

# Botanical Exploration of Saipal Himal, Bajura District, Nepal, 2017.

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THE SOCIETY OF HIMALAYAN BOTANY TOKYO SS]



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**Figure 1.** *Meconopsis horridula* and *Saussurea topkegolensis* growing in a gully at 4500m

## Abstract

The Bajura-Saipal Himal expedition was carried out in the Saipal Himal region of Bajura District in western Nepal by staff and affiliates from the Royal Botanic Garden Edinburgh (RBGE), the Government of Nepal's Department of Plant Resources (DPR) and the University of Tokyo. The aim of the fieldwork was to collect seed, herbarium specimens, and DNA samples to support the research programmes of DPR and RBGE and contribute to the Flora of Nepal project. The expedition consisted of six members, with three from RBGE, one from DPR, one from the University of Tokyo and one from Altai State University, Russia and affiliated to RBGE to work on the Flora of Nepal. The expedition took place from 4<sup>th</sup>-24<sup>th</sup> August 2017, starting and finishing in Martadi, Bajura District. 571 herbarium collections and 62 seed collections were made. One new species of *Potentilla* and possible new *Saussurea* have been identified so far. *Stipa roborowskii* and *Sehima notatum* are new records for Nepal.

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## Acknowledgements

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**Figure 2.** The Expedition field botany team at 4400m on Chauki Lekh, Thursday 17<sup>th</sup> August. Left to Right, William Hinchliffe, Dr Hiroshi Ikeda, Dr Polina Gudkova, Jeevan Pandey, Dr Colin Pendry, Matthew Jackson, Mingma Sherpa, Pemba Sherpa and Padam Sherpa.

## Expedition Overview

Our expedition took place in August 2017. The remote district of Bajura in Western Nepal was chosen, as current knowledge of the flora of the region is poor. The expedition coincided with one of the worst monsoons in years. Preliminary plans made in Edinburgh to reach the glacial valley to the east of Saipal had to be adapted and the final route of the expedition loosely followed a pilgrimage trail to the lake of the Goddess Budhinanda. This took us up to mountain areas that were used for seasonal grazing of sheep, goats and cattle. Despite the relative remoteness of the areas visited, the impact of human pressure was evident at all locations. Herbarium specimens and DNA samples collected during fieldwork are to be analysed as part of an ongoing, international project to publish *The Flora of Nepal*. The plant communities we looked at are changing. Seasonal grazing has a strong influence on the vegetation structure. The absence of intact woodland in the area is notable and the lack of regeneration in woodlands was concerning. This is typical of the situation across much of Nepal.

Seeds were collected for the National Botanical Garden, Nepal (NBG). Permission has been sought from DPR for the export of seed to grow at RBGE for research and display but has not yet been granted.



**Figure 3.** Looking to the head of the valley. Above the valley's headwall is the lake of the Goddess Budhinanda. This is a very important spiritual site. Thousands of sheep and goats are brought into the valley for summer grazing. The animals graze up above 4500m during the day, returning to lower ground in the evening.

## Participants



## Objectives

The fieldwork was purely for scientific research and had no commercial value.

The primary aims were to:

- Collect herbarium specimens and associated data used to prepare the *Flora of Nepal*
- Collect seed material for cultivation at RBGE and Nepal's National Botanical Garden.
- Collect herbarium specimens, DNA samples and seeds from a poorly known region of Nepal
- Support one Nepalese staff member from DPR in fieldwork, further developing their existing seed collection and herbarium techniques.

## Context for the Expedition

### NEPAL'S BIODIVERSITY STRATEGY

The *Nepal Biodiversity Strategy 2002 (NBS)* and *Nepal Biodiversity Strategy Implementation Plan 2006 (NBSIP)* described the current status of conservation activities in Nepal, and the plans to strengthen and build on them in the future. Both publications note that there are major constraints to conservation from the lack of accurate base-

line information on plant taxonomy, distribution, and conservation status. These data are needed to formulate effective action plans and are being compiled in the *Flora of Nepal*.

## FLORA OF NEPAL PROJECT

The *Flora of Nepal* is a priority project in NBS and NBSIP. It is an international collaboration between Nepalese, UK and Japanese institutions which have signed MOUs to work together to produce the Flora. DPR and RBGE are signatories to these MOUs and have a strong record of collaborative research, which in recent years has included joint fieldwork, training and publication, e.g.:

- The Flora of Nepal
- Fascicles of the Flora of Nepal
- Darwin Initiative Capacity Building Project (2002-2006)
- Darwin Invasive Plants Project (2016-2019)

The Flora is a long-term project, which will publish an estimated 7000 species of vascular plants in ten volumes, the first of which was published in September 2011. A further three volumes are currently in preparation, with each of the partner countries coordinating work on a different volume. The project also has an interactive website ([www.floraofnepal.org](http://www.floraofnepal.org)) which already makes data on the plants of Nepal freely available.

## Justification for the Research

### HERBARIUM SPECIMEN COLLECTING IN NEPAL

Herbarium specimens are the scientific reference collections used by botanists describing plant biodiversity. When properly named they also provide an authenticated set of reference materials with which to compare unidentified samples and voucher materials for occurrence records. It is vital that national herbaria such as KATH, Nepal hold a comprehensive collection of herbarium specimens representing all plant species from their country. Duplicate herbarium specimens enable scientists in different locations to work on the same materials, sharing their experience and expertise to enhance the accuracy of identification and develop skills, and enabling them to undertake collaborative research.

The collection density of herbarium specimens in Nepal is low in comparison with other countries, so we do not yet have a complete picture of the country's plant diversity. Expeditions regularly collect species not previously known from Nepal and even species completely new to science. Uncovering this diversity requires high quality reference collections and frequently also the expertise of international specialists.

Collection density is very variable across Nepal, with some areas scarcely visited by botanists. The Saipal Himal region is poorly collected when compared with other mountain ranges in Nepal, as shown in Figure 4.



**Figure 4.** Distribution of all the occurrence records in the Flora of Nepal's taxonomic database system. The collecting area is shown within the red circle



**Figure 5.** Burned and grazed hillside cleared of trees dominated by *Cremanthodium ellisii*.

## Research Methodology

### HERBARIUM COLLECTIONS

- The expedition made herbarium collections of fertile material of plants using standard botanical collecting techniques.
- All herbarium samples were pressed and dried in the field using kerosene stoves.
- Herbarium specimens were collected in sets of at least four, with one set deposited at each of KATH, RBGE, TUCH (Central Department of Botany, Tribhuvan University, Nepal) and TI (University of Tokyo) – the last two being our partner organisations and MOU signatories on the *Flora of Nepal* project. An additional specimen was collected for complex plant groups where material needed to be sent to an international expert for identification.
- The first set of all the specimens collected was deposited in the National Herbarium (KATH), and therefore type specimens of any new species will be represented at KATH.
- A small portion of leaf material from each collection was dried in silica gel for DNA extraction.





**Figure 6.** Polina Gudkova collecting a grass.

## SPECIMEN IDENTIFICATION

- Specimens were assigned provisional identifications in the field and final identifications are now being carried out at RBGE and KATH, and for difficult groups by international experts.
- A preliminary list of collections with field names has been prepared (Appendix 4). Herbarium labels will be provided for these specimens once the initial identification process is completed (usually one year).

## FIELD RECORDS

- Field observations of common, readily identified species (such as dominant trees and shrubs) were gathered to supplement the records provided as preserved specimens. These were given full location data in the database and may be linked to digital images as vouchers.

## DATA COLLECTION

- Data for all the collections were compiled at the time of collection and were collated daily using a laptop computer.
- Electronic copies of the data and lists of the collections have been generated from the database and distributed to DPR.

## SEED COLLECTIONS

- Small quantities of seeds were collected for cultivation at the National Botanic Garden where the plants will be used in educational displays and research.
- Seeds were also deposited at the short to medium-term seed/germplasm storage facility at DPR.

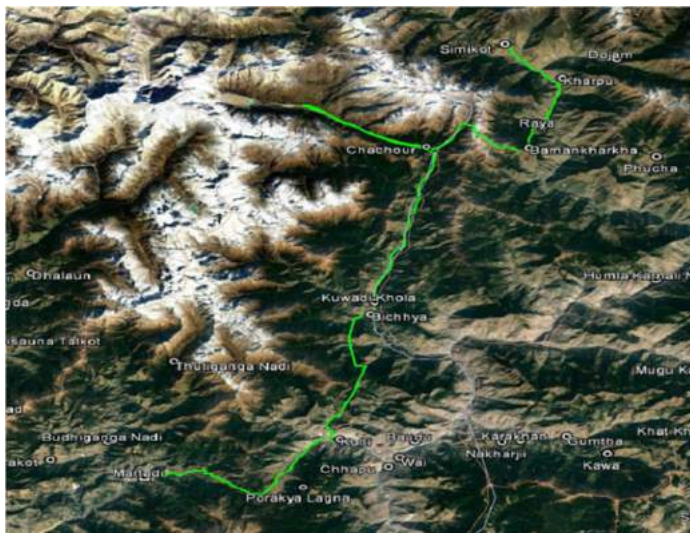
- We are hopeful that a share of seed material will be exchanged with RBGE under a Material Transfer Agreement that follows the Nagoya Protocol and in accordance with the MoFSC guidelines. The use of the seeds will be restricted to non-commercial, scientific research and educational purposes only and they will not be passed to a third party.



**Figure 7.** Discussing route options in Kathmandu.

## Route

The area is relatively unexplored and there are very few accounts of the area. The first route option (Figure 8) was to have taken us from Martadi to Kolti then along the Kuwadu Khola (river) and up to the glacial valley below Saipal at around 3600m with higher elevations to explore up the sides of the valley. We would then walk out to Simkot and take a flight back to Kathmandu.



**Figure 8** Showing the route planned back at the desk in Edinburgh.

A climbing team had taken the same route from the confluence of the Karnali and the Kuwadi Khola in 1992. *Evans. Saipal, 1992 The Himalayan Journal Vol.49. 1993.* They had attempted to use this route as a backdoor to climb Saipal from the glacier. Their attempts ended when an ankle was broken and a team member had to run to Simkot to arrange a helicopter rescue. Our expedition guides were unable to get clear advice on the suitability of

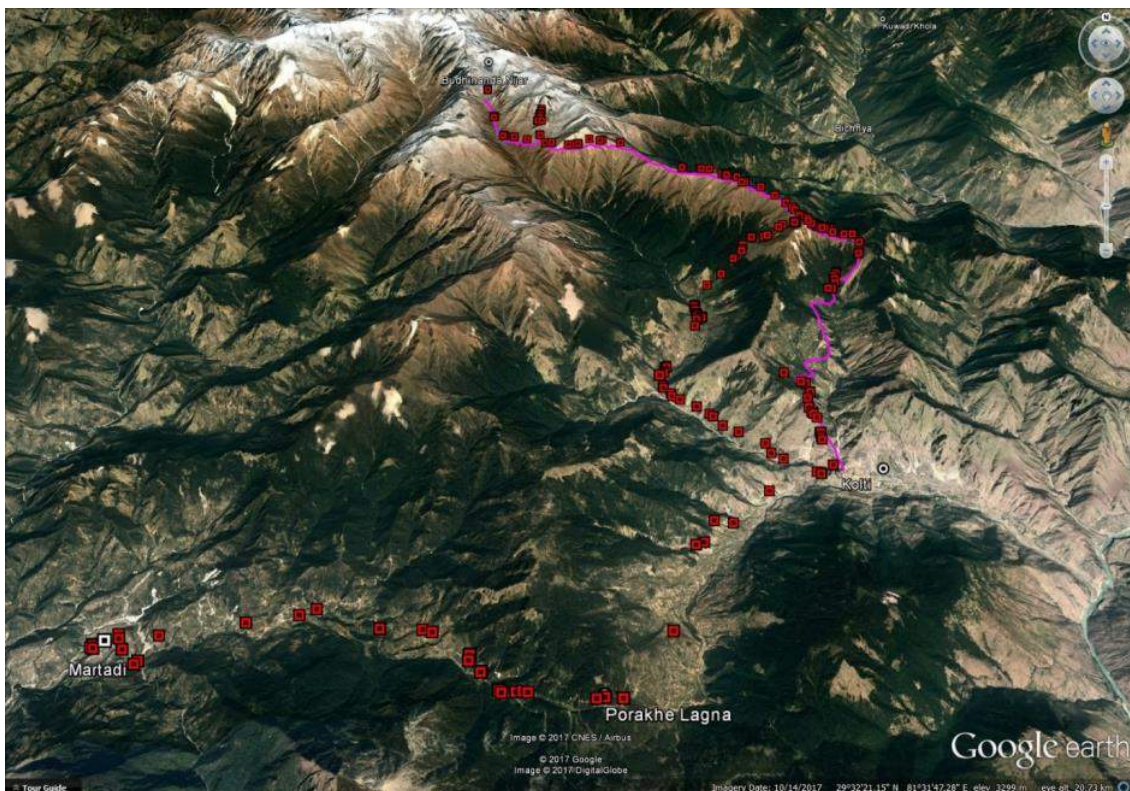
the route for an expedition of our size and the condition of the rivers and tracks would greatly affect progress. Figure 9 shows a mountaineer's view of the glacial valley bellow Saipal Himal.



**Figure 9.** Bikrum Singh, a young Nepalese guide, on the upper NE ridge of Saipal. In the middle distance, the fine, triangular snow/ice pyramid is an unclimbed 5,638m peak. The rockier peak to its left is 5,696m, also unclimbed. In the far distance lie the peaks straddling the Nepal-Tibet border. From left to right; Changla, Gorek and Kanjiroba Himal. Photo: Paolo Grobel 2011 American Alpine Club. The glacier below is covered with debris

from the slopes that bound the valley. This is typical of a Himalayan glacier.

The itinerary had to be very flexible and respond to local conditions (flooding, difficult pathways, landslides etc.) and religious areas. Due to the unusually severe monsoon rains, the schedule was reconsidered each day. There were many changes to our plans. The actual route (Figure 10) beginning and ending in Martadi (bottom left in both maps) was as much a response to the weather as it was to our initial overambitious route planning! It is very easy to underestimate the terrain when looking at a map.



**Figure 10.** The collecting points are depicted with red boxes.

## Logistics

We engaged a trekking company that specialises in scientific expeditions in Nepal. Dawa Sherpa, the trek leader, has extensive experience accompanying botanical and geological expeditions across Nepal. Dawa arranged a team of around 40 staff to run the camps and portage between camps. Having the camp run by staff allowed the team to focus on the management of the specimens, seed, DNA samples and data. Due to the remoteness of the route porters carried all specimens. By the end of the trek we had amassed over 2000 herbarium sheets.

## Daily routine

0600hrs – Wake, pack up. Dismantle drying frame, empty presses, pack up dry specimens and separate damp specimens for re-drying that evening. 0730hrs – Breakfast. 0800hrs – Leave camp for fieldwork, the camp staff would break camp and head off, marking the route to the new camp. 1700hrs – Arrive at camp. Unpack the field presses and arrange specimens for drying. Prepare DNA samples. 1900hrs – Dinner. 1930hrs – Finish off the presses and set up for drying. Add data collected from specimens to Padme (database) on the laptop.

Field work had to be coordinated and managed to ensure that a variety of habitats were properly surveyed along the route whilst still making the camp in good time to process collections.

## Itinerary

**01 - 04 Aug.** Kathmandu

- Meetings with DPR, NBG and visit to KATH
- Visit Biodiversity Education Garden in NBG
- Meetings with DAWA Sherpa to arrange Trek logistics.
- Checking and packing up of expedition equipment.
- Purchase supplies and medical equipment
- Team briefings

**05 Aug.** Fly from Kathmandu to Dhangadhi drive to Sanphe Bazaar

We had hoped to make the drive to Martadi in one day but the road conditions deteriorated throughout the drive. Road conditions deteriorated so badly that we had to send back the 4x4s that we had brought from Dhangadhi and decant into a more rugged local 4x4.

**06-Aug.** Drive from Sanphe Bazar to Martadi.

**07-Aug** Martadi to Dhamkane.



**Figure 11.** Martadi Alt 2300m 6<sup>th</sup> August 2017. Our trekking began and ended here.



**Figure 12.** *Pinus roxburghii* wood-pasture viewed from Martadi. The lower limbs have been cut to provide fuel this also allows more light to improve the grazing. Many of the trees are blazed at the base to produce resinous kindling.

**08-Aug** Dhamkane to Pandusain



**Figure 13.** Pandusain 7<sup>th</sup> August. Children from Pandusain look on with interest as we set camp and sort specimens.



**Figure 14.** Pandusain 7<sup>th</sup> August. Women from Pandusain returning with foliage cut for fodder and bedding. Our kitchen and work tents are given the extra protection of a tarpaulin as rain approaches.



**Figure 15.** *Abies pindrow* in the valley between Dhamkane and Pandusain. The lower forest was less heavily grazed and wetter throughout the year. The dominant tree species was *Aesculus indica* with *Rhododendron arboreum* in small numbers. There were also tall trees of *Tsuga dumosa*. As we gained more height we entered a pure stand of *Abies pindrow*. The tallest tree was estimated at 44m. A ring count on a felled tree of 75cm diameter put the age of the tree at 240 years. The surrounding trees were of a similar size. With no regeneration due to the use of the forest for grazing this population is in decline.



**Figure 16.** *Cautleya gracilis* growing on the trunk of *Aesculus indica* in a wet valley



**Figure 17.** Colin trims down *Ligularia fischeri* next to the river swollen by the monsoon rains. The Path meandered in and out of the river as we followed it up the valley.



**Figure 18.** *Ligularia fischeri* growing in a wet *Aesculus indica* woodland bank in a natural setting. A planting that could be easily replicated.

**09-Aug** Pandusain to Nuri Khat



**Figure 19** Looking down the valley to Kolti, which has an airstrip and a medical centre. Kolti would be a good place to fly into for future exploration of the area.

The previous day Polina's eye had become infected and we had to get it checked out before heading further into the hills. Polina was treated at the medical centre in Kolti and recovered well after being given antibiotic eye ointment. Without this treatment she would have had to leave the expedition.

10-Aug Nuri Khat to Dam Goth



**Figure 20.** *Capparis spinosa*. Specimen photographs were taken of all collections using black velvet as a background. To accurately capture key features up to 20 photos may have to be taken of each specimen. Photos are linked to the collections using Padme and will be accessible using the Flora of Nepal Website.



**Figure 21.** Collecting *Capparis spinosa* from cliffs in a dry gully



**Figure 22.** *Ficus religiosa* with a stone seat offering some welcome shade to the porters on a hot morning that soon turned into a wet afternoon.



**Figure 23.** *Quercus semecarpifolia*, wood-pasture. The *Quercus* is cut regularly for fodder.



**Figure 24.** In the woodland you can see disturbance where Ginseng is being collected for sale. The woodland was a good collecting site and contained some large specimens of *Tsuga dumosa*, *Picea smithiana*, *Aesculus indica* and *Quercus semecarpifolia*.



**Figure 25.** Collection number B26. *Phryma leptostachya* growing in the woodland. Once fertilised the calyx reflexes back along the stem. High quality images complement the herbarium specimens and increase accessibility to the fieldwork data. In this image you can clearly see the hooks on the ends of the calyx teeth.



**Figure 26.** *Salvia hians* growing in a meadow above a gully with large trees of *Tsuga dumosa* and *Abies spectabilis*. This is an artificial tree line at around 3000m. The meadow has been cleared, possibly hundreds of years ago, and is maintained by seasonal grazing and regular burning.

#### 12-Aug Chauki Lekh (buffalo camp)

A lekh is a mountain ridge. Our camp was on a shoulder of the ridge at around 3300m. We camped two nights here, exploring the ridge in the day. The camp area was used for shelter by the buffalo and was heavily puddled. We climbed the ridge and carried out fieldwork on the way back down. This allowed for some acclimatisation to the altitude.





**Figure 27.** The north side of the Chauki Lekh is wetter and covered in a scrub of *Rhododendron*, *Betula utilis*, *Sorbus microphylla*, *Hydrangea heteromalla*, and *Acer pectinatum*. *Rhododendron lepidotum* in the foreground. The drier south face of the ridge had been burnt and was heavily grazed.



**Figure 28.** Hiroshi Ikeda photographing *Potentilla eriocarpa* var *major*, previously recorded only from Mustang District, about 250 km to the east.

13-Aug Chauki Lekh (Chorten camp)



**Figure 29.** The ridge was heavily grazed but rich in *Peduncularis* species



**Figure 30.** Bright blue berries of *Gaultheria trichophylla*.



**Figure 31.** The Chauki Lekh path is marked by gates with bells. Offerings of flowers are placed on the gate and the bells rung three times when passing through.



**Figure 32.** These gates are a striking characteristic of this region. A replica would be a great addition to the Nepalese area in the RBGE's Edinburgh garden.

15 – 17 Aug. Sheep corrie camp on the Chauki Lekh. Exploration of the source of the Buadi Khola and the high corries.



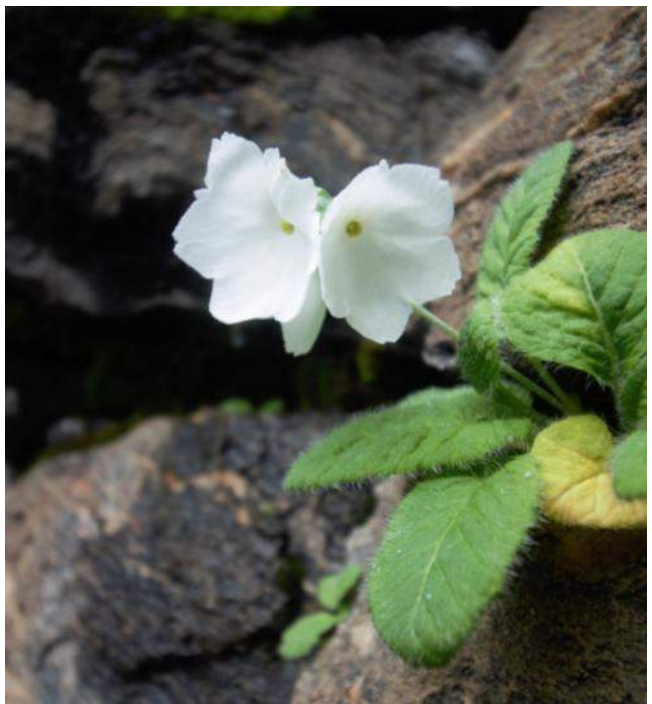
**Figure 33.** *Meconopsis paniculata* in seed.



**Figure 34.** *Meconopsis paniculata* in flower. Flower spikes to 1.8m tall.



**Figure 35.** *Meconopsis horidula*.



**Figure 36.** *Primula reidii* with its beautiful papery white corolla.



**Figure 37.** A wet gully at 4400m rich in *Rheum*, *Cremanthodium*, *Primula*, *Meconopsis* and *Saussurea*



**Figure 38.** Sharing camp with dozens of sheep and goats.

18-Aug Chauki Lekh (Chorten camp)



**Figure 39.** Our camp on the Chauki Lekh was at 3900m and was beside two chortens and a shelter used by pilgrims. The views from here should be fantastic but the weather did not clear at all during our time on the Chauki Lekh.

19-Aug. Descent to the village of Kuru.

**Figure 40.** The distinctive bark of *Prunus rufa*.



**Figure 41.** *Meconopsis robusta* in heavily grazed *Quercus semecarpifolia* wood pasture.

## 20-Aug Kuru

We stayed two nights in the village of Kuru. The village surrounds the floodplain of the Buadi Khola river. The floodplain had a parkland feel to it with specimen trees that were uncut. A network of canals and aqueducts carved from logs fed small watermills for milling grain. The 21<sup>st</sup> of August was spent collecting along the river, the meadow and river banks that were particularly rich in sedges. The village was truly beautiful.



**Figure 42.** Villagers chop a fallen tree for firewood. Locally employed forestry officers impose fines for the cutting down of live trees. Trees may be surreptitiously felled in the night and chopped up for firewood over a year later.



**Figure 43.** A local woman climbs a *Pyracantha crenulata* on the floodplain in Kuru to cut branches and snack on the fruit.

## 21-Aug Kuru to Kolti



**Figure 44.** Kuru villagers rest by a gate on the path to Kolti. The Buadi Khola river drops over 700m before reaches Kolti and the force it generates is fearsome.

**22-Aug** Porakhe Lagna. A camp near the pass above Pandusain.



**Figure 45.** One of our favourite plants of the trip was *Parnassia wightiana*. Found growing in wet grassy areas the fimbriate margins to the petals make it a stunning flower. Good seed collections have been stored at NBG and we hope to exchange them.

### **23-24 Aug**

Return to Martadi then back to Kathmandu via Dipayal and Dhangadhi.

The personal diary of Matthew Jackson (Appendix 2) gives further detail of each location and field experience.

## Collections Summary

A detailed list of the collections is included in Appendix 4. Full details will have been entered into the Padme database that outputs information to the Flora of Nepal Website. Photographs taken of individual collections will be published here once processing is complete.

571 herbarium specimens were collected and included:

- 20 species of Labiatae
- *Potentilla* – 15 species, 1 new species discovered
- Stipae – 1 new record for Nepal
- *Sehima notatum*, new record for Nepal
- Compositae – 1 possible new species of *Saussurea* (BSH B122)

Large range extensions were identified for *Potentilla eriocarpa* var. *major* and *Saussurea topkegolensis*.

Currently, half of the specimens have been determined to the species level (Appendix 4).

62 seed collections were made. Seed collections were kept to species of particular interest that would add to the living collections in the NBG and, hopefully RBGE.

## Expedition Outcomes

### Human capacity building

The DPR participant on the expedition, Jeevan Pandey, was further trained in fieldwork techniques, data recording, seed collecting and preparation, as well as herbarium specimen collection and preparation.

### Institute capacity building

The collected materials (herbarium specimens) was shared between DPR, Tribhuvan University's Central Department of Botany and RBGE, for the use of research. The first set of specimens will be deposited at DPR (KATH), and these will be a significant enhancement to the national reference collections in Nepal. As a complete set of specimens will be deposited at KATH, any type material for new species or new records for Nepal will be represented there.

The collected seed will be used in new plantings at Nepal's National Botanical Garden, particularly the BEG, and has supplemented DPR's Seed Bank.

Staff at NBG were trained in seed collecting, processing, storage and sowing.

### Increase in the knowledge of plant diversity in Nepal

The accurately identified collections will significantly increase the level of knowledge of plants growing in the study areas. These data will contribute to the national checklist and be used by Nepalese and foreign botanists in preparing accounts for the Flora of Nepal. All data, including photographs of plants collected will be made available on the Flora of Nepal's website ([www.floraofnepal.org](http://www.floraofnepal.org)).

### Publications

The research findings, including the expedition report(s), list of plants collected, additions to the Flora of Nepal and scientific publications will be jointly authored by Nepalese and foreign counterparts involved in the field research and all parties will have equal share in the authorship of research findings and ownership of data and copyright.

## Troubleshooting

By the nature of this type of pioneering expedition, the route was likely to change and revisions were made on a day-to-day basis. The main aim of reaching high altitude collect localities was achieved. This was down to the experience of Dawa Sherpa, the Nepalese trek leader and his effective management and communication.

Any issues arising surrounding transport, camping, food, accommodation, movement of equipment were all quickly solved by Dawa and his team.

Cultural sensitivities meant that a planned exploration of the corrie around Budhinanda Javi lake, the source of the Baudi Khola, was abandoned. Respecting local customs and wishes is an important consideration when travelling in remote regions where few foreigners are ever seen.

Despite the severity of the monsoon rains, we were able to keep specimens dry in the excellent Japanese plastic boxes that Dawa uses on his trips. The only problem occurred in one bundle of specimens that included a *Roscoea* that had not been dried properly, and consequently it and several other specimens had begun to go mouldy. Luckily we noticed this problem before too long, and by painting on high strength alcohol with a brush then re-drying the specimens we were able to stop the mould progressing and the quality of the specimens was only slightly impaired.

## Summary and Conclusion

The expedition achieved its objectives and has substantially added to the botanical knowledge of one of the least studied regions of Nepal. Immediate studies arising from this expedition include *Stipa*, *Potentilla* and *Impatiens*. The Flora of Nepal will continue to undertake fieldwork in priority locations in order to complete this large-scale collaborative project.

Even without the heavy monsoon rains the original route was far too ambitious for an expedition of our size. Distances and terrain were underestimated. There is still no published account of the flora of the glacial valley of Saipal nor any herbarium specimens lodged from here. Whether the valley holds any exciting new finds is still unknown and there would be great value in accurately documenting the plant communities that exist there.

Any future expeditions in the area could save some travel time by starting the trek in Kolti but they would have to manage the logistics carefully to supply the expedition and transport specimens back to Kathmandu.

There is ongoing discussion to try to export seed collected back to RBGE. Seed from RBGE's Living Collection has been exchanged to NBG and we are hopeful that RBGE will be sent the seed collected.

A material transfer agreement is in place between RBGE and DPR. Permission for the transfer of seed was granted in 2016. RBGE follows the Nagoya Protocol on access to genetic resources to ensure sustainable development and benefit sharing. The politics and bureaucracy of permits can seriously disrupt conservation work where the ultimate beneficiary is always intended to be the country of origin.

Plants collected at higher altitudes cannot conceivably be conserved in *ex situ* collections at the National Botanic Garden Godavari due to climatic constraints. Alpine growers back in Edinburgh could easily bring them into cultivation for conservation as they have done with so many other collections. It was a missed opportunity not to bring back seed from this expedition and RBGE staff are working with DPR to resolve this issue. Any illegal export of plant material from Nepal have the potential to jeopardise the work of the Flora of Nepal Project.



## Personal statements

MATT JACKSON



Having only learnt about botanical expeditions through lectures it was a fantastic and very enjoyable experience putting it into practice. I learnt how to press herbarium specimens in the field, make descriptions of the specimens and to take photographs *in situ* and portraits of key characters for later identification. I took responsibility for the collection of DNA samples from all accessions as well as the collection of ferns and fern allies.

Seeing the genera that I studied through my HND project on the Nepalese flora, and many more, enriched my plant knowledge not only in species but in species composition and natural landscapes which I am sure will be used later in my career through horticulture and garden design.

Working with scientists who specialise in their respective taxonomic groups such as temperate trees, grasses and Rosaceae enabled me to learn how to identify difficult groups in the field.

To see another botanic garden and the different techniques used was also fascinating. The National Botanic Garden has a lot of potential which I am sure will be enriched with the continued strong partnership between RBGE and NBG.

I am keen to go on more botanical expeditions in the future and to continue to undertake plant research during the Master of Science in Biodiversity and Taxonomy of Plants which I started in September in 2017 having been awarded a place whilst on this expedition in Nepal.

I would like to thank Dr Colin Pendry for inviting me as a third year BSc. Student of Horticulture and Plantsmanship (RBG Edinburgh) to join the expedition and for his tuition throughout the fieldwork. Heartfelt thanks to Simon Milne, Regius Keeper and David Knott, Curator of the Living Collections at RBG Edinburgh for their encouragement and references in support of my applications for funding. I greatly appreciate Dr Greg Kenicer's help in preparing for the expedition

## WILLIAM HINCHLIFFE



To visit an unstudied region of Nepal was a fantastic experience. The human impact on the landscapes that we visited was evident at every location. To see plant communities so pressured by the dynamics of seasonal grazing surprised me and it was easy to draw parallels with the historic degradation of upland systems in the UK.

All of the woodlands that we saw were relics and in poor condition; with no regeneration and continued grazing these woodlands have little longevity and little resilience. Descending from the Chauki Lekh to Kuru, we entered into some woodland that had been cleared within the last 20 years. Buffalo had puddled the ground and enriched it with dung. The few remaining trees were regrowth from old stumps. One lone specimen of *Prunus rufa* was growing. If that tree is cut for fuel or fodder, it could be lost from that location. The threats are clear.

I am proud that the specimens that we collected, the data and the field notes will contribute to the *Flora of Nepal* and it has inspired me to continue to familiarise myself with the flora further. It was disappointing not to be granted the permission to export seed.

Despite the human pressures, there was still a great diversity of plant communities to observe. Some pasture is likely to have been more diverse than the woodlands that they have replaced. The plant communities we observed gave great inspiration for planting combinations back at RBGE. I hope to bring a more natural feel to parts of the Nepalese beds by trying to replicate these naturally occurring assemblages by splitting up an existing planting and re-spacing the plants to encourage more interplay and a loose natural feel. It is this quality inspiration that I am most thankful for. Through further development of the Nepalese plantings, I hope that we can continue to inspire more people to visit the country of Nepal, promote the work of the *Flora of Nepal* project and communicate the need to conserve the flora.

## Appendix 1: Expedition Costs

Prepared by Dr Colin Pendry, Expedition Leader, RBG Edinburgh

<b>Total Expedition Income</b>	<b>£</b>	<b>Total Expedition Actual Costs</b>	<b>£</b>
RBGE Foreign Travel Fund	8925.00	Trek fee (\$28,100 = £3,703.33 p.p.)	22219.97
Eve Bennett Trust	4000.00	Flights and airport transfers	4601.18
Davis Expedition Fund	4980.00	Visas	202.00
Hiroshi Ikeda (personal contribution)	3600.00	Equipment	1335.16
RHS	4000.00	Kathmandu subsistence	1675.11
Merlin	1500.00	Internal flights	1713.37
Kenneth Black (Hardy Plant Society)	700.00	Insurance (Matt and Polina)	395.00
Finnis Scot Foundation	3500.00	DPR daily allowance (20 x \$50 per day)	758.78
William Steele Trust	750.00	<b>Total costs</b>	<b>32900.57</b>
<b>Total Income</b>	<b>31955.00</b>		
<b>William Hinchliffe Costs</b>		<b>Matthew Jackson's Costs</b>	
Trek fee	3703.33	Trek fee	3703.33
Flight	960.54	Flight	705.00
Visa	33.00	Visa	70.00
Half of cost of seed bags	67.67	Equipment	436.00
One third share of DPR counterpart costs	1515.67	Insurance	200.00
<b>William Hinchliffe Total Cost</b>	<b>6280.21</b>	Half of cost of seed bags	67.67
		One third share of DPR counterpart costs	1515.67
		<b>M. Jackson Total Cost</b>	<b>6697.34</b>

Signed by William Hinchliffe 06/12/2017

Signed by Matthew Jackson 29/11/2017




## Appendix 2: Matthew Jackson's Personal Expedition Diary

02-AUG

I arrived in Kathmandu early in the morning; Collin and Will landed later that morning. We collected the kit from the stores, which was almost an expedition in its own right, and then set it all up to check that it was complete and in working order.

03- AUG

We visited the National Botanic Garden and Herbarium, where Polina worked on their *Stipa* collections, while Will and I went into the garden to look around and see how the new Biodiversity Education Garden created by RBGE in 2016 was maturing

After that we visited the Department of Plant Resources where we met the newly appointed Director General and explained to them an outline of our plans of where we wanted to go to and what we wanted to achieve. During this visit we were given letters authorising the expedition and managed to get permission to collect seed but not to subsequently export it.

04 -AUG

All the team members assembled at Tibet Guest House for a last expedition briefing. The last items of kit were purchased around Thamel and final preparations were made for the next morning.

05-AUG KATHMANDU

After an early domestic flight to Dhanghadi, we drove to meet the Dhanghadi DPR Director, with whom we talked through our plans and the logistics for the expedition. We also had a brief discussion about the new ethnobotanical garden in Dhanghadi.

At 10am we took two Suzuki 4x4s and started the drive to Sanphe. It was my first experience of such driving conditions with the driver using (and needing to use) the horn for every overtake due to the numbers of: goats, rogue cows, tuk-tuks, coaches...

It was also my first experience of Dhal Bhat. All I can say is it's a good job that the UK doesn't have bottomless bowls!

It was with enormous excitement that I spotted *Roscoea* out of the corner of my eye as it whizzed past the jeep window. It was clinging onto the grassy walls, out of reach of the goat's voracious grazing. There was also *Ficus religiosa*, planted for religious purposes, by a riverside gravesite (or wedding?) One species is used for men and another for women.

During a stop for lunch, I found *Gossypium* and I asked the locals if we could take a seed sample back for the Nepal ethnobotanical garden. It was the first time that I had seen cotton growing.

Although I had seen *Lantana camara* growing in the Mediterranean this was the first time I had seen how much damage it can do to the native vegetation; it was good to see that people had been cutting and burning it as a control.

The roads were in good condition although the modern road surfaces did not continue all the way.

Finally we reached Sanphe Bazar by 8pm where we stayed overnight.

## 06-AUG SANPHE BAZAAR

I woke at 6am to see kites, with many torn or missing feathers giving them a ragged appearance, swooping low over the bazaar, looking to scavenge scraps off the streets.

Our second day of driving now found us down in the valley driving up alongside the river where we saw boys, herding their water buffalo, amusing themselves with a game of kabadi, their pitch drawn on the sandy banks. The road got steadily muddier and muddier until finally we reached an impassable section of deep ruts filled with sludge which forced us to get out of the vehicles to check it out and recon the route ahead. All of a sudden, we heard a powerful vehicle coming towards us at speed. It is a souped-up, all-terrain bus that hits the rutted road at full speed, bouncing through the ruts, caking everything in the vicinity in mud as the tyres start to lose traction. We decided that the cars are no longer capable of these road conditions and drive back to the nearest bazaar to collect a more suitable SUV with higher road clearance. The SUV had room for one passenger in the front and four in the back which was one seat short so I volunteered to ride in the back with all the kit. The back was covered with a canvassed metal cage but there was also an exterior footplate that I had great fun standing on, taking photos as we went through many large rivers and past steep ravine passes. In many places it was clear that bulldozers or diggers had removed recent, large landslides from the road. Towards the end of the journey, we realised that we had run out of properly constructed road when we passed the road construction team building the bridge over a river.

The SUV did its job and got us to just outside Martadi where we met the Sherpas who were to porter for the rest of the expedition. We had all got our rucksacks on when we realised, collectively, that our supplies of sunscreen was limited. Much to the amusement of the Sherpas I wiped fine clay all over my face like OTC camouflage.

After a twenty minute walk up hill we arrived in Martadi and “checked in” to our hotel and our last bed for 3 weeks. No time had been wasted though, we had already made our first collections which were then pressed in the best available space considering the heavy downpours outside. On this short walk I also saw my first Chautara which had an *Olea sp.* for shade. Chautaras are used by locals, but especially porters to rest and support their heavy loads. They are positioned on the ridgeline of a hill to maximise any wind and have a tree planted in the centre for shade. In the subtropical areas this was commonly a religious tree, *Ficus religiosa*. Dinner that evening was very civilised with a nicely laid table, another thing that wasn't to be seen for three weeks, along with a shower.

## 07-AUG MARTADI

After our last night in a proper bed we set off. Dawa was let down by a local pony man who failed to turn up as arranged. In the end additional porters were hired which took the total number in the porter team to thirty-four.

We only made three hundred metres out of Martadi before the science team's enthusiasm for collecting got the better of them possibly they even got a bit carried away at this early stage of the expedition. I got to lead us over the first metal suspension bridge which are being built by a government initiative and are vital to increase trade and communication between communities and access to them. Personally, I was really feeling the subtropical heat on a scorchingly hot day.

The hillsides were grazed, with *Agave sp.* grown for its fibre, as well as *Pinus roxburgii* which was easy to spot from a distance, with its more upright, denser needles in the inner whorl (it has 3 needles instead of the 5 of *P. wallichiana*)

Every conceivable piece of flat ground was used for rice; planted on the banks of the paddy fields were beans, as a second, minor crop, completely utilising every space.

We also found a *Spiranthes sp.* in hard-grazed grass hillside.

At the end of the day we were welcomed to a very misty campsite with heavy rain throughout the evening.

Having shot-gunned out loud the newest tent, Colin said it was Ikeda's which was fair enough, I proceeded to ask for the next best one and was rejected in preference to another expedition member, this continued until the sixth and final one. I loved my tent. It had seen many an expedition and it was a rather damp experience with frequent dripping from the centre, all 4 pockets and both doors. However, it was definitely preferable to sleeping under a tarpaulin.

#### 08-AUG DHAMKANE

We woke to heavy mist cloaking our campsite which remained throughout the day. The morning was spent walking through great *Rhododendron arboreum* forest, where collections were made of a climbing *Hydrangea sp.* Still following the river valley upstream, the team walked through *Abies* and *Tsuga* forests as well as a very large *Aesculus sp.* on the riverbank. I made a collection of *Tsuga sp.* using the long extendable cutting tool.

Further along we stopped to collect a *Begonia sp.* on a narrow path cut out of the cliff face.

We had to hurriedly move our equipment out of the way when a caravan of water buffalo came through where we were collecting. Lunch nearby was spent at the waterside with a wall of *Hedychium* alongside and *Bergenia* above that.

Another collection later that day bagged: *Ligularia*, *Rubus indica*, *Impatiens spp.* Whilst looking around for a plant I came across a sterile *Daphne sp.* population which would have been wonderful to see in bloom! Will found a particularly large *Tsuga*.

In the late afternoon we climbed up to the saddle of the ridgeline and dropped into the next valley where the woodland was heavily stripped. Foliage was being harvested for animal fodder from the epicormic growth, leaving some short branches for footholds. Apparently, this was a technique used in the UK on oaks right up until a few centuries ago. Our campsite was halfway down the hillside, walking past many small communities where the children got very excited to see us. Word of our campsite had definitely got out to the wider communities by the evening as crowds of children flocked into our campsite with intrigue and playful mischief. So much so that a Sherpa had to guard our tents so they were not accidentally broken whilst the children played. In the evening, whilst we worked on the day's specimens, the children lay side by side with their heads tucked under the tent flaps giggling away watching us work.

#### 09-AUG PANDUSAIN

Unfortunately, overnight Polina's eye had swollen up at an alarming rate causing her great discomfort. So, we walked down the hill to the closest hospital which took a look at her but recommended that we sought advice at the next hospital in Kolti. By this point, the team were concerned for her health as there was no sign of improvement. On the walk to Kolti we made few collections as Polina was our priority, however, on the way back there was only a handful of species to collect anyway. I had spotted a fertile *Taxus sp.*, which was collected on the way back, in what looked to be a community forest as grazing was not present.

The weather was still persistent rain with some heavier showers. When we arrived at camp, Will, Jeevan, Dawa and Polina went across the river to the main town in Kolti to seek medical advice whilst the rest of the team looked at the maps trying to find a potential new route to take. Whilst they were in Kolti the rivers swelled significantly following rain up-river; the river that had previously been ankle deep and could be crossed in bare feet rose to thigh depth, rolling stones along the riverbed, so that it had to be crossed wearing boots. School children waited on either side for the water levels to drop like at a pedestrian crossing.

In the evening we could hear the jackals crying in the surrounding mountains. Apparently, jackals would cry from hill to hill right across Nepal's Himalayas – maybe folklore... but awesome to picture!

## 10-AUG KOLTI

Straight off the bat this morning we had to cross the river twice to traverse up the tight gorge in order to access the mountain range to the North. I got some great pictures of the porters crossing the river fully laden. It was steep climb up the burnt and grazed hillside, in full sun, very hot and exposed. Here we found *Sehima notatum* (a new generic record for Nepal!) and a couple of orchids, along with sightings of griffin and Egyptian vultures. We stopped at the top for lunch when the path levelled out there was a very beautiful *Cotoneaster sp.*, *Drosera sp.* and *Rhododendron arboreum*. I felt rather than heard the whistle of feathers above my head. It was a peregrine in a dive and I watched it swerve past a pigeon as it had to abort its dive. We passed a teahouse that had a massive, ancient, sacred oak tree alongside it.

We were still trekking as it was getting late and when we got to what we thought was going to be our camp we found it had been deemed unsuitable. The porters were not impressed but, fortunately, those porters, who had made it to the real camp, came back with torches to give the rest a hand which lifted morale. Finally, we arrived in the dark. Interestingly, we were camped in a freshly felled *Cannabis sativa* and *Urtica* field which made for a rather fragrant evening. That evening was the first time that we came together as a team and processed our day's collections with machine like efficiency.

## 11-AUG DOKDA

Today we descended a little into temperate woods with: *Acer cappadocicum*, *Impatiens sp.*, *Anemone sp.*, *Thalictrum sp.*, the only downside was that it was also a leech zone. From there we walked out into a stunning, south-facing, sub-alpine meadow which was quickly dubbed "Staircase to heaven". It had been grazed lightly by cattle and contained: *Delphinium sp.*, Orchids, *Silene sp.*, *Bistorta sp.*, *Phlomis*, the first *Potentilla sp.*, *Salvia sp.* (Colin's special) and *Roscoea sp.*

My shoes were coated in tiny leeches, trying to squeeze through my laces. Then heavy rain came down so much so that the leeches retreated.

Will took a collection of *Abies* in the woodland below.

At the top of the hill, in thick mist/cloud we found *Sibbaldia sp.*

Walking down into the next valley we arrived at a rather steeply sloping campsite. Having a tent on a slope made life surprisingly difficult as everything had to be levelled by wedging things underneath. The table legs had to be collapsed completely.

We met a local who asked to walk with us for the remainder of the expedition as we were going into sacred land.

## 12-AUG CHAUKI LEKH (BUFFALO CAMP)

Due to the experience of walking up the spine of a high ridge, we decided to go back to camp to start acclimatising - mountaineer's phrase "climb high, sleep low". In the meadows we found *Rheum sp.* and *Potentilla spp.* At one point an eagle flew out of the mist straight over our heads. We also encountered a caravan of nanny goats carrying satchels which probably would have traditionally contained salt. Higher up still, more *Rhododendron spp.* appeared, along with *Gaultheria trichophylla* sporting bright jade fruits. Right up on the top was very exposed with high winds and horizontal rain. Here we came across *Taraxacum sp.* and *Leontopodium sp.*

As we lunched below the ridge in the shelter under an overhang we found *Utricularia sp.* and *Rhododendron sp.*

By that night the camp was starting to become a quagmire. Branches were placed by doors and main pathways to walk over.

### 13-AUG CHAUKI LEKH (BUFFALO CAMP)

Back up to the ridge for a few more collections in the morning. Carried on a bit further (1-2 hours) until we reached our next camp. The ridge top was very heavily grazed, leaving little of botanical interest.

When we arrived at the chorten camp right on top of the ridgeline. Such great potential for magazine-quality photos, except for the 30m of visibility. There was a traditional stone sheep shelter sheltered by a large boulder. The shepherds shelter behind the next large boulder. It was so refreshing to work on flat ground! Very civilised...

### 14-AUG CHAUKI LEKH (CHORTEN CAMP)

Walked further along the ridge line – still heavily grazed but within fifteen minutes from starting we found *Mecanopsis horridula* in a disturbed, rocky, but sheltered area. Pika were staring at us with great interest and I saw Hoopoes – the last thing I was expecting! In a stoney outcrop *Schrophularia urticifolia* and a couple of ferns were hanging on. *Betula utilis* woodland grew below on the north side of the ridge. We stopped for a collection of *Gentiana sp.* on the ridge and dropped onto the north side to a grassland slope where we collected *Pedicularis trichoglossa*.

The ridge then ascended very sharply and the path skirted to the left. As we were running late only a handful of collections were made. We found more *Mecanopsis horridula* in narrow scree bed.

As we started to walk down into the valley, the clouds finally broke and we could see the camp far below through the sacred gate with a Chautara. This was our base camp for three nights and was the furthest camp on the expedition. There was a large sheep herd in what appeared to be permanent grazing grounds. There were great facilities; finally, a really good river to have a proper wash. It was very cold and had the added benefit of an audience of the flock of sheep and the shepherd dog. It was also where we found the first bit of *Polygonum vacciniifolium*.

### 15-AUG BAUDI KHOLA

We decided to walk to the large cliff below Budhinanda Javi, the sacred lake. Turning the corner into the main valley we found a big, yellow *Meconopsis paniculata*. We headed up the main valley along the river in a classic U-shaped, glacial valley. There were now more *Pedicularis sp.*, *Potentilla sp.* and *Mecanopsis horridula* sheltered under a large boulder.

When we reached the cliff face, what a spectacular place! Numerous waterfalls cascading down with a large, dry, overhang in the middle. The ground underneath the overhang was terraced and we used it as the last campsite before the pilgrimage up to the lake. In the vicinity we found: *Primula reidii* (Lithophytic), *Mecanopsis horridula* (Lithophytic), *Saussurea sp.*, *Corydalis sp.* and *Myosotis sp.*

### 16-AUG BAUDI KHOLA

Today we walked to the east up the ridge in a torrential downpour on a par with the rain on Benbecula OTC summer camp (Hebrides)... It was a steep ascent up to meadows in full flower; *Potentilla*, *Bistorta*, *Pedicularis* amongst others.

Half the team scrambled up the rocky ridgeline as far as we could with steep scree gulleys on each side densely populated with *Rheum*. We found a nest of a blue-winged, large bird up there and collected some *Stipa spp.*

When we met back up for lunch, clouds were sweeping past giving glimpses of the other side of the valley. Walking over the ridge into the valley we stopped for another collection: three ferns, *Potentilla sp.*, *Primula?*



### 17-AUG BAUDI KHOLA

Today we walked back to the site of our high ridge camp. We collected along the skirting pass as it was under collected on our first pass through and added *Caltha palustris* and *Juniperus sp.*.

I thought the weather might break in the evening and we would finally get some views of the Himalayas but no, although I did get some atmospheric, moody shots of the sacred archways.

That night we finished at a civilised time of eight pm and I managed to look at the Flora of Nepal and, even, played Dobble and Pass the Pigs with some of the Sherpas

### 18-AUG CHAUKI LEKH (CHORTEN CAMP)

All downhill from here! We dropped off the heavily grazed ridgeline and descended. Stopping off by a small patch of sparse woodland of *Prunus* and *Betula*, we collected *Sassaurea sp.* As we descended there were many, very mature, large *Betula*. The areas we were descending through had obviously been unsustainably grazed by livestock before as the vegetation did not look natural however, we found *Meconopsis robusta* growing in the meadow.

When we stopped to collect *Sorbus* and some epiphytic ferns, a lady was collecting a root of a plant for medicinal purposes for the stomach. A couple more minutes down the path we came across a mud swamp that was previously a field. It had been churned up by water buffalo. I hadn't seen a field in such a state before.

At the bottom of the summer grazing fields we collected *Lilium* and *Artemesia*.

The pathway got steeper and steeper and equally as churned up. It felt like this was the only path up to the summer grazing areas for all the livestock from the communities below. We were walking through large oak trees in a mature woodland, as we came out of the other side we had dropped below the thick clouds and into sunshine. A stunning view of the valley bottom below and waterfalls on the sides of the gorge was revealed to our right. Men sitting by their traditional hut, were weaving bamboo baskets for collecting fruits. The path now changed to an actual built wider track and levelled with stone wall to the outside. It zig-zagged down to the valley floor where we all felt a sense of euphoria on reaching the bottom. The sun was shining and it was nice and warm. We were surrounded by orchards. The valley bottom was wide and flat with an English parkland feel with large mature trees of *Aesculus*.

### 19-AUG KURU

We conducted a lot of collecting around the parkland itself by the river. This included visiting the mill house. When we collected tree specimens the local children gathered around in curiosity. Women on the riverbanks were washing clothes with their feet which created washing pools. We walked over the river on an impressive solid wood bridge. On the inside bend of the river we made more collections. There was an impressive, very floriferous and productive *Pyracantha* orchard. Some ladies came to harvest some berries to eat. We collected many tiny sedges and an *Equisetum sp.*

When we walked further upstream past the camp we found a family chopping wood from a fallen tree. A group of young men were walking back with large bundles of bamboo. We collected *Arisaema* and *Spiranthes*.

That evening I became rather ill. I was excused from dinner and I went straight to bed.

### 20-AUG KURU

To get to Kolti the next day the team followed the river downstream, moving from a temperate to a subtropical zone. The fields changed from millet to rice/corn fields.

I was still very dehydrated and not feeling well at all. There were also many landslides but at least the sun was out again. We made the following collections: *Cornus* and *Erythrina*.

At camp I was able to take rehydration salts and I had a proper wash which made things feel so much better.

#### 21-AUG KOLTI

As we were reaching the end of the trip we agreed not to collect anything fleshy as they needed to dry within a day or two.

It was a long steady walk up the large valley. There weren't many collections as we had walked over it already and there are not many species anyway. We did collect *Taxus* sp.

We pitched camp at the top of the valley with Martadi at the bottom of the next valley over. There was a nice lake where I swam.

#### 22-AUG PORAKHE LAGNA

The porters we had employed from Martadi screamed on ahead as they could finish as soon as they got there. We didn't make many collections this day.

When we arrived in Martadi we finished processing material and set the drier going as early as possible. It felt like the expedition was coming to a close, we had a nice dinner and then I walked out to have a shower without a headtorch - slipped and landed in goodness knows what! But I had a shower/whiskey/cake and a bed to sleep in!

#### 23-AUG MARTADI

We had an early start so that we could finish processing all the material, get it all packed away and load all the kit into the trailer ready for the tractor to take down to the bus. We walked down to the bottom where we had been dropped off two weeks before. We couldn't get a car so we started to walk. The tractor came up behind us, I took advantage and jumped on – a very bumpy experience! I helped to load the kit onto the roof of the bus and met back up with the team later when they arrived at the bus.

I tried to sleep on the bus but it's a very bumpy experience! We arrived mid-afternoon at Dipayal with personal kit to fly with and specimens. We said our goodbyes to the staff and worked on specimens in the hotel's meeting room, sorting specimens into collectors A, B, C, D etc. We used alcohol to remove mould from some specimens that had packed away with an incompletely dried specimen of *Roscoea*.

#### 24-AUG DIPAYAL

We said goodbye to Jeevan at the airport. I was so excited. I was on the left side (N facing) of the plane and I would finally get to see the mountains! It was cloudy. I could see the tips of some of the tallest ones, the Annapurnas. I imagined they were there by placing the flight magazine to the window. We arrived at the Tibet Guest House late that evening.

## Appendix 3: Equipment used

### Essential Equipment

#### Collecting

- Digging trowel: for digging up specimens as the roots/corms/bulbs are important characteristics
- Secateurs/extendable pole to collect large woody material where only the fertile (fruits & flowers) material is needed
- Camera and black velvet background for taking detailed close up photographs

#### Pressing

- Newspaper and field press to pressing plants throughout the day

#### The drying process

- Blotter sheets, metal corrugate sheets, wooden press-ends and compression straps for the specimens, in their newspaper, to be pressed in for drying
- Drying rack, foil-insulated skirt and kerosene burners. Presses sat on the elevated rack. Wick kerosene stoves are used for their slow gentle heat to reduce damage to the specimens during drying. A skirt clipped around the sides of the drying frame channels the hot air through the presses

#### Campsite set up

- Science tent: used for processing all the material
- Drying tent with drying frames and storage
- Kitchen tent
- Personal tents

## Appendix 4. A Preliminary List of Collections

A1	<i>Potentilla indica</i> (Andrews) Th.Wolf	A142	Molluginaceae
A10	<i>Henckelia pumila</i> (D.Don) A.Dietr.	A143	<i>Euphorbia</i> L.
A100	<i>Potentilla leuconota</i> D.Don	A144	<i>Rosa webbiana</i> Wall. ex Royle
A101	<i>Sedum</i> L.	A145	<i>Impatiens</i> L.
A102	<i>Impatiens</i> L.	A146	<i>Impatiens</i> L.
A103	<i>Ligularia amplexicaulis</i> DC.	A147	<i>Parnassia wightiana</i> Wall. ex Wight & Arn.
A104	<i>Bistorta appendiculata</i>	A148	<i>Impatiens</i> L.
A105	<i>Euphorbia</i> L.	A149	<i>Monochoria</i> C. Presl
A106	<i>Potentilla polyphylla</i> Wall. ex Lehm.	A15	<i>Galium</i> L.
A107	<i>Rhodiola chrysanthemifolia</i> (H.Lév.)	A150	Hydrocharitaceae
S.H.Fu		A16	<i>Commelina maculata</i> Edgew.
A108	<i>Sedum</i> L.	A17	<i>Cautleya gracilis</i> (Sm.) Dandy
A109	<i>Rosa brunonii</i> Lindl.	A18	<i>Begonia</i> L.
A11	<i>Galium</i> L.	A19	<i>Elatostema</i> Wedd.
A110	Umbelliferae	A2	<i>Galium</i> L.
A111	<i>Epilobium</i> L.	A20	<i>Cyanotis vaga</i> (Lour.) Schult.f.
A112	<i>Rumex</i> L.	A21	<i>Spiraea</i> L.
A113	<i>Plantago</i> L.	A22	<i>Rubus franchetianus</i> H.Lév.
A114	<i>Polygonum</i> R. Br.	A23	<i>Bistorta</i> Scop.
A115	<i>Chenopodium album</i> L.	A24	<i>Sedum</i> L.
A116	<i>Chenopodium</i> L.	A25	<i>Impatiens</i> L.
A117	<i>Polygonum</i> R. Br.	A26	<i>Impatiens</i> L.
A118	<i>Urtica</i> H. Lev.	A27	<i>Cyanotis cristata</i> (L.) D.Don
A119	<i>Urtica</i> H. Lev.	A28	<i>Ajuga bracteosa</i> Wall. ex Benth.
A12	<i>Galium</i> L.	A29	<i>Euphorbia</i> L.
A120	Caryophyllaceae	A3	<i>Commelina maculata</i> Edgew.
A121	Caryophyllaceae	A30	<i>Solanum</i> L.
A122	<i>Boeninghausenia albiflora</i> (Hook.) Rchb. ex Meisn.	A31	<i>Euphorbia</i> L.
A123	<i>Bistorta appendiculata</i>	A32	<i>Jasminum</i> L.
A124	<i>Persicaria</i> (Willd.) M. Gomez	A34	<i>Cotoneaster microphyllus</i> Wall. ex Lindl.
A125	<i>Hedyotis</i> L.	A35	<i>Rosa macrophylla</i> Lindl.
A126	<i>Bulbostylis densa</i> (Wall.) Hand.-Mazz.	A36	<i>Impatiens</i> L.
A127	<i>Geum roylei</i> Wall. ex Bolle	A37	<i>Potentilla griffithii</i> Hook.f.
A128	<i>Bupleurum</i> Wall. ex DC.	A38	<i>Sorbaria tomentosa</i> (Lindl.) Rehder
A129	<i>Bupleurum</i> Wall. ex DC.	A39	<i>Impatiens</i> L.
A13	<i>Roscoea purpurea</i> Sm.	A4	<i>Persicaria capitata</i> (Buch.-Ham. ex D.Don) H.Gross
A130	<i>Stellaria</i> L.	A40	<i>Impatiens</i> L.
A131	<i>Pilea</i> Lindl.	A41	<i>Impatiens</i> L.
A133	<i>Stellaria</i> L.	A42	<i>Cotoneaster</i> Medik.
A134	<i>Sinocrassula</i> A.Berger	A43	<i>Arisaema consanguineum</i> Schott
A135	<i>Phyllanthus</i> L.	A44	<i>Arisaema tortuosum</i> (Wall.) Schott
A136	<i>Smilax aspera</i> L.	A45	Urticaceae
A137	<i>Streptolirion volubile</i> Edgew.	A46	<i>Impatiens</i> L.
A138	<i>Rubia</i> L.	A47	<i>Impatiens</i> L.
A139	Scrophulariaceae	A48	<i>Cremanthodium arnicoides</i> (DC. ex Royle) R. Good
A14	<i>Impatiens</i> L.	A49	<i>Potentilla atrosanguinea</i> Lodd.
A140	Androsace L.	A5	<i>Impatiens</i> L.
A141	<i>Achyranthes aspera</i> L.		

- A50 *Bistorta affinis* (D.Don) Greene  
A51 *Rhodiola wallichiana* (Hook.) S.H.Fu  
A52 *Rhodiola bupleuroides* (Wall. ex Hook.f. & Thomson) S.H.Fu  
A53 *Crucihimalaya himalaica* (Edgew.) Al-Shehbaz, O'Kane & R.A.Price  
A54 *Potentilla eriocarpa* var. *major* Murata  
A55 *Potentilla festiva* Soják  
A56 *Aconogonon molle* (D.Don) H.Hara  
A57 *Oxygraphis endlicheri* (Walp.) Bennet & Sum.Chandra  
A58 *Saxifraga* L.  
A59 *Potentilla fruticosa* L.  
A6 *Leptodermis* Wall.  
A60 *Rosa sericea* Lindl.  
A61 *Galium* L.  
A62 *Galium* L.  
A63 *Euphorbia* L.  
A64 *Rhodiola* L.  
A65 *Saxifraga* L.  
A66 *Parnassia nubicola* Wall. ex Royle  
A67 *Impatiens* L.  
A68 *Valeriana hardwickii* Wall.  
A69 *Potentilla cuneata* Wall. ex Lehm.  
A7 *Agrimonia* L.  
A70 Boraginaceae  
A71 *Onosma* L.  
A72 *Potentilla peduncularis* D.Don  
A73 *Potentilla x micropeduncularis* H.Ikeda & H.Ohba  
A74 *Impatiens* L.  
A75 *Saxifraga* L.  
A76 *Bistorta vivipara* (L.) Gray  
A77 *Bistorta macrophylla* (D.Don) Sojak  
A78 *Saxifraga* L.  
A79 *Impatiens* L.  
A8 *Impatiens* L.  
A80 *Sanguisorba diandra* (Hook.f.) Nordborg  
A81 *Oxyria digyna* (L.) Hill  
A82 *Gypsophila* L.  
A83 *Rhodiola* L.  
A84 *Rhodiola* L.  
A85 *Sibbaldia cuneata* Hornem. ex Kuntze  
A86 *Sibbaldia macropetala* Murav.  
A87 *Caltha palustris* L.  
A88 *Bistorta affinis* (D.Don) Greene  
A89 *Potentilla x micropeduncularis* H.Ikeda & H.Ohba  
A9 *Houttuynia cordata* Thunb.  
A90 *Bistorta affinis* (D.Don) Greene  
A91 *Sibbaldia purpurea* Royle  
A92 *Potentilla* L.  
A93 *Potentilla peduncularis* D.Don  
A94 *Potentilla commutata* Lehm. var. *commutata*  
A95 *Potentilla tristis* Soják  
A96 *Geum elatum* Wall. ex G.Don  
A97 *Saxifraga* L.  
A98 *Potentilla microphylla* D.Don  
A99 *Potentilla x micropeduncularis* H.Ikeda & H.Ohba  
B1 Unknown  
B10 Apocynaceae  
B100 *Aster diplostephioides* (DC.) C. B. Clarke  
B101 *Meconopsis paniculata* (D.Don) Prain  
B102 *Saussurea auriculata* (DC.) Sch. Bip.  
B103 *Saxifraga* L.  
B104 *Myosotis* L.  
B105 *Corydalis* DC. nom cons.  
B106 *Primula reidii* Duthie  
B107 *Corydalis* DC. nom cons.  
B108 *Cremanthodium ellisii* (Hook. f.) Kitam. ex Kitam. & Gould  
B109 *Saxifraga* L.  
B11 Fern  
B110 *Microula* Benth.  
B111 *Leontopodium himalayanum* DC.  
B112 *Saussurea topkegolensis* H. Ohba & S. Akiyama  
B113 *Rheum australe* D.Don  
B114 *Myosotis* L.  
B115 *Geranium donianum* Sweet  
B116 *Pedicularis siphonantha* D.Don  
B117 *Campanula aristata* Wall.  
B118 *Draba gracillima* Hook.f. & Thomson  
B119 Caryophyllaceae  
B12 *Origanum vulgare* L.  
B120 *Primula* L.  
B121 *Cyananthus lobatus* Wall. ex Benth.  
B122 *Saussurea chrysotricha* Ludlow  
B123 *Pedicularis pectinata* Wall. ex Benth.  
B124 *Caltha palustris* L.  
B125 Boraginaceae  
B126 *Cynoglossum* L.  
B127 *Nardostachys grandiflora* DC.  
B128 *Draba amoena* O.E.Schulz  
B129 *Draba amoena* O.E.Schulz  
B13 *Bupleurum* Wall. ex DC.  
B130 *Senecio kunthianus* Wall. ex DC.  
B131 *Erigeron multiradiatus* (Lindl. ex DC.) C. B. Clarke  
B132 *Anaphalis contorta* (D.Don) Hook. f.  
B133 *Anaphalis royleana* DC.  
B134 *Senecio raphanifolius* Wall. ex DC.

- B135 *Saussurea nimborum* W.W.Sm.  
 B136 *Jurinea dolomiaea* Boiss.  
 B137 *Dubyaea hispida* DC.  
 B138 *Meconopsis robusta* Hook.f. & Thomson  
 B139 *Myriactis wallichii* Less.  
 B14 *Hedyotis lindleyana* Hook. ex Wight & Arn.  
 B140 *Delphinium vestitum* Wall. ex Royle  
 B141 *Doronicum kamaonense* (DC.) Álv. Fern.  
 B142 *Artemisia incisa* Pamp.  
 B143 *Anaphalis* Hook. f.  
 B144 *Holboellia latifolia* var. *angustifolia* (Wall.) Hook.f. & Thomson  
 B145 *Scurrula elata* (Edgew.) Danser  
 B146 *Aster ageratoides* Turcz.  
 B147 *Pseudognaphalium affine* (D.Don) Anderb.  
 B148 *Conyza bonariensis* (L.) Cronquist  
 B149 *Conyza stricta* Willd.  
 B15 *Clinopodium umbrosum* (M. Bieb.) C. Koch  
 B150 *Geranium nepalense* Sweet  
 B151 *Corydalis* DC. nom. cons.  
 B152 *Viola* L.  
 B153 *Crucihimalaya lasiocarpa* (Hook.f. & Thomson) Al-Shehbaz, O'Kane & R.A.Price  
 B154 *Scrophularia* Wall. ex Benth.  
 B155 *Trigonella pubescens* Edgew. ex Baker  
 B156 *Geranium robertianum* L.  
 B157 *Solanum* L.  
 B158 *Sopubia* Buch.-Ham. ex D.Don  
 B159 *Dicliptera bupleuroides* Nees  
 B16 *Scrophulariaceae*  
 B160 *Erigeron karvinskianus* DC.  
 B161 *Lindenbergia muraria* (Roxb. ex D.Don) Bruhl  
 B162 *Micromeria biflora* (Buch.-Ham. ex D.Don) Benth.  
 B163 *Leucas lanata* Benth.  
 B164 *Mentha royleana* Wall. ex Benth.  
 B165 *Scrophularia* Wall. ex Benth.  
 B166 *Lindernia* All.  
 B167 *Stellaria* L.  
 B168 *Justicia pubigera* (Nees) C.B.Clarke  
 B169 *Sigesbeckia orientalis* L.  
 B17 *Begonia* L.  
 B170 *Henckelia pumila* (D.Don) A.Dietr.  
 B171 *Polygala persicariifolia* DC.  
 B172 *Ipomoea purpurea* (L.) Roth.  
 B173 *Justicia simplex* D.Don  
 B174 *Bidens pilosa* L.  
 B175 *Barleria cristata* L.  
 B176 Unknown
- B176 *Anaphalis* Hook. f.  
 B18 *Begonia* L.  
 B19 *Hypericum himalaicum* N. Robson  
 B2 *Peperomia* Ruiz & Pav.  
 B20 *Stellaria* L.  
 B21 *Verbascum thapsus* L.  
 B22 *Oxalis* L.  
 B23 *Desmodium elegans* DC.  
 B24 *Fagopyrum* Mill.  
 B25 *Strobilanthes* C. B. Clarke  
 B26 *Myriactis nepalensis* Less.  
 B27 *Conyza canadensis* (L.) Cronquist  
 B28 *Hydrangea anomala* D.Don  
 B29 *Begonia* L.  
 B3 *Erigeron bonariensis* L.  
 B30 *Scurrula elata* (Edgew.) Danser  
 B31 *Didymocarpus aromaticus* Wall. ex D.Don  
 B32 *Indigofera atropurpurea* Buch.-Ham. ex Hornem.  
 B33 *Berberis aristata* DC.  
 B34 *Lyonia* Nutt.  
 B35 *Isodon coetsa* (Buch.-Ham. ex D.Don) Kudô  
 B36 *Boenninghausenia albiflora* (Hook.) Rchb. ex Meisn.  
 B37 *Platystemma violoides* Wall.  
 B38 *Ligularia fischeri* (Ledeb.) Turcz.  
 B39 *Lecanthus* Wedd.  
 B4 *Galinsoga ciliata* (Raf.) Blake  
 B40 *Phlomis macrophylla* (Wall. ex Benth.) Kamelin & Makhm.  
 B41 *Notochaete hamosa* Benth.  
 B42 *Stachys melissifolia* Benth.  
 B43 *Micromeria biflora* (Buch.-Ham. ex D.Don) Benth.  
 B44 *Leucas cephalotes* (Roth) Spreng.  
 B45 *Vitex negundo* L.  
 B46 *Capparis spinosa* L.  
 B47 *Launaea secunda* (C. B. Clarke) Hook.f.  
 B48 *Pedicularis bifida* (Buch.-Ham. ex D.Don) Pennell  
 B49 *Polygala abyssinica* R. Br. ex Fresen.  
 B5 *Cynoglossum* L.  
 B50 *Eriosema himalaicum* H. Ohashi  
 B51 *Geranium nepalense* Sweet  
 B52 *Salvia moorcroftiana* Wall. ex Benth.  
 B53 *Leguminosae*  
 B54 *Androsace* L.  
 B55 *Stachys sericea* Wall. ex Benth.  
 B56 *Salvia nubicola* Wall. ex Sweet  
 B57 *Desmodium* DC.  
 B58 *Stachys melissifolia* Benth.

- B59 *Anemone vitifolia* Buch.-Ham. ex DC.  
 B6 *Cynoglossum* L.  
 B60 *Anemone rivularis* Buch.-Ham. ex DC.  
 B61 *Carpesium nepalense* Less.  
 B62 *Achyranthes aspera* L.  
 B63 *Strobilanthes* C. B. Clarke  
 B64 *Panax pseudo-ginseng* Wall.  
 B65 *Ranunculus diffusus* DC.  
 B66 *Circaea* L.  
 B67 *Phryma leptostachya* var. *oblongifolia* (Koidz.) Honda  
 B68 *Wulfenia* Jacq.  
 B69 *Scutellaria* L.  
 B7 *Cirsium wallichii* DC.  
 B70 *Pedicularis gracilis* Wall. ex Benth.  
 B71 *Veronica deltigera* Wall. ex Benth.  
 B72 *Salvia hians* Royle ex Benth.  
 B73 *Tanacetum dolichophyllum* (Kitam.) Kitam.  
 B74 *Anaphalis nepalensis* (Spreng.) Hand.-Mazz.  
 B75 *Leontopodium jacotianum* Beauverd  
 B76 *Pedicularis gracilis* Wall. ex Benth.  
 B77 *Pedicularis hoffmeisteri* Klotzsch  
 B78 *Taraxacum* Soest  
 B79 *Corydalis* DC. nom. cons.  
 B8 *Erigeron karvinskianus* DC.  
 B80 *Cardamine impatiens* L.  
 B81 *Nepeta laevigata* (D. Don) Hand.-Mazz.  
 B82 *Arisaema griffithii* Schott  
 B83 *Circaea* L.  
 B84 *Lamium album* L.  
 B85 *Delphinium himalayense* Chowdhury ex Mukerjee  
 B86 *Phlomis bracteosa* (Royle ex Benth.) Kamelin & Makhm.  
 B87 *Geranium wallichianum* D. Don ex Sweet  
 B88 *Cirsium nishiokae* Kitam.  
 B89 *Viola biflora* L.  
 B9 *Bistorta* Scop.  
 B90 *Pedicularis pectinata* Wall. ex Benth.  
 B91 *Acanthocalyx nepalensis* (D. Don) M.J. Cannon  
 B92 *Parnassia* L.  
 B93 *Meconopsis horridula* Hook. f. & Thomson  
 B94 *Parnassia pusilla* Wall. ex Arn.  
 B95 *Scrophularia urticifolia* Wall. ex Benth.  
 B96 *Cassiope* (Wall.) D. Don  
 B97 *Mulgedium lessertianum* DC.  
 B98 *Pedicularis trichoglossa* Hook. f.  
 B99 *Pedicularis porrecta* Wall. ex Benth.  
 C1 *Setaria palmifolia* (Koenig) Stapf  
 C10 *Elymus* (Hook. f.) Melderis  
 C100 *Erioscirpus comosus* (Wall.) Palla  
 C101 *Sporobolus diander* (Retz.) P. Beauv.  
 C102 *Arundinella* Raddi  
 C103 *Murdannia nudiflora* (L.) Brenan  
 C104 *Eragrostis* Wolf  
 C105 *Glyceria* R. Br.  
 C11 *Setaria pumila* (Poir.) Roem. & Schult.  
 C12 *Eragrostis nigra* Nees ex Steud.  
 C13 *Elymus* (Hook. f.) Melderis  
 C14 *Eulalia* Kunth  
 C15 *Dactylis glomerata* L.  
 C16 *Brachypodium sylvaticum* (Huds.) P. Beauv.  
 C17 *Poa* L.  
 C18 *Festuca gigantea* (L.) Vill.  
 C19 *Dactyloctenium aegyptium* (L.) P. Beauv.  
 C2 *Brachypodium sylvaticum* (Huds.) P. Beauv.  
 C20 *Urochloa panicoides* P. Beauv.  
 C21 *Cyperus niveus* Retz.  
 C22 *Sporobolus diander* (Retz.) P. Beauv.  
 C23 *Sehima notatum* (Hack.) A. Camus  
 C24 *Fimbristylis falcata* (Vahl) Kunth  
 C25 *Erioscirpus comosus* (Wall.) Palla  
 C26 *Carex filicina* Nees  
 C27 *Festuca gigantea* (L.) Vill.  
 C28 *Juncus* L.  
 C29 *Agrostis micrantha* Steud.  
 C3 *Arundinella* Raddi  
 C30 *Muhlenbergia duthieana* Hack.  
 C31 *Koeleria* Pers.  
 C32 *Danthonia cumminsii* Hook. f.  
 C33 *Calamagrostis filiformis* Griseb.  
 C34 *Bromus* L.  
 C35 *Trisetum spicatum* (L.) K. Richt.  
 C36 *Trisetum spicatum* (L.) K. Richt.  
 C37 *Calamagrostis* Adans.  
 C38 *Clintonia udensis* Trautv. & Meyer  
 C39 *Festuca* L.  
 C4 *Chrysopogon gryllus* (L.) Trin.  
 C40 *Agrostis nervosa* Nees ex Trin.  
 C40A *Calamagrostis filiformis* Griseb.  
 C41 *Poa* L.  
 C42 *Ptilagrostis dichotoma* Y.L. Keng ex Tzvelev  
 C44 *Agrostis* L.  
 C45 *Festuca* L.  
 C46 *Kobresia* Willd.  
 C47 *Juncus* L.  
 C48 *Agrostis* L.  
 C49 *Poa* L.

C50	<i>Agrostis nervosa</i> Nees ex Trin.	C94	<i>Cyperus cuspidatus</i> Kunth
C51	<i>Poa</i> L.	C95	<i>Carex filicina</i> Nees
C52	<i>Ptilagrostis dichotoma</i> Y.L.Keng ex Tzvelev	C96	<i>Microstegium nudum</i> (Trin.) A. Camus
C53	<i>Calamagrostis</i> Adans.	C97	<i>Oplismenus compositus</i> (L.) P. Beauv.
C54	<i>Poa</i> L.	C98	<i>Cymbopogon</i> (Hook. f.) Raizada & Jain
C55	<i>Kobresia</i> Willd.	C99	<i>Elymus</i> (Hook. f.) Melderis
C56	<i>Calamagrostis lahulensis</i> G.Singh	D1	<i>Olea</i> L.
C57	<i>Aletris pauciflora</i> (Klotzsch) Hand.-Mazz.	D10	<i>Utricularia</i> L.
C58	<i>Juncus himalensis</i> Klotzsch	D11	<i>Rhus</i> L.
C59	<i>Juncus benghalensis</i> Kunth	D12	<i>Sarcococca hookeriana</i> Baill.
C5A	<i>Agrostis</i> L.	D13	<i>Tsuga dumosa</i> (D.Don) Eichler
C5B	<i>Isachne</i> Bor	D14	<i>Abies pindrow</i> Royle
C6	<i>Commelina</i> L.	D15	<i>Deutzia staminea</i> R.Br. ex Wall.
C60	<i>Juncus benghalensis</i> Kunth	D16	<i>Euonymus</i> L.
C61	<i>Juncus</i> L.	D17	<i>Ficus</i> Blume
C62	<i>Agrostis nervosa</i> Nees ex Trin.	D18	<i>Viburnum nervosum</i> D.Don
C63	<i>Trisetum spicatum</i> (L.) K. Richt.	D19	<i>Colquhounia coccinea</i> Wall.
C64	<i>Agrostis</i> L.	D2	<i>Helixanthera ligustrina</i> (Wall.) Danser
C65	<i>Agrostis</i> L.	D20	<i>Viburnum</i> L.
C66	<i>Calamagrostis filiformis</i> Griseb.	D21	<i>Picea smithiana</i> (Wall.) Boiss.
C67	<i>Juncus duthiei</i> (C. B. Clarke) Noltie	D22	<i>Rhododendron anthopogon</i> D.Don
C68	<i>Maianthemum purpureum</i> (Wall.) LaFrankie	D23	<i>Rhododendron lepidotum</i> Wall. ex G. Don
C69	<i>Carex nubigena</i> D.Don ex Tilloch & Taylor	D24	<i>Rhododendron campanulatum</i> D.Don
C7	Commelinaceae	D25	<i>Sorbus microphylla</i> Wenz.
C70	<i>Polygonatum verticillatum</i> (L.) All.	D26	<i>Rhododendron</i> Wall. ex G. Don
C71	<i>Pennisetum flaccidum</i> Griseb.	D27	<i>Acer pectinatum</i> Wall. ex Pax
C72	<i>Pycreus flavidus</i> (Retz.) T. Koyama	D28	<i>Gaultheria</i> (C. B. Clarke) Airy Shaw
C73	<i>Carex nubigena</i> D.Don ex Tilloch & Taylor	D29	<i>Hydrangea heteromalla</i> D.Don
C74	<i>Juncus wallichianus</i> Laharpe	D3	<i>Celtis</i> L.
C75	<i>Kyllinga brevifolia</i> Rottb.	D30	<i>Ribes griffithii</i> Hook.f. & Thomson
C76	<i>Glyceria</i> R. Br.	D31	<i>Berberis thomsoniana</i> C.K.Schneid.
C77	<i>Fimbristylis complanata</i> (Retz.) Link	D32	<i>Lonicera</i> L.
C78	<i>Eragrostis nigra</i> Nees ex Steud.	D33	<i>Rhododendron</i> Wall. ex G. Don
C79	<i>Calamagrostis</i> Adans.	D34	<i>Meconopsis horridula</i> Hook.f. & Thomson
C8	<i>Festuca gigantea</i> (L.) Vill.	D35	<i>Abies spectabilis</i> (D.Don) Mirb.
C80	<i>Echinochloa crus-galli</i> (L.) P. Beauv.	D36	<i>Juniperus</i> L.
C81	<i>Digitaria ciliaris</i> (Retz.) Koeler	D37	<i>Prunus rufa</i> Hook.f.
C82	<i>Festuca gigantea</i> (L.) Vill.	D38	<i>Sorbus</i> L.
C83	<i>Bothriochloa bladhii</i> (Retz.) S.T.Blake	D39	<i>Sorbus</i> L.
C84	<i>Cyanotis vaga</i> (Lour.) Schult.f.	D4	Tree
C85	<i>Commelina maculata</i> Edgew.	D4	Tree
C86	<i>Tripogon filiformis</i> Nees ex Steud.	D40	<i>Prunus</i> L.
C87	<i>Bulbostylis densa</i> (Wall.) Hand.-Mazz.	D41	<i>Ribes himalense</i> Royle ex Decne.
C88	<i>Agrostis</i> L.	D42	<i>Acer pectinatum</i> Wall. ex Pax
C89	<i>Agrostis</i> L.	D43	<i>Hippophae salicifolia</i> D.Don
C9	<i>Eragrostis nigra</i> Nees ex Steud.	D44	<i>Quercus</i> L.
C90	<i>Cynodon dactylon</i> (L.) Pers.	D45	<i>Rhamnus</i> L.
C91	<i>Eragrostis nigra</i> Nees ex Steud.	D46	<i>Ilex</i> L.
C92	<i>Brachiaria villosa</i> (Lam.) A. Camus	D47	Tree
C93	<i>Cyperus cuspidatus</i> Kunth	D48	<i>Fraxinus</i> L.
		D49	<i>Euonymus</i> L.
		D5	<i>Ulmus</i> L.



D50	<i>Celtis</i> L.	E36	<i>Bistorta vacciniifolia</i> (Wall. ex Meisn.) Greene
D51	<i>Aesculus indica</i> (Wall. ex Cambess.) Hook.f.	E37	Polygonaceae
D52	<i>Pyracantha crenulata</i> (D.Don) M.Roem.	E38	<i>Swertia speciosa</i> D Don
D53	<i>Symplocos</i> Wall. ex G. Don	E39	<i>Gentiana</i> L.
D54	<i>Cotoneaster</i> Medik.	E4	Orchidaceae
D55	<i>Ligustrum</i> L.	E40	<i>Swertia cuneata</i> D.Don
D56	<i>Zanthoxylum</i> L.	E41	<i>Swertia</i> L.
D57	<i>Cornus capitata</i> Wall.	E42	Umbelliferae
D58	Climber	E43	<i>Cortia depressa</i> (D.Don) C.Norman
D59	<i>Taxus</i> L.	E44	<i>Saxifraga</i> L.
D6	<i>Sarcococca hookeriana</i> Baill.	E45	<i>Gentiana venusta</i> (G. Don) Griseb.
D60	<i>Rhododendron arboreum</i> Sm.	E46	Orchidaceae
D61	<i>Viburnum</i> L.	E47	<i>Koenigia</i> L.
D62	<i>Cardiocrinum giganteum</i> (Wall.) Makino	E48	<i>Polygonum</i> R. Br.
D63	<i>Grewia optiva</i> J.R.Drumm. ex Burret	E49	<i>Pratia nummularia</i> (Lam.) A.Braun & Asch.
D7	<i>Leptodermis</i> Wall.	E5	<i>Platanthera</i> Rich.
D8	<i>Myrica</i> L.	E50	<i>Swertia cordata</i> (G. Don) C. B. Clarke
D9	<i>Osbeckia stellata</i> Buch.-Ham. ex D.Don	E51	Umbelliferae
E1	<i>Spiranthes</i> Rich.	E52	Orchidaceae
E10	Umbelliferae	E53	Vitaceae
E11	<i>Dioscorea deltoidea</i> Wall. ex Griseb.	E54	<i>Swertia angustifolia</i> Buch.-Ham. ex D.Don
E12	unknown	E55	<i>Erythrina arborescens</i> Roxb.
E12	<i>Epipactis</i> Zinn	E56	Rubiaceae
E13	<i>Heracleum</i> L.	E6	<i>Artemisia verlotiorum</i> Lamotte
E14	<i>Goodyera</i> R.Br.	E7	Orchidaceae
E15	<i>Silene</i> L.	E8	<i>Satyrium nepalense</i> D.Don
E16	<i>Achyranthes</i> L.	E9	<i>Thalictrum</i> L.
E17	<i>Stellaria</i> L.	F1	<i>Polypodium</i> L.
E18	Orchidaceae	F10	Fern
E19	<i>Bupleurum</i> Wall. ex DC.	F11	Fern
E2	<i>Halenia elliptica</i> D.Don	F12	Fern
E20	Umbelliferae	F13	Fern
E21	Umbelliferae	F14	Fern
E22	unknown	F15	Fern
E23	Polygonaceae	F16	Fern
E24	<i>Androsace</i> L.	F17	Fern
E25	<i>Platanthera</i> Rich.	F18	Fern
E26	<i>Astragalus Klotzsch</i>	F19	Fern
E27	<i>Parochetus communis</i> Buch.-Ham. ex D.Don	F2	<i>Gymnocarpium</i> Newman
E28	<i>Epilobium</i> L.	F20	Fern
E29	Umbelliferae	F21	Fern
E3	<i>Corallodiscus lanuginosus</i> (Wall. ex DC.) Burtt	F22	Fern
E30	<i>Swertia</i> L.	F3	<i>Pyrrosia</i> Mirb.
E31	<i>Cyananthus lobatus</i> Wall. ex Benth.	F4	Fern
E32	<i>Pleurothallis</i>	F5	<i>Polystichum</i> Roth
E33	<i>Euphrasia</i> L.	F6	Fern
E34	<i>Gentiana ornata</i> (G. Don) Griseb.	F7	Fern
E35	<i>Koenigia</i> L.	F8	Fern
		F9	Fern