

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

Progress Report

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Background

This continuing work of Booster Grant conducted in December, 2014, was focused mainly on the effective run of the community based Awareness Program. This program was implemented in a local community at Chimling Village adjacent to Lamosangu of the Sindhupalchok District of central Nepal. This work also considered the study and collections of the bryophyte flora in different planned areas of this district. The activity for awareness program will go till the end of January, 2015. The identification work of unidentified bryofloral species is still continuing in the laboratory of Natural History Museum in Kathmandu and has been expected to complete before the final report is submitted to the Rufford Foundation at the end of February, 2015.

Study at Mankha Village Development Committee

A vast area in Mankha Village Development Committee which faced a disaster of a huge landslide in August 2014 was also considered in this study. This land slide made massive destruction of bryophyte habitats in this part. Sunkoshi River has also been blocked and turned into a lake due to the landslide in Lamosangu area of this district. Now re-construction of the road in destroyed areas is underway which also has left direct impact on greeneries mainly the bryophyte habitats in the surrounding areas. Mankha Village where this study was conducted displayed different habitats for bryophytes within the elevation range of 860-1720 m. This part represents mixed vegetations of tropical to subtropical climatic types.



Fig. 1. Field Photography

Popular vegetations noted here are *Shorea robusta*, *Anlus nepalensis*, *Dalbergia sissou*, *Schima wallichii*, *Ficus semicardifolia* and *Sapium insigne*.

Recorded bryofloral species in this village community includes *Pogonatum microstomum*, *Fissidens serratus*, *Mnium pseudopunctatum* and *Hyophila involuta*. *Hyophila nymaniana* recorded in this study is a new addition to the country's list.

Study at Ramche Village Development Committee

The study area lies east of Barahbise and touches Mankha Village to the west and to the north is Maneswar Village Community.



Fig.2. Keeping field records

Located at the geographical position of 27°47'17"N, 85°53'56"E, this area features the altitudinal range of 956 m to 1880 m. This is a good settlement area where mixed tribes of Brahmin, Newars, Tamangs and others are accommodated.

Influenced with subtropical climate type, this part represents popular floral species like *Dalbergia sisso*, *Schima wallichii*, *Castanopsis indica*, *Myrica esculenta*, *Ficus semicardifolia*, etc.

Interesting bryophyte species recorded here include *Jungermannia subelliptica*, *Taxiphyllum taxirameum*, *Rhytidium rugosum*, *Thuidium cambifolium* and *Fossombronia cristula* Aust. which is an additional record to the Country.

Awareness Program at Chimling Village

This program was implemented successfully at Chimling village located at the coordinates of 1124 m, 27°45'47" N: 85°50'28"E and 1124 m of elevation. This village has 67 households with good forested zone managed and run by the village community. This forest comprised various floral components with majority of *Dalbergia sisoo*, *Shorea robusta*, *Ficus* sps etc.

The faunal components found in this forest include Langur Monkey (*Presbytes entellus*), Common Leopard (*Panthera pardus*), Barking Deer (*Muntiacus muntjack*), Porcupine (*Hystrix indica*), Indian Mongoose (*Herpestes edwardsii*), Pangolin (*Pangolin crassicaudata*) and field rat (*Ratus rattus*). Observed bird species associated to bryophyte habitats in this forest were Dark Kite (*Milvus migrans*), Redbilled Blue Magpie (*Cissa erythrorhyncha*), Black Headed Shrike (*Lanius schach*), Black Drongo (*Dicrurus adsimilis*), Indian Cuckoo (*Cuculus micropterus*), Plaintive Cuckoo (*Cacomantis merulinus*) etc.

Recorded invertebrate species in this habitat were very few as winter is not a favorable period for these species.

Very good cooperation was received to make successful run of the scheduled conservation awareness program in Chimling village which lies close to the Lamosangu area. The venue for this program was considered at the Seti Devi Primary School of this village which is the Mankha-4 Village Development Committee under the political division.

School teachers, community leader and about 60 participants from this village were all present during the entire period of this awareness program.



Fig. 3 & 4. Disseminating knowledge on use of Bryophytes

Participants were highly interested and curious to know more about bryophytes found in their area. They also committed to extend their participation in conserving this plant in their area.

At the end of program, the participants were taken to field visit in their community area so to make them familiarized with rare species of this plant found in their area and so to create their interest in conservation. Dr. Nirmala Pradhan, the coordinator of this work was the Resource Person to this program.

Questionnaire sheets were developed for interviewing the local peoples in order to collect maximum information on the traditional uses of this plant in their society and to get information on conserving bryophytes under the participation of community peoples.

Study of Bryophytes

This work is in continuation to the previous study/collection made in May to November of 2014. Registered specimen number of the previous collections made in May to November was RSG 1423. This study made in December brought a list of 50 specimens and its entry number starts from RSG 1424 to RSG 1481. The cold and harsh weather condition of December was not favorable to bring good diversity of bryophyte species.

A list of the recorded species of bryophytes in December, 2014 is provided in Appendix I at the end.

Route Followed for Sixth Phase of Study

Work schedule and route followed in December work is in tabulated form below.

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	

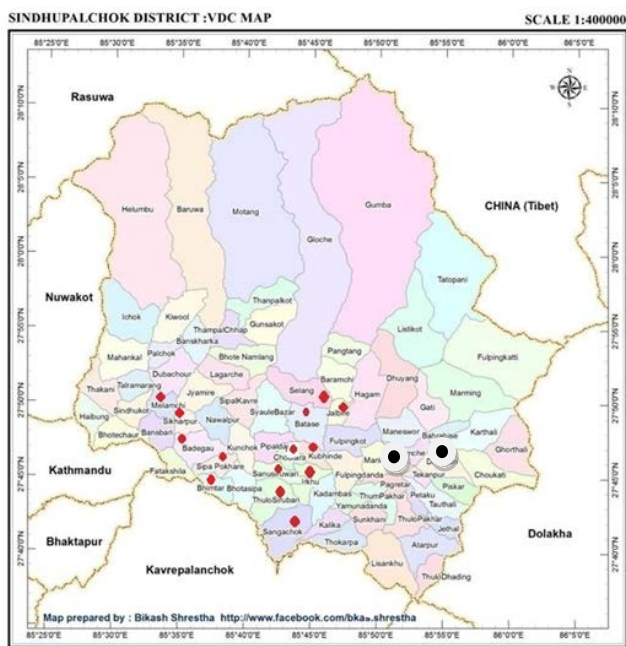


Fig. 5. Map of Sindhupalchok district showing additional Study sites in December, 2014 Faunal Association

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

None of reptiles and amphibian species was noted except some species of butterflies in sunny days only. These common butterflies were recorded around moss habitats in Chimling and Ramche Village forests.

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 of 62 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 inside bryophyte thallus and earth worms were noted inside the soil which remained intact to the root of bryofloral species.

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

Appendix I

Species Diversity of Bryophytes in Sixth Phase Field Visit

S. N.	Classes/Orders / Families	Latin Names	Localities	Addition to the previous list	Status
Hepaticae/ Jungermanniales					
	Geocalycaceae	<i>Heteroscyphus planus</i> (Mitt.) Schiffner	Barhabise- Ramche 950 m, RSG 1425, RSG 1427; 85°53'49"E, 29.12.2014, Pradhan <i>et al.</i> Chimlingbesi, 1250 m, 26.12.2014, Pradhan <i>et al.</i> RSG 1457	+	Previously recorded new from lowland
	Jungermanniaceae	<i>Jungermannia subelliptica</i> (Lindb. ex Kaal.) Lev.	Ramche-7, 1000 m, 29.12.2014, Pradhan <i>et al.</i> RSG 1432		Common but new
Hepaticae /Metzgeriales					
	Aneuraceae	<i>Riccardia multifida</i> L.Gray	Chimlingbasi, 1200 m, 26.12.2014, Pradhan <i>et al</i> RSG 1454		R
	Fossombroniaceae	* <i>Fossombronia cristula</i> Aust.	Barhabise- Ramche, 935 m, 27°47'11"N, 85°53'49"E, 29.12.2014, Pradhan <i>et al.</i> RSG 1430.	+	R, New
Hepaticae /Marchantiales					
	Aytoniaceae	<i>Asterella multiflora</i> (Steph.) Pande <i>et al.</i>	Barhabise- Ramche 935 m, 27°47'11"N, 85°53'49"E, 29.12.2014, Pradhan <i>et al.</i> RSG 1424.		FC
	Aytoniaceae	<i>Asterella wallichiana</i> (Lehm. & Lindenb.) Grolle	Ramche, 980 m, 27°47'11"N, 85°53'49"E, 29.12.2014, Pradhan <i>et al</i> RSG 1466; Listikot, 1550 m, RSG 1478.		Common; Dry
		<i>Plagiochasma pterospermum</i> C. Massal	Ramche, 980 m, 29.12.,2014, Pradhan <i>et al.</i> RSG 1463; Tatopani, 1600 m, 30.12.2014, Pradhan <i>et al</i> RSG 1477.		Common
	Aytoniaceae	<i>Reboulia hemispherica</i> (L.) Raddi.	Listikot, 1450 m, 30.12.2014, Pradhan <i>et al.</i> RSG1481.		
	Marchantiaceae	<i>Marchantia emarginata</i> Reinw. <i>et al.</i>	Ramche-7, 956 m, 27°47'17"N, 85°53'56"E, 29.12.,2014, Pradhan <i>et al.</i>		Common

			RSG 1431; RSG Ramche-7, 956 m, 27°47'17"N, 85°53'56"E, 29.12.,2014, Pradhan <i>et al.</i> RSG 1438, RSG 1448; Listikot, 1400 m, 30.12.2014, Pradhan <i>et al.</i> RSG 1465.		
	Marchantiaceae	<i>Marchantia papillata</i> var. <i>grossibarba</i>	Ramche-7, 956 m, 27°47'17"N, 85°53'56"E, 29.12.,2014, Pradhan <i>et al.</i> RSG 1436; Chimlingbasi-Mangkha 1200 m, 26.12.2014, Pradhan <i>et al.</i> RSG 1442.		Common
	Marchantiaceae	<i>Marchantia paleacea</i> Bertol.	Barhabise- Ramche 935 m, 27°47'11"N, 85°53'49"E, 29.12.2014, Pradhan <i>et al.</i> RSG 1467.		Common
	Monosoleniaceae	<i>Monosolenium tenerum</i> Griff. cf.	Chimlingbasi- Mangkha 1200 m, 26.12.2014, Pradhan <i>et al.</i> RSG 1452.	+	R, Previous record from lowland.
	Ricciaceae	<i>Riccia himalayensis</i> Kashyap	Barhabise- Ramche, 950 m, 29.12.2014, Pradhan <i>et al.</i> RSG 1441.		
	Ricciaceae	<i>Riccia incurvata</i> cf.	Chimlingbasi, 1200 m, 26.12.2014, Pradhan <i>et al.</i> RSG 1454		New?
Musci					
Musci /Eubryales					
	Bryaceae	<i>Bryum coronatum</i> Hedw.	Lamosanghu-Mangkha, 860 m, 28.12.2014, Pradhan <i>et al.</i> RSG 1474.		Specimens dry
	Bryaceae	<i>Bryum argenteum</i> Hedw.	Listikot, 1550 m, 30.12.2014, Pradhan <i>et al.</i> RSG 1472; Tatopani, 1600 m, 30.12.2014, Pradhan <i>et al.</i> RSG 1475.		Specimens dry
	Mniaceae-	<i>Mnium pseudopunctatum</i> Bruch & Schimp.	Chimlingbasi, 1275 m, 27°76'61"N, 85°83'31"E, 26.12.2014, Pradhan <i>et al.</i> RSG 1444;	+	Beetle crysomilidae, Earthworm, Nematodes
Musci /Fissidentales					
	Fissidentaceae	* <i>Fissidens serratus</i> C. Muell.	Chimling, Purana Gaun-Mangkha 1276 m, 27°76'61"N, 85°83'31"E, 26.12.2014, Pradhan <i>et al.</i>	+	New

			RSG 1456.		
	Fissidentaceae	<i>Fissidens bryoides</i> Hedw.	Barhabise- Ramche, 978 m, 29.12.2014, Pradhan <i>et al.</i> RSG 1449.		Dry
	Fissidentaceae	<i>Fissidens taxifolifolius</i> Hedw.	Listi, 1500 m, 30.12.2014, Pradhan <i>et al.</i> RSG 1480.		
Musci / Funaliales					
	Funariaceae	<i>Funaria hygrometrica</i> Hedw.	Ramche, 978 m, 29.12.2014, Pradhan <i>et al.</i> RSG 1433; Ramche 4, 950 m, RSG 1464; Dhimeri-Mangkha, 1275 m, RSG 1451; Balephi - Mangkha, 900 m, RSG 1470.		Common
Musci / Hypnobryales					
	Brachytheciaceae	<i>Eurhynchium proelongum</i> W.P. Schimper	Ramche -7, 1300 m, 29.12.2014, Pradhan <i>et al.</i> RSG 1463.	+	
	Hypnaceae	<i>Taxiphyllum taxirameum</i> (Mitt.) Fleisch.	Ramche-7, 966 m, 29.12.2014, Pradhan <i>et al.</i> RSG 1460		
	Thuidaceae	<i>Thuidium cambifolium</i> Dozy & Molk.	Ramche-7, 986 m, 29.12.2014, Pradhan <i>et al.</i> RSG 1428; Tatopani, 1600 m, 30.12.2014, Pradhan <i>et al.</i> RSG 1479.		C
	Rhytidiaceae	<i>Rhytidium rugosum</i> (Hedw.) Kindb.	Ramche-7, 956 m, 27°47'17"N, 85°53'56"E, 29.12.,2014, Pradhan <i>et al.</i> RSG 1426	+	Bettle larve
Musci / Leucobryales					
	Leucobryaceae	<i>Octoblepharum albidum</i> Hedw.	Ramche-7, 1000 m, 29.12.2014, Pradhan <i>et al.</i> RSG 1435.		
Musci / Polytrichales					
	Polytrichaceae	<i>Pogonatum microstomum</i> (Schwaegr.) Brid.	Chimlingbasi -Dhimeri, 1276 m, 27°76'61"N, 85°83'31"E, 26.12.2014, Pradhan <i>et al</i> RSG 1458.		Common
Musci / Pottiales					
	Pottiaceae	<i>Hydrogonium arcuatum</i> (Griff.) Wijk. & Marg.	Chimlingbasi-Dhimeri, 1276 m, 27°76'61"N, 85°83'31"E, 26.12.2014, Pradhan <i>et al</i> RSG 1434, RSG 1440; Ramche-7, 956 m, 27°47'17"N, 85°53'56"E, 29.12.,2014, Pradhan <i>et al.</i> RSG 1462; Tatopani, 1600 m,30.12.2014,		Common

			Pradhan <i>et al.</i> RSG 1471.		
	Pottiaceae	<i>Hyophila involuta</i> (Hook.) A. Jaeger	Chimlingbasi-Dhimeri- Mangkha, 1276 m, 27°76'61"N, 85°83'31"E, 26.12.2014, Pradhan <i>et al.</i> RSG 1446	+	
	Pottiaceae	* <i>Hyophila nymaniana</i> (Fleisch.) A. Jaeger	Chimlingbasi-Dhimeri, 1276 m, 27°76'61"N, 85°83'31"E, 26.12.2014, Pradhan <i>et al.</i> RSG 1445; Chimling, 1400 m, 26.12.2014, Pradhan <i>et al.</i> RSG 1446	+	R, New

* New records of made in December 2014

Appendix II

A. Vegetation composition in Mankha VDC (840- 1600 m)

Herb			
S.N.	Latin names	Common names/ Local names	Families
	<i>Ageratum conizoides</i> L.	Goat Weed/Gannemanne Jhar	Compositae
	<i>Anomum aromaticum</i> Roxb.	Nepal Cardamon/Alaichi	Zingiberaceae
	<i>Argemone mexicana</i> L.	Prickly Poppy /Thakal	Papaveraceae
	<i>Cyperus iria</i> L.	Umbrella Sedge/Mothe	Graminae
	<i>Drymaria cordata</i> (L.) Willd.	Lightening weed/Abijalo	caryophyllaceae
	<i>Euphorbia hirta</i> L.	Snake weed	Euphorbiaceae
	<i>Euphorbia milii</i> Desmoul	/Simri	Euphorbiaceae
	<i>Fagopyrum esculentum</i> Moench.	Common Buchwheat/Fafar	Polygoniaceae
	<i>Galinsoga parviflora</i> Cav.	/Chitlange Jhar	Compositae
	<i>Leonotis nepetaefolia</i> (L.) Aiton	Drug lion's ear/ Uduse jhar	Leguminosae
Shrubs			
	<i>Artemisia indica</i> Willd.	Mugwort/ Titepate	Compositae
	<i>Berberis aristata</i> Roxb. ex. D.C.	Berberry/ Chutro	Berberidaceae
	<i>Bidens pilosa</i> L.	Begger's stick/ Kuro	Compositae
	<i>Calotropis gigantea</i> (L.) Dryand.	Gaint Milkweed/ Ank	Asclepiadaceae
	<i>Drepanostachyum intermedum</i> (Munro) Keng.	/Nigalo	Graminae
	<i>Eupatorium adenophorum</i> Spreng	Spreng Cotton weed/ Banmara	Compositae
	<i>Justicia adhatoda</i> L.	/Ashuro	Acanthaceae
	<i>Lantana camara</i> L.	Lantana/ ban phanda	Verbenaceae
	<i>Morus nigra</i> L.	Black Mulberry/ Kimbu	Moraceae
	<i>Osbeckea stellata</i> Buch. - Ham ex D.Don	/Rato Chulsi	Melastomaceae
	<i>Rubus ellipticus</i> Smith	Golden raspberry/Aisalu	Rosaceae
	<i>Thysanoleana maxima</i> (Roxb.) O. Kuntze	Broom grass/ Amreso	Graminae
		Indian Titepate	Compositae
Trees			
	<i>Alnus nepalensis</i> D. Don	Alder/Uttis	Betulaceae
	<i>Bauhinia purpurea</i> L.	/Bhorla	Leguminosae
	<i>Bombax ceiba</i> L.	Silk Cotton tree/ Simal	Bombacaceae
	<i>Castanopsis indica</i> (Roxb.) Miq.	Chest nut tree/Dhale Katus	Fagaceae
	<i>Colebrookea oppositifolia</i> Sm.	Dhasure	Lobiatae
	<i>Citrus maxima</i> (Burm.) Herr.	Shaddock/ Bhogate	Rutaceae
	<i>Dalbergia sissoo</i> DC.	/Sishou	
	<i>Ficus benghalensis</i> L.	Banyan Tree/ Baar	Moraceae...
	<i>Ficus lacor</i> Buch.- Ham.	- /Kavro	Moraceae
	<i>Ficus racemosa</i> L.	Chester fig/ Dumri	Moraceae
	<i>Ficus religiosa</i> L.	Pipal Tree/ Peepal	Moraceae

	<i>Ficus semicordata</i> Buch.-Ham ex Sm.	Nepal Fodder fig/ Khanyu	Moraceae
	<i>Litsea monopetala</i> (Roxb.) Pers.	/Kutmiro	Lauraceae
	<i>Pinus roxbughii</i>	Pine/ Sallo	Pinaceae
	<i>Prunus domestica</i> L.	Bullace/ Alcha	Rosaceae
	<i>Sapium insigne</i> (Royle.) Benth. Ex Hook. f.	Tallow tree/Khirro	Euphorbiaceae
	<i>Schima wallichii</i> (DC.) Korth.	Needle wood/Chilaune	Theaceae
	<i>Shorea robusta</i> Geartn.	Sal Tree/Sal	Dipterocarpaceae

B. Vegetation composition in Ramche VDC

Herbs			
	<i>Coelogyne cristata</i> Lindl.	Orchid	Orchidaceae
	<i>Drymaria cordata</i> (L.) Willd.	Lightening weed/Abijalo	Caryophyllaceae
	<i>Euphorbia hirta</i> L.	Snake weed	Euphorbiaceae
	<i>Euphorbia milii</i> Desmoul	/Simri	Euphorbiaceae
	<i>Fagopyrum esculentum</i> Moench.	Common Buchwheat/Fafar	Polygoniaceae
	<i>Galinsoga parviflora</i> Cav.	/Chitlange Jhar	Compositae
	<i>Leonotis nepataefolia</i> (L.) Aiton	Drug lion's ear/ Uduse jhar	Leguminosae
	<i>Potentilla supina</i> L.		Rosaceae
	<i>Solanum nigrum</i> L.	Black Nightshade/ Jangali bihi	Solanaceae
	<i>Stellaria media</i> (L.) Vill.		Caryophyllaceae
Shrubs			
	<i>Agave Cortula</i> Roxb.	Agavaceae	Agavaceae
	<i>Artemisia indica</i> Willd.	Mugwort/ Titepate	Compositae
	<i>Berberis aristata</i> Roxb. ex. D.C.	Berberry/ Chutro	Berberidaceae
	<i>Cannabis sativa</i> L.	Hemp/Bhang	Cannabiaceae
	<i>Cassia floribunda</i>	Cassia/	Leguminosae
	<i>Ficus semicordata</i> Buch.-Ham ex Sm.	Nepal Fodder fig/ Khanyu	Moraceae
	<i>Osbeckea stellate</i> Buch.-Ham. ex D.Don	/ Rato Chulsi	Melastomaceae
	<i>Sida rhombifolia</i> L.	/Sano Cillya	Malvaceae
	<i>Thysanoleana maxima</i> (Roxb.) O. Kuntze	Broom grass/ Amreso	Graminae
Trees			
	<i>Albizia julibrissin</i> Durazz.	/Siris	Leguminosae
	<i>Alnus nepalensis</i> D. Don	Alder/Uttis	Betulaceae
	<i>Bauhinia purpurea</i> L.	/Bhorla	Leguminosae
	<i>Bombax ceiba</i> L.	Silk Cotton tree/ Simal	Bombacaceae
	<i>Castanopsis indica</i> (Roxb.) Miq.	Chest nut tree/Dhale Katus	Fagaceae
	<i>Choerospondias axillaris</i> (Roxb.) B.L. Brutt. & A.W. Hill.	Nepalese Hug plum/Lapsi	Anacardiaceae
	<i>Ficus religiosa</i> L.	Pipal Tree/ Peepal	Moraceae
	<i>Ficus semicordata</i> Buch.-Ham ex Sm.	Nepal Fodder fig/ Khanyu	Moraceae
	<i>Litsea monopetala</i> (Roxb.) Pers.	/Kutmiro	Lauraceae
	<i>Nyctanthus arbor-tristis</i> L.	/Parijat	Oleaceae
	<i>Schima wallichii</i> (DC.) Korth.	/Chilaune	Theaceae
	<i>Shorea robusta</i> Geartn.	Sal Tree/Sal	Dipterocarpaceae

Appendix III

Recorded Bird species in December Study

S.N	Common Name	Scientific Name	Elevation
1.	Spotted Owlet	<i>Anthene brama</i>	800 m
2.	Eurasian Kingfisher	<i>Alcedo atthis</i>	830 m
3.	Blue Throated Barbet	<i>Megalaima asiatica</i>	900 m
4.	Small Yellownaped Woodpecker	<i>Picus chlorolophus</i>	830 m
5.	Crested Swift	<i>Hemiprocne longipennis</i>	960 m
6.	Black Headed Shrike	<i>Lanius schach</i>	900 m
7.	Black Drongo	<i>Dicrurus adsimilis</i>	1000 m
8.	Ashy Drongo	<i>Dicrurus leucophaeus</i>	950 m
9.	Gray Headed Myna	<i>Sturnus malabaricus</i>	950 m
10.	Common Myna	<i>Acridotheres tristis</i>	1000 m
11.	Jungle Myna	<i>Acridotheres fuscus</i>	980 m
12.	Redbilled Blue Magpie	<i>Cissa erythrorhyncha</i>	950 m
13.	Indian Tree Pie	<i>Dendrocitta vagabunda</i>	920 m
14.	House Crow	<i>Corvus splendens</i>	800-1100 m
15.	Redvented Bulbul	<i>Pycnonotus cafer</i>	1130 m
16.	Eurasian Cuckoo	<i>Cuculus canorus</i>	1050 m
17.	Indian Cuckoo	<i>Cuculus micropterus</i>	1000 m
18.	Plaintive Cuckoo	<i>Cacomantis merulinus</i>	1150 m
19.	Black Shouldered Kite	<i>Elanus caeruleus</i>	850 m
20.	Dark Kite	<i>Milvus migrans</i>	1000 m
21.	Black Eagle	<i>Ictinaetus malayansis</i>	1130 m
22.	Little Egret	<i>Egretta garzetta</i>	830 m
23.	Jungle Crow	<i>Corvus macrorhynchos</i>	900 m
24.	Robin Dayal	<i>Copsychus saularis</i>	850 m
25.	White Capped River Chat	<i>Chaimarrornis leucocephalus</i>	1150 m
26.	Plumbeous Redstart	<i>Rhyacornis fuliginosus</i>	1000 m
27.	Pied Bush Chat	<i>Saxicola caprata</i>	980 m
28.	Thickbilled Flower Pecker	<i>Dicaeum agile</i>	1000 m

Appendix IV

Recorded Invertebrate species in December

S.N.	Order	Family	Common Name	Scientific Name
1.	Phasmida	Phasmidae	Stick Insect	<i>Phyllium soythe</i>
2.	Dermaptera	Forficulidae	Earwig	<i>Irdex</i> spp.
3.	Dermaptera	Forficullidae	Earwig	<i>Forficula acris</i>
4.	Dermaptera	Forficullidae	Earwig	<i>Forficula beelzebub</i>
5.	Orthoptera	Acridiidae	Grass Hopper	<i>Acrida</i> spp.
6.	Orthoptera	Gryllidae	Cricket	<i>Gryllotalpa africana</i>
7.	Orthoptera	Acridiidae		<i>Hieroglyphus banian</i>
8.	Dictyoptera	Mantidae	Praying mantis	<i>Mantis religiosa</i>
9.	Dictyoptera	Blattidae	Cockroach	<i>Periplaneta Americana</i>
10.	Odonata	Libellulidae	Dragon Fly	<i>Ortheform Sabina</i>
11.	Odonata	Gomphidae	Dragon Fly	<i>Lanelligomphus biforceps</i>
12.	Coleoptera	Coccinellidae	Lady Bird Beetle	<i>Cocinella spetopunctata</i>
13.	Coleoptera		Tortoise Beetle	
14.	Coleoptera	Chrysomellidae	Chrosomelid beetle	
15.	Thysanoptera		Chilly Thrips	<i>Scirtothrips dorsalis</i>
16.	Lepidoptera	Syntomidae	Moth	<i>Amata bicinta</i>
17.		Notodontidae		<i>Gazalina chrysolopha</i>
18.		Arctiidae	Arctiid moth	<i>Spilarctia</i> spp.
19.		Arctiidae	Arctiid Moth	<i>Spilosoma punctaria</i>
20.		Arctiidae		<i>Lemyra stigmata</i>
21.		Arctiidae		<i>Spilaractia casignata</i>
22.		Arctiidae		<i>Cretonotus gangis</i>
23.		Arctiidae		<i>Agina argus</i>
24.		Eupteroptidae		<i>Euproctis</i> spp.
25.		Noctuidae		<i>Asota caricae</i>
26.	Lepidoptera	Pieridae	Large Cabbage White Butterfly	<i>Pieris brassicae</i>
27.		Pieridae	Indian Cabbage White	<i>Pieris canidia</i>
28.		Pieridae	Common Grass Yellow	<i>Eurema hecabe</i>
29.		Nymphalidae	Indian Fritillary	<i>Argyreus hyperbius</i>
30.		Nymphalidae	Indian Tortoise Shell	<i>Aglais cashmirensis</i>
31.		Nymphalidae	Common Sailor	<i>Neptis hylas</i>
32.		Nymphalidae	Red Admiral	<i>Vanessa indica</i>
33.		Nymphalidae	Painted Lady	<i>Vanessa cardui</i>
34.		Nymphalidae	Peacock Pansy	<i>Precis almana</i>
35.		Nymphalidae	Common Leopard	<i>Phalanta phalantha</i>
36.		Lycaenidae	Pale Grass Blue	<i>Zizeeria maha</i>
37.		Lycaenidae	Common Hedge Blue	<i>Celastrina puspa</i>
38.		Lycaenidae	Oakblue	<i>Arophala</i> spp. (damaged)
39.		Papilionidae	Common Mormon	<i>Papilio polytes</i> (off season form)
40.		Arctiidae	Arctiid Moth	<i>Areas galactina</i>

41.				
42.	Mollusca (Phylum)	Class Gastropoda	Land Snail	
43.	Annelida (Phylum)		Earthworm	