which was very unfavorable month for diversity and maturity of this lower plant group.

Different seasons were covered to study bryophyte diversity in the field. So the entire period of this work from May, 2014 to February 2015 was divided into seven phases of the field study program.

An outline of the field visit period in each phase is as follows.**Total Days in the Field: 56 days**

First Phase: May 9, 2014- May 15, 2014 (7 days)

Second Phase: June 5, 2014- June 11, 2014 (8 days)
Third phase: July 192014- July 28, 2014 (10 days)
Fourth Phase: August 30, 2014 – September 5, 2014 (7 days)
Fifth Phase: September 20, 2014- September 29, 2014 (10 days)
Sixth Phase: December, 25, 2014-december 31, 2014 (7 days)
Seventh Phase: January 30, 2015- February 2, 2015 (7 days)

3.2.1. Detail of each field study phase

The detail of each field study phase with places of visit and elevations including dates is provided in tabulated forms. Field programs of all the seven phases been given below.

3.2.1.1. First Phase Collection

Date	From	To (VDC)	Locality Major
May 9, 2014	Kathmandu	Kadambas VDC - Sukute	Sukute, 920; Simle, 900 m; Kodari, 850 m.
May 10, 2014	Sukute	Barhebise	Khadichour, Lamosangu, Jure
May 11, 2014	Barhebise	Golche VDC - Baikunthe	Baikunthe, 1350 m; Tarke, 1300 m;
May12, 2014	Golche VDC - Baikunthe	Golche VDC - Baikunthe	Kubeshwor 1300 m; Kause, 1300 m; Kopicha, 1250 m
May 13, 2014	Golche- Baikunthe	Barhabise	On the way observation
May14, 2014	Barhabise	Maneshwar VDC - Barhabise	Maneswara, 1360 m; Harre, 1200m; Ghumang, 1200 m.
May 15, 2014	Barhabise	Kathmandu	---

3.2.1.2. Second Phase Collection

Date	From	To	Locality Major
June 5, 2014	Kathmandu	Mangkha VDC- Khadichour	Khadichour, 850 m; Lamosangu, 860 m.
June 6, 2014	Mangkha VDC- Khadichour	Barhabise	Khorsani Bari 850 m, Thulo palate, 1150 m.
June 6, 2014	Barhabise	Dhumthang VDC – Danda Gaun	Danda Gaun 1520 m; Kolbari, 1520 m.

June 7, 2014	Dhumthang VDC-Danda gaun	Listikot VDC – Panglang	Pansang and periphery areas, 1350-1400 m
June 8, 2014	Listikot – Panglang	Tatopani VDC - Tatopani Kunda	Chaku, 1250 m; Tatopani Kunda 1650 m;
June 9, 2014	Tatopani VDC	Tatopani VDC	Bhote koshi Dam site, 1600 m, Larcha, 1500 m.
June 10, 2014	Tatopani	Barhabise	Duguna Gadhi; Chhoti Bhansar; Larcha pool; Bhairab Khola, Andheri Khola
June 11, 2014	Barhabise	Kathmandu	Kopheshwar temple, 840 m; Sun koshi River bank, 850 m.

3.2.1.3. Third Phase Collection

Date	**From**	**To**	**Locality Major**
July 19, 2014	Kathmandu	Barhabise	On the way collection
July 20, 2014	Barhabise	Barhabise	Khorsanibari, 950 m; Dharpa, 1400 m; Kyayung, 1620 m; Sunkoshi forest, 980 m.
July 21, 2014	Barhabise	Kadambas VDC – Sukute	Jure, 780 m; Mangkha, Pahadi Gaun 900 m.
July 22, 2014	Kadambas VDC – Sukute	Jalbire VDC-Jalbire	Simle, 860 m; Balafi, 850 m; Ban Sanghu, 930 m; Chimling base, 920 m; Way to Jalbire, 850- 1600 m.
July 23, 2014	Jalbire VDC- Jalbire	Jalbire VDC-Jalbire	Jalbire, 820 m; Kartike, 1160 m; Khamare, 1230 m.
July 24, 2014	Jalbire VDC- Jalbire	Baramchi VDC	Ramche, 1240 m; Sisneri, 1120 m;
July 25, 2014	Baramchi VDC	Jalbire VDC - Jalbire	Adhamara, 1000 m; Paire, 1250 m; Chanaute, 1260 m.
July 26, 2014	Jalbire	Barhabise	On the way observation

July 27, 2014	Barhabise	Ramche VDC – Ramche	Ramche, 1320 m; Chepe Gaun, 1240 m; Ratmate, 1200 m.
July 28, 2014	Ramche – Barhabise	Kathmandu	-

3.2.1.4. Fourth Phase Study

Date	**From**	**To**	**Locality major**
August 30, 2014	Kathmandu	Melamchi	Melamchi Bazar, 820 m
August 31, 2014	Melamchi	Melamchi	Dovantar, 840 m; Tipeni, m; Gupha Danda, 1250 m.
September 1, 2014	Gupha Danda	Melamchi	Hydro power, 1050 m; Tipeni, 1250 m
September 2, 2014	Melamchi	Melamchi	Bahun Tole, 1270 m; Bahun Danda 1550 m;
September 13, 2014	Melamchi	Melamchi	Pande tole, 1250 m; Damai Tole, 1300; Ghatere Tole, 1300 m
September 4, 2014	Melamchi	Timbu	Kiualpati, 1150 m; Tar, 1150 m; Timbu, 1600 m.
September 5, 2014	Timbu	Kathmandu	….

3.2.1.5. Fifth Phase Study

Date	**From**	**To**	**Locality Major**
September 20	Kathmandu	Chautara	Purana Bazar, 1300 m; Chautara Bazar, 1430 m;
September 21, 2014	Chautara	Irkhu; Sano Sirubari	Chilaune, 1260 m; Jalkani, 1470 m; Lamidanda, 1240 m; Mulabari, 1470 m; Tipling, 1040 m
September 22, 2014	Irkhu	Thulo Sirubari	Ratamate, 820 m; Ranitar, 1060 m; Bhulbhule, 1380 m; Thulo Sirubari, 1420 m.
September 23, 2014	Thulo Sirubari	Sanga Chok	Phalete, 1100 m; Panichour, 1040 m; Karki Tar, 1030 m;

September 24, 2014	Sanga Chok	Chautara	Laxman Danda, 1290 m; Bhirkuna, 1330; Gaurati, 1530 m
September 25, 2014	Chautara	Kubinde; Batase	Gairigaun, 1340 m; Kaptan pati, 1330 m; Bagbazar, 1270 m; Thulo Khet, 1040 m; Kubinde Khola, 870 m; Daurali, 1230 m; Batase, 930 m.
September 26, 2014	Batase	Jalbire	Katunje 930 m; Jalbire, 780 m
September 27, 2014	Jalbire	Jalbire	Ranitar, 910 m; Sera, 820 m; Khatarbesi, 815 m, Jalbire, 780 m
September 28, 2014	Jalbire	Selang	Sano Bhanjyang, 800m; Dobate, 820 m; Kunigaun, 1380 m; Selang, 1340 m; Sera, 1000 m; Daurali, 1180 m; Ale 1100 m.
September 29, 2014	Jalbire	Kathmandu	----
October 1-31, 2014	Kathmandu	Kathmandu	Identification and labwork
November 2-17, 2014	Kathmandu	Kathmandu	Preparation of Progress report

3.2.1.6. Sixth Phase of Study

Date	**From**	**To**	**Remarks**
December 25, 2014	Kathmandu	Barhabise	Collection made in the Adjoining areas of Barhabise
December 26, 2014	Barhabise	Mangkha VDC	Awareness Program at chimlingbesi 1200 m; Dhimeri, 1280 m; Chimling, 1480 m

December 27, 2014	Mangkha	Khadichour	Collection made in different localities of Mangkha, 1200-1400 m to Khadichour, 840 m
December 28, 2014	Khadichour, Mankha VDC	Barhabise	Collection made in the adjoining areas (Jure, 860 m; Lamoshanghu, 860 m, Balephi 900 m)
December 29, 2014	Barhabise	Ramche VDC	Collection made on the way to Ramche -4 to Ramche-7
December 30, 2014	Barhabise	Way to Tatopani	Collection made on the way to Listikot 1550 m and Tatopani 1600 m.
December 31, 2014	Barhabise	Kathmandu	-

3.2.1.7. Seven Phase of Study

Date	**From**	**To**	**Remarks**
January 30, 2015	Kathmandu	Tatopani	Arrived in the Evening
January 31, 2015	Tatopani	Tatopan0069	Awareness Program; Collection in the periphery areas- Kodari Highway1600 m; Liping upto 1650 m, larcha, 1550 m.
February1, 2015	Tatopani	Barhabise	On the way Collection – Listikot 1550 m,
February 2, 2015	Barhabise	Ramche-	Awareness Program; Collection in the periphery areas of Ramche, 1320 -160 m
February 3, 2015	Ramche	Chepegaun	Collection made in Chepegaun, 1250 m, Gairegaun, 1310 m, Ratmate, 1200 m,
February 4, 2015	Chepegaun	Barhabise	Collection on the way
February 5, 2015	Barhabise	Kathmandu	Back to Kathmandu

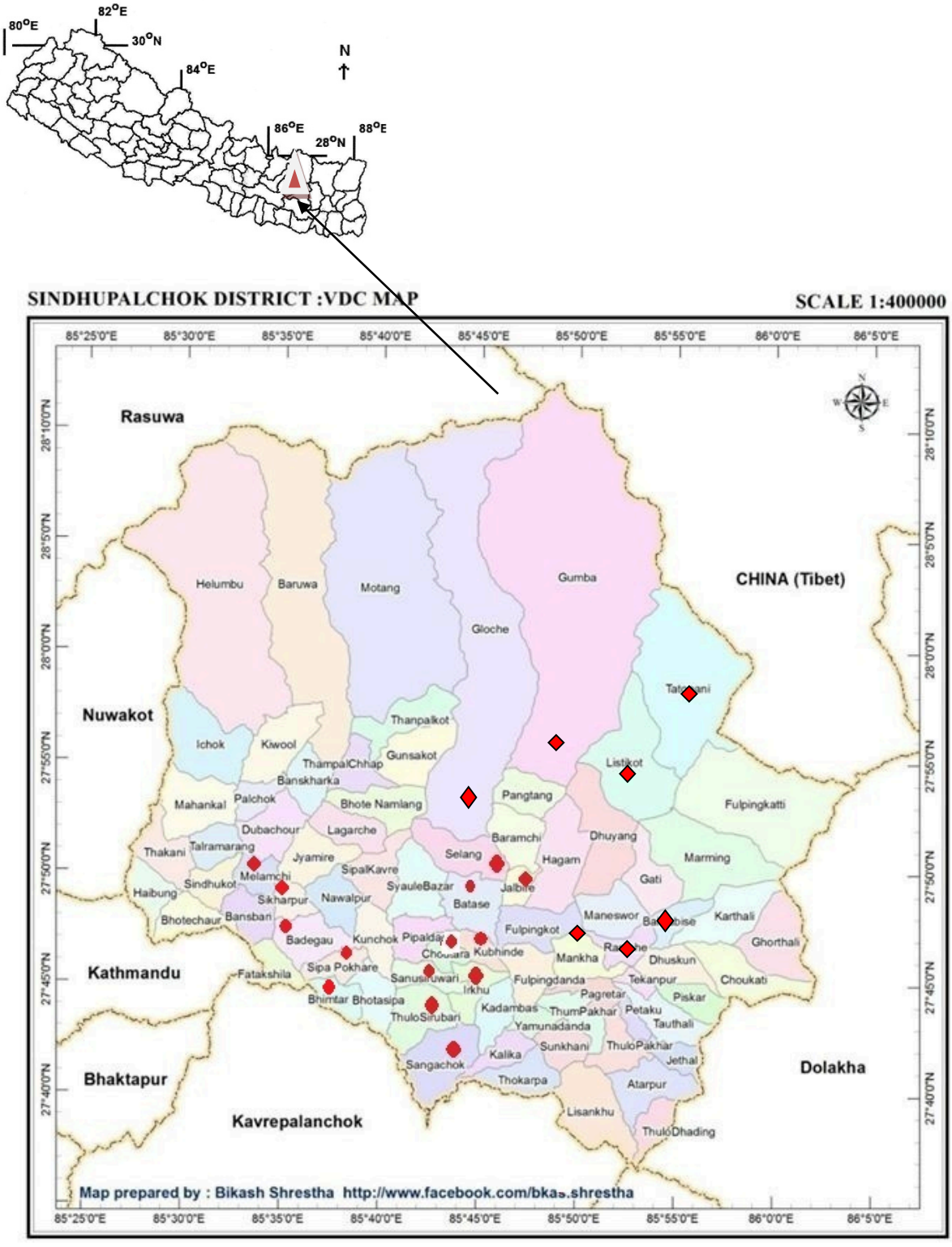

Fig. 1. Map of Sindhupalchok District showing the Study sites

4. Findings of this Study

4.1. Records of Bryophyte species

Fifty-six (56) days of field study made from May (2014) to the first week of February (2015) covered most of the southern, central and eastern parts of this district which were potential for bryophytes. The harsh and cold climatic condition of December and January was not favourable for bryophytes as many of the species were in dry forms, some under vegetative forms and some were matured with sporophytes and many species did not form spores though sporophytes were present.

All the collected specimens were identified properly upto species levels. Every collected specimen is given its voucher number and is deposited to the reference section of the Natural History Museum (Tribhuvan University) in Kathmandu. These specimens are preserved dry in paper packets while some specimens preserved wet in 4% formalin solution with detail field data and information are on display at the main exhibition gallery of this museum.

4.2. Total Species diversity of bryophytes in three different Classes

Total Species diversity of bryophytes in three different Classes recorded during this work from May (2014) to February (2015). Species diversity of each class is provided below in tabular form.

Classes	**Orders**	**Families**	**Genera**	**Species**
Anthocerotae	1	1	2	4
Hepaticae	3	22	26	61
Musci	9	19	47	95
Total	**13**	**42**	**75**	**160**

These specimens are entered into the data base in this museum. Specimens collected in May to November have the brochure number of RSG 1423. Study made in December brought 61 more specimens and its entry number continued from RSG 1424 to RSG 1484. Specimens collected in the month of January totaled just 45 and is entered into the Natural History Museum database with continuing voucher number from RSG 1485 - RSG 1529. Some of these specimens are still on the process of identification. This entire work was divided into Seven Phases of study programs which covered different months and seasons. Of the total records of 160 species, 22 species have been identified as new to the country list

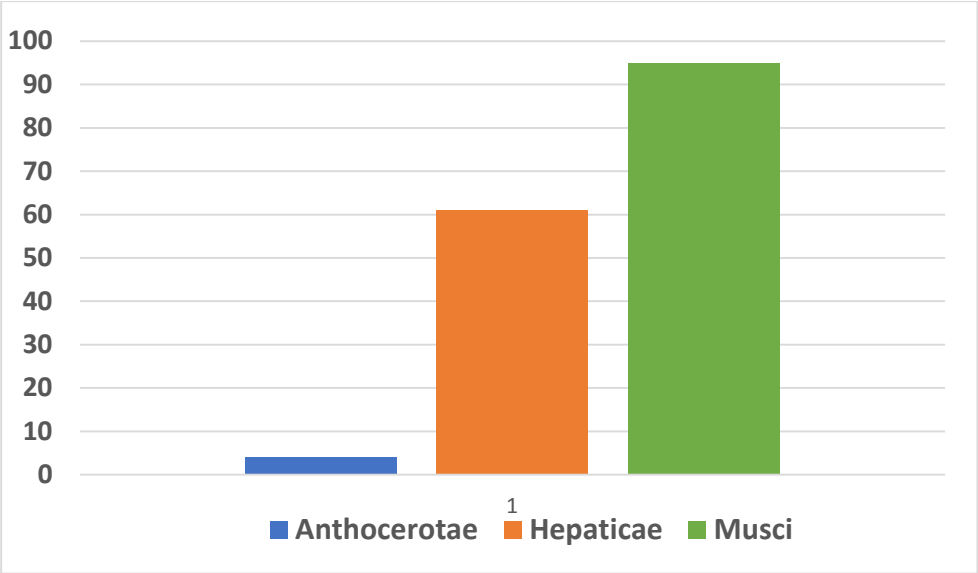

Fig.2. Bar Diagram showing Species Diversity of Bryophytes in Three classes.

A list of the recorded species of bryophytes in this work (May 2014 – February, 2015) is provided in Appendix Section.

4.3. New Records

The entire study made in this work proved to be highly successful to come up with 22 new records of bryophyte species to the country. These records were made from 800 to 1530 m of elevation at central and southern parts of this district. Of these recorded species, 14 species were from the class of Hepaticae and 8 species from Musci. A list of recorded species with family, elevations and habiat types are given in the Appendix II at the end.

4.4. Faunal Association to Bryophyte Habitats

Bryofloral habitats provide shelters to diverse group of faunal components. Various species of invertebrates were found sheltered in the moist habitats of different bryophyte species. This plant grows intact to the soil so diverse species of micro-organism were noted contaminated to bryophyte species. Small faunal species found in such habitats were more diverse in warm and humid tropical and subtropical parts than the cooler upper temperate and above zones (First and Second RSGs).

Various faunal species associated to bryophyte habitats were recorded in this study conducted at different areas of the tropical to the lower temperate parts of Sindhupalchok district. Due to warm and humid atmospheric conditions, the faunal components observed in August to October end were little different than the records made in midterm work. Most of the records were made on invertebrates which were sheltered in bryofloral habitats. The lower parts of this district

were mostly warm and dry and a vast area of the study sites comprised the riverine forests. This also has influenced the diversity richness of the faunal components at this belt. A list of the recorded faunal components is provided in the Appendix Section (Appendix **V**).

November end to February end was not the favoring months for faunal species like the invertebrates and lower vertebrates (except birds). Only those species which could tolerate cold climate condition were seen but were scarce in some moss habitats.

Faunal association to bryophyte habitat is an important aspect to study specially in context to Nepal where bryophyte and faunal diversity is changing following the changing pattern of elevations from the lowest bioclimatic zone of 52 m to 5000 m where scarce growth of small vegetation still can be noticed including some bryophytes specific to the Himalayan region.

Many insects especially beetles were seen sheltering under bryophyte thallus and earth worms were noted under soil surface remaining intact to the roots of bryofloral species.

Winter is the best period to observe birds in Nepal. Many bird species visit this country during this period. So a good diversity of birds was recorded during the study made in the winter period. Most of the recorded birds were observed in and around the forested areas where good growth of diverse bryofloral species occurred.

4.5. Conservation Issues and Challenges

Bryophytes were noted at high risk due to enormous loss of their habitats at several potential areas of this district. Deforestation, urbanization, hydropower stations, road networking and human pressure were assessed as the main threats. The knowledge and conservation status of this plant has not been fully understood among conservation authorities, community peoples and policy makers.

The main threats observed in this study were road networking and increasing deforestation leading enormous loss of the habitat areas Physical constructions like the hotels, resorts and hydropower stations are also causing impact to some extent. These indeed are essential requirements for the development, employment opportunities and tourism promotion but need to understand equally to the significances of conservation. This is an understood fact that the development and conservation should go side by side without disturbing each other.

It has been assessed that the potential habitats of bryophyte especially at Barahbishe, Tatopnai, Sunkoshi and Dolal Ghat areas were highly impacted. Listikot, the southern part of Barahbise and peripheral parts of Jalbire village still display good forested habitats for diverse species of this plant.

In country's context, this work keeps special significance as a least study of bryophytes in few pockets of this district had been done before. The outcome of this study has been expected to play a significant role to develop a baseline data and can be a good reference to formulate an effective conservation policy on community level. This study can also help to update the IUCN Red list category on Nepalese context.

As mentioned before, this is a least studied plant group in Nepal. This is mainly due to the lack of sufficient number of bryologists in the country. Complicated physiography and least or no knowledge on bryophytes among the peoples are the basic problems for its conservation. Urbanization and physical constructions ignoring this plant's potential habitats also made many significant species disappeared from this country for the last 10 years. This can be exemplified with a very rare species of moss called *Sauteria spongisa* which no more exists in the Chandragiri Mountain of Kathmandu district. This was first reported from this place in 1984. The road network linking Kathmandu to Makwanpur district made massive destruction to the habitat of this plant in the last 10 years. Unfortunately, no record of this species has been made from rest of the country so far.

Physical constructions and road networking are the principal factors to impose direct impact on the habitat of bryophytes in this part. Implementation of the Environment Impact Assessment prior to initiate physical constructions is still a feebly developed aspect in this part. People's dependency on forest resources is high especially around the peripheral parts of this district which still remain beyond the conservation area. High rate of deforestation and unsustainable harvesting of forest resources are the basic problems in different parts of this district. It has been estimated that only 30 % of forest cover has been left in this district at present. So the awareness program which was one of the important aspects has been expected to bring effective understanding of the local peoples on significant values of forest resources and associated habitats of bryophytes and other biodiversity components.

4.6. Awareness activities

Effective and impressive launching of conservation programme basically depends on simple education and awareness raising activities in the relevant areas. Without letting peoples to know on grass root level about conservation issues and sustainable harvesting the conservation policy may be weak or not possible considering villages and areas where conservation awareness is still not well understood. So awareness programme is a need in the present context that motivates peoples impressively on environmental conservation. This enhances the

understanding of people at grass root levels on how to develop harmony with the environment. This kind of program builds up their capacity and definitely aids to protect the habitats of bryophytes and other flora and fauna in wild.

Knowledge dissemination of rare bryophytes, its uses and conservation issues were implemented at many of the study sites. This was done in gatherings of some village peoples and visiting their houses and shops in and round the study sites. School students were also made aware on bryophytes, uses and conservation aspects. All the contacted peoples responded positively and were enthusiasts to know more about this plant. This program was found still more effective as many of school students learnt more about this plant as this is also in their 8th and 9th grade courses but briefly. Some peoples were interested on the uses of this plant which they were taught to use in their livelihood but under sustainable way.

4.7. Information Sharing and Awareness

Information on rare and endangered bryophytes which is a significant outcome of this work was provided to the public through Science Exhibition organized by the Ministry of Science, Technology and Environmen in Kathmandu on September 17-18, 2014. Visitors were provide basic knowledge on bryophyte, its conservation issues besides information on prestigious Rufford Small Grant and how this made generous support to this study. Flex prints and specimens of bryophytes both were used as exhibits in this exhibition which was inaugurated by the Honorable Prime Minister of Nepal.

5. Discussion

The work on the First Rufford program “Assessment of Biodiversity in Panch Pokhari of Sindhupalchok District of Central Nepal Emphasizing Conservation Needs” (Our Ref. 10.09.07) submitted in March, 2009 was carried out to the north eastern part of this district covering subtropical to alpine zones was successful to explore out 77 species of bryophytes categorized into 33 families.

The second Rufford Grant “Approach to Determine the Diversity and Conservation Status of Bryophytes in Northern Sindhupalchok District of Nepal (Application ID: 10111-2) submitted in June, 2012 was confined to northern parts of this district brought a list of 141 species of this plant of 75 genera and 41 families.

This work under Booster Grant "Study on the Bryofloral Diversity, Their Current status and Conservation Issues in Central and South-Eastern Region of Sindhupalchok District, Central Nepal (Application ID: 12663-B)" was very significant to investigate the diversity of this plant in developed parts of this district where deforestation, urbanization and road networking are extensive with dense human settlement as compared to northern parts. This study brought a list of 160 species of this plant categorized into 42 families.

Of the recorded species of bryoflora, *Heteroscyphus planus,* though common in Sindhupalchok is a rare species in lowland Tarai and was recorded new to the country (Pradhan and Joshi, 2009). Next species, *Jungermannia exertifolia* and *J. pumila* which previously were recorded new in lowland observed fairly common in this study (Pradhan, 2014). Significant species like *Jungermannia macrocarpa* which is an endemic species to East Himalaya was recorded in this study at Sunkoshi forest. *Jungermannia subelliptica* was found to be a popular species at Chautara to Jalbire areas (830-1530 m). Similarly, *Mylia taylorii* was noted most common in Sunkoshi forest near Barhabise area.

Rare species like *Monosolenium tenerum* was recorded only in Chimlingbasi of Mangkha VDC at 1200 m of elevation which was previously recorded new from lowland Tarae, W. Nepal (Pradhan & al, 2007). An isolated patch of the fertile thalli of this species was recorded at the boulder stone near the stream.

The fresh thalli with well-developed sporophytes of *Reboulia hemispherica* was recorded in cold harsh month of January though is not a favorable period for this plant. This occurred on stone wall near Sunkoshi River (890 m) at Barhabise. *Cyathodium tuberosum*, a dominant species was found distributed in Barhabise, Chautara, Thulo Sirubari, Melamchi and Jalbire areas in August. A good diversity of leafy liverwort (Hepaticae) was observed in the family Jungermanniaceae with records of two genera and 13 species. Seven new records of this plant were made from the order Jungermanniales (Appendix. I).

Among seven species of the order Metzgeriales, 4 species were identified as new additions to the country's list. They include *Riccardia incurvata, Fossombronia cristula* Aust., *Metzgeria fruticulosa and Pallavicinia subciliata.* In the class Musci, species diversity was recorded high in the family Bryaceae (13 species), Fissidentaceae (13 spp.) and Pottiaceae (15 spp.)

6. Team and Other Contact

Dr. Nirmala Pradhan: bryophyte expert. Several research papers on bryophytes go to her credit. She is affiliated to the Nepal Bio-heritage Forum for Resources Conservation, a non-governmental organization based in Kathmandu.
Ms Sanam Prajapati: experienced plant taxonomist She has good experience related to field research. Team member in this work.
Mr. Madan Krishna Shrestha: zoologist, who is a field researcher on the ecology and taxonomy of the fauna of Nepal. Team member in this work.
Ms. Hira Shova Shrestha: botanist with good knowledge of bryophyte taxonomy. She will work as a field assistant.
Ms. Pristi Dongol: botanist, doing her research on lower plants of central Nepal. She will work as a field assistant in this project.

7. References

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Appendix I

Bryophytes Diversity

Classes/Orders/Families	Texa	Specimens Examined	Status
ANTHOCEROTAE **Anthocerotales**			
Anthocerotaceae	*Anthoceros erectus* Kashyap	Jalbire, 790 m, 27°48'38"N, 85°46'06"E, 28.09.2014, Pradhan & al. RSG 902; Sano Bhanjyang-Jalbire, 800 m, 27°49'13"N, 85°46'13"E, 28.09.2014, Pradhan & al. RSG 907.	**FC**
	Anthoceros longii Steph.	Jalbire, 780 m, 27°43'46"N, 85°46'17"E, 27.09.2014, Pradhan & al. RSG 901.	**R**
Anthocerotaceae	*Anthoceros punctatus* L.	Listikot- Chaku, 1240 m, 27°53' N, 85°55'E, 08.06.2014, Pradhan RSG 624; Barhabise-Khorsanibari, 950 m, 27°47' 11"N, 85°55'E, Pradhan RSG 711; Melamchi Ghat, 800 m, 27°50'07" N, 85°34'40"E, 01.09.2014, Pradhan & al. RSG 790.	**C**
	Phaeoceros laevis (L.) Prosk.	Kadambas-Sukute, 920 m, 27 42'N, 85 45'E, 09.05.2014, Pradhan RSG 598; Barhabise-Khorsanibari, 950 m, 27°47' 11"N, 85°55'E, 20.07.2014, Pradhan RSG712.; Dovantar- Melamchi, 840 m, 27°50' N, 85°35'E, 31.08.2014, Pradhan & al. RSG 1053.	**C**
HEPATICAE **Jungermanniales**			
Calypogeiaceae	**Calypogeia arguta* Mont. & Nees	Barhabise-Sunkoshi forest, 980 m, 27°52'11" N, 85°45'5"E, 20.07.2014, Pradhan RSG 682.	**R**
Calypogeiaceae	**Calypogeia suecica* (H. Arn. & J. Press) K. Muell.	Jalbire- Ban Sangu, 920 m, 27°46' N, 85°52'E, 22.07.2014, Pradhan RSG 703.	**R**

Cephaloziaceae	**Cephalozia bicuspidata* (L.) Dumort.	Sipaghat-Melamchi, 800 m, 27°48' 49"N, 85°34'22E, 03.08.2014, Pradhan RSG 782.	**R**
Cephaloziellaceae	**Cephaloziella calyculata* (Durieu. & Mont.) K, Muell,	Jalbire, 790 m, 27 48 58" N, 85 46 06" E, 28.09.2014, Pradhan & al. RSG899b.	**R**
Frullaniaceae	*Frullania ericiodes* (Nees) Mont.	Kadambas-Sukute, 920 m, 27°42'11" N, 85°45'5"E, 09.05.2014, Pradhan RSG586; Mangkha - Jure, 780 m; 27°46'08" N, 85°51'6"E, 21.07.2014, Pradhan RSG 736.	**R**
Frullaniaceae	*Frullania dilatata* (L.) Dumort.	Maneswara-Ghumang, 1200 m, 27°48' N, 85°53'5"E, 14.05.2014, Pradhan *et al*. RSG 595; Barhabise-Sunkoshi forest, 980 m, 27°52'11" N, 85°45'5"E, 20.07.2014, Pradhan RSG708; Sunkoshi- Barhabise, 900 m, 20.07.2014, Pradhan & al. RSG 710.	**C**
Frullaniaceae	*Frullania muscicola* Steph.	Dovan Tar- Melamchi, 840 m, 27°50' N, 85°35'E, 31.08.2014, Pradhan & al. RSG1054; Thulo Sirubari, 1420 m, 27°44' N, 85°43' E, 23.09.2014, Pradhan RSG 1060; Virguna-Chautara, 1320 m, 27°46' 24"N, 85°43'30"E, 25.09.2014, Pradhan & al. RSG 1119; Jalbire-Chanaute, 1260 m, 25.07.2014, Pradhan RSG 729; Jalbire-Andheri Khola, 900 m, 10.06.2015, Pradhan & all RSG 679.	**FC**
Frullaniaceae	*Frullania tamariscii* (L) Dumort.	Virguna-Chautara, 1310 m, 27°46' 24"N, 85°43'30"E, 25.09.2014, Pradhan & al. RSG 1118	**R**
Frullaniaceae	**Frullania teneriffae* (F. Weber) Nees	Tatopani-Tatopani Kund, 1650 m, 27°53' N, 85°55'E, 06.06.2014, Pradhan RSG 648.	**R**
Geocalycaceae	*Heteroscyphus argutus* (Reinw. et al.) Schiffn.	Kadambas-Kodari, 800 m, 27°43' N, 85°46'E, 09.05.2014, Pradhan 581; Thulo Sirubari, 1420 m, 27°44' N, 85°43' E, 22.09.2014, Pradhan RSG 1058; Kaptanpati- Chautara, 1330 m, 25.09.2014, Pradhan RSG 1059;	**FC**

Geocalycaceae	*Heteroscyphus planus* (Mitt.) Schiffn.	Sunkoshi forest- Barhabise, 900 m, 20.07.2014, Pradhan & al. RSG 687a; Jalbire, 980 m, 27°52'11" N, 85°45'5"E, 22.07.2014, Pradhan RSG 690a; Barhabise-Ramche, 950 m, 27°47'17" N, 85°53'56"E, 20.07.2014, Pradhan RSG 1426; Jalbire- Simle, 860 m, 27°45'N, 85°46'E, 22.07.2014, Pradhan RSG 687; Shipaghat-Melamchi, 800 m, 03.09.2014, Pradhan & al. RSG 784; Jalbire, 790 m, 27°48'58", 85°46'06"E, 27.09.2014, Pradhan et al. RSG 899a; Chimlingbesi-Dhimeri- Mangkha, 1250 m, 26.12.2014, Pradhan *et al*. RSG 1457; Barhabise-Ramche- 835 m, 27°27'11", 85°53'49"E, 29.12.2014, Pradhan et al. RSG 1425; Barhabise- Ramche 950 m, RSG 1425, RSG 1427; 85°53'49"E, 29.12.2014, Pradhan *et al*. Chimlingbesi, 1250 m, 26.12.2014, Pradhan *et al.* RSG 1457	**C**
Lophocoleaceae	*Lophocolea minor* Nees	Chepe Gaun- Ramche, 1250 m, 27°46' N, 85°53'E, 27.07.2014, Pradhan RSG 728.	**R**
Jungermanniaceae	*Jungermannia atrovirens* Dumort.	Barhabise-Sunkoshi forest, 980 m, 27°52'11" N, 85°45'5"E, 20.07.2014, Pradhan RSG 681a.	**FC**
Jungermanniaceae	*Jungermannia confertissima* Nees	Thulo Sirubari, 1460 m, 27°46'55" N, 85°42'38"E, 22.09.2014, Pradhan & al. RSG 1098.	**R**
Jungermanniaceae	**Jungermannia crinulata* Smith	Thulo Sirubari, 1460 m, 27°46'55" N, 85°42'38"E, 22.09.2014, Pradhan & al. RSG 1017.	**F**
Jungermanniaceae	*Jungermannia exertifolia* Steph.	Ramche-Chepe Gaun, 1250 m, 27°46' N, 85°53'E, 27.07.2014, Pradhan & al. RSG 732.; Tar-Melamchi, 870 m, 27°50' N, 85°34'E, 31.08.2014, Pradhan & al. RSG1055; Thulo Sirubari, 1420 m, 27°44' N, 85°43' E, 22.09.2014, Pradhan & al. RSG 1061; Panichour-Sangha Chok, 1040 m, 27°41' N, 85°42' E, 23.09.2014, Pradhan & al. RSG 1077.	**FC**
Jungermanniaceae	*Jungermannia filamentosa* Amakawa	Barhabise-Sunkoshi forest, 980 m, 27°52'11" N, 85°45'5"E, 20.07.2014, Pradhan RSG 676a; Sunkoshi forest, 890 m, 20.07.3\2014, Pradhan & all. RSG 699a	**R**
Jungermanniaceae	*Jungermannia hyalina* Lyell. in Hook.	Kadambas-Jure, 780 m, 27°45'56" N, 85°52'39"E, 21.07.2014, Pradhan RSG 699a.; Melamchi Ghat, 800 m, 27°50'07" N, 85°34'40"E, 01.09.2014, Pradhan & al. RSG 789a; Chautara, 1440 m, 27°47' 8"N, 85°42'45"E, 24.09.2014, Pradhan & al. RSG 1117.	**FC**
Jungermanniaceae	*Jungermannia macrocarpa* Steph.	Barhabise-Sunkoshi forest, 950 m, 27°52'11" N, 85°45'5"E, 20.07.2014, Pradhan RSG 684.	**R** **Eedemic to E. Him**

Jungermanniaceae	**Jungermannia paroica* (Schiffn.) Griff.	Melamchi Ghat, 800 m, 27°50'07" N, 85°34'40"E, 01.09.2014, Pradhan & al. RSG 789b.	**R**
Jungermanniaceae	*Jungermannia pumila* With.	Barhabise-Sunkoshi forest, 980 m, 27°52'11" N, 85°45'5"E, 20.07.2014, Pradhan RSG 693a; Jalbire, 820 m, 23.07.2014, Pradhan et al. RSG718;	**FC**
Jungermanniaceae	**Jungermannia subelliptica* (Lindb. ex Kaal.) Lev.	Syaule-Chautara, 1460 m, 27°46' 55"N, 85°42'38"E, 24.09.2014, Pradhan & al. RSG 812; Gaurati-Chautara, 1510-1610 m, 27°47' 8"N, 85°42'45"E, 24.09.2014, Pradhan & al. RSG 836; Patali panii-Chautara, 1530 m, 27°47' 8"N, 85°42'45"E, 24.09.2014, Pradhan & al. , RSG 839, RSG 846; Jalbire, 830 m, 27°48' 15"N, 85°45'55"E, 26.09.2014, Pradhan & al. RSG 845, RSG 894; Ramche-7, 1000 m, 29.12.2014, Pradhan *et al*. RSG 1432 (NHM).	**FC**
Jungermanniaceae	*Jungermannia tetragona* Lindenb.	Kiualpati, 1150 m, 27°56'N, 85°34'E, 04.09.2014, Pradhan RSG 1057; Gaurati-Chautara, 1550 m, 27°47' 8"N, 85°42'45"E, 24.09.2014, Pradhan & al. RSG 1116;	**FC**
Jungermanniaceae	*Jungermannia truncata* Nees	Barhabise-Sunkoshi forest, 980 m, 27°52'11" N, 85°45'5"E, 20.07.2014, Pradhan RSG 701; Jalbire, 820 m, 23.07.2014, Pradhan *et al.* RSG 717; Jalbire, 790 m, 27°48'38" N, 85°46'6"E, 28.09.2014, Pradhan RSG 903.	**C**
Jungermanniaceae	*Mylia taylorii* (Hook.) S.F. Gray	Barhabise-Sunkoshi forest, 980 m, 27°52'11" N, 85°45'5"E, 20.07.2014, RSG 687b; Kadambas-Jure, 780 m, 27°45' 56"N, 85°52'39"E, 21.07.2014, Pradhan RSG 699b; Mangkha- Pahadi Gaun, 900 m, 27°46' N, 85°51'E, 21.07.2014, RSG 683; Melamchi Hydro Porwe, 1050 m, 01.09.2014, Pradhan & al. RSG 1056; Kubinde Jalbire, 1200 m, 25.09.2014, Pradhan & al. RSG 1000.	**C**
Lepidoziaceae	*Bazzania tridens* (Reinw. et al.) Trev.	Virguna-Chautara, 1310 m, 27°46' 24"N, 85°43'30"E, 25.09.2014, Pradhan & al. RSG 1120	**R**
Plagiochilaceae	*Plagiochila chinensis* Steph.	Timbu-Melamchi, 1550 m, 04.09.2014, Pradhan & al. RSG 1049;	**R**
Plagiochilaceae	*Plagiochila nepalensis* Lindenb	Timbu- Pati-Melamchi, 1550 m, 04.09.2014, Pradhan & al .RSG 1050;	**R**
Scapaniaceae	*Scapania undulata* (Sw.ex Lindb.) Dumort.	Jalbire, 790 m, 27 48 58" N, 85 46 06" E, 28.09.2014, Pradhan & al. RSG1153.	
HEPATICAE			

Marchantiales			
Aytoniaceae	*Asterella khasiana* (Griff.) Grolle	Jalbire-Kartike, 1160 m, 27°49’ N, 85°47’E, 23.07.2014, Pradhan RSG715; Gaurati- Chautara, 1510, 27°47’ 8”N, 85°42’45”E, 24.09.2014, Pradhan & al. RSG 828;	**FC**
Aytoniaceae	*Asterella multiflora* (Steph) Pande & al.	Ghumthang- Kolbari, 950 m, 06.06.2014, Pradhan RSG 570; Ramche-Ratmate, 1200 m, 27°47’ N, 85°53’E, 27.07.2014, Pradhan RSG716.; Jalbire, 800 m, 26.09.2014, Pradhan & al. RSG 893; Barhabise-Ramche- 835 m, 27°27’11”, 85°53’49”E, 29.12.2014, Pradhan et al. RSG 1424.	**C**
Aytoniaceae	*Asterella wallichiana* (Lehm. & .Lindenb.) Grolle	Barhabise-Khorsanibari, 950 m, 27°48’ N, 85°55’E, 06.06.2014, Pradhan RSG 615**;** Jalbire-Ratmate 1200 m, 27°47’ N, 85°53’E, 27.07.2014, Pradhan RSG714; Ramche, 980 m, 27°47’ 11” N, 85°53’49”E, 29.12.2014, Pradhan & al. RSG 1466; Listikot- way to Tatopani, 1450 m, 30.12.2014, Pradhan & al. RSG 1478; Tatopani, 1490 m, 27°56’49” N, 85°57’5” E, 31.01.2015, Pradhan & al.. RSG 1510.; Liping- Tatopani, 1550 m, 27°45’N, 85°57’E, 31.01.2015, Pradhan & al 1511.	**C**
Aytoniaceae	*Plagiochasma appendiculatum* Lehm. & Lindenb.	Mangkha-Khadichour, 850 m, 27°45’ N, 85°40’E, 05.05.2014, Pradhan RSG 561; Golche-Tarke, 1300 m, 27°53’ N, 85°46’E, 11.05.2014, Pradhan RSG 566; Barhabise- Kopheshwar; 900 m, 27°42’11” N, 85°53’5”E, 11.06.2014, Pradhan, RSG 734.; Koirala Tar- Badegaun, 770 m, 27°47’ N, 85°35’E, 02.09.2014, Pradhan & al RSG 1052.	**MC**
Aytoniaceae	*Plagiochasma pathankotensis* Kashyap	Lamidanda-Irkhu, 1240 m, 27°45’ N, 85°44’ E, 21.09.2014, Pradhan RSG 1076.	**R**
Aytoniaceae	*Plagiochasma pterospermum* C. Massal	Mangkha-Jure, 780 m, 27°45’56” N, 85°52’39E, 10.05.2014, Pradhan RSG 565; Dhumthang-Kolbari, 1520 m, 27°50’ N, 85°51’E, 06.06.2014, Pradhan RSG568; Barhabise- Kopheshwar; 900 m, 27°42’11” N, 85°53’5”E, 11.06.2014, Pradhan, RSG733; Jalbire- Paire, 1250 m, 27°49’ N, 85°47’E, 25.07.2014, Pradhan, RSG 740. Koirala Tar- BadeGaun, 770 m, 27°47’ N, 85°35’E, 02.09.2014, Pradhan & al RSG 1051; Virguna-Chautara, 1310 m, 27°46’ 24”N, 85°43’30”E, 25.09.2014, Pradhan & al. RSG 1121; Ratmate-Thulo Sirubari, 820 m, 27°44’ N, 85°41’ E, 22.09.2014, Pradhan RSG 1062; Lamidanda-Irkhu, 1240 m, 27°45’ N, 85°44’ E, 21.09.2014, Pradhan RSG 1078; Ramche, 980 m, 27°47’ 11” N, 85°53’49”E, 29.12.2014, Pradhan & al. RSG 1477 (NHM); Tatopani, 1490 m, 27°56’49” N, 85°57’5” E, 31.01.2015, Pradhan & al.. RSG 1509 Liping- Tatopani, 1550 m, 27°45’N, 85°57’E, 31.01.2015, Pradhan & al 1512; Ramche, 1320 m, 27°47’N, 85°53’E, 02.02.2015, Pradhan & al 1519; Chepegaun-Ramche, 1240 m, 27°46’N, 85°53’E, 03.02.2015, Pradhan & al 1520.	**MC**

Aytoniaceae	*Reboulia hemispherica* (L.) Raddi	Dhumthang- Kolbari, 1520 m, 27°50' N, 85°51'E, 06.06.2014, Pradhan RSG 569; Sunkoshi-Barhabise, 890 m, 01.02.2015, Pradhan & al. RSG 1485; Listikot, 1450 m, 30.12.2014, Pradhan & al. RSG 1481 (NHM).	**FC**
Conocephalaceae	*Conocephalum conicum* (L.) Underw.	Timbu- Pati-Melamchi, 1550 m, 04.09.2014, Pradhan & al .RSG 1048; Chautara, 1360 m, 27°48'29" N, 85°43'2"E, 25.09.2014, Pradhan & al. RSG 1128, Jalbire-Paire, 1250 m, 27°49' N, 85°47'E, 25.07.2014, Pradhan, RSG 737.	**FC**
Conocephalaceae	*Conocephalum japonicum* (Thunb.) Grolle	Sahele-Ramche-8, 960 m, 01.02.2015, Pradhan & al.. RSG 1504.	**R**
Marchantiaceae	*Marchantia emarginata* .Reinw. et al.	Golche-Baikunthe, 1350 m, 11.05.2014, Pradhan RSG576; Maneswara- Harre, 1200 m, 14.05.2014, Pradhan RSG584; Barhabise-Khorsanibari, 950 m, 27°47' 11"N, 85°55'E , 06.06.2014, Pradhan & al. RSG 612**.;** Tatopani-Tatopani Kund, 1650 m, 27°53' N, 85°55'E, 06.06.2014, Pradhan RSG 620 Melamchi Bazar 850 m, 27°50'N, .85°35'E, 30.08.2014 Pradhan & al .RSG 1047; Daurali-Chautara, 1200 m, 27°47'51" N, 85°44'8"E, 25.09.2014, Pradhan & al. RSG 1127; Jalbire, 820 m, 27°48' 5"N, 85°45'55"E, 27.09.2014, Pradhan & al.. RSG 1156; Ramche -7, 956 m, 27°47' 17"N, 85°53'56"E, 29.12.2014, Pradhan & al. RSG 1431 (NHM); RSG 1438; RSG 1448 (NHM); Listikot, 1400 m, 30.12.2014, Pradhan & al. RSG 1465 (NHM); Sahele-Ramche-8,960 m, 02.02.2015, Pradhan & al.. RSG 1503; Gairigaun-Ramche, 1240 m, 27°46'N, 85°53'E, 03.02.2015, Pradhan & al 1526. .	**C**
Marchantiaceae	*Marchantia paleacea* Bertol.	Barhabise-Khorsanibari, 950 m, 27°47' 11"N, 85°55'E, 06.06.2014, Pradhan RSG 613**;** Ramche -7, 935 m, 27°47' 171"N, 85°53'49"E, 29.12.2014, Pradhan & al. RSG 1467 (NHM); Gairigaun-Ramche, 1240 m, 27°46'N, 85°53'E, 03.02.2015, Pradhan & al 1527; Phepegaun-Ramche, 1240 m, 27°46'N, 85°53'E, 03.02.2015, Pradhan & al 1528. .	**C**
Marchantiaceae	*Marchantia papillata* var. *grossibarba* (St.) Bischl.	Ramche -7, 956 m, 27°47' 17"N, 85°53'56"E, 29.12.2014, Pradhan & al. RSG 1436 (NHM); Chimling basi- Mangkha, 1200 m, 26.12.2014, Pradhan et & al RSG 1442 (NHM).	**FC**
Marchantiaceae	*Marchantia polymorpha* L.	Golche-Kubeshwar, 1300, 27°52' N, 85°45'E, 12.05.2014, Pradhan RSG591**;** Barhabise-Khorsanibari, 950 m, 27°47' 11"N, 85°55'E , 06.06.2014, Pradhan RSG 614**;** Melamchi Bazar 850 m, 27°50'N, 85°35'E, 30.08.2014 Pradhan & al .RSG 1046; Daurali-Chautara, 1200 m, 27°47'51" N, 85°44'8"E, 25.09.2014, Pradhan & al. RSG 1126	**C**
Marchantiaceae	*Marchantia tosana* cf.	Barhabise-Thulopalati, 1150 m, 27°48' N, 85°54'E, 06.06.2014, Pradhan RSG 619.	**R**
Monosoleniaceae	*Monosolenium tenerum* Griff.	Chimlingbesi- Dhimeri- Mangkha, 1200 m, 26.12.2014, Pradhan et & al. RSG 1452.	**R**

Ricciaceae	**Riccia canaliculata* Hoffm.	Ranitar-Batase, 860 m, 27°47’ 37”N, 85°45’30”E, 27.09.2014, Pradhan *et al.* RSG 883a (NHM); Sera- Jalbire, 820 m, 27°48’ 5”N, 85°45’55”E, 27.09.2014, Pradhan & al.. RSG 889.	**FC**
Ricciaceae	**Riccia cavernosa* Hoffn.	Sano Bhanjyang- Jalbire, 820 m, 27°49’ 37”N, 85°46’16”E, 28.09.2014, Pradhan & al. RSG 911.	
Ricciaceae	*Riccia fluitans* L.	Kadambas-Sukute, 900 m, 27°42’ N, 85°45’E, 21.07.2014, Pradhan RSG 741.; Sera- Jalbire, 820 m, 27°48’ 15”N, 85°45’55”E, 28.09.2014, Pradhan & al.. RSG 891; Jalbire-Sano Bhanjyang, 800 m, 27°49’ 13”N, 85°46’13”E, 28.09.2014, Pradhan & al. RSG 915a	**R**
Ricciaceae	*Riccio-carpous natans*	Sera Jalbire, 820 m, 27°48’ 15”N, 85°45’55”E, 28.09.2014, Pradhan & al. RSG 712.	**R**
Ricciaceae	*Riccia himalayensis* St (Ms.) Kashyap	Barhabise-Khorsanibari, 950 m, 27°47’31”N, 85°53’53”E, 20.07.2014, Pradhan RSG 656**;** Kadambas-Jure, 780 m, 27°45’56” N, 85°52’39’E, 21.07.2014, Pradhan RSG668; Ratmate-Ramche, 1200 m, 27°53’ N, 85°43’E, 27.07.2014, Pradhan RSG 738; Jalbire, 830 m, 27°48’ 15”N, 85°45’55”E, 27.09.2014, Pradhan & al. RSG 896; Sano Bhanjyang, 800 m, 27°48’ 15”N, 85°45’55”E, 27.09.2014, Pradhan & al. RSG 896; Barhabise-Ramche, 950 m, 29.12.2014, Pradhan & al. RSG 1441 (NHM).	**MC**
Ricciaceae	*Riccia pathankotensis* Kashyap	Sano Bhanjyang-Jalbire, 800 m, 27°49’13”N, 85°46’13”E, 28.09.2014, Pradhan & al. RSG 908; Dobate-Jalbire, 820 m, 27°49’37”N, 85°46’16”E, 28.09.2014, Pradhan & al. RSG 910; Batase-Jalbire, 820 m, 27°49’13”N, 85°46’13”E, 28.09.2014, Pradhan & al. RSG 1018.	
Targioniaceae	*Cyathodium cavernarum* Kunze.	Dovan Tar- Melamchi Bazar 820 m, 27°50’N, 85°35’E, 31.08.2014 Pradhan & al .RSG 1045	+
Targioniaceae	*Cyathodium tuberosum* Kashyap	Melamchi Bazar 850 m, 27°50’N, 85°35’E, 30.08.2014 Pradhan & al .RSG 1044 .Chautara, Jalbire	
Targioniaceae	*Targionia hypophylla* L.	Ramche-Ratmate, 1200 m, 27°53’ N, 85°43’E, 27.07.2014, Pradhan RSG 739.	**R**
Wiesnerellaceae	*Dumortiera hirsuta* (Sw.) Nees	Jure- Mangkha, 780 m, , 27°45’ 56”N, 85°58’58”E, 10.05.2014, Pradhan *& al.* RSG 686b; .Barhabise-Sunkoshi forest, 980 m, 27°52’11” N, 85°45’5”E, 20.07.2014, Pradhan RSG 727; Dhungedharas- Jalbire, 780 m, 27°49’ 46”N, 85°46’17”E, 27.09.2014, Pradhan *& al.* RSG 895.	**FC**
HEPATICAE **Metzgeriales**			

Aneuraceae	**Riccardia incurvata* Lindb.	Chimlingbesi- Mangkha, 1200 m, 26.12.2014, Pradhan RSG 1454.	**R**
Aneuraceae	*Riccardia multifida* (L.) Gray.	Baramchi-Jalbire, 1030 m, 27°49' N, 85°47'E, 25.07.2014, Pradhan RSG 693b; Batase- Jalbire, 930 m, 27°47'16"N, 85°45'47"E, 25.09.2014, Pradhan & al RSG 1028.	**R**
Fossombroniaceae	**Fossombronia cristula* Aust.	Barhabise- Ramche, 935 m, 27°47'11"N, 85°53'49"E, 29.12.2014, Pradhan et al RSG 1430.	**R**
Metzgeriaceae	*Metzgeria conjugata* Lindb.	Daurali-Chautara, 1200 m, 27°47'51" N, 85°44'8"E, 25.09.2014, Pradhan & al. RSG 1125; Jalbire, 780 m, 27°49'46"N, 85°46'17" E, 28.09.2014, Pradhan RSG 1159. Lamidanda-Irkhu, 820 m, 27°45' N, 85°44' E, 22.09.2014, Pradhan RSG 1079.	**FC**
Metzgeriaceae	**Metzgeria fruticulosa* (Dicks.) Evans	Sano Bhanjyang-Jalbire, 800 m, 27°49'13"N, 85°46'13"E, 28.09.2014, Pradhan & al. RSG 905	**R**
Pallaviciniaceae	**Pallavicinia subciliata* (Aust.) Steph.	Bahunpati Community Forest- Melamchi, 1000 m, 27°49'26" N, 85°34'26"E, 02.09.2014 Pradhan & al. RSG 775.	**R**
Pelliaceae	*Pellia calycina* (Tayl.) Nees	Ramche-Ratmate, 1200 m, 27°47' N, 85°53'E, 27.07.2014, Pradhan RSG 713.	**R**
MUSCI			
Eubryales			
Bartramiaceae	**Bartramidula bartramioides* (Griff.) Wijk & Marg.	Daurali- way to Jalbire, 1230 m, 27°46'51" N, 85°44'8"E, 25.09.2014 Pradhan & al .RSG 867 (NHM).	
Bartramiaceae	*Fleischerobryum longicolle* (Hanpe) Loesk.	Bahunpati Community Forest- Melamchi, 1150 m, 27°49'26" N, 85°34'26"E, 02.09.2014 Pradhan & al .RSG 777.	
Bartramiaceae	*Philonotis falcata* (Hook.) Mitt.	Ranitar-Thulo Sirubari, 1060 m, 27°42' N, 85°42' E, 22.09.2014, Pradhan RSG 1063	+
Bartramiaceae	*Philonotis fontana* (Hedw.) Brid.	Thulo Sirubari, 1420 m, 27°44' N, 85°43' E, 22.09.2014, Pradhan RSG 1064.	+
Bartramiaceae	*Philonotis mollis*	Barhabise-Kopheshwar, 840 m, 11.06.2014, Pradhan RSG633; Barhabise- Sunkoshi, 850 m, 27°52'11" N, 85°45'5"E, 20.07.2014 Pradhan RSG 725.	**C**

Bartramiaceae	*Philonotis revoluta* Bouch & Sande4 lac.	Hydro Power- Melamchi,1050 m, 01.09.2014, Pradhan & al. RSG 1096; Daurali-Chautara, 1200 m, 27°47'51" N, 85°44'8"E, 25.09.2014, Pradhan & al. RSG 1124	+
Bartramiaceae	*Philonotis thwaitsii*	Barhabise- Sunkoshi, 950 m, 27°52'11" N, 85°45'5"E, 20.07.2014 Pradhan RSG 725; Jalbire--Paire, 1220 m, 27°49' N, 85°47'E, 23.07.2014, Pradhan RSG 691.	**C**
Bartramiaceae	*Philonotis turneriana* (Schwaegr.) Mitt.	Ramche, 1320 m, 27°53' N, 85°47'E, 27.07.2014, Pradhan RSG 726; Ranitar-Batase, 860 m, , 27°47'47"N, 85°45'30"E, 27.09.2014, Pradhan *et al.* RSG 886; Panichour - Sanga Chok, 1040 m, 27°42' N, 85°42' E, 22.09.2014, Pradhan RSG 1065	**C**
Bryaceae	*Anomobryum julaceum* (Gaertn *et al.)* Schimp.	Mangkha- Khadichour, 850 m, 27°45'N, 85°40'E, 05.06.2014, Pradhan & al. RSG 623; Gaurati-Chautara, 1530 m, 27°47' 8"N, 85°42'45"E , 24.09.2014, Pradhan RSG 843; Tatopani, 1490 m, 27°56'49" N, 85°57'5" E, 31.01.2015, Pradhan & al.. RSG 1491; Sahele-Ramche-8,960 m, 01.02.2015, Pradhan & al .RSG 1497.	**C**
	Brachymenium acuminatum Harv.	Thulo Sirubari, 1420 m, 27°44' N, 85°43' E, 22.09.2014, Pradhan RSG 1066.	+
	Bryum apiculatum Schwaegr.	Tatopani, 1490 m, 27°56'49" N, 85°57'5" E, 31.01.2015, Pradhan & al.. RSG 1495.	+
	Bryum argenteum Hedw.	Dhumthang- Danda Gaun, 1520 m, 06.06.2014, Pradhan RSG 644; Barhabise-Khorsanibari, 950 m, 27°47'31"N, 85°53'53"E,20.07.2014, Pradhan RSG 723; Ramche, 1320 m, 27°47' 11"N, 85°53'E , 27.07.2014, Pradhan RSG 724; Listikot, 1550 m, 30.12.2014, Pradhan & al. RSG 1472; Tatopani, 1600 m, 30.12.2014, Pradhan & al. RSG 1475 (NHM); Tatopani, 1490 m, 27°56'49" N, 85°57'5" E, 31.01.2015, Pradhan & al.. RSG 1486; Sahele-Ramche-8,960 m, 01.02.2015, Pradhan & al.. RSG 1496; Chepegaun-Ramche, 1240 m, 27°46'N, 85°53'E, 03.02.2015, Pradhan & al 1522.	**C**
	Bryum capillare L. ex Hedw.	Tatopani-Tatopani Kund, 1650 m, 27°53' N, 85°55'E, 06.06.2014, Pradhan RSG 629; Phalate Sanga Chok, 1100 m, 27°41' N, 85°42' E, 23.09.2014, Pradhan RSG 1067; Kubinde-Batase, 990 m, 27°47'14" N, 85°45'30" E, 28.09.2014, Pradhan & al.. RSG 1153.	**C**
	Bryum cellulari Hook.	Jalkani-Irkhu, 1470 m, 27°43' N, 85°44' E, 21.09.2014, Pradhan RSG 1065.	+
	Bryum coronatum Schwaegr.	Mangkha- Lamosangu, 860 m, 27°45' N, 85°51'E 06.2014, Pradhan RSG 634**;** Melamchi, 850 m, 27°49'26'N, 85°34"26" E, 04.09.2014, Pradhan RSG 765; Jalbire Bazar, 830 m, 27°48' 15"N, 85°45'55"E , 26.09.2014, Pradhan & al. RSG 900; Sano Bhanjyang 800 m, 27°49'13"N,	**FC**

		85°46’17”E , 28.09.2014, Pradhan & al. RSG 909; Mangkha- Lamosangu, 870 m, 27°45’ N, 85°51’E 28.12.2014, Pradhan RSG 1474 (NHM)**.**	
	Bryum dichotomus Hedw.	Jalkani-Irkhu, 1470 m, 27°43’ N, 85°44’ E, 21.09.2014, Pradhan RSG 1068.	+
	Bryum recurvulum Mitt.	Kubinde-Batase, 990 m, 27°47’14” N, 85°45’30” E, 28.09.2014, Pradhan & al.. RSG 1158.	+
	Pohlia camptotrachela (Ren & Card.) Broth.	Sun Koshi forest- Barhabise, 950 m, 20.07.2014, Pradhan & al RAG 675: Melamchi	**R**
	Pohlia flexuosa Hook.	Melamchi Bazar, 850 m, 31.08.2014, Pradhan & al. RSG1043; Jalbire-Paire, 1250 m, 27°49’ N, 85°49’E, 25.07.2014, Pradhan RSG730.	**FC**
	Pohlia leucostoma (Busch. & Lac.) Fleisch.	Thulo Sirubari, 1050 m, 27°44’ N, 85°41’E, 22.09.2014, Pradhan & al. RSG 1157.	
	Rhodobryum giganteum (Schwaegr.) Paris.	Listikot- Pasang, 1400 m, 27°53’ N, 85°53’E, 07.06.2014, Pradhan et al. RSG 645; Gaurati – Chautara, 1530 m, 27°47’ 84”N, 85°42’45”E, 24.09.2014, Pradhan & al. RSG 1154; Larcha-Tatopani, 1520 m, 27°58’N, 85°58’E, 31.01.2015, Pradhan & al 1518;	**FC**
Mniaceae	******Mnium pseudopunctatulum* Bruch. & Schimp.	Chimlingbesi-Dhimeri- Mangkha, 1275 m, 27°76’61” N, 85°83’31” E, 28.12.2014, Pradhan *et al.* RSG 1444.	**R**
Dicraneales			
Dicranaceae	*Campylopus ericoides* (Griff.) A. Jaeger	Jalbire- Balefi, 850 m, 27°43’ 58”N, 85°45’50”E, 23.07.2014, Pradhan RSG 702; Tatopani Kund-Tatopani, 1490 m, , 27°53’N, 85°55’E, 06.06.2014, Pradhan RSG 531. Melamchi Bazar, 850 m, 31.08.2014, Pradhan & al. RSG1042; Kubinde-Batase, 990 m, 27°47’14” N, 85°45’30” E, 28.09.2014, Pradhan & al.. RSG 1152; Tatopani, 1490 m, 27°56’49” N, 85°57’5” E, 31.01.2015, Pradhan & al.. RSG 1494.	R
Dicranaceae	*Campylopus nilghriensis* (Mitt.) A. Jaeger	Daurali-Chautara, 1200 m, 27°47’51” N, 85°44’8”E, 25.09.2014, Pradhan & al. RSG 1123; Bhulbhule-Thulo Sirubari, 1380 m, 27°43’ N, 85°42’E, 22.09.2014, Pradhan & al. RSG 1080; Batase- Way to Jalbire, 930 m, , 27°47’ 16”N, 85°45’17”E, 25.09.2014, Pradhan & al. RSG 1150.	**FC**
Dicranaceae	*Campylopus umbellatus* (Arnott.) Paris	Ranitar-Thulo Sirubari, 1050 m, 27°44’ N, 85°41’E, 22.09.2014, Pradhan & al. RSG 1081	**R**

Dicranaceae	*Garckea phascoides* (Hook.) C. Muell.	Chautara, 1450 m, 27°48’ 29”N, 85°43’2”E, 25.09.2014, Pradhan & al .RSG 855; Jalbire, 830 m, , 27°83’ 15”N, 85°45’55”E, 27.09.2014, Pradhan & al RSG 920., Kubinde-Batase, 990 m, 27°47’14” N, 85°45’30” E, 28.09.2014, Pradhan & al.. RSG 1151; Tatopani, 1490 m, 27°56’49” N, 85°57’5” E, 31.01.2015, Pradhan & al.. RSG 1492.	**C**
Dicranaceae	**Microdus brasillensis* (Dub.) Ther.	Thulo Sirubari, 1420 m, 22.09.2014, Pradhan & al. RSG 1025; Virkuna- Chautara, 1360 m, 27°48’29” N, 85°43’2”E, 24.09.2014, Pradhan & al. RSG 1129.	**R**
Dicranaceae	*Trematodon longicolle* Michx.	Barhabise- Khorsanibari, 950 m, 27°47’31”N, 85°53’53”E, 20.07.2014, Pradhan RSG 661.	**FC**
Fissidentales			
Fissidentaceae	*Fissidens bryoides* Hedw.	Tar-Melamchi, 870 m, 27°50’ 31”N, 85°34’15”E , 04.09.2014, Pradhan & al. RSG1041; Ranitar-Thulo Sirubari, 1050 m, 27°44’ N, 85°41’E, 22.09.2014, Pradhan & al. RSG 1082; Sano Sirubari, 1300 m, 27°41’ N, 85°42’E, 23.09.2014, Pradhan & al. RSG 1095; Barhabise- Ramche, 978 m, 29.12.2014, Pradhan *et al*. RSG 1449; Gairigaun-Ramche, 1310 m, 27°46’N, 85°53’E, 03.02.2015, Pradhan & al 1525.	**C**
Fissidentaceae	*Fissidens ceylonensis* Dozy & Molk.	Ranitar-Thulo Sirubari, 1050 m, 27°44’ N, 85°41’E, 22.09.2014, Pradhan & al. RSG 1083; Tar-Melamchi, 870 m, 27°50’ 31”N, 85°34’15”E , 04.09.2014, Pradhan & al. RSG1040.	**FC**
Fissidentaceae	*Fissidens crenulatus* Mitt.	Listikot- Pasang, 1400 m, 27°53’ N, 85°53’E 07.06.2014, Pradhan & al,. RSG 547; Sunkoshi-Barhabise, 950 m, 27°52’11” N, 85°45’5”E, 22.07.2014, Pradhan RSG 690b; Melamchi, 820 m, 27°50’07” N, 85°34’40”E, 31.08.2014, Pradhan & al. RSG 1029, Ranitar-Thulo Sirubari, 1050 m, 27°44’ N, 85°41’E, 22.09.2014, Pradhan & al. RSG 1084; Sano Sirubari,1300 m, 27°46’ N, 85°43’E, 21.09.2014, Pradhan & al. RSG 1094; Batase- Way to Jalbire, 930 m, , 27°47’ 16”N, 85°45’17”E, 25.09.2014, Pradhan & al. RSG 1149; Purana Bazar-Chautara, 1450 m, 27°16’ 30”N, 85°42’62”E, 20.09.2014, Pradhan & al RSG 1122; Kubinde-Batase, 990 m, 27°47’14” N, 85°45’30” E, 28.09.2014, Pradhan & al.. RSG 1148.	**C**
Fissidentaceae	*Fissidens gangulee* Norkett	Bahunpati Community forest-Melamchi, 850 m, 27°49’26” N, 85°34’27”E, 02.09.2014, Pradhan & al. RSG 779; Ranitar- Thulo Sirubari, 1050 m, 27°44’ N, 85°41’E, 22.09.2014, Pradhan & al. RSG 1085;	**FC**
Fissidentaceae	*Fissidens javanicus* Dozy & Molk.	Jalbire, 850 m, 27°49’ N, 85°47’E, 23.07.2014, Pradhan RSG 695; Dovan-tar- Melamchi, 820 m, 27°50’07” N, 85°34’40”E, 31.08.2014, Pradhan & al. RSG 797; Bhulbhule-Thulo Sirubari, 1380 m, 27°43’ N, 85°42”E, 22.09.2014, Pradhan & al. RSG 1086.	**FC**

Fissidentaceae	*Fissidens laxitextus* Broth. ex. Gangulee	Banghari- Kubinde, 1040 m, 27°47’ 1”N, 85°14’41”E, 25.09.2014, Pradhan & al. RSG 869.	**R**
Fissidentaceae	*Fissidens nobilis*	Tatopani-Tatopani Kund, 1650 m, 27°53’ N, 85°55’E, 06.06.2014, Pradhan RSG614, Tatopani-Tatopani Kund, 1650 m, 27°53’ N, 85°55’E, 06.06.2014, Pradhan RSG618.	**FC**
Fissidentaceae	*Fissidens robinsonii* Broth.	Barhabise-Khorsanibari, 950 m, 27°48’N, 85°55’E, 20.07.2014, Pradhan & al. RSG 672; Barhabise-Sunkoshi forest, 980 m, 27°52’11” N, 85°45’5”E, 20.07.2014, Pradhan RSG681c; Jalbire, 930 m, 27°47’ 16”N, 85°45’17”E, 26.09.2014, Pradhan & al. RSG 1147	**C**
Fissidentaceae	**Fissidens serratus* C. Muell.	Chimling-Purano Gaun, Mangkha, 1276 m, 27°76’61” N, 85°83’31”E, 27.12..2014, Pradhan et al. RSG 1456 (NHM);	**R**
Fissidentaceae	*Fissidens sylvaticus* Griff.	Golche- Kopicha, 1250 m, 27°52’N, 85°45’E, 12.05.2014, Pradhan RSG589; Ramche, 1250 m, 27°47’ 11”N, 85°53’E, 27.07.2014, Pradhan RSG722; Melamchi,820 m, 27°50’07” N, 85°34’40”E, 31.08.2014, Pradhan & al. RSG 1030; Gaurati- Chautara, 1530 m, 27°45’ 84”N, 85°42’45”E, 24.09.2014, Pradhan & al. RSG 1115; Irkhu, 1370 m, 27°45’ N, 85°45’ E, 22.09.2014, Pradhan RSG 1069; Batase 930 m, , 27°47’ 16”N, 85°45’17”E, 25.09.2014, Pradhan & al. RSG 874; RSG 1016; Sahele-Ramche-8, 960 m, 02.02.2015, Pradhan & al.. RSG 1501; Chepegaun-Ramche, 1240 m, 27°46’N, 85°53’E, 03.02.2015, Pradhan & al 1524. .	C
Fissidentaceae	*Fissidens sylvaticus* Griff. var. *auriculatus* (C. Muell.) Gangulee	Batase- Way to Jalbire, 930 m, , 27°47’ 16”N, 85°45’17”E, 25.09.2014, Pradhan & al. RSG 1027. .	**R**
Fissidentaceae	*Fissidens taxifolius* Hedw.	Sunkoshi forest, 900 m, 20.07.2014, Pradhan & al. RSG 676b; Bhulbhule-Thulo Sirubari, 1380 m, 27°43’ N, 85°42E, 22.09.2014, Pradhan & al. RSG 1087; .Phalate-Sanga chok, 1100 m, 27°41’ N, 85°42’ E, 23.09.2014, Pradhan & al. RSG 1093; Barhabise- Ramche, 978 m, 29.12.2014, Pradhan *et al*. RSG 1449.; Listi- Listikot 1500 m, 30.12.2014 , Pradhan & al. RSG 1480; Batase- Way to Jalbire, 930 m, 27°47’ 16”N, 85°45’17”E, 26.09.2014, Pradhan & al. RSG 1146.	**C**
Fissidentaceae	*Fissidens zippelianus* Dozy & Molk.	Sano Bhanjyang, 800 m, 27°47’13”N, 85°46’13”E, 26.09.2014, Pradhan & al. RSG 1014..	**R**
Funariales			
Funariaceae	*Enthosthodon wallichii* Mitt.	Melamchi Ghat, 840 m, 27°50’07” N, 85°34’40”E, 31.08.2014, Pradhan & al. RSG 1031; Jalbire, 830 m, 27°47’ 16”N, 85°45’17”E, 27.09.2014, Pradhan & al. RSG 1145 .	**FC**

Funariaceae	*Funaria hygrometrica* Hedw.	Golche-Tarke, 1300 m, 11.05.2014, Pradhan 7 al. RSG 580; Ramche, 1250 m, 27°47' 11"N, 85°55'E, 27.07.2014, Pradhan RSG 721; Melamchi Ghat, 840 m, 27°50'07" N, 85°34'40"E, 31.08.2014, Pradhan & al. RSG 1032; Bhulbhule-Thulo Sirubari, 1380 m, 27°43' N, 85°42E, 22.09.2014, Pradhan & al. RSG 1088; Sano Sirubari, 1300 m, 27°46' N, 85°43E, 21.09.2014, Pradhan & al. RSG 1090; Chautara, 1450 m, 27°16' 30"N, 85°42'62"E, 20.09.2014, Pradhan & al RSG 897; Ramche, 978 m, 29.12.2014, Pradhan *et al*. RSG 1433; Ramche 4, 950 m, RSG 1464; Dhimeri-Mangkha, 1275 m, RSG 1451; Balephi - Mangkha, 900 m, RSG 1470; Tatopani, 1490 m, 27°56'49" N, 85°57'5" E, 31.01.2015, Pradhan & al.. RSG 1493; Sahele-Ramche-8,960 m, 01.02.2015, Pradhan & al. RSG 1499.; Liping- Tatopani, 1550 m, 27°45'N, 85°57'E, 31.01.2015, Pradhan & al 1513; Chepegaun-Ramche, 1240 m, 27°46'N, 85°53'E, 03.02.2015, Pradhan & al 1521.	**C**
	Funaria nepalensis C. Muell.	Gaurati- Chautara, 1530 m, 27°45' 84"N, 85°42'45"E, 24.09.2014, Pradhan & al. RSG 1114;	**C**
	Physcomitrium eurystomum Sendth.	Kadambas-Simle, 900 m, 27°45'N, 85°46'E, 09.05.2014, Pradhan RSG 577; Melamchi Ghat, 840 m, 27°50'07" N, 85°34'40"E, 31.08.2014, Pradhan & al. RSG 1033;	**R**
Splachnaceae	*Gymnostomiella vernicosa* (Hook.) Fleisch.	Jalbire, 830 m, 27°47' 16"N, 85°45'17"E, 27.09.2014, Pradhan & al. RSG 892 .	**R**
Hypnobryales			
Brachytheciaceae	*Brachythecium rutabulum*	Barhabise-Dharpa, 1400 m, 27°55' N, 85°49'E, 20.07.2014, Pradhan RSG 670; ; Gaurati-Chautara, 1530 m, 27°45' 84"N, 85°42'45"E, 24.09.2014, Pradhan & al. RSG 1113; Sahele-Ramche-8,960 m, 01.02.2015, Pradhan & al.. RSG 1505; Tatopani, 1490 m, 27°56'49" N, 85°57'5" E, 31.01.2015, Pradhan & al.. RSG 1506;	**C**
Brachytheciaceae	*Brachythecium wichurai (Broth.) Paris*	Melamchi Ghat, 840 m, 27°50'07" N, 85°34'40"E, 31.08.2014, Pradhan & al. RSG 1034; Batase,Daurali,- Jalbire 1200 m, 27°46'51"N, 85°44'8" E, 25.09.2014, Pradhan et al RSG 1144.	**FC**
Brachytheciaceae	*Eurhynchium proelongum* (Hedw.) B.S.G.	Kaptanpati-Chautara, 1310 m, 27°46' 24"N, 85°43'30"E, 25.09.2014, Pradhan & al. RSG 860 ; Kubinde Khola, 870 m, 27°17'17"N, 85°44'57" E, 25.09.2014, Pradhan et al RSG 1143;; Batase,Daurali,- Jalbire 1200 m, 27°46'51"N, 85°44'8" E, 25.09.2014, Pradhan et al RSG 1142; Ramche -7, 1300 m, 29.12.2014, Pradhan & al. RSG 1463.	**C**

Brachytheciaceae	*Eurhynchium swartzii* (Turne) Curn.	Bshunpati Community Forest- Melamchi, 860 m, , 27°49' 26"N, 85°34'26"E, 2.09.2014, Pradhan & al. RSG 776; Sipa Ghat-Melamchi, 1150 m, 02.09.2014, Pradhan & al. RSG1035.	**FC**
Entodontaceae	*Entodon flavescens* (Hedw.) A. Jaeger	Batase,Daurali,- Jalbire 1200 m, 27°46'51"N, 85°44'8" E, 25.09.2014, Pradhan et al RSG 1141.	**R**
Entodontaceae	*Entodon macropodus* (Hedw.) C. Muell.	Jalkani- Irkhu, 1479 m, , 27°46' 54"N, 85°42'40"E, 21.09.2014, Pradhan & al. RSG 806; Gaurati-Chautara, 1530 m, 27°45' 84"N, 85°42'45"E, 24.09.2014, Pradhan & al. RSG 1112;	**FC**
Entodontaceae	*Entodon prorepens* (Mitt.) A. Jaeger	Jalkani- Irkhu, 1470 m, , 27°46' 54"N, 85°42'39"E, 21.09.2014, Pradhan & al. RSG 805; Syaule-Chautara, 1480 m, 27°45' 05"N, 85°42'46E, 25.09.2014, Pradhan & al. RSG 1110;	**FC**
Entodontaceae	*Erythrodontium julaceum* (Mitt.) A. Jaeger	Banghari- Kubinde, 1040 m, 27°47'1"N, 85°44'41" E, 25.09.2014, Pradhan et al RSG 1139;	**FC**
Hypnaceae	*Hypnum cupressiforme Hedw.*	Batase,Daurali, 1200 m, 27°46'51"N, 85°44'8" E, 25.09.2014, Pradhan et al RSG 1140. .	**R**
Hypnaceae	*Hypnum pleumaforme*	Golche-Tarke, 1300 m, 11.05.2014, Pradhan & al. RAG 533; Tatopani-Tatopani Kund, 1650 m, 27°53' N, 85°55'E, 06.06.2014, Pradhan RSG631; Ramche, 1250 m, 27°47' 11"N, 85°55'E, 27.07.2014, Pradhan RSG722; Bhimtat- Melamchi 800 m, 27°50'07" N, 85°34'40"E, 31.08.2014, Pradhan & al. RSG 1031; Thudikhel- Chautara, 1450 m, 27°46' 30"N, 85°42'62E, 24.09.2014, Pradhan & al. RSG 1109; Banghari- Kubinde, 1040 m, 27°47'1"N, 85°44'41" E, 25.09.2014, Pradhan et al RSG 1138; Sahele-Ramche-8,960 m, 01.02.2015, Pradhan & al.. RSG 1498; Tatopani, 1490 m, 27°56'49" N, 85°57'5" E, 31.01.2015, Pradhan & al.. RSG 1507 .	**C**
Hypnaceae	*Ptiliem crista-cristensis*	Golche-Kubeshwar, 1300 m, 27°52'N, 85°45'E, 12.05.2014, Pradhan & al.. RSG 599; Maneswara, 1360 m, 27°49'N, 85°52'E, 13.05.2014, Pradhan & al. RSG 600.	**FC**
Hypnaceae	*Taxiphyllum taxirameum* (Mitt.) Fleisch.	Mangkha- Jure, 780 m, 27°45'56" N, 85°52'39"E, 10.05.2014, Pradhan *et al.* RSG 583; Barhabise-Kopheshwar temple, 950 m, 27°42'11" N, 85°53'53"E, 06.06.2014, Pradhan RSG 650; Simdhara- Melamchi, 820 m, 27°49' 41"N, 85°34'24"E, 04.09.2014, Pradhan & al. RSG 755; .Jalbire- Simle, 860 m, 27°49'N, 85°55'E, 22.07.2014, RSG 690c.; Chautara Bazar, 1360 m, 27°48'29"N, 85°43'2" E, 20.09.2014, Pradhan & al. RSG 854; Batase- Jalbire, 930 m, 27°47' 16"N, 85°45'17"E, 26.09.2014, Pradhan & al. RSG 873;. Lamosnaghu- Mangkha, 850 m, 28.12.2014, Pradhan & al. RSG 1473; Ramche-7, 966 m, 29.12.2014, Pradhan *et al*. RSG 1460; Sahele-Ramche-8,960 m, 01.02.2015, Pradhan & al.. RSG 1495; Tatopani, 1490 m, 27°56'49" N, 85°57'5" E, 31.01.2015, Pradhan & al.. RSG 1508.	**C**

Leskeaceae	*Lescuraea incurvata*	Listikot- Chaku, 1240 m, 27°53’ N, 85°55’E, 08.06.2014, Pradhan & al. RSG 626.	**R**
Plagiotheciaceae	*Plagiothecium neckeroideum* B.S.G.	Gaurati- Chautara, 1510 m, 27°46’24”N, 85°43’30” E, 24.09.2014, Pradhan & al. RSG 837b; Virkuna-Chautara, 1310 m, 27°46’24”N, 85°43’30” E, 25.09.2014, Pradhan & al. RSG 862; Ranitar- Batase, 910 m, 27°47’47”N, 85°45’30” E, 27.09.2014, Pradhan & all. RSG 877.	**FC**
Rhytidiaceae	*Rhytidium rugosum* (Hedw.) Kindb.	Barhabise-Ramche, 956 m, 27°47’17” N, 85°53’56”E, 20.07.2014, Pradhan RSG 1426; Melamchi, 870 m, , 27°50’N, 85°34’ E, 04.09.2014, Pradhan & al. RSG1036; Purana Bazar- Chautara, 1300 m, 20.09.2014, Pradhan & al RSG 1107; Ramche-7, 956 m, 27°47’17”N, 85°53’56”E, 29.12,.2014, Pradhan *et al*. RSG 1426	**Beetle larvae** **FC**
Stereophyllaceae	*Entodontopsis anceps* (Bosch & Sande Lac.) Buck & Ireland	Karkitar- Sanga chok, 1030 m, 27°53’ N, 85°55’E, 08.06.2014, Pradhan & al. RSG 1091; Purana Bazar- Chautara, 1300 m, 20.09.2014, Pradhan & al RSG 1108; Jalbire, 790 m, 27°46’58”N, 85°46’06” E, 27.09.2014, Pradhan et al RSG 11136. .	**FC**
Stereophyllaceae	*Entodontopsis leucostega* (Bred.) Buck & Ireland	Gaurati- Chautara, 1530 m, , 27°47’ 8”N, 85°42’45”E, 24.09.2014, Pradhan & al. RSG 1106; Jalbire, 790 m, 27°46’58”N, 85°46’06” E, 27.09.2014, Pradhan et al RSG 1137.	**FC**
Stereophyllaceae	*Entodontopsis wightii* (Mitt.) Buck & Ireland	Jalbire, 790 m, 27°46’58”N, 85°46’06” E, 27.09.2014, Pradhan et al RSG 1022.	**FC**
Thuidaceae	*Abietinella abietina* (Hedw.) Broth.	Barhabise- Kopheshwar, 890 m, 27°47’ N, 85°53’E, 11.06.2014, Pradhan RSG632,	**FC**
Thuidaceae	*Haplocladium angustifolium* (Hampe & C. Muell.) Broth.	Bhulbhule-Thulo Sirubari, 1380 m, 27°43’ N, 85°42E, 22.09.2014, Pradhan & al. RSG 1089, Irkhu, 1370 m, 21.09.2014, Pradhan & al. RSG 1070; Gaurati- Chautara, 1530 m, 27°47’ 8”N, 85°42’45”E, 24.09.2014, Pradhan & al. RSG 1105	**FC**
Thuidaceae	*Herpetineuron toccoae* (Sull. & Sesque) Cardot.	Listikot- Pasang, 1400 m, 27°53’ N, 85°53’E, 07.06.2014, Pradhan RSG 654: Jure- Mangkha-4, 780 m, 27°45’56” N, 85°52’39”E,21.07.2014, Pradhan & al.; RSG 679; Irkhu, 1360 m, 27°45’N, 85°45’E, 22.09.2014, Pradhan & al. RSG 1071.	**R**
Thuidaceae	*Thuidium cambifolium* Dozy & Molk.	Barhabise-Sunkoshi forest, 980 m, 27°52’11” N, 85°45’5”E, 20.07.2014, Pradhan RSG690c; Barhabise-Dharpa,1400 m, 27°49’ N, 85°55’E, 20.07.2014, Pradhan RSG677; Gupha Danda-Melamchi,1250 m, 31.08.2014, Pradhan & al. RSG1037; Gaurati- Chautara, 1500 m, , 27°47’ 8”N, 85°42’45”E, 24.09.2014, Pradhan & al. RSG 842; Ramche-7, 986 m, 29.12.2014, Pradhan & al. RSG 1428; Tatopani, 1600 m, 30.12.2014, Pradhan *et al*. RSG 1479	**C**

Thuidaceae	*Thuidium glaucinoides* Broth.	Jalkani-Irkhu, 1470 m, 27°44'N, 85°45'E, 21.09.2014, Pradhan & al. RSG 1072.	**R**
Thuidaceae	*Thuidium meyenianum* (Hamp.) Dozy & Molk.	Jalbire, 950 m, 27°52'11" N, 85°45'5"E, 23.07.2014, Pradhan & al. RSG 693b.	**R**
Thuidaceae	*Thuidium tamariscellum*	Barhabise-Sunkoshi forest, 980 m, 27°52'11" N, 85°45'5"E, 20.07.2014, Pradhan & al. RSG693c; Gupha Danda-Melamchi,1250 m, 31.08.2014, Pradhan & al. RSG1038; Gaurati- Chautara, 1500 m, 27°47' 8"N, 85°42'45"E, 24.09.2014, Pradhan & al. RSG 1104;	**C**
Leucobryales			
Leucobryaceae	*Octoblepharum albidum*	Barhabise-Sunkoshi forest, 980 m, 27°52'11" N, 85°45'5"E, 20.07.2014, Pradhan RSG 678; Pahadi gaun-kadamVDC, 900 m, 21.07.2014, Pradhan & all RSG 661; Jalbire, Bazar, 790 m, , 27°46' 58"N, 85°46'06"E, 27.09.2014, Pradhan & al RSG 897; Ramche-7, 1000 m, 29.12.2014, Pradhan *et al*. RSG 1435.	**FC**
Orthotrichales			
Orthotrichaceae	**Macromitrium moorcroftii* (Hook. & Grev.) Schwaegr.	Patalepani- Chautara, 1530 m, 27°47'8" N, 85°42'45"E, 24.09.2014, Pradhan & al. RSG 847.	**R**
Orthotrichaceae	*Macromitrium nepanense* (Hook. & Grev.) Schiffn.	Ban Sanghu-Jalbire, 920 m, 27°48'15" N, 85°45'55" E, 22.07.2014, Pradhan & al. RSG704.	**R**
Polytrichales			
Polytrichaceae	*Pogonatum junghuhnianum* (Dozy & Molk.) Dozy & Molk.	Danda Gaun- Ghumthang, 1520 m, 06.05.2014, Pradhan & al. RSG 663; Liping- Tatopani, 1550 m, 27°45'N, 85°57'E, 31.01.2015, Pradhan & al 1517.	**FC**
Polytrichaceae	*Pogonatum microphyllum* (Dozy & Molk.) Dozy & Molk.	Kubinde-Batase, 990 m, 27°47'14" N, 85°45'30" E, 28.09.2014, Pradhan & al.. RSG 1135; Tatopani, 1490 m, 27°56'49" N, 85°57'5" E, 31.01.2015, Pradhan & al.. RSG 1490; Liping-Tatopani, 1550 m, 27°45'N, 85°57'E, 31.01.2015, Pradhan & al 1515.	**C**
Polytrichaceae	*Pogonatum microstomum* (Schwaegr.) Brid.	Golche- Baikunthe, 1350 m, 27°54' N, 85°46'E, 11.05.2014, Pradhan RSG 588; Syaule-Chautara, 1400 m, 27°46'55"N, 85°42'38"E, 25.09.2014, Pradhan & al. RSG 1026; Batase, 930 m, 27°47'16"N, 85°45'7"E, 26.12.2014, Pradhan *et al* RSG 1133; Chimlingbasi -Dhimeri, 1276 m, 27°76'61"N, 85°83'31"E, 26.12.2014, Pradhan *et al* RSG 1458; Tatopani, 1490 m, 27°56'49" N,	**C**

		85°57’5” E, 31.01.2015, Pradhan & al.. RSG 1489; Liping- Tatopani, 1550 m, 27°45’N, 85°57’E, 31.01.2015, Pradhan & al 1514.	
Polytrichaceae	*Pogonatum neesii* (C. Muell.) Dozy & Molk.	Kubinde-Batase, 930 m, 27°47’16” N, 85°45’17” E, 28.09.2014, Pradhan & al.. RSG 1134	**R**
Polytrichaceae	*Pogonatum muticum* Broth.	Syaule- Chautara, 1480 m, 27°45’05 N, 85°42’46”E, 21.09.2014, Pradhan *& al.* RSG 826.	**R**
Polytrichaceae	*Polytrichum commune* Hedw.	Listikot- Pasa 1400 m, 27°53’ N, 85°53’E, 07.06.2014, Pradhan & al. RSG 636.; Gaurati-Chautara, 1500 m, , 27°47’ 8”N, 85°42’45”E, 24.09.2014, Pradhan & al. RSG 1102; Liping-Tatopani, 1550 m, 27°45’N, 85°57’E, 31.01.2015, Pradhan & al 1516.	**C**
Pottiales			
Pottiaceae	*Anoectangium thomsonii* Mitt.	Barhabise-Thulopalati, 1150 m, 27°54’ N, 85°48’E, 06.06.2014, Pradhan & al. RSG617.	**FC**
Pottiaceae	**Barbula convoluta* Hedw.	Sano Bhanjyang- Jalbire, 800 m, 27°49’13” N, 85°46’13” E, 28.09.2014, Pradhan & al.. RSG 906	**R, new**
Pottiaceae	*Barbula constricta* Mitt.	Karkitar- Sanga chok, 1030 m, 27°53’ N, 85°55’E, 08.06.2014, Pradhan & al. RSG 1092; Bag-Bazar- Chautara, 1270 m, 27°16’30” N, 85°42’62” E, 25.09.2014, Pradhan & al. RSG 1101; Kubinde Khola, 870 m, 27°17’17” N, 85°44’57” E, 25.09.2014, Pradhan & al. RSG 1132.	**FC**
Pottiaceae	*Barbula indica* (Hook.) Spring.	Gaurati- Chautara, 1500 m, , 27°47’ 8”N, 85°42’45”E, 24.09.2014, Pradhan & al. RSG 1103; Kubinde	**R**
Pottiaceae	*Barbula cylindrica* (Tays.) Schimp.	Syaule- Chautara, 1480 m, 27°45’ 05”N, 85°42’46E, 25.09.2014, Pradhan & al. RSG 1111;	**FC**
Pottiaceae	*Bryoerythrophyllum recurvirostrum* (Hedw.) Chen	Ranitar-Batase, 860 m, 27°47’ 37”N, 85°45’30”E, 09.2014, Pradhan & al. RSG 883b (NHM);	**FC**
Pottiaceae	*Hydrogonium arcuatum* (Griff.) Wijk. & Marg.	Jalbire-Balefi, 850 m, 27°43’ 58”N, 85°46’50”E, 22.07.2014, Pradhan & al. RSG 666; Tar-Melamchi, 870 m, 27°50’ 31”N, 85°34’15”E , 04.09.2014, Pradhan & al. RSG 1039; Mulabari-Irkhu, 1470 m, 21.09.2014, Pradhan & al. RSG 807; Kaptan Pati- Chautara, 1340 m, 27°45’ 20”N, 85°42’01”E, 25.09.2014, Pradhan & al. RSG 858; Jalbire- Kuni Goun, 800 m, , 27°50’ 31”N, 85°46’15”E, 28.09.2014, Pradhan & al. RSG 1024; Chimlingbasi-Dhimeri, 1276 m, 27°76’61”N, 85°83’31”E, 26.12.2014, Pradhan *et al* RSG 1434, RSG 1440; Ramche-7, 956 m, 27°47’17”N, 85°53’56”E, 29.12,.2014, Pradhan *et al*. RSG 1462; Tatopani, 1600 m, 30.12.2014, Pradhan *et al*. RSG 1471; Tatopani, 1490 m, 27°56’49” N, 85°57’5” E, 31.01.2015, Pradhan & al.. RSG 1486;	**C**

		Sahele-Ramche-8,960 m, 02.02.2015, Pradhan & al. RSG 1500; Phepegaun-Ramche, 1240 m, 27°46'N, 85°53'E, 03.02.2015, Pradhan & al 1523. .	
Pottiaceae	*Hymenostylium recurvirostre* (Hedw.) Dix. var. *aurantiacum* (Mitt.) Gangulee	Bag-Bazar- Chautara, 1270 m, 27°16.30" N, 85°42'62" E, 25.09.2014, Pradhan & al. RSG 863; Aldanda- Batase, 990 m, 27°47'14" N, 85°45'30" E, 25.09.2014, Pradhan & al. RSG 1131.	**R**
Pottiaceae	*Hyophila involuta (*Hook.) A. Jaeger	Barhabise- Kopheshwar, 890 m, 27°47' N, 85°53'E, 11.06.2014, Pradhan RSG 635; Barhabise-Sunkoshi forest, 980 m, 27°52'11" N, 85°45'5"E, 20.07.2014, Pradhan RSG 681b; Dovan tar-Melamchi, 820 m, 31.08.2014, Pradhan & al.. RSG 800; Kaptan Pati- Chautara, 1340 m, 25.09.2014, Pradhan & al. RSG 857; Sano Sirubari, 1300 m, 27°46'N, 85°43'E, 21.09.2014, Pradhan & al. RSG 1075; .Karkitar- Sanga Chok, 1030 m, 23.09.2014, Pradhan & al RSG1073; Chimlingbesi-Dhimeri- Mangkha, 1276 m, 27°76'61" N, 85°83'31" E, 28.12.2014, Pradhan & al.. RSG 1446; Dhimeri, 1250 m, 28.12.2014, Pradhan & al. RSG 1447; Tatopani, 1490 m, 27°56'49" N, 85°57'5" E, 31.01.2015, Pradhan & al.. RSG 1488.	**C**
Pottiaceae	**Hyophila nymaniana* (Fleisch.) Menzel.	Chimlingbesi- Dhemeri -Mangkha, 1276 m, 27°76'61" N, 85°83'31"E, 28.12.2014, Pradhan & al.. RSG 1445, RSG 1448 (NHM).	**R**
Pottiaceae	*Hyophila rosea* Williams	Barhabise-Sunkoshi forest, 910 m, 27°52'11" N, 85°45'5"E, 20.07.2014, Pradhan & al. RSG 709.; Chimlingbesi-Dhimeri- Mangkha, 1276 m, 27°76'61" N, 85°83'31" E, 28.12.2014, Pradhan & al.. RSG 1445.	**R**
Pottiaceae	*Merceya gediana* (Lac.) Nog.	Sano Bhanjyang- Jalbire, 800 m, 27°49'18" N, 85°46'13"E, 28.09.2014, Pradhan & al. RSG 913; Chautara, 1360 m, 27°48'29" N, 85°43'2"E, 25.09.2014, Pradhan & al. RSG 1130.	**FC**
Pottiaceae	*Semibarbula orientalis* (F. Weber) Wijk & Margad	Mangkha-Khadichour, 850 m, 27°40' N, 85°45'E, 05.06.201`4, Pradhan & al. RSG621	**FC**
Pottiaceae	*Weissia edentula* Mitt.	Kadambas-Simle, 900 m, 27°45'N, 85°46'E, 09.05.2014, Pradhan & al. RSG597.	**FC**
Pottiaceae	**Weisiopsis angulosa* (Broth.) Beih.	Ranitar-Batase, 860 m, 27°47'07" N, 85°45'30"E, 27.09.2014, Pradhan & al. RSG 888;	**R**

Appendix II

New Records of Bryophytes for Nepal

Families	Latin names	Proper Locality	Habitat	Voucher No.
Hepaticae				
Aneuraceae	*Riccardia incurvata* Lindb.	Chimlingbesi- Mangkha, 1200 m	Stream side	RSG 1454.
Calypogeiaceae	*Calypogeia arguta* Mont. & Nees	Barhabise-Sunkoshi forest, 980 m, RSG 682.	Soil	RSG 682
Calypogeiaceae	*Calypogeia suecica* (H. Arn. & J. Press) K. Muell.	Jalbire- Ban Sangu, 920 m,	Bark	RSG 703.
Cephaloziaceae	*Cephalozia bicuspidata* (L.) Dumort.	Sipaghat-Melamchi, 800 m,	Boulder stone	RSG 782
Cephaloziellaceae	*Cephaloziella calyculata* (Durieu. & Mont.) K, Muell,	Jalbire, 790 m,	Soil	RSG 899b
Fossombroniaceae	*Fossombronia cristula* Aust.	Barhabise- Ramche, 935 m	Mountain slope	RSG 1430.
Frullaniaceae	*Frullania teneriffae* (F. Weber) Nees	Tatopani-Tatopani Kund, 1650 m	Bark	RSG 648.
Jungermanniaceae	*Jungermannia crinulata* Smith	Thulo Sirubari, 1460 m,	Soil	RSG 1017
Jungermanniaceae	*Jungermannia paroica* (Schiffn.) Griff.	Melamchi Ghat, 800 m,	Rock	RSG 789b
Jungermanniaceae	*Jungermannia subelliptica* (Lindb. ex Kaal.) Lev.	Syaule-Chautara, 1460 m; Gaurati-Chautara,1500-160 m Patali panii-Chautara, 1530 m,	Soil, mountain slope	RSG 812; RSG 836; RSG 839;

		Jalbire, 830 m Ramche-7, 1000 m,		RSG 894; RSG 1432
Metzgeriaceae	*Metzgeria fruticulosa* (Dicks.) Evans	Sano Bhanjyang-Jalbire, 800 m,	Wet stone	RSG 905
Pallaviciniaceae	*Pallavicinia subciliata* (Aust.) Steph.	Bahunpati Community Forest- Melamchi, 1000 m	Rock	RSG 775.
Ricciaceae	*Riccia canaliculata* Hoffm.	Ranitar-Batase, 860 m, Sera- Jalbire, 820 m,	Mountain slope	RSG 883a; RSG 889
Ricciaceae	*Riccia cavernosa* Hoffn.	Sano Bhanjyang- Jalbire, 820 m	Stone wall	RSG 911.
Musci				
Bartramiaceae	*Bartramidula bartramioides* (Griff.) Wijk & Marg.	Daurali- way to Jalbire, 1230 m	Stone wall, Rock	RSG 867
Dicranaceae	*Microdus brasiliensis* (Dub.) Ther.	Thulo Sirubari, 1420 m, Virkuna- Chautara, 1360 m,	Mountain slope	RSG 1025; RSG 1129.
Fissidentaceae	*Fissidens serratus* C. Muell.	Chimling-Purano Gaun, Mangkha, 1276 m	Rock	.RSG 1456
Mniaceae	*Mnium pseudopunctatulum* Bruch. & Schimp.	Chimlingbesi-Dhimeri- Mangkha, 1275 m	Rock	RSG 1444.
Orthotrichaceae	*Macromitrium moorcroftii* (Hook. & Grev.) Schwaegr.	Patalepani- Chautara, 1530 m		RSG 847.
Pottiaceae	*Barbula convoluta* Hedw.	Sano Bhanjyang- Jalbire, 800 m	Stone	RSG 906
Pottiaceae	*Hyophila nymaniana* (Fleisch.) Menzel.	Chimlingbesi- Dhemeri -Mangkha, 1276 m	Soil	RSG 1448
Pottiaceae	*Weisiopsis angulosa* (Broth.) Beih.	Ranitar-Batase, 860 m	Rock	RSG 888

Appendix III

Fern Diversity associated with Bryophytes

Serial No.	Latin names	Families	localities	Altitude	Status
1.	*Adiantum capillusus- beneris* L.	Adeantaceae	Golche-Tarke; Golche- Baikunthe; Barhabise- Sunkoshi; Jalbire- Kartike	950-1300	C
2	*Adiantum fimbriatum* Christ.	Adeantaceae	Dhimeri- Mangha-4	1600	R
3	*Adiantum philippense* L	Adeantaceae	Panighat- Melamchi; Gaurati- Chautara	850-1500	FC
4	*Azolla imbricata* (Roxb.) Nakal.	Salviniaceae	Kubheshwar- Barhabise; Bhote Koshi- Tatopani; Sahele- Ramche; Jalbire	1300-1500	FC
5	*Botrychium lanuginosum* Wall. Ex Hook. & Grev.	Botrychiaceae	Paire, Kubinde, Batase, Jalbire	1250- 1500	FC
6	*Cheilanthus anceps* Blanf.	Pteridaceae	Barhabise -Sunkoshi forest; Kadambas-Simle; Tatopani- Tatopani Kund Garden; jalbire –Paire.	950-1220	C
7	*Cheilanthus bicolor* (Roxb. In Griff.) Griff. ex Frax.-Jenk.	Pteridaceae	Kadambas –Simle; Golche- Baikunthe	900-1350	FC
8	*Cheilanthus dubia* C. Hope	Pteridaceae	Dhimeri- Chimlingbesi- Mangkha; Gaurati- Chautara	1400-1500	FC
9	*Diplazium esculentum* (Retz.) Sw.	Aspidiaceae	Barhabise- Sunkoshi forest; Kadambas-Kodari; Listikot-Chaku; Ramche-Ratmate; Ramche- Purana Gaun	850-1300	MC
10	*Diplazium javanicum* (Bl.) Makino	Aspidiaceae	Ramche-Ramche; Listikot-Chaku; Tatopani- Tatopani Kund Garden	1200-1300	C
11	*Diplazium maximum* (D.Don) C. Chr.	Aspidiaceae	Barhabise-Dharpa	1420	R
12	*Dryopteris pulcherrima*	Dryopteridaceae	Listikot- Chaku Bazar- Tatopani; Barhabise- Sunkoshi forest	950- 1500	FC

14.	*Equisetum diffusum* D. Don	Equisetaceae	Barhabise -Sunkoshi forest; Golche-Kause; jalbire- Simle	860-1300	C
15	*Equisetum ramosissimum* Desf.	Equisetaceae	Mangkha- Jure; Mangkha-Khadichour; Golche-Baikunthe; Listikot-Chaku	780-1300	C
16	*Gleichenia gigantica* Wall. ex Hook. et bauer.	Gleicheniaceae	Chaku-Listikot; Ghumthang- Danda Gaun; Saubesi- Ramche-8; Sano Bhanjyang, Daurali-Jalbire	1000-1500	C
17	*Lycopodium japonicum Thunb.ex A. Myrray*	Lycopodiaceae	Listikot- Pasang; Barhabise-Dharpa	1400	FC
18.	*Lygodium flexuasum* L.	Schizaeaceae	Sunkoshi forest -Barhabise;	950	R
19.	*Nephrolepis cordifolia* (L.) Presl.	Dryopteridaceae	Khosanibari- Barhabise; Sunkoshi- Barhabise; –Jure, Chipling, Dhimeri—Mangkha; Chaku-Listikot; Danda Gaun; -Ghumthang; Sano Sirubari; Kubinde-Batase.	780-1500	MC
20.	*Onychium siliculosum* (Desv.) C. Chr.	Pteridaceae	Mangkha-Jure; Barhabise-Sunkoshi forest;Kadambas-Sukute; Kadambas-Simle; Listikot-Chaku; Golche- Baikunthe	780-1550	MC
21	*Ophioglossum reticulatum* L.	Ophioglossaceae	Melamchighat- Melamchi	850	FC
22	*Polystichum sp.*	Dryopteridaceae	Sahele-Ramche; Daurali-Jalbire;	1200-1400	FC
23.	*Pteris vitatta* Linn.	Pteridaceae	Barhabise- Khosanibari; Barhabise-Sunkoshi; Chaku -Listikot;	950-1300	C
24	*Selaginella chrysocaulos (Hook. & Grev.) Spring.* (D.Don) Spring.	Selaginellaceae	DovanTar- Melamchi; Thulo Sirubari-Chautara; Gaurati-Chautara; Sera; Daurali-Jalbire	950-1550	FC
25.	*Selaginella pinnata* (D.Don) Spring.	Selaginellaceae	Barhabise- Khosanibari; Barhabise-Sunkoshi forest	950-1000	FC

Appendix IV

Floral Diversity

S. No.	Latin names	Families	Localities	Altitude m.	Local Status
HERB					
1	*Ageratum conizoides* L.	Compositae	Chimlingbesi -Mangkha	850-1500	MC
2	*Ageratum houstanianum* Miller	Compositae	Irkhu; Mayelchour-Chautara; Bahunpati- Melamchi Kubinde- Batase	850-1400	MC
3	*Altermanthera philoxeroides*	Amaranthaceae	Sunkoshi- Bahrabise	850-1500	MC
4	*Amaranthus spinosus* L.	Amaranthaceae	Listikot-Chaku; Golche on the way	1240- 1350	C
5	*Amaranthus viridis* L.	Amaranthaceae			C
6	*Ananus comosus* (L.) Merr.	Bromeliaceae	Sipaghat- Melamchi	800-850	R
7	*Anomum aromaticum* Roxb.	Zingiberaceae	Chimlingbesi- Mangkha,	1250	FC
8	*Argemone maxicana* L.	Papaveraceae	Pahadi Gaun; Chimlingbesi- Mangkha- Kadambas- Simle	850-1200	FC
9	*Arisaema tortuosum* (Wall.) Scott.	Araceae	SunKoshi- Bahrabise	850	R
10	*Begonia ovalifolia* DC	Begoniaceae	Tatopani- Kund Garden Kubinde-Batase	1560	R
11	*Begonia picta* Smith.	Begoniaceae	Listikot-Panglang; Selang	1150-1650	FC
12	*Centipede minima* (L.) A. Br. & Aschers.	Compositae	Sunkoshi forest- Barhabise Gaurati - Chautara	890-1400	FC
13	*Chenopodium botrys*	Chenopodiaceae	Chaku Bazar -Tatopani	1500	FC
14	*Coelogyne cristata* Lindl.	Orchidaceae	Dhimeri- Chimling;	1300	FC

			Saheli- Ramche		
15	*Commelina benghalensis* L.	Caryophyllaceae	Sunkoshi forest- Barhabise; KhadiChour - Mangkha	810	C
16	*Cuphea* sp.	Lythraceae	Sunkoshi forest- Barhabise -	950	FC
17	*Cyperus iria* L.	Cyperaceae	Sunkoshi forest – Barhabise Chimlingbesi- Mangkha,	800-1250	C
18	*Desmostachya bipinnata* (L.) Stapf.	Graminae	Chimlingbesi- Mangkha; Sahele- Ramche	1200-1400	C
19	*Drymaria diandra* Blume	Caryophyllaceae	Purana Gaun- Mangkha, Khorsani bari-Barhabise; Ramche	900-1400	C
20	*Eclipta prostrata* (L.) L.	Compositae	Sunkoshi forest- Barhabise	950	C
21	*Euphorbia hirta* L.	Euphorbiaceae	Jure-Mangkha; Chimlingbesi- Mangkha, Saheli- Ramche-8	780-1400	C
22	*Euphorbia millii* Desmoul.	Euphorbiaceae	Jure-Mangkha; Khadichour; Chimlingbesi; Saheli- Ramche-8	780-1450	FC
23	*Fagopyrum esculentum* Moench	Polygoniaceae	Chaku – Listikot; Dhimeri- Mangkha, Saubesi- Ramche-8	1240 1550	FC
24	*Fragaria rubicola Lindt. Ex Lacaita*	Rosaceae	Saubesi- Ramche-8	1200	FC
25	*Galinsoga parviflora* Cav.	Compositae	Mangkha- Pahadi Gaun; Dhimeri - Mangkha Simle;Kadambas Saubesi- Ramche-8	850- 1470	MC
26	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitacea e	Bhote Koshi dam site -Tatopani	1450	R
27	*Hypericum oblongifolium* Choisy	Clusiaceae	Panighat- Melamchi; Gaurati-Chautara; Jalbire Tatopani	800-1500	C
28	*Hypericum uralum* Buch.-Ham.ex D.Don	Clusiaceae	Panighat, Dovantar- Melamchi; Gaurati-Chautara Bhotekoshi-Tatopani	1200-1500	C
29	I*nula cappa* DC.	Compositae	Sunkoshi- Barhabise; Sipaghat- Melamchi; Kubinde Khola- Batase;	950- 1440	C

			Chimlingbesi - Mangkha		
30	*Leonotis nepataefolia* (L.) Aiton	Leguminosae	Dhimeri- Mangkha, Saubesi- - Ramche-8	1400-1500	FC
31	*Mimosa pudica* L.	Leguminosae	Larcha - Tatopani -	1520	R
32	*Mintha arvensis* L.	Labiateae	Khorsanibari - Barhabise	900	C
33	*Mintha spicata* L.	Labiateae	Khorsanibari - Barhabise	900	C
34	*Oxalis corniculata* L.	Oxalidaceae	Bhotekoshi-Tatopani	1350	C
35	*Oxalis latifolia* Humb.	Oxalidaceae	Kubinde-Batase Ramche	1350	FC
36	*Peperomia tetraphylla* (Frost.f.) Hook.f. & Arn.	Piperaceae	Kubinde-Batase	1250	R
37	*Potentella supina* L.	Rosaceae	Sahele- Ramche-8	1200	R
38	*Saussurea heteromala* (D.Don) Hand.-Mazz.	Compositae	Bahunpati- Melamchi Liping- Tatopani	850-1600	FC
39	*Solanum nigrum* L.	Solanaceae	Dharapani- Melamchi; Sahele- Ramche-8	850-1200	C
40	*Stellaria media* (L.) Vill.	Caryophyllaceae	Sahele- Ramche-8 Dovantar- Melamchi	900-1200	C
SHRUBS					
1	*Achyranthes aspera* L.	Amaranthaceae	Barhabise-Sunkoshi; Selang	950-1200	C
2	*Achyranthes dentata* Blume	Amaranthaceae	Khadichour- Magkha; Dovantar- Melamchi; Kubinde-Batase	800-950	FC
3	*Agave cantula* Roxb.	Agavaceae	Barhabise; Sahele- Ramche	800- 1200	R
4	*Artemisia indica* Willd.	Compositae	Chimlingbasi – Mangkha Sahele- Ramche	850-1400	FC
5	*Asparagus offisinal* B.L.	Liliaceae	Phulphing VDC		R
6	*Asparagus racemosus* Wild.	Liliaceae	Bandau Check post- Barhabise		

7	*Berberis aristata* DC	Berberidaceae	Balephi; Barhabise; Thulo Sirubari- Chautara; Sahele- Ramche	800-1200	C
8	*Bidens pilosa* L.	Compositae	Dovantar- Melamchi; Chimlingbasi; Dhimeri – Mangkha; Sahele- Ramche	1450- 1470	FC
9	*Buddleja aasiatica*	Loganiaceae	Lamosangu – Mangkha Barhabise-Ramche Selang	850-1500	C
10	*Callicarpa macrophylla* Vahl.	Verbenaceae	Bahunpati Community Forest - Melamchi	1250	R
11	*Calotropis gigantia* (L.) Dryand.	Asclepiadaceae	Dovantar- Melamchi; Chimlingbasi - Mangkha	850-1450	FC
12	*Cannabis sativa* L.	Cannabaceae	Barhabise-Sunkoshi; Khadichour – Mangkha; Kubinde-Batase Ramche-7	850-1250	C
13	*Cassia fistula* L.	Legumonosae	Lamosangu – Mangkha Barhabise- Ramche	860 -935	C
14	*Cassia floribunda* Cav.	Legumonosae	Lamosangu – Mangkha Barhabise-Ramche	860- 935	C
15	*Clerodendron cerratum*	Labitae	Indrawati-Melamchi; Irkhu Sano Sirubari- Chautara Kubinde-Batase Golche- on the way Barhabise-Ramche	890-1450	MC
16	*Clerodendron viscosum*	Labitae	Jalbire	950	C
17	*Colebrookea oppositifolia* Sm.	Lamiaceae	Purana Gaun – Chimling; Dovantar-Melamchi	850-1400	C
18	*Crotolaria alata* Buch.- Ham. ex D.Don	Legumonosae	Sunkoshi - Barhabise; Chaku -Listikot	950-1250	FC
19	*Daphne bholua* Buch.- Ham. ex D. Don	Thymelaeaceae	Sunkoshi;- Barhabise	950	FC
20	*Dhtura stramonium* L.	Solaniaceae	Balephi- Jalbire	850	FC
21	*Drepanostachyum intermedum* (Munro) Keng.	Gramminae	Purana Bazar- Mangkha	1440	FC

22	*Durenta repens* L.	Verbenaceae	Barhabise- Khorsanibari	900	R
23	*Eragrotis atrovirens (Deaf.) Trin.*	Gramminae	Lamosangu- Mangkha; Barhabise- Ramche; Sunkoshi forest- Barhabise	800-1500	C
24	*Eupatorium adenophorum* Spreng.	Compositae	Phulping Danda; Pothe; Chimlingbasi - Mangkha	1400-1`450	C
25	*Euphorbia royleana* Boiss	Euphorbiaceae	Ramche-Ratmate	1200	R
26	*Ficus semicordata* Buch.-Ham. ex Sm.	Moraceae	Lamosangu- Mangkha; Barhabise- Ramche Sahele- Ramche-8	860- 1200	C
27	*Jasminum officinale* L.	Oleaceae	Kopheswar-Sunkoshi – Barhabise; Khorsanibari- Barhabise; Melamchi; Kubinde-Batase	900-1150	FC
28	*Jatropha curcas* L.	Euphorbiaceae	Jalbire	900	FC
29	*Justicia adhatoda* L.	Acanthaceae	Sunkoshi forest- Barhabise; Melamchi Dovan- Melamchi; Chimlingbasi – Mangkha	950 1450	FC
30	*Lantana camara* L.	Verbenaceae	Sunkoshi forest- Barhabise; Jalbire in the way; Chimlingbasi - Mangkha	950- 1500	MC
31	*Maesa chisia* Buch.-Ham. ex D. Don	Myrsinaceae	Barhabise- Dharpa	1400	FC
32	*Mauhonia nepalensis* DC	Berberidaceae	Saubesi- Ramche-8; Batase-Jalbire	1200-1400	FC
33	*Mirabilis jalapa* L.	Nectaginaceae	Sunkoshi forest- Barhabise; Mangkha-Jure;Maneswara; Sepaghat- Melamchi	780-1200	C
34	*Morus nigra* L.	Moraceae	Chimlingbasi - Mangkha	1300-1450	C
35	*Osbeckia nepalensis*	Melastomaceae	Jalbire	1010	R
36	*Osbeckia stellata* Buch.-Ham ex D.Don	Melastomaceae	Simle-Kadambas; Barhabise-Kupheshwor; Gaurati- Chautara; Kubinde-Batase Balephi -Jalbire;	860-1570	MC

			Chimlingbasi – Mangkha Saheli- Ramche-8		
37	*Phragmites karka* (Retz.) Trin. Ex Steudel	Gramineae	Sukute - Kadambas	920	FC
38	*Rubus ellipticus* Smith	Rubiaceae	Kubinde-Batase Larcha; Liping- Tatopani; Chimlingbasi - Mangkha	1450-1600	FC
39	*Sida rhombifolia* L.	Malvaceae	Saheli- Ramche-8	1200	C
40	*Thysanoleana maxima* (Roxb.) O. Kuntze	Gramineae	Khadichour; Chimlingbasi – Mangkha; Saheli- Ramche-8	900-1450	FC
41	*Urtica dioca* L.	Urticaceae	Bahunpati-Melamchi; Jalbire	850-950	C
42	*Woodfordia fruticosa* (L.) Kurz.	Lythraceae	Al Danda-Batase	1000	R0
43	*Xanthium strumarium* L.	Compositae	Barhabise-Kupheshwor;	860	FC
CLIMBERS					
1	*Abrus precatorius* L.	Leguminosae	Kadambas- Simle	860	R
2	*Cuscuta reflexa* Roxb.	Convolvulaceae	Sunkoshi forest -Barhabise	800- 950	C
3	*Dioscorea deltoids*	Dioscoreaceae	Bahunpati- Melamchi Irkhu	850-1000	FC
4	*Dioscorea sagittata* Royle	Dioscoreaceae	Sunkoshi forest -Barhabise	950	FC
5	*Ipomoea batatus* (L.) Lam.	Convolvulaceae	Bahunpati- Melamchi Irkhu	850-1000	FC
6	*Ipomoea purpurea* (L.) Roth.	Convolvulaceae	Sunkoshi forest -Barhabise	950	R
7	*Lonicera glabrata* Wall.	Caprifoliaceae	Panighat- Melamchi	850	FC
8	*Momordica dioica* Roxb. ex Willd.	Cucurbitaceae	Sukute-Mangkha	800	R
9	*Smilax ovalifolia* Roxb. ex D.Don	Smilaceae	Sunkoshi forest -Barhabise Golche-Kause	950-1300	R
TREES					

1	*Adina cordifolia* (Wild. ex Roxb.) Benth.- Hook.f. ex Brandis	Rubiaceae	Dolalghat- way to Bandau; Kadambas-Simle	900-950	FC
2	*Aegle marmelos* (L.) Correa	Rutaceae	Bahunpati- Melamchi	850	R
3	*Albizia julibrissin* Durazz.	Leguminosae	Gaurati- Chautara; Saheli- Ramche-8	1200 -1400	FC
4	*Alnus nepalensis* D. Don	Betulaceae	Sano Sirubari- Chautata; Gaurati- Chautara; Mangkha-Chimlinbesi; Thulo Sirubari- Chautara; Sano Bhanjyang – Jalbire Selang	1200-1460	C
5	*Aesandra butyracea* (Roxb.) Baehni	Sapotaceae	Mangkha-Chimlinbesi; Kopheshwar forest area-	920-1460	FC
6	*Agave cantula* Roxb.	Agavaceae	Bandau -Kadambas	900	C
7	Albizia julibrissin Durazz.	Legumonosae	Lamosangu – Mangkha; Thulo Sirubari- Chautata;	860-1400	C
8	*Alnus nepalensis* D. Don	Betulaceae	Sunkoshi; Tatopani Kubinde- Batase	800-1200	C
9	*Azadirachta indica* A. Juss	Meliaceae	Barhabise-Khorsanibari	900	
10	*Bauhinia purpurea* L.	Leguminosae	Purana Gaun, Dhimeri- Mangkha; Barhabise – Ramche -7	1400-1600	FC
11	*Bombax cieba* L.	Bobacaceae	Dolalghat; Thulo Sirubari- Chautata; Chimlingbesi- Mangkha Baehabise- Ramche	800-1450	MC
12	*Callistemon citrinus* (Curtis) Skeels	Myrtaceae	Lamosangu- Mangkha; Khadichour- Mangkha; Irkhu-Chautara Purana Gaun-Ramche;, Suebesi- Ramche-8	840-1320	FC
13	*Castanopsis indica* (Roxb.) Miq.	Fagaceae	Barhabise -Sunkoshi forest; Listikot-Pangsang Jure; Khadichour – Mangkha; Selang Patale Pani- Chautara; Sahele- Ramche-8	800-1400	C

14	*Castanopsis latifolia* (Kura.) Hickel & A. Carnus	Fagaceae	Barhabise -Sunkoshi forest; Listikot-Pangsang	850-1400	C
15	*Celtis australis* L.	Ulmaceae	Barhabise- Kupheshwar	900	FC
16	*Choerospondias axillaris* (Roxb.) B.L. Brutt. & A.W. Hill.	Anacardiaceae	Bahunpati Community Forest-Melamchi; Kubinde- Batase Sahele- Ramche-8	1030-1300	FC
17	*Cinnamomum camphora* (L.) J. Presl.	Lauraceae	Andheri Check post – Kadambas; Bhaise- Kadambas;	860-1000	C
18	*Cinnamomum tamala* (Buch.-Ham.) Nees & Eberm.	Lauraceae	Patalipani- Chautara	1550	FC
19	*Citrus maxima* (Burm.) Herr.	Rutaceae	Purana Gaun- Chimling -Mangkha	1125	R
20	*Colebrookea oppositifolia* Sm.	Lobiaceae	Balephi- Chimlingbesi, Mangkha	850-1450	C
21	*Cleistocalyx operculata (Roxb.) Merr. & Perry*	Myrtaceae	Seubesi- Ramche-8	1200	FC
22	*Dalbergia sisso* Roxb.	Leguminosae	Sukute- Kadambas; Jalbire- Mangkha-Khadichour; Golche-Baikunthe; Sano Sirubari- Chautata; Purana Gaun- Chimling- Mangkha	850-1380	C
23	*Diospyrus kaki* Thunb.	Ebenaceae	Sano Bhanjyang; Sahele- Ramche	800-1200	FC
24	*Elaeocarpus sphaericus* (Gaertn.) K. Schum		Gaurati- Chautara	1550	R
25	*Engelhardia spicata* Leschen ex Brume	Juglandaceae	Bahunpati- Melamchi	900	FC
26	*Eurya acumnata* DC.	Tetramelaceae	Patalepani- Chautara; Selang;	1400	FC
27	*Ficus auriculata* Lour.	Moraceae	Saubesi-Ramche-8	1200	FC
28	*Ficus benghalensis* L.	Moraceae	Kadambas-Bandau; Golcje-Baikhnthe; Sano Sirubari- Chautata; Tatopani Kund; Dhimeri- Chimling	850-1560	C
29	*Ficus benjumina* L.	Moraceae	Gaurati- Chautara	1500	R
30	*Ficus lacor* Buch.- Ham.	Moraceae	Dhimeri- Chimling	1650	R
31	*Ficus racemosa* L.	Moraceae	Gaurati-Chautara,	850-1500	C

			Jalbire Dhimeri- Chimling		
32	*Ficus religiosa* L.	Moraceae	Barhabise-Kopheshwar; Kadambas-Bhaise; Sano Sirubari- Chautata; Tatopani-Tatopani Kund Garden; Ramche -8	800-1550	C
33	*Ficus semicordata* Buch.-Ham ex Sm.	Moraceae	Khadichour – Mangkha; Gaurati-Chautara, Jalbire Dhimeri- Chimling	800-1600	C
34	*Fraxunus floribunda* wall.	Oleaceae	Saubesi-Ramche-8	1200	FC
35	*Grevillea robusta* A. Cunn. ex R. Br.	Proteaceae	Dolalghat- on the way to Barhabise	800-950	R
36	*Juglans regia* L.	Juglandaceae	Saubasi- ramche-8	1200	R
37	*Lagerstroemia indica* L.	Lythraceae	Bandau-Kadambas; Simle Kadambas ; Sano Sirubari- Chautata; Bhaise -Kadambas	800-900	FC
38	*Lionia ovalifolia* (Hook.f.) Drude	Ericaceae	Kubinde- Batase	1200	FC
39	*Litsea monopetala* (Roxb.) Pers.	Lauraceae	Chautara Bazar, Patale Pani; Thulosirubari -Chautara; Melamchi Chimling- Mangkha Sano Bhangyang-]albire; Ramche-8	800-1450	C
40	*Mangifera indica* L.	Anacardaceae	Bandau Kadambas; Bhaise- Kadambas; Thulo Sirubari- Chautata; Lamosangu- Mangkh Daurali- Jalbire	800-1250	MC
41	*Melia azederach* L.	Meliaceae	Sukute –Mangkha; Khosanibari –Barhabise; Jalbire	800-950	C
42	*Morus nigra* L.	Moraceae	Balephi -Jalbire	850	FC
43	*Mucuna pruriens* (L.) DC	Leguminosae	Saubesi-Ramche-8	1200	FC
44	*Mussaenda macrophylla* Wall.	Rubiaceae	Barhabise-Sunkoshi forest; Listikot-Panglang	950-1380	FC

45	*Myrica esculenta* Buch.-Ham. ex D. Don	Myricaceae	Kadambas-Bandau; Thulo Sirubari- Chautata; -Baikhnthe - Golche; Tatopani Kund; Thulo Palati- Barhabise- Golche-Kopicha	850-1560	C
46	*Nerium oleander* Blanco.	Apocynaceae	Kadambas-Bandau; Mangkha-Ban Sanghu	900-1000	R
47	*Nyctanthus arbor-tristis* L.	Oleaceae	Narayanthan-Jalbire; Sunkoshi – Barhabise; Sahele- Ramche	900-1250	C
48	*Oroxylum indicum* (L.) Kurz.	Bignoniaceae	Daurali-jalbire	1230	R
49	*Phyllanthus emblica* L.	Euphorbiaceae	Gaurati-Chautara	1500	R
50	*Quercus glauca* Thunb.	Fagaceae	Barhabisr - Ramche-8	900-1300	FC
51	*Rhus wallichii* Hook.f.	Anacardiaceae	Kuni Gaun-Jalbire	850	FC
52	*Ricinus communis* L.	Euphorbiaceae	Bandau;Kadambas-	800	
53	*Sapium insigne* (Royle.) Benth.ex Hook. f.	Euphorbiaceae	Andheri Check Post; Sera - Jalbire- Kadambas -Bandau; Kadambas –Simle Dovantar- Melanchi Bhaise - Kadambas Dhimeri- Chimling- Mangkha-4	800-1400	MC
54	*Schima wallichii* (DC.) Korth.	Theaceae	Dolalghat- Kadambas Patale Pani; Gaurati – Chautara; Sano Sirubari- Chautata; Selang Sahele- Ramche-8	900- 1550	C
55	*Semicarpus anacardium* L.f.	Anacardaceae	Saubesi-Ramche-8	1200	FC
56	*Shorea robusta* Gaertn.	Dipterocarpaceae	Dolalghat; Sukute; Phulphing Danda; Melamchi; Jure- Mangkha Thulo Sirubari- Chautata; Barhabise- Ramche	780-1200	MC
57	*Symbucus canadensis* L.	Sambucaceae	Balephi Jalbire; Sano Sirubari- Chautata; Sunkoshi-Barhabise; Ramche	850-1250	FC

58	*Terminalia bellirica* (Gaerta.) Roxb.	Cambretaceae	Bahunpati- Melamchi Sano Bhanjyang;	860 -1400	R
Gymnospermae					
1	*Juniperus* sp.	Cupressaceae	Tatopani- Kunda	1560	FC
2	*Pinus roxburghii* Sarg.	Pinaceae	Kadambas-Bandau; Khadichour; Chimling- Mangkha Jalbire-Paire; Batase Mayal Chour- Chautara; Thulo Sirubari- Chautata;	850-1420	C

Appendix V

Faunal Association to Brophyte Habitats

May-August
Elevation Range: 750-1550 m

Serial No.	Family	Fauna	Family
1.	Coleptera	Carabiid Beetle	Carabus sps
2.	Coleoptera	Scarabiid Beetle	Onthiophagus sps
3.	Coleoptera	Chrysomelid beetle	Acropteryx sp
4.	Diptera	Ant fly	Dicranosepsis bicolor
5.	Arachnidae	Orb Weaving Spider	Araneus sps
6.	Arachnidae	Jumping Spider	Saltis sps.
7.	Arachnidae	Sparassid spider	Heteropoda sps.
8.	Arachnidae	Red mite	Epicriopsis sps
9.	Diptera	Chironomid	Chironomid larvae
10.	Diptera	Bibionid Flies	Bibio sps
11.	Diptera	Green Fly	Calliphorid sps
12.	Diptera	Fly	Tachinid sps
13.	Diptera	Mosquito	Anopheles sps
14.	Diptera	Crane Fly	Tipula sps.
15.	Homoptera	Aphid	Capitophorus sps.
16.	Homoptera	Cicada	Cicada
17.	Hemiptera	Seed Bug	Lygaeus sps.
18.	Annelida	Earthworm	Pheritima posthuma
19.	Annelida	Leech	Hirudo medicinalis
20.	Mollusca	Land Snail	Helix pomatia
21.	Gryllotalpidae	Mole Cricket	Gryllotalpa major
22.	Odonata	Damsel Fly	Still to identify
23.	Nematohelminthes	Nematod	Eudorylaimus sp
24.	Reptilia	Lizard	Gecko gecko
25.	Rodentia	Field Rat	Ratus ratus

26.	Rodentia	Squirrel	
27.	Lepidoptera	Arctiid Moth	Spilosoma casignatum
28.	Lepidoptera	Acraeid Butterfly	Acraea issoria
29.	Lepidoptera	Satyrid Butterfly	Melanitis leda
30.	Lepidoptera	Brown Moth	Noctuid sps.
31.	Hymenoptera	Formicid	Formicid ants
32.	Hymenoptera	Ichneumoniid wasp	Megarhyssa sps
33.	Demaptera	Ear Wigs	Forficula sps.
34.	Myriapoda	Diplopod	Millipede

September -November

Elevation Range: 800- 1320 m

SN	Class	Order	Family	Genus and species
1.	Insecta	Diptera	Culicidae	Anopheles culicifacies
2.			Psychodidae	Phleobotomus sps.
3.			Bibionidae	Bibio sp.
4.			Tipulidae	Tipula sp.
5.				
6.		Homoptera	Aphidae	Aphis sp.
7.				Brachysiphoniella sp.
8.			Cicadidae	Cicadas
9.		Hemiptera		Pleotrichophorus sps.
10.				Rhopalosiphum
11.				Greenidea ormosana
12.		Hymenoptera	Tenthredinidae	Lycosa sp.
13.			Chalsiidae	Polistes sps
14.			Apidae	Apis dorsata
15.			Bombydae	Orientalibombus sps
16.		Coleoptera	Ciccindalidae	Orthotrichinus sps

17.				Cicindela virgule
18.			Lampyridae	Luciola cruciata
19.			Cerambycidae	Hoplocerambyx spinicornis
20.			Chrysomelidae	Laccoptera quadrimaculata
21.				Colasposoma semicostatum
22.				Corynodes pyrophorus
23.				Chrysolina sp.
24.				Chrysomela chlorine
25.			Lucanidae	Dorcus antaeus
26.			Scrabeidae	Onthophagus
27.			Carabidae	Carabus sp.
28.		Dermaptera	Forficulidae	Forficula sp.
29.				Forficula sp.
30.		Lepidoptera	Acreidae	Acreae issoria
31.			Lycaenidae	Ziseeia maha
32.				Freyeria putli
33.				Celastrina pusp
34.			Nymphalidae	Precis iphiia
35.			Pieridae	Pieris brassicae
36.				Eurema hecabe
37.				Eurema brigitta
38.			Arctiidae	Cyana distinct
39.			Syntomidae	Amata bicincta
40.			Geometridae	Arichana flavinigra
41.			Zygaenidae	Campylotes histrionicus
42.		Odonata	Aeschinidae	Anotogaster gregoryi
43.			Gomphidae	Paragomphus sp.
44.			Coenagriidae	Agriocnemis clauseni
45.		Arachnida	Salticidae	Bocus sp (Jumping spider)
46.			Araneidae	Garden spider
47.	Phylum:Mollusca	Gastropoda	Helicidae	Cornu aspersum
48.	Phylum Annelida	Class: Clitellata	Hirudinidae	Hirudinea sp.
49.			Megascolecidae	Pheretima posthuma

50.	Mammalia	Rodentia	Muridae	Ratus ratus
51.	Aves	Bucerotif ormes	Upupidae	Upupa epops
52.	Amphibia	Anura	Bufonidae	Duttaphrynus melanostictus
53.	Reptilia	Squamata	Agamidae	Calotes versicolor

December, 2014

Elevation Range: 840-1600 m

Birds

S.N	Common Name	Scientific Name	Elevation
1.	Spotted Owlet	Anthene brama	800 m
2.	Eurasian Kingfisher	Alcedo atthis	830 m
3.	Blue Throated Barbet	Megalaima asiatica	900 m
4.	Small YellownapedWoodpecker	Picus chlorolophus	830 m
5.	Crested Swift	Hemiprocne longipennis	960 m
6.	Black Headed Shrike	Lanius schach	900 m
7.	Black Drongo	Dicrurus adsimilis	1000 m
8.	Ashy Drongo	Dicrurus leucophaeus	950 m
9.	Gray Headed Myna	Sturnus malabaricus	950 m
10.	Common Myna	Acridotheres tristis	1000 m
11.	Jungle Myna	Acridotheres fuscus	980 m
12.	Redbilled Blue Magpie	Cissa erythrorhyncha	950 m
13.	Indian Tree Pie	Dendrocitta vagabunda	920 m
14.	House Crow	Corvus splendens	800-1100 m
15.	Redvented Bulbul	Pycnonotus cafer	1130 m
16.	Eurasian Cuckoo	Cuculus canorus	1050 m
17.	Indian Cuckoo	Cuculus micropterus	1000 m
18.	Plaintive Cuckoo	Cacomantis merulinus	1150 m

19.	Black Shouldered Kite	Elanus caeruleus	850 m
20.	Dark Kite	Milvus migrans	1000 m
21	Black Eagle	Ictinaetus malayansis	1130 m
22.	Little Egret	Egretta garzetta	830 m
23.	Jungle Crow	Corvus macrorhynchos	900 m
24.	Robin Dayal	Copsychus saularis	850 m
25.	White Capped River Chat	Chaimarrorhnis leucocephalus	1150 m
26.	Plumbeous Redstart	Rhyacornis fuliginosus	1000 m
27.	Pied Bush Chat	Saxicola caprata	980 m
28.	Thickbilled Flower Pecker	Dicaeum agile	1000 m

Invertebrates

Elevation 840-1600 m

S.N.	Order	Family	Common Name	Scientific Name
1.	Phasmida	Phasmidae	Stick Insect	Phyllium soythe
2.	Dermaptera	Forficulidae	Earwig	Irdex spp.
3.	Dermaptera	Forficullidae	Earwig	Forficula acris
4.	Dermaptera	Forficullidae	Earwig	Forficula beelzebub
5.	Orthoptera	Acridiidae	Grass Hopper	Acrida spp.
6.	Orthoptera	Gryllidae	Cricket	Gryllotalpa africana
7.	Orthoptera	Acridiidae		Hieroglyphus banian
8.	Dictyoptera	Mantidae	Praying mantis	Mantis religiosa
9.	Dictyoptera	Blattidae	Cockroach	Periplaneta Americana
10.	Odonata	Libellulidae	Dragon Fly	Orthefrum Sabina
11.	Odonata	Gomphidae	Dragon Fly	Lanelligomphus biforceps
12.	Coleoptera	Coccinellidae	Lady Bird Beetle	Cocinella spetopunctata
13.	Coleoptera		Tortoise Beetle	-----
14.	Coleoptera	Chrysomellidae	Chrosomelid beetle	-----
15.	Thysanoptera		Chilly Thrips	Scirtothrips dorsalis
16.	Lepidoptera	Syntomidae	Moth	Amata bicinta
17.		Notodontidae		Gazalina chrysolopha
18.		Arctiidae	Arctiid moth	Spilarctia spp.
19.		Arctiidae	Arctiid Moth	Spilosoma punctaria
20.		Arctiidae	Arctiid Moth	Lemyra stigmata

21.		Arctiidae	Arctiid Moth	Spilaractia casignata
22.		Arctiidae	Arctiid Moth	Creatonotus gangis
23.		Arctiidae	Arctiid Moth	Agina argus
24.		Eupteroptidae		Euproctis spp.
25.		Noctuidae		Asota caricae
26.	Lepidoptera	Pieridae	Large Cabbage White Butterfly	Pieris brassicae
27.		Pieridae	Indian Cabbage White	Pieris canidia
28.		Pieridae	Common Grass Yellow	Eurema hecabe
29.		Nymphalidae	Indian Fritillary	Argyreus hyperbius
30.		Nymphalidae	Indian Tortoise Shell	Aglais cashmirensis
31.		Nymphalidae	Common Sailor	Neptis hylas
32.		Nymphalidae	Red Admiral	Vanessa indica
33.		Nymphalidae	Painted Lady	Vanessa cardui
34.		Nymphalidae	Peacock Pansy	Precis almanac
35.		Nymphalidae	Common Leopard	Phalanta phalantha
36.		Lycaenidae	Pale Grass Blue	Zizeeria maha
37.		Lycaenidae	Common Hedge Blue	Celastrina puspa
38.		Lycaenidae	Oakblue	Arophala spp. (damaged)
39.		Papilionidae	Common Mormon	Papilio polytes (off season form)
40.		Arctiidae	Arctiid Moth	Areas galactina
41.	Phasmida		Stick Insect	Necroscia pholidotus
42.	Dermaptera	Forficulidae	Earwig	Eparchus insignis
43.		Labiduriidae	Earwig	Labidura riparia
44.		Labiidae	Earwig	Labia sps
45.	Orthoptera	Gryllidae	Cricket	Acheta assiusmilis
46.	Odonata	Corduliidae	Dragon Fly	Macromia trituberculata
47.		Gomphidae	Dragon Fly	Onychogomphus sps
48.	Mollusca (Phylum)	Class Gastropoda	Land Snail	Helix pomatia
49.	Annelida (Phylum)		Earthworm	Pheritima posthuma

December, 2014

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Birds

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6.	Black Headed Shrike	Lanius schach	900 m
7.	Black Drongo	Dicrurus adsimilis	1000 m
8.	Ashy Drongo	Dicrurus leucophaeus	950 m
9.	Gray Headed Myna	Sturnus malabaricus	950 m
10.	Common Myna	Acridotheres tristis	1000 m
11.	Jungle Myna	Acridotheres fuscus	980 m
12.	Redbilled Blue Magpie	Cissa erythrorhyncha	950 m
13.	Indian Tree Pie	Dendrocitta vagabunda	920 m
14.	House Crow	Corvus splendens	800-1100 m

December, 2014

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Elevation 840-1600 m

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19.		Arctiidae	Arctiid Moth	Spilosoma punctaria
20.		Arctiidae	Arctiid Moth	Lemyra stigmata
21.		Arctiidae	Arctiid Moth	Spilaractia casignata
22.		Arctiidae	Arctiid Moth	Creatonotus gangis
23.		Arctiidae	Arctiid Moth	Agina argus
24.		Eupteroptidae		Euproctis spp.
25.		Noctuidae		Asota caricae
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27.		Pieridae	Indian Cabbage White	Pieris canidia
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