The Rufford Foundation

Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Nirmala Pradhan
Project title	Study on the Bryofloral Diversity, their Current Status and Conservation Issues in Central and South-eastern Region of Sindhupalchok District, Central Nepal.
RSG reference	12663-B
Reporting period	1 year
Amount of grant	£ 11675
Your email address	bryonep@yahoo.com; nir.pradhan1@gmail.com
Date of this report	March 03, 2015

1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Diversity study of bryophytes at 750-1550 m elevation of the central, southern and eastern parts of Sindhupalchok district of central Nepal.			Fully achieved	Records of 160 species of bryophytes have been made with 22 new records to the country's list.
Conservation Issues			Fully achieved	Prevailing threats were assessed at different habitat areas. High impacts were noticed at several places mainly due to deforestation and road constructions and expansions.
Documentation of floral diversity around bryophyte habitats.			Fully achieved	Diversity of the floral components (ferns - 25 species, climbers – nine species, herbs - 40 species, shrubs - 43 species, trees- 58 species and Gymnosperm - two species) in and around bryophyte habitats were also documented at all studied areas.
Implementation of the community awareness programmes.			Fully achieved	Community people, leaders and schoolteachers at three different visited areas were invited to this community-based awareness programme so as to provide them with knowledge on bryophytes and their conservation significances. Good gatherings of 40-50 people of the community were made at each programme organised place.
Implementation of door to door awareness programme			Fully achieved	Door to door awareness programme was implemented in different village households. School students and villagers were provided knowledge on this plant and its conservation values
Study on the faunal association to bryophyte habitats.			Fully achieved	Faunal species associated to bryophyte habitats were documented at different altitudinal levels which represented invertebrates (88 species), birds (29 species), mammals (two species), herpetofauna (two species) and amphibian (one species). Majority of them were the insect species.

Information sharing to conservationists and students			Fully achieved	This was done through a 1-day presentation programme on these findings among gatherings of the conservation biologists and students in Kathmandu. Permanent exhibition of bryophytes of the Sindhupalchok collected in this project has been done at the Natural History Museum besides participating in a 3-day national level exhibition held in Kathmandu in October 2014.

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

No foreseen difficulties were faced except a heart shocking huge landslide that occurred in the Mangkha Village Development Area in September 2014 7 days after our study was done in that place. Now that habitat is completely destroyed.
Cooperation from all the concerned authorities and local community was obtained wherever we visited during this study.

3. Briefly describe the three most important outcomes of your project.

a. Most significant outcome in this work is the exploration and documentation of 160 species of bryophytes including 22 new records to the country's list. In First Rufford Grant (ID: Our Reference, 10.09.07) five new records were made and in Second Rufford Grant (ID: 10111-2) 11 new additions were made to the country.
b. Conservation status and prevailing threats of this plant were assessed minutely at 750 to 1550 m elevation in the central, southern and eastern parts of this district which is close to the Chinese border. Different faunal components associated to bryophyte habitats were also documented which is a new topic in Nepal's context.
c. Effective implementation of awareness programme in three different places among the gatherings of the community peoples, fruitful interaction with them and implementation of the door to door awareness at different villages are significant achievements in this work. Knowledge sharing of this work was achieved through the presentation and exhibition which also added significant points for conservation.

4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).

a. Local community was familiarised with bryophytes, their uses and conservation techniques in three different communities where a total of 130 participants were present. Three local people were employed in this work from which they financially benefitted. Hotels, restaurants and shopkeepers also benefitted financially in our visited areas during the entire study period. Some stationery was also provided to the local Seti Devi School at Chimling Village of Mangkha Village Development Committee.

5. Are there any plans to continue this work?

So far, we made extensive study in the northern, north western, southern, central parts of this one of the largest districts of Nepal. Still the western and some potential areas which are not explored yet are left for the documentation of bryophytes and their conservation issues. So, these parts have been planned to study with the next Second Booster Grant programme of Rufford Foundation. These areas are under the rapid rate of urbanisation and need extensive exploration before significant species disappear from these parts.

6. How do you plan to share the results of your work with others?

- The process of sharing results of this work has already been started through community based awareness and door to door awareness programmes, by participating in national level exhibition in Kathmandu, seminar presentation to conservation biologists and students at Natural History Museum and displaying informative flex prints and collected and identified specimens of bryophytes of this work at the permanent display gallery of this museum.
- Publication of this work will be done in a suitable research journal though the publication of the First and Second RSGs have already been done. Published papers will be circulated to the conservation biologists and researchers and will also be uploaded in Internet system.
- Community leaders, conservation authorities and forest department of Sindhupalchok district will also be shared with these findings.

7. Timescale: Over what period was The Rufford Foundation grant used? How does this compare to the anticipated or actual length of the project?

April 7, 2014 - Orientation lecture to the team members on time scale of work schedules

The project was started from May 2014 under seven phases of field studies.

1. **First Phase Study**
   - Field visit: study and documentation of bryophyte diversity, associated vegetation and faunal components as well as door to door awareness programme from May 9- May 15, 2014 (7 days)
   - Lab work for identification of collected specimens – May 16-May 30. 2014 (15 days).

2. **Second Phase Study**
   - Field Visit: study and document bryophyte diversity, associated vegetation and faunal components as well as door to door awareness programme from June 5- June 11, 2014 (8 days).
   - Lab work - identification and preservation of the collected specimens – June 13- July 13, 2014 – 1 month.

3. **Third Phase Study**
   - Field Visit: study and documentation of bryophyte diversity, associated vegetation and faunal components as well as door to door awareness programme from July 19- July 28, 2014, (10 days).
   - Lab work - identification and preservation of the collected specimens from August 1- August 10, 2014 (10 days).

- Preparation of mid-term report: August 11 – August 17, 2014
- Submission of mid-term report: August 17, 2014.

4. **Fourth Phase Study**
   - Field Visit – for study of bryophyte diversity, associate vegetation and faunal relation as well as door to door awareness programme – August 30- September 5, 2014, (7 days).
   - Lab work - Identification and preservation – September 6- September 16, 2014 (11 days).

5. **Fifth Phase Study**

   - Field Visit: study and documentation of bryophytes diversity, associated vegetation and faunal components as well as door to door awareness programme from September 20- September 29, 2014, (10 days).

   - Participation in science exhibition displaying rare bryophyte specimens collected at Sindhupalchok District - this exhibition was organised by the Ministry of Science and Technology in Kathmandu (September 17-18, 2014)

   - Lab work - identification and preservation – October 1- October 31, 2014 (1 month).
   - Preparation of progress report – November 2- 21, 2014
   - Submission of progress report – November 21, 2014.

6. **Sixth Phase Study**

   - Field Visit: study and diversity record of the winter bryophyte species, associated vegetation, faunal components and implementation of awareness programme at Chimlingbesi, Mangkha-4 from December 25, - December 31, 2014 (7 days).
   - Lab work and preparation of December progress report – January 2- January 22, 2015.
   - Submission of December progress report – January 23, 2015.
   -

7. **Seventh Phase Study**
   - Field Visit: study and document bryophyte diversity, associated vegetation and faunal components and implementation of awareness programme at two different places (Tatopani and Ramche VDCs) – January 30 – February 5, 2015 (7 days).
   - Lab work – February 6 – February 10, 2015
   - Report preparation – February 11 – March 2, 2015.
   - Final report submission- March 3, 2015.

8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Bryophyte specialist @ £ 35/day for 55 days	£ 1925	£ 1960	£ 35	One day more in field expenditure
Plant taxonomist @ £ 30/day for 55 days	£ 1650	£ 1680	£ 30	One day more in field expenditure

Faunal specialist (Zoologist) @ £ 30/day for 55 days	£ 1650	£ 1680	£ 30	One day more in field expenditure
Assistant Botanists -2 (MSc level) @ £ 20/day for 55 days	£ 2200	£ 2240	£ 40	One day more in field expenditure
Porters -3 @ £ 15/day for 50 days	£ 2250	£ 2250	-	No addition days for the porters
Transportation	£ 300	£ 560	£ 260	Field visit was made for 7 times, so extra 260 was contributed by Nepal Bio-heritage forum for resources Conservation (NBFRC)
Awareness programme in 4 localities	£ 500	£ 525	£ 25	Awareness programme launched at 3 places@£ 175 in each locality,
Photocopy/ Photography	£ 100	£ 150	£ 50	contributed by NBFRC
Stationary	£ 100	£ 100	-	Stationaries for Awareness Program at three different places
Equipment hire	£ 550	£ 600	£ 50	Required Field Equipment including sleeping bags and tents on hire
Report Writing	£ 50	£ 50	-	Typing and other associated expense
Consultancy Fee	£ 400	£ 500	£ 100	consultation for identification at research Institutes
TOTAL	**£ 11,675**	**£12,950**	**£ 620**	Difference= £ 620 which is contributed by NBFRC/ Current Local Exchange Rate, £1 = NRs. 152.13.

9. Looking ahead, what do you feel are the important next steps?

Bryophytes are least known plants in Nepal. Not only for village peoples this plant is even least known among the circles of conservation biologists and policy makers. This has made least attentions on this plant to formulate effective policy for its conservation in its natural condition. Now Rufford Foundation's generous support with two RSGs and Booster Grant for its study and conservation worked effectively for its familiarisation and developed good understanding on its conservation significances to many community peoples of Sindhupalchok and conservation authorities of the country including students and some political leaders. Continuation to this work in future could still strengthen widely on conservation values of this plant on community levels and extensive documentation will be done at the remaining unexplored parts of the Sindhupalchok district. This may further add many new records to the overall list of the country. So, in my feeling these are the most significant steps to be implemented in future.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the RSGF receive any publicity during the course of your work?

Yes, in every activity related to this grant, the logo of Rufford Foundation was emphasised most. The logo of Rufford Foundation was used in exhibitions, in informative flex prints exhibited at Natural History Museum, Conservation awareness programmes and during seminar presentation programme. During awareness programmes, significance of the Rufford Foundation was highlighted informing the participating peoples on how this prestigious organisation is helping to conserve biodiversity in Nepal.

High acknowledgement has been made to the Rufford Small Grant Foundation in my research publication on the findings of the First and Second RSGs in a reputed research journal of the Natural History Museum of Nepal.

This work has also been planned to go for series of publications in national and international journals. I am also working for a book on Bryophytes of Sindhupalcok District which also will comprise very high valued acknowledgement to the Rufford Small Grant Foundation.

11. Any other comments?

Before the start of the First Rufford Grant in 2008 (10.09.07), no work on documentation of bryoflora was done in Sindhupalchok which is one of the largest districts of Nepal and display wide range of altitudinal variations from the lowest of 750 m to the highest of 4200 m (where this study was conducted in First Rufford Grant). With the generous support of the Rufford Small Grants many parts of this district have been explored extensively for this plant except the remaining western and south western regions. With this support many new additions of this plant (16 species in First and Second Rufford and 22 species in Booster Grants) has been made to the country's list besides documenting many significant, rare and common species. Many potential habitats of this plant have already been destroyed for the purpose of road networking and urbanization before being documented. So, this work keeps high significance and can be said to be a timely approach to document and conserve existing diversity of the bryoflora found in this district. This generous support of Rufford Foundation also made familiarisation and conservation values of this plant among the community peoples, conservation authorities, schoolteachers and students of this district. Information sharing on the present status of bryoflora in this district has also been achieved through the seminar presentation, national level exhibition and providing collected specimens and informative flex prints to the only Natural History Museum of Nepal based in Kathmandu where these are placed in public display section. This informs every visitor on this work and provides good message to the public on how the Rufford Small Grant Foundation helped to study the unexplored bryophytes of the Sindhupalchok district. My plan is to run extensive work on conserving this plant which also has been done to a greater extent with this and previous works implemented with grants of the Rufford Foundation. Besides this, I plan to bring out a series of research and feature articles and a book on bryophytes of Sindhupalchok District after the remaining areas of this district are explored extensively.

Addition to the Final Report Application ID: 12663-B

Spring Diversity of Bryophytes

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

Background Information

An extensive study of bryophytes in unexplored areas of the south, central and eastern Sindhupalchok district was carried out by a team of expertise especially on the diversity and its related aspects for a period of one year (2014-2015). Diversity documentation of bryophytes of every season (except spring) was done in this study from the month of May, 2014 to the end of January, 2015. This spring study conducted in March 18-23 is an additional part to the list of my final report which was submitted on March 3, 2015.

Spring season displayed a low diversity of this plant with few representatives of sporophytic generations. This study which was confined to the altitudinal limits of 840 to 1608 m was very significant to reveal out a list of 34 species of bryoflora which were adjusted mostly to the warm climate type. Of the recorded species *Mitthyridium flavum* (C. Muell.) Robinson was identified as a new record to the country's list. Most of the species documented in their study are common and widely distributed and these include *Plagiochasma pterospermum, Marchantia emarginata, Marchantia palaecea, Bryum coronatum,* and *Hydrogonium arcuatum.*

The river and stream sides of Melamchi where moist condition prevailed accommodated some rare species like *Dumortiera hirsuta, Fleischerobryum longicolee, Eurhynchium swartzii, Mitthyridium flavum, Herpetineuron toccoae,* etc. Many of the species are in Vegetative form and some show dehiscence capsules.

Altogether 75 specimens of this plant were collected which under taxonomical division included a total of 36 species. This comprised one family, one genus and one species of class

Anthocerotae, 10 species under six genera and five families of the class Hepaticae and 23 species under 20 genera and 12 families of the class Musci. The Voucher Number of these collected specimens is from RSG 1530 to RSG 1615.

Normally, the spring season is for a short period featuring dry and windy atmospheric condition. Though the temperature was mild, no favourable physical gradients occurred in study sites to increase species richness of this plant. Moist condition is an optimum requirement for the rich growth of many species of this plant into their sporophytic generation.

This spring study covered a low to slightly elevated zone (60° of slope) within the altitudinal limits of 840 to 1608 m and focusing southern face. This mid-central zone is the crossing point for the lower temperate and upper subtropical bryofloral species. The localized species which are specific to the micro-habitat types were not observed at this range. Also, the particular species which are specific to spring temperature was not recorded as most of the species observed in this month occurred widely in other months as well. So the spring season with less optimal gradients provided a low diversity of bryophytes which also shared some popular species of other seasons. Due to uprising temperature in spring, many of the invertebrates were noticed emerging out in nature. In and surrounding areas of the bryophytes also provided shelter to some invertebrates like beetles, moths, butterflies and dipterans. No higher fauna were observed except a field rat (*Rattus ratus*). Among birds, Scarlet Minivet (*Pericrocotus flammeus*), Jungle Crow (*Corvus macrorhynchos*), Redvented Bulbul (*Pycnonotus cafer*), Redbilled Blue Magpie (*Cissa erythrorhyncha*), House Sparrow (*Passer domesticus*) and Dark Kite (*Milvus migrans*) were sighted around habitats of this plant.

Field Visits (March, 2015)

Date	From	To	Locality majors
March 18, 2015	Kathmandu	Melamchi	Peripheries areas (840-950 m)
March 19, 2015	Melamchi	Melamchi	Tar, Bagaiche, Melamchi River sides (800-950 m)
March 20, 2015	Melamchi	Melamchi	Dhunge, Dovantar, Indrawati River sides (840-900 m)
March 21, 2015	Melamchi	Melamchi	Gairigaun, Pakhrin, Bahun Danda (1000-1300 m)
March 22, 2015	Melamchi	Ichok	Talamarang, Palchok, Kiual (900-1400 m)
March 23, 2015	Ichok	Kathmandu	-

Appendix I

Bryophytes Diversity Melamchi and Peripheries Areas

S. No.	Families	Latin names	Specimens Examined
Anthocerotae			
1	Anthocerotaceae	*Anthoceros punctatus* L.	Talamarang, 1000 m , 22.03.2015, Pradhan & al. RSG 1584
Hepaticae			
1	Aytoniaceae	*Asterella wallichiana* (Lehm. & Lindenb.) Grolle	Pakhrin- Melamchi, 1110 m, 21.03.2015, Pradhan & al. RSG 1579; Daujatar-Talamarang,1150 m , 22.03.2015, Pradhan & al. RSG 1585.
2	Aytoniaceae	*Plagiochasma appendiculatum* Lehm. & Lindenb.	Bagaiche- Melamchi, 970 m, 19.03.2015, Pradhan & al. RSG 1531; Gairi Gaun, 1050 m,21.03.2015, Pradhan & al. RSG 1561.
3	Aytoniaceae	*Plagiochasma pterospermum* C. Massal	Simdhara- Melamchi, 850 m, 20.03.2015, Pradhan & al. RSG 1547; Dovantar- Melamchi, 840 m, 20.03.2015, Pradhan & al. RSG 1540; Bagaiche-Melamchi, 970 m, 19.03.2015, Pradhan & al. RSG 1530; Gairi Gaun, 1050 m, 21.03.2015, Pradhan & al. RSG 1562; Talamarang, 1000 m , 22.03.2015, Pradhan & al. RSG 1586; Palchokbesi-Palchok, 950 m, 22.03.2015, Pradhan & al. RSG 1592.
4	Jungermanniaceae	*Jungermannia exertifolia* Steph.	Thulokhet- Talamarang, 900 m, 22.03.2015, Pradhan & al. RSG 1612.
5	Marchantiaceae		Dovantar- Melamchi, 840 m, 20.03.2015, Pradhan & al. RSG 1537; Simdhara-Melamchi, 850 m, 20.03.2015, Pradhan & al. RSG 1545; Pakhrin- Melamchi, 1100 m, 21.03.2015, Pradhan & al. Pradhan & al. RSG 1552; Gairigaun, 1050 m, 21.03.2015, Pradhan & al. RSG 1559; Bagaiche- Melamchi, 970 m, 19.03.2015, RSG 1532; Talamarang,1000 m, 22.03.2015, Pradhan & al. RSG 1587; Palchokbesi-Palchok, 950 m, 22.03.2015, RSG 1591; Tarkebesi- Ichok, 1335 m, 22.03.2015, Pradhan & al. RSG 1608.
6	Marchantiaceae	*Marchantia paleacea* Bertol.	Dovantar- Melamchi, 840 m, 20.03.2015,

			Pradhan & al. RSG 1538; Bahungaun-Melamchi, 1300 m, 21.03. 2015, Pradhan & al. RSG 1557; Gairigaun, 1050 m, 21.03.2015, RSG 1560; Palchokbesi-Palchok, 950 m, 22.03.2015, Pradhan & al. RSG 1590.
7	Marchantiaceae	*Marchantia papillata* ssp. *grossibarba* Raddi	Gairigaun, 1050 m, 21.03.2015, RSG 1558; Thulo khet-Talamarang, 980 m, 22.03.2015, Pradhan & al. RSG 1588.
8	Ricciaceae	*Riccia* sp.	Dhunge- Melamchi, 1060 m, 20.03.2015, Pradhan & al. RSG 1573.
9	Ricciaceae	*Riccia* sp.	Sera- Palchok, 1130 m, 22.03.2015, Pradhan & al. RSG 1589.
10	Wiesnerellaceae	*Dumortiera hirsuta* (Sw.) Nees	Simdhara- Melamchi, 850 m, 20.03.2015, Pradhan & al. RSG 1546; Gairigaun, 1050 m, 21.03.2015, Pradhan & al. RSG 1563; Tarkebesi- Ichok, 1335 m, 22.03.2015, Pradhan & al. RSG 1607.
Musci			
1	Bartramiacceae	*Bartramidula bartramioides* (Griff.) Wijk & Marg.	Dhunge- Melamchi, 1060 m, 20.03.2015, Pradhan & al. RSG 1580;
2	Bartramiacceae	*Fleischerobryum longicolle* (Hamp.) Loeske	Pakhrin- Melamchi, 1100 m, 21.03.2015, Pradhan & al. RSG 1551; Palchokbesi-Palchok, 950 m, 22.03.2015, Pradhan & al. RSG 1593.
3	Brachytheciaceae	*Eurhynchium swartzii* (Turner) Curn.	Dhunge- Melamchi, 1060 m, 20.03.2015; Pujarichok- Palchok, 1380 m, 22.03.2015, Pradhan & al. RSG 1594.
4	Bryaceae	*Anamobryum julaceum* Schimper	Bahungaun- Melamchi, 1300 m, 21.03. 2015, Pradhan & al. RSG 1556; Tarkebesi- Ichok, 1335 m, 22.03.2015, Pradhan & al. RSG 1605.
5	Bryaceae	*Bryum argenteum* Hedw.	Pakhrin-Malamchi, 1100 m, 21.03.2015, Pradhan & al. RSG 1550; Tarkebesi-Ichok, 1335 m, 22.03.2015, Pradhan & al. RSG 1606.
6	Bryaceae	*Bryum coronatum* Schwaegr.	Dovantar- Melamchi, 840 m, 20.03.2015, RSG 1541a Bagaiche- Melamchi, 970 m, 19.03.2015, Pradhan & al. RSG 1534; Dhunge- Melamchi, 1060 m, 20.03.2015 RSG 1572; Palchokbesi- Palchok, 950 m, 22.03.2015, Pradhan & al. RSG 1595.
7	Calymperaceae	*Mitthyridium flavum* (C. Muell.) Robinson	Taramarang, 1000, 22.03.2015, Pradhan & al. RSG 1583.

8	Dicranaceae	*Garckea phascoides* (Hook.) Dozy & Molk.	Dhunge- Melamchi, 1060 m, 20.03.2015 RSG 1569; Kiuakpati-Kiual, 1175 m, 22.03.2015, Pradhan & al. RSG 1596; Tarkebesi- Ichok, 1335 m, 22.03.2015, Pradhan & al. RSG 1604.
9	Entodontaceae	*Erythrodontium julaceum* (Schwaegr.) Par.	Mahendreshwar-Dovantar, Melamchi, 840 m, 20.03.2015, Pradhan & al. RSG 1543; Churetar- Kiual, 1120 m, 22.03.2015, Pradhan & al. RSG 1597; Pipaldanda- Ichok, 1250 m, 22.03.2015, Pradhan & al. RSG 1610.
10	Hypnaceae	*Hypnum cupressiforme* Hedw.	Tarkebesi- Ichok, 1335 m, 22.03.2015, Pradhan & al. RSG 1603.
11.	Hypnaceae	*Ectropothecium obtusulum* (Cardot) Z. Iwats	Talamarang, 1350 m, 22.03.2014, Pradhan & al. RSG 1614 (NHM).
12	Hypnaceae	*Taxiphyllum taxirameum* (Mitt.) Fleisch.	Dhunge- Melamchi, 1060 m, 20.03.2015, Pradhan & al. RSG 1568.
13	Leucobryaceae	*Octoblepharum albidum* Hedw	Dhunge- Melamchi, 1060 m, 20.03.2015, Pradhan & al. RSG 1574; Churetar-Kiual, 1120 m, 22.03.2015, Pradhan & al. RSG 1598.
14	Plytrichaceae	*Pogonatum microstomum* (R. Br. ex Schwaegr.) Brid.	Tarkebesi- Ichok, 1350 m, 22.03.2015, Pradhan & al. RSG 1611.
15	Pottiaceae	*Barbula constricta* Mitt.	Indrawati River site- Melamchi, 850 m, 20.03.2015, Pradhan & al. Pradhan & al. RSG 1613 (NHM).
16	Pottiaceae	*Hydrogonium arcuatum* (Griff.) Wijk & Marg.	Dovantar- Melamchi, 840 m, 20.03.2015, Pradhan & al. RSG 1539; Tar – Melamchi, 870 m, 19.03.2015, Pradhan & al. RSG 1535, Dhunge- Melamchi, 1060 m, 20.03.2015, Pradhan & al. RSG 1577, RSG 1582; Pipal Danda-Ichok, 1250 m, 22.03.2015, Pradhan & al. RSG 1602.
17	Pottiaceae	*Hyophila involuta* (Hook.) A. Jaeger	Tar – Melamchi, 870 m, 19.03.2015, Pradhan & al. RSG 1536; Gairi Gaun, 1050 m, 21.03.2015, Pradhan & al. RSG RSG 1564, RSG 1567.
18	Pottiaceae	*Hyophila spathulata* (Harv.) A. Jaeger	Simdhara- Melamchi, 850 m, 20.03.2015, RSG 1549; Bahungaun-Melamchi, 1300 m, 21.03. 2015, Pradhan & al. RSG 1553; Indrawati River side, 840 m, 20.03. 2015, Pradhan & al. RSG 1554; Pipal Danda- Ichok, 1250 m, 22.03.2015, Pradhan & al. RSG 1601.

19	Pottiaceae	*Semibarbula orientalis* (Web.) Wijk & Marg.	Simdhara- Melamchi, 850 m, 20.03.2015, Pradhan & al. RSG 1548; Bahungaun- Melamchi, 1300 m, 21.03. 2015, Pradhan & al. RSG 1555; Gairi Gaun, 1050 m, 21.03.2015, Pradhan & al. RSG 1565; Dhunge- Melamchi, 1060 m, 20.03.2015, Pradhan & al. RSG 1578.
20	Pottiaceae	*Semibarbula ranuii* Gangulee	Simdhara- Melamchi, 840 m, 20.03. 2015, Pradhan & al. RSG 1544; Indrawati River side, 840 m, 20.03. 2015, Pradhan & al. RSG 1545.
21	Stereophyllaceae	*Entodontopsis leucostega* (Brid.) W.R. Buck & Ireland	Dhunge- Melamchi, 1060 m, 20.03.2015, Pradhan & al. RSG 1575.
22	Thuidaceae	*Herpetineuron toccoae* (Sull. & Lesq.) Card.	Dhunge- Melamchi, 1060 m, 20.03.2015, Pradhan & al. RSG 1581; Churetar-Kiual, 1120 m, 22.03.2015, Pradhan & al. 1599.
23	Thuidaceae	*Thuidium cambifolium* Dozy & Molk	Dhunge- Melamchi, 1060 m, 20.03.2015, Pradhan & al. RSG 1576; Kiual, 1400 m, 22.03.2015, Pradhan & al. RSG 1600; Tarkebesi- Ichok, 1335 m, 22.03.2015, Pradhan & al. RSG 1609.

Appendix II

A list of the recorded species of invertebrates in and around bryophyte habitats.

Serial Number	Order	Family	Scientific Name	Common Name
1.	Diptera	Tabanidae	*Tabanus rubidius*	Tabanid Fly
2.		Caliphoridae	*Lucilia* sps.	-
3.		Sarcophagidae	*Sarcophaga crassipalpis*	
4.		Muscidae	*Musca domestica*	House Fly
5.	Coleoptera	Chrysomelidae	*Haltica* spp.	Flea Beetle
6.			*Laccopters quadrimaculata*	Tortoise Beetle
7.		Staphylinidae	*Paederus litoralis*	Rove Beetle
8.		Coccinelidae	*Coccinela septopunctata*	Lady Bird Beetle
9.	Lepidoptera	Notodontidae	*Gazalina chrysolopha*	
10.		Noctuidae	*Chrysodeixis eriosoma*	
11.			*Trichopulsia orichalcea*	
12.		Papilionidae	*Papilio polyctor*	Common Peacock
13.			*Papilio demoleus*	Common Swallowtail
14.			*Troides Helena*	Common Birdwing
15.		Nymphalidae	*Neptis hylas*	Common Sailor
16.			*Aglais cashmirensis*	Indian Tortoise Shell
17.			*Kallima inachus*	Orange Oakleaf
18.			*Precis almanac*	Peacock Pansy
19.			*Precis atlites*	Grey Pansy
20.			*Precis hierta*	Yellow Pansy
21.			*Vanessa cardui*	Painted Lady
22.			*Vanessa indica*	Red Admiral
23.			*Ariadne merion*	Common Castor
24.			*Athyma perius*	Common Sergeant
25.		Pieridae	*Pieris brassicae*	Large Cabbage White
26.			*Eurema hecabe*	Common Grass Yellow
27.			*Gonepteryx rhamni*	Common Brimstone
28.			*Catopsilia pomana*	Lemon Emigrant
29.		Lycaenide	*Heliophorous epicle*	Purple Sapphire
30.			*Celastrina puspa*	Common Hedge Blue
31.			*Jamides celeno*	Common Cerulean
32.		Nemeobiidae	*Zemeros flegyas*	Punchinello
33.		Hesperiidae	*Udaspes folus*	Grass Dart
34.			*Potanthus pseudomaesa*	Common Indian Dart