

**DAVIS EXPEDITION FUND**  
**REPORT ON EXPEDITION / PROJECT-2015**

|                                  |                                                                                                                                                                                                                                                           |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Expedition/Project Title:</b> | Expedition to collect Gesneriaceae taxa from Sri Lanka                                                                                                                                                                                                    |
| <b>Travel Dates:</b>             | 01 <sup>st</sup> June – 30 <sup>th</sup> June 2015                                                                                                                                                                                                        |
| <b>Location:</b>                 | Sri Lanka; Kurunegala, Ratnapura, Badulla, Anuradhapura, Kandy, Galle, Ratnapura, Nuwara Eliya and Kalutara Districts                                                                                                                                     |
| <b>Group Members:</b>            | Subhani Ranasinghe                                                                                                                                                                                                                                        |
| <b>Aims:</b>                     | The aim of this expedition was to complete the collection of samples of Gesneriaceae taxa from <i>Sri Lanka</i> for molecular species delimitation studies at population level, taxonomic revisions and investigations on their biogeographic affinities. |

### **Introduction**

This proposed field work conducted in Sri Lanka during the period of 01<sup>st</sup> June- 30<sup>th</sup> June 2015 included 17 days in the field (12 days in the original proposal) and five days travelling from Kandy to Colombo for sort out export permits issued by the forest department and the department of wild life in Sri Lanka. The original proposal also aimed to conduct field work in both South India and Sri Lanka. However, the Indian permits are still in the processing stage and therefore it was decided to conduct field studies only in Sri Lanka. This final expedition was intended to complete the sampling in Sri Lanka, especially for the DNA samples at population level necessary for taxonomy, phylogeny and biogeography including samples for RADseq, a next generation sequencing technique. Therefore the field expedition basically aimed at the following;

- Collection of samples from *Henckelia communis*, *Henckelia angusta* and putative hybrids between these two species for next generation sequencing RADseq; initially we aimed at the collection of c. 150 individuals (15 individuals \* 10 populations) and the 2014 field work covered c. 90 samples. This expedition aimed to cover c. 50-60 individuals of these two species and their putative hybrid. The latter were especially focused on since putative hybrid plants could not be collected in the last expedition as only very young seedlings were found, too small for the extraction of sufficient DNA (80 – 100 mg of dry weight required for this DNA extraction).

- According to the preliminary phylogeny of the genus *Henckelia* there are two main clades of *Henckelia humboldtiana* with 4-5 sub clades. Therefore, this expedition covered the entire distribution range of *Henckelia humboldtiana* including dry and intermediate zones in Sri Lanka.
- Field work in 2014 covered only one location for *Aeschynanthus ceylanicus*, *Rhynchoglossum gardneri*, *Rhynchoglossum notonianum* and *Rhynchotechum permolle*. Therefore, this expedition also covered the remaining distribution ranges of these species with the collection of 2-3 populations / locations from each species.

The proposed budget included funding from three sources, Davis Expedition Fund (£ 1923) mainly for field work in Sri Lanka plus air tickets, the Royal Horticultural Society (£ 850) for accommodation and subsistence in India and RBGE field work funding 2015 for Dr Michael Moller (£ 1415) shared expenses for India field work, travelling and counterpart subsistence. Only the Davis Expedition funds were utilized for Sri Lankan field work and the RHS funds were returned as we did not receive the Indian permits. However, more in depth sampling from Sri Lankan Gesneriaceae was achieved as the present research focused exclusively on Sri Lanka (deviating from the original proposal which included Indian Gesneriaceae samples).

### **Methodology**

*Henckelia communis* morphotype 1, *Henckelia angusta* and putative *Henckelia* hybrids were sampled and leaf material for population genetics studies collected. 4-5 leaves per individual from 15-20 individuals were sampled from each population for RADseq DNA extraction. 3-5 individuals from the same populations were sampled for flowers, fruit and leaf material for morphological studies.

Five DNA samples were collected from each population from the rest of the species; *Henckelia humboldtiana*, *Aeschynanthus ceylanicus*, *Rhynchoglossum notonianum*, *Rhynchoglossum gardneri* and *Rhynchotechum permolle*. Up to three individuals from the same populations were sampled for flowers, fruits, leaves for detail taxonomic work. These samples were fixed in FAA solution soon after collection and transferred to 40% alcohol solution a day before travelling back to Edinburgh.

Herbarium specimens were also collected in duplicates or triplicates, preserved in newspaper bundles with alcohol and dried at the National Herbarium in Sri Lanka for deposition in the local herbarium and to be studied and deposited in the herbarium at the Royal Botanic Garden Edinburgh (E). All collections were enriched with digital photos and precise GPS coordinates. Table 1 gives a summary of the field expedition with details on collected taxa.

### **Results:**

Thirty individuals from two populations of the putative *Henckelia* hybrid, fifteen individuals from two populations of *Henckelia communis* morphotype 2 and 10 individuals of *Henckelia angusta* were collected for next generation sequencing RADseq. Extensive field surveys conducted in 2014 as well as in this field expedition to find *Henckelia angusta* in South West lowland wet forests of Ratnapura, Galle and Kalutara districts failed to find any population other than the population at Halmendiya dola in Sinharaja forest reserve. Visits to Delwala forest reserve in Ratnapura, Hiniduma in Galle and Morapitiya forest reserve in Kalutara district, confirmed that these forest habitats were destroyed by activities linked to human settlements and tea cultivation. *Henckelia communis* morphotype 2 was still observed in preserved forest covers in these districts. However, the very restricted distribution of *H. angusta* will be further studied beyond the present study to find out possible impacts on its severe habitat restriction, and whether additional populations may be present in remote areas. A similar situation was observed for *Henckelia ceylanica*. It also has a very restricted distribution in the foothills of the Adam's Peak sanctuary.

Altogether, 30 herbarium specimens, 77 leaf samples in silica, 36 flowers samples, 24 seed samples and 36 leaf samples were collected from eight taxa of Sri Lankan Gesneriaceae, i.e. *Henckelia communis* morphotype 1, *Henckelia communis* morphotype 2, *Henckelia humboldtiana* morphotype 1, *Henckelia humboldtiana* morphotype 2, *Aeschynanthus ceylanicus*, *Rhynchochelys permolle*, *Rhynchochelys gardneri* and *Rhynchochelys notonianum*.

From my extensive field expeditions it can be concluded that the majority of Gesneriaceae species in Sri Lanka are under severe threat of extinction in the near future if no remediate measures are undertaken. A large fraction of their habitats are already destroyed and the remaining populations are confined to fragmented forests. Especially in the Hiniduma forest, Galle district, Gesneriaceae taxa that were previously recorded in the intact forest here could no longer be found. This might be a consequence of climate changes rather than habitat destruction. This again confirms that this group of plants is very sensitive to habitat changes and good indicators of habitat quality.

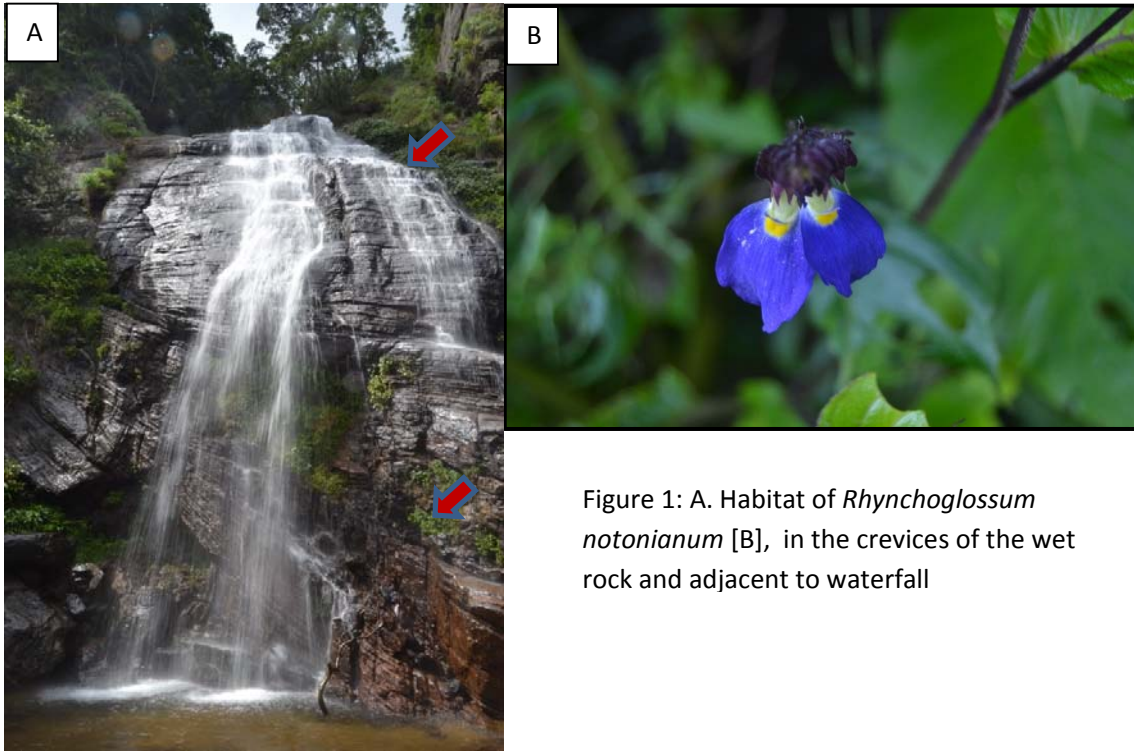


Figure 1: A. Habitat of *Rhynchoglossum notonianum* [B], in the crevices of the wet rock and adjacent to waterfall



Figure 2: A. Putative hybrid between *Henckelia communis* and *H. angusta*, B. *Henckelia communis* morphotype 1, C. *Henckelia communis* morphotype 2, D. *Henckelia angusta*; putative hybrids are always very short and leaves are more linear closer to *H. angusta* and flowers are more closer to *H.*

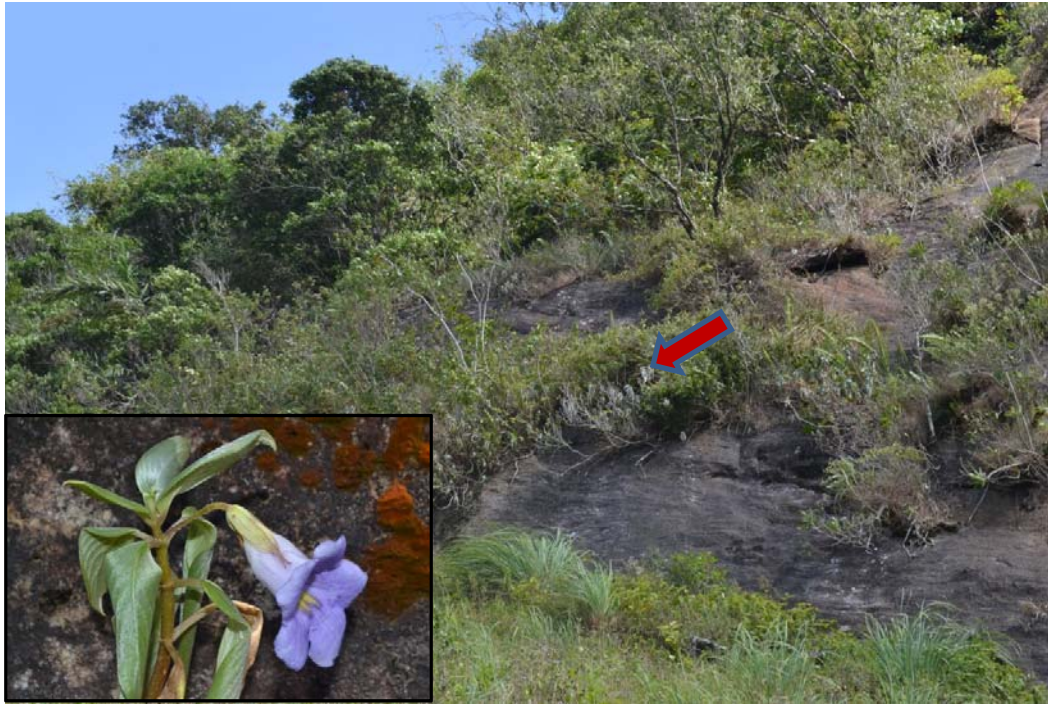
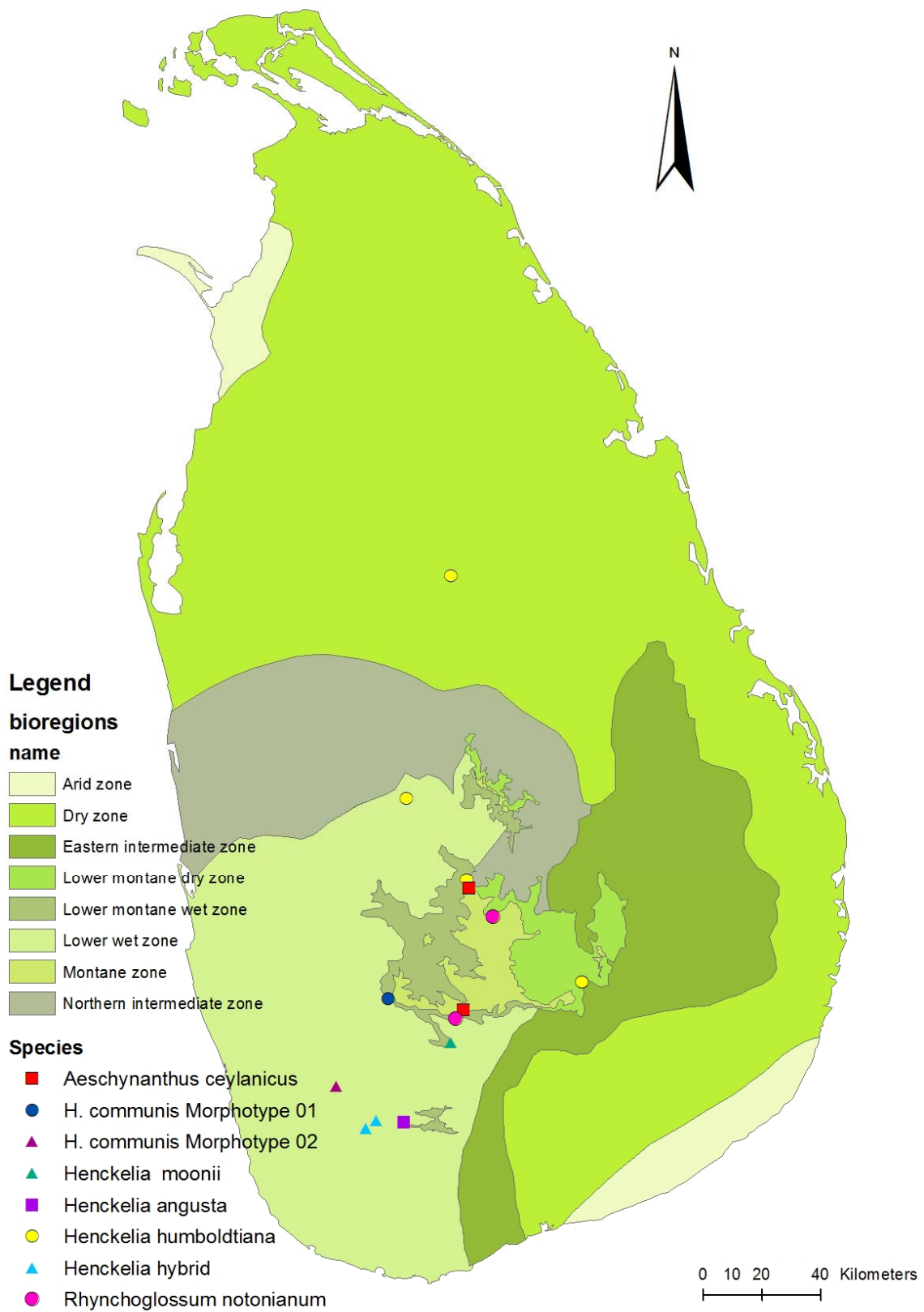


Figure 3 Habitat of *Henckelia moonii* in the Balangoda forest reserve



Figure 4 Habitat of *Henckelia humboldtiana*, in the relic forest of Ritigala, Unakanda



**Figure 5:** Location of the field collections of Gesneriaceae taxa in the bio-regions map of Sri Lanka.

**Table 1:** Details of the field collections of Gesneriaceae taxa in 2015 in Sri Lanka.

| Species                          | Collector                                    | Coll. No | Date of coll.         | Locality details                                                                                 | Elevation | Habitat                                |
|----------------------------------|----------------------------------------------|----------|-----------------------|--------------------------------------------------------------------------------------------------|-----------|----------------------------------------|
| <i>Henckelia humboldtiana</i>    | Subhani Ranasinghe and Tharanga Wijewickrama | 1071     | 01/05/2015-02/05/2015 | Unakanda Hill, Ritigala, Anuradhapura district                                                   | 700 m     | on wet rock crevices                   |
| <i>Henckelia humboldtiana</i>    | Subhani Ranasinghe and Tharanga Wijewickrama | 1072     | 03/05/2015            | Forest behind James Taylor's bungalow, Lookondara Tea Estate, Deltota, Kandy District            | 1191 m    | Wet rock crevices and wet rock surface |
| <i>Aeschynanthus zeylanicus</i>  | Subhani Ranasinghe and Tharanga Wijewickrama | 1073     | 03/05/2015            | Forest behind James Taylor's bungalow, Lookondara Tea Estate, Deltota, Kandy District, Sri Lanka | 1280 m    | hanging from large trees               |
| <i>Henckelia humboldtiana</i>    | Subhani Ranasinghe and Tharanga Wijewickrama | 1074     | 05-06/05/2015         | Rawana Ella Water Fall, Ella, Badulla District, Sri Lanka                                        | 735 m     | wet rocks and soil bank along the road |
| <i>Aeschynanthus zeylanicus</i>  | Subhani Ranasinghe and Tharanga Wijewickrama | 1075     | 07/05/2015            | Balangoda Forest Reserve, Balangoda, Ratnapura district                                          | 1308 m    | hanging from large trees               |
| <i>Rhynchoglossum notonianum</i> | Subhani Ranasinghe and Tharanga Wijewickrama | 1076     | 08/05/2015            | Massenna Forest, Balangoda, Ratnapura District                                                   | 700 m     | adjascent to a water fall              |
| <i>Henckelia moonii</i>          | Subhani Ranasinghe and Tharanga Wijewickrama | 1077     | 09/05/2015            | Balangoda Forest Reserve, Balangoda, Ratnapura district                                          | 600 m     | on exposed rocks to sun                |
| <i>Henckelia communis</i>        | Subhani Ranasinghe and Tharanga              | 1078     | 09/05/2015            | Balangoda Forest Reserve, Balangoda, Ratnapura District                                          | 502 m     | on the wet forest floor under shade    |

|                                             |                                              |      |               |                                                                                                           |             |                                                   |
|---------------------------------------------|----------------------------------------------|------|---------------|-----------------------------------------------------------------------------------------------------------|-------------|---------------------------------------------------|
|                                             | Wijewickrama                                 |      |               |                                                                                                           |             |                                                   |
| <i>Henckelia humboldtiana</i>               | Subhani Ranasinghe and Tharanga Wijewickrama | 1079 | 12/05/2015    | Weudakanda, Kurunegala district                                                                           | 550 m       | on rock faces with water seepage                  |
| <i>Rhynchoglossum notonianum</i>            | Subhani Ranasinghe and Tharanga Wijewickrama | 1080 | 15/05/2015    | Mandaram Nuwara, foot of Piduruthalagala, Nuwara Eliya district                                           | 1186 m      | on wet rock crevices adjacent to a water fall     |
| <i>Henckelia zeylanica was not recorded</i> | Subhani Ranasinghe and Tharanga Wijewickrama |      | 17-18/05/2015 | Forest adjacent to Gartmore Estate (Rajamalwatta forest reserve and Peakwilderness sanctuary- NuwaraE.ya) | 1588-2058 m |                                                   |
| <i>Henckelia</i> hybrid                     | Subhani Ranasinghe and Tharanga Wijewickrama | 1081 | 21-22/05/2015 | Sinharaja Forest in 25 ha megaplot, Sinharaja, Ratnapura District, Sri Lanka                              | 521 m       | Along the stream in the mega plot                 |
| <i>Henckelia angusta</i>                    | Subhani Ranasinghe and Tharanga Wijewickrama | 1082 | 22/05/2015    | Halmandiya Dola, Kudawa, Sinharaja Forest, Ratnapura district                                             | 510 m       | Along the stream                                  |
| <i>Henckelia</i> hybrid                     | Subhani Ranasinghe and Tharanga Wijewickrama | 1083 | 23-24/05/2015 | Forest behind Duwili Ella (water fall), Kosmulla, Neluwa, Galle District, Sri Lanka                       | 110 m       | Along a stream behind kosmulla buddhist monastery |
| <i>Henckelia communis</i>                   | Subhani Ranasinghe and Tharanga Wijewickrama | 1084 | 25/05/2015    | Forest behind aranya (Buddhist monastery), Morapitiya,                                                    | 168 m       | Along a stream behind kosmulla buddhist monastery |



