

# DAVIS EXPEDITION FUND

## REPORT ON EXPEDITION / PROJECT

<b>Expedition/Project Title:</b>	<u>Bryophyte survey of the Yulong Xue Shan</u>
<b>Travel Dates:</b>	<u>May 2012</u>
<b>Location:</b>	<u>Yunnan Province, China</u>
<b>Group Members:</b>	<u>David Bell</u>
<b>Aims:</b>	<u>Survey the bryophyte flora and collect herbarium specimens and associated silica dried samples for molecular studies.</u>

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### **Outcome (not less than 300 words):-**

This bryophyte survey was undertaken as part of a larger Royal Botanic Garden Edinburgh (RBGE) expedition to the Yulong Xue Shan (Jade Dragon Snow Mountain) in May 2012 in collaboration with the Kunming Institute of Botany (KIB), with the primary aim of collecting bryophyte and vascular plant specimens from the Lijiang area along with silica gel material for molecular research. David Long (RBGE), David Bell (RBGE) and Wen-zhang Ma (KIB) were the bryologists on this expedition and collected over 800 bryophyte specimens to be deposited in the Edinburgh and Kunming herbaria.

### **Introduction**

The Yunnan Province of China has a rich flora and the area surrounding the city of Lijiang was historically studied by renowned botanists such as Joseph Rock, George Forrest and Heinrich Handel-Mazzetti, the latter making extensive bryophyte collections. However, the Lijiang area and Yulong Xue Shan have not been explored for bryophytes since RBGE's 'Chungtien-Lijiang-Dali' expedition of 1990 when the eastern slopes of the Yulong Xue Shan were investigated.

The main study areas on the 2012 expedition were the southern part of the Yulong Xue Shan range near the city of Lijiang and the Ma'er Shan mountain to the south, and general collections were made of all the bryophyte species encountered in both regions. Two bryophyte species of particular interest were *Ptychomitrium yulongshanum*, known from a single collection made from the Yulong Xue Shan in 1990, and *Herbertus delavayi*, a species originally described from material collected on the Ma'er Shan which is at the centre of taxonomic controversy spanning 3 continents.

### **Ptychomitrium yulongshanum – ‘Yulong Pincushion’**

The Jade Dragon Field Station, developed by KIB and RBGE between 2001 and 2011, serves as an excellent base for exploring the Yulong Xue Shan range and sits on the southern ridge of the range by the Haligu Lake at 3200m. On the CLD expedition in 1990 David Long collected cushions of a *Ptychomitrium* from a ridge overlooking this lake which turned out to be a species new to science and eleven years later was described as *Ptychomitrium yulongshanum* (Cao & Guo 2001).

On the 2012 expedition a priority was to relocate this species and assess the size and vigour of populations. *P. yulongshanum* was found in three locations over a 1km length of the ‘Haligu Ridge’ and in one of these sites it was in considerable abundance. A further two small colonies were later discovered 1.5 km to the north on another ridge. These sites were at an elevation of 3290 to 3456m, where the moss grew on friable black volcanic rock which outcropped sporadically along the two ridges. The moss did not grow on the much more extensive hard volcanic rocks nearby. The general vegetation on the ridges was open *Pinus yunnanensis* woodland with an understorey of shrubs including evergreen oak *Quercus pannosa* and several *Rhododendron* species.

The two perceived threats to these populations are quarrying of rock (one quarry already exists close to these colonies) and fire which is not infrequent in the pine forests around Lijiang. In view of the highly localised occurrence of this species and the relatively small populations this species should be added to the world ‘Red List’ of bryophytes as a vulnerable species (Long *et al.* 2012).

### **Herbertus delavayi – ‘Delavay’s Prongwort’**

Although described from Yunnan, the name *Herbertus delavayi* is familiar to British bryologists, as it has been suggested that it is an earlier name for the Scottish *Herbertus borealis* based on morphological and molecular evidence (Feldberg & Heinrichs 2005). However, the material of *H. delavayi* used in that study came from Bhutan and not from China leaving some doubt as to its identification. Furthermore, other workers have treated *H. delavayi* as a synonym of *H. sendtneri* (Hattori 1966; Juslén 2006), while Hodgetts (2003) treated *H. borealis* as conspecific with *H. dicranus*. In a recent study of European *Herbertus* using DNA barcoding, Bell *et al.* (2012) and Bell & Long (2012) maintained *H. borealis* as a distinct taxon. The confusion surrounding *H. delavayi* also extends to North America where different workers have variously applied the names *H. delavayi*, *H. dicranus* and *H. sakurii* to the same taxon in recent years. In order to test these conflicting opinions, we considered it desirable to collect *H. delavayi* from as close to its *locus classicus* as possible. The type material of *H. delavayi*, collected in 1889 by French missionary and botanist Jean Marie Delavay, is labelled ‘Bois de Ma Eul Chan, 2800m’ and type specimens exist in Geneva (G), Paris (PC) and the Natural History Museum (BM) herbaria. The type locality corresponds to what is now known as the Ma’er Shan, between Lijiang and Dali. Additional specimens of *H. delavayi* collected more recently exist in several herbaria from the Cang Shan and from the Yulong Xue Shan, but none has been seen from the Ma’er Shan. As all of these are too old for DNA extraction, a priority on the 2012 expedition was to visit both the Ma’er Shan and Yulong Xue Shan to search for *H. delavayi*.

Camping at 3900m on the west flank of the southernmost peak of the Yulong Xue Shan allowed access to the uppermost stands of *Abies* and *Rhododendron* forest. *Herbertus dicranus* was frequent in these forests, usually growing on living trees, and in three places *H. delavayi* was also found, growing on rocks and soil but not epiphytically. The two species were relatively easy to distinguish in the field, with *H. dicranus* recognised by its diffuse habit, with strongly hooked shoot tips, and leaves with long narrow rather flexuose lobes, while *H. delavayi* grew in rigid erect tufts with shoots tips only weakly curved, and its leaves with short broad lobes regularly pointing to one side.

When exploring the Ma'er Shan, the mountain ridge was approached from both the east side (from Shui He village near Songgui) and west side (from Da Songping village near Niujie Xiang), reaching 3640m and 3563m respectively. However, the dominant vegetation encountered on both flanks of the range was dry *Quercus* dominated forest, rather than humid *Abies* forest where *H. delavayi* was expected to occur. *Herbertus dicranus* was frequent as an epiphyte here but no *H. delavayi* was found. Unlike the Yulong Xue Shan, the Ma'er Shan does not enjoy any environmental protection and logging and grazing may have changed the habitat considerably since 1889. Other parts of the Ma'er Shan could not be visited so further fieldwork is desirable.

Following the expedition the bryophyte collections are being curated and a labelled set will be returned to Kunming. Many collections of *Herbertus* were dried in silica gel, and as a priority some of these (including samples of *H. delavayi* and *H. dicranus*) have already been sequenced for comparison with material of European and North American *Herbertus*, as the next stage in an ongoing project using DNA barcoding to shed light on the complex taxonomy of the Prongworts.

### **Acknowledgments**

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