



The vivid flower colour of *Nomocharis basilissa* distinguishes it from the commoner species in cultivation

Simon Crutchley

Plant hunting in Gaoligong

SIMON CRUTCHLEY describes the rich variety of plants found on a scientific expedition to a mountain range in Yunnan

YUNNAN RARELY FAILS to capture the hearts and minds of its visitors. The diverse cultures, landscapes and, of course, the plants all contribute to make it a most beautiful and colourful place.

As part of a global collaborative project to preserve biodiversity in China, the California Academy of Sciences launched the China Natural History Project (CNHP) in 1998. The pilot projects of CNHP aimed to survey and inventory the biodiversity of the Gaoligong Shan, a mountain range in western Yunnan. The California Academy of Sciences

The expedition to the Gaoligong range of mountains involved a collaboration between many national institutions



Jin-hyuh Paik

asked a number of other institutions to collaborate, including the Royal Botanic Garden Edinburgh (RBGE) and the Chinese Academy of Sciences. The funding is from the US National Science Foundation. RBGE was asked to collaborate because of its long experience and expertise in investigating and documenting the flora of China. The Chinese Academy of Sciences is an umbrella organisation encompassing scientific organisations throughout China. A number of these were asked to collaborate on the project, namely the Kunming Institute of Botany, the Kunming Institute of Zoology, the Institute of Zoology in Beijing, and the Hunan Normal University.

There have been ten expeditions which have run through the years of 2002 to 2007 with the aim of sampling and documenting the biodiversity at different seasons. With regard to the plants, the main aim was to survey and inventory the flora and to collect herbarium specimens. Specimens were collected so that each institution had at least

one set, with a set also collected for the local county that we were collecting in. In effect, small local herbaria were being established in each of the counties that encompassed the Gaoligong Shan.

In this article I will discuss some of the subalpine plants and landscapes that I experienced as a member of the CNHP during a collecting trip in August and September 2005.

Location and natural history

Lying between the Irrawaddy River to the west and the Salween River to the east, the Gaoligong Shan runs north to south along the border between Yunnan in China and northeast Myanmar (Burma). This long, narrow range stretches 600km south, from near the border with the Xizang Autonomous Region (Tibet) to where the Salween River turns westwards into Myanmar.

The Gaoligong Shan is the southernmost extension of the Hengduan mountains, a spectacular series of parallel, north to south

ranges, separated by gorges through which flow four of the great rivers of Asia; the Irrawaddy, Salween, Mekong and Yangtze. Elevations in the Gaoligong Shan from 700m in Tenchong county to the south, to 4,640m in Gongshan county to the north. The habitat types in this region are zoned by elevation and include evergreen broad-leaved forests, subalpine coniferous forests, alpine scrub and meadows, and scree vegetation.

As far as the plants are concerned the statistics are remarkable. The mountain range is home to 224 families, 1,279 genera and over 5,400 species and infraspecific taxa of flowering plants, in an area of approximately 25,000km². China is home to approximately 30,000 species of plants, distributed through nearly 400 families, so it is easy to see the extent of richness of the Gaoligong Shan mountains.

Unlike much of the surrounding area, the forests of the Gaoligong Shan have remained largely intact through their remote location. This has led to the recent establishment of two large national nature reserves protecting most of the Chinese side of the ridge. Yet, the biodiversity of this remote region remains poorly documented. This is due to the lack of comprehensive scientific exploration of the range, which can largely be attributed to the physical isolation and political sensitivity of the region.

Because of the rapid speed of expansion and economic development all over China, few places are completely safe in the face of the huge demand for timber, minerals and hydro-electric power. A goal of the CNHP is to catalogue the extraordinary biodiversity and use this to try to enforce its protection by the Chinese government. ➤



The Gaoligong range of mountains runs north-south for about 500km along the border between Yunnan in China and Myanmar (Burma)

The expedition

The expedition aimed to visit the high mountains west of the town of Fugong. This was highlighted as an area that had not been surveyed since the start of the project, and the leaders were keen to sample the high alpine plants. I was accompanied by Dr David Long and Jin-hyub Paik from RBGE and staff from the California Academy of Sciences and the Chinese Academy of Sciences.

A couple of buildings in a small, former forestry station were used for accommodation and for processing data and specimens. This hamlet, Shibali, was situated in a clearing amongst broad-leaved evergreen forest at approximately 2,500m and adjacent to a road which crosses into Myanmar.

Fugong lies alongside the Salween River in the upper reaches of the Gaoligong Shan. It is a medium-sized town, consisting predominately of people from the Lisu minority. As

is usual with minority tribes of southwest China, the women have very colourful costumes. The Lisu women have brightly coloured beads and scarves for their heads, alongside their similar coloured waist jackets and bags. The people are generally tall and slender in build, contrasting with their neighbours from the Nu minority who are shorter and stockier, and who live further north along the valley in the more rugged mountainous country.

It is little wonder that this beautiful area has attracted the attention of so many of the great Victorian plant collectors. George Forrest, Frank-Kingdon Ward, Reginald Farrer and Euan Cox all collected here and enriched our gardens with flowers that we scarcely believed existed.

Subalpine and alpine plants

The subalpine and alpine regions that we explored above the town of

Fugong hold an astonishing diversity of flowering plants.

Primula agleniana was one of the greatest finds of the whole trip. This majestic plant was first discovered by George Forrest in 1905 on the Salween-Mekong divide. At the time, Forrest was being pursued by hostile Tibetans and secured just one inflorescence. This specimen remained unidentified until Forrest collected it again on the Salween-Kiu-chiang divide, and soon after it was given a formal description.

It reaches over 30cm in height, bearing up to 8 flowers in each inflorescence. The flowers are marvellous, and range in colour from yellow to pink and white. The plants that we found had beautiful, pure white flowers. At the fruiting stage the serrated leaves, covered beneath with a conspicuous white farina, enlarge considerably and can reach up to 30cm in length.

We also found *Primula serratifolia*.



Primula agleniana was first discovered by George Forrest. Those found in Gaoligong had pure white flowers

This striking plant was discovered by Abbé Delavay on the Tali range, and found its way into cultivation via George Forrest who introduced it in 1905. It has since proved to be widespread in northwest Yunnan, inhabiting wet alpine meadows. We found it nestling between rocks and boulders beside fast flowing streams. The individual flowers are a conspicuous combination of yellow

and white, held atop 30cm stems.

Two little known *Primula* species were discovered in this wildflower wonderland, both members of section *Amethystina*. *Primula valentiniana* is a tiny plant reaching no more than 7cm in height. The bell-shaped flowers are a lovely crimson and sit singly at the top of the flowering stem. It inhabited very wet alpine meadows at around 4,000m. The other was *P. silaensis*, which is another small and delicate plant, also reaching no more than 7cm in height. It was growing in very shallow soil in a rocky side valley amongst various species of *Spiraea*, *Rodgersia* and *Clematis*, with *Abies delavayi* as the dominant tree. The lovely purple flowers appear in small clusters at the top of the stem. It is apparently widespread on the borders of Yunnan, Assam, South East Tibet and Myanmar.

Another of the gems of the expedition was *Cremanthodium campanulatum* in the *Asteraceae*. A great number of *Cremanthodium* species have yellow flowers so it was a refreshing change to encounter a species with purple flowers. It is a

diminutive little plant, reaching no more than 10cm in height. The basal leaves are leathery, with a cordate base, green above and purple below. The solitary flowerhead hangs daintily from the top of the stem and is notable on account of the deep purple colour suffusing the whole inflorescence, with conspicuous bristles on the outside. It was growing in boggy, silty soil in a completely open aspect. I have no experience of it in cultivation and I know this genus is difficult to grow.

I have long been an admirer of the genus *Nomocharis* which contains some of the most desirable plants for the garden. Not long after starting at RBGE I became familiar with *N. farreri* and *N. pardanbina* which grew on the peat walls. They both shared the similar flower colour of a white background with various markings on the flat, spreading tepals. As there was only a handful of species I presumptuously thought that there would be no great difference in flower colour between them. How utterly wrong could I be!

On the first day of collecting we were scouring the alpine meadows, stopping at almost every pace to look at something interesting and new. I was suddenly transfixed by the intense colour of a flower. It was a bulb approximately 30cm high with a flower of a vibrant salmon-peach colour. I dared not think for a moment that it could be a *Nomocharis*, but the characteristic winged filaments of the stamens kept me thinking that it could be. I did not identify it in the field but set about the task once back at RBGE. It proved to be *N. basilissa* and this was confirmed by Dr Henry Noltie, a botanist at the garden. It was absolutely wonderful to see it there in the wild. I have been informed by Peter Cox, whose father Euan Cox, and Reginald Farrer, were the



Primula silaensis is a short, delicate species with rounded leaves



Simon Crutchley

The bristly flowerhead of *Cremanthodium campanulatum* deepens in colour as it develops

first Westerners to discover it, that we were among the first people to collect and photograph it since. Euan Cox and Reginald Farrer collected it in 1920 on the Gaoligong Shan. It seems to be restricted to the upper reaches of that mountain range and into northern Myanmar. To know that it is still growing there is both thrilling and satisfying. I am sure that it is only one example of the many plants that struggle to survive in such a fragile environment.

The genus *Codonopsis* contains some first class garden plants. I was familiar with the trailing *C. forrestii* which has blue, saucer-shaped flowers and which I remember seeing on the southern slopes of the Yulong Xue Shan in 2004 where it made a fine display in September. *Codonopsis chimiliensis*, which I found growing on the high alpine meadows of the Gaoligong Shan, belongs to the group that has campanulate flowers. It too is a trailing plant, 30cm high, and completely glabrous throughout. The leaves are ovate-



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Codonopsis chimiliensis was refound near to the site where George Forrest had first seen it. This trailing plant typically favours grassy slopes

lanceolate with a crenate margin. The charming flowers are pale yellow-green with purple veins running through the corolla. The flowers are solitary and mostly terminal, aside from the few which occur in the leaf axils near the apex of the stem. George Forrest can be credited with discovering it near to Chimi-Li (hence its name) on the Gaoligong Shan, so it was extra special to have re-discovered it near to its type locality. I have never seen it in cultivation, and I would be interested to hear of any grower that has had success with it.

Amitostigma farreri is a wonderful terrestrial orchid that also grew in this alpine wonderland. It was described in 1924 from a specimen collected by Reginald Farrer during August 1920, just two months before he tragically died. Farrer found it locally abundant in marshy grassland in the upper reaches of the Gaoligong Shan but stated that otherwise it was rare. Our experience was the same. Reaching just 10cm in height its 1–1.5cm long,

purple-flecked flowers are its most endearing feature.

Woody plants

It is easy to assume that all plants in alpine regions are herbs or bulbs. However, woody plants are an important constituent of the alpine flora and they occur in great abundance and diversity in these mountains.

I was intrigued to find a cherry growing in these hostile alpine regions. It proved to be *Prunus mugus* which formed a low, arching habit, its thick, stiff branches clambering over rocks and boulders. The usually paired flowers are pinkish white and followed by dark red fruits. It is endemic to northwest Yunnan. Its discovery can be credited to the explorer and botanist Handel-Mazzetti who also formally described it in 1923. It was introduced to cultivation by Forrest from the northern part of the Gaoligong Shan in 1922 and is cultivated in specialist collections.

Another woody plant that enjoys these harsh conditions is *Potentilla glabra*. It resembles the British native *P. fruticosa* but differs most obviously in its white flowers. We saw it in a small population of about 12 plants, nesting between rocks and boulders with various species of dwarf *Rhododendron*. This species enjoys a widespread distribution occurring all over western, central and northern China, as well as Mongolia, Korea and Russia. It was first introduced into cultivation (probably as *P. davurica*) in 1822 by the gardener and nurseryman Conrad Loddiges. Forrest re-introduced it and there is an old specimen, collected by him in Yunnan, still growing on the rock garden at RBGE that flowers every year.

A wonderful find was *Spiraea hemicyptophyta*, which I knew from a cultivated plant in the rock garden at RBGE. I have often admired it, and thought it should be more widely cultivated. It grows to 30cm high and bears clusters of bright red and

white flowers in June and July. The stems die back to an underground rootstock in winter. This lovely species was first described in 1987 by the late Andrew Grierson, a RBGE botanist, during the Flora of Bhutan project from material collected in Sikkim. Its distribution has since been shown to cover the eastern Himalayas into western China. The cultivated plant at RBGE is from seed (EMAK 308) collected from the Barun Khola in eastern Nepal.

Rhododendrons, not surprisingly, occur in astonishing abundance. One could write an article solely on this marvellous group. The transition of species from the moist, mixed *Fagaceae* forests to the alpine zone is remarkable to observe. Large-leaved species such as *R. arizelum* and *R. rex* subsp. *fictolacteum* fight for space in the lush, humid, mixed forests whilst dwarf species hug the high alpine screes.

In the alpine zone we saw *Rhododendron saluense* as a wind swept, wiry shrub to 10cm high. The wide open, magenta to purple

flowers contrast significantly in size with the small leaves. It was first discovered by Abbé Soulie in 1894 on the Salween-Mekong divide, and has later been found in other parts of northwest Yunnan and into southeast Tibet. In cultivation, away from harsh winds, it can reach 50cm in height and is a perfect shrub for the rock garden. Another species we encountered was *R. campylogynum*, also a dwarf shrub barely reaching 10cm in height. The thimble-shaped flowers were deep red in colour.

A little lower, in a side valley dominated by *Abies delavayi*, we found *Acer caudatum*. I have seen giant specimens of this maple in northwest Yunnan with trunk diameters to 3m. In Gaoligong Shan they formed medium sized trees to 10m in height. The bark is light brown in colour, sometimes visible under the layers of moss that seems to clothe everything in these clean, unpolluted mountains. The long, red leaf stalk is both attractive and characteristic of this ornamental tree, and the leaf blade is 3-5 lobed with a sharp and irregularly toothed margin. The colourful red fruit is held on short erect spikes and is most conspicuous. Unfortunately, and for a reason that I cannot explain, this tree seems almost a complete failure in cultivation. It was first described by Nathaniel Wallich from material gathered by one his collectors in Nepal.

The aristocratic shrub *Clethra delavayi* also finds its home here. This beautiful shrub was described by the French botanist Adrien Franchet, and named after its discoverer, the missionary Jean Marie Delavay. I first came across this wonderful plant at RBGE, which came from a collection made by Forrest on the Cangshan mountains near Dali in Yunnan. Not only is it magnificent in flower, it also blooms late in the season ➤



A small terrestrial orchid, *Amitostigma farreri* was discovered by Reginald Farrer just two months before his death

(August) when most shrubs have finished flowering. Here, in its native home it favoured the margins of forests, where it reached 3m in height. The leaves are elliptic to lanceolate in outline with a crenate margin, and downy and glaucous beneath. Its flowers are its most ornamental characteristic, appearing in racemes that can reach almost 30cm in length. Each raceme can carry up to 100 individual flowers, each one a glorious white and bearing a superficial resemblance to those of lily-of-the-valley.

Conservation and new discoveries

It can be considered that the objective of biological conservation is to maintain genetic diversity. Endemic species and populations that are geographically isolated from other populations of the same species are likely to represent significant genetic diversity. There are many examples of endemic species and isolated populations in the Gaoligong Shan and they are therefore of high conservation importance. The work of the CNHP has also led to the discovery and naming of new genera and species.

For example, a bamboo that was previously known as *Arundinaria megalothyrsa* has been found to be distinct enough to be placed in its own genus – it is now known as *Gaoligongshania megalothyrsa*. The only member of its new genus, this rare bamboo is endemic to the Gaoligong Shan where it grows in evergreen, broadleaved forests, sometimes on the trunks of old, upright and fallen trees.

At least two new bryophyte genera have also been recognised. The moss *Shevockia inunctocarpa* belongs to a new genus and was discovered on the trunks of old trees in wet, broadleaved, evergreen forest. The



David Long

Corydalis myriophylla is a new species described from Gaoligong Shan as recently as 2008

leafy liverwort *Hamatostrepta concinna* is also representative of a new genus and is found growing in the subalpine zone in dwarf *Rhododendron* heath.

Coelogyne tsii is a newly discovered orchid from the warm temperate and subtropical regions of the mountain range. It was described in 2006 by a young Chinese orchid expert who has already worked extensively in the area. It is usually epiphytic, with a rhizomatous root-stock, and oblong, leathery leaves. The startling red flowers stand high above the foliage and provide a great

display. Unfortunately, the small population that was found is at risk from agriculture.

A new *Corydalis* was found on the cliffs and ledges of Mount Ke-nyichum-po, the highest peak of the Gaoligong Shan, situated at the most northerly end. It has recently been named *C. myriophylla*. The colourful flowers are mix of blues, violets and white and stand proudly above the glaucous foliage.

Before the CNHP began only 3,800 plant species were known from the area. This total has now

the Gaoligong Shan.

The project has provided training opportunities for students, staff and employees of the nature reserves in the form of field work, workshops, and the use of IT equipment. It has also strengthened international collaboration through reciprocal short term visits by personnel from the various institutions to study collections and conduct research together.

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Acer caudatum has a wide range and forms large robust trees in the wild but is rare in cultivation

increased to over 5,400. This rise can be attributed to collaborative field work and documentation. It reveals the extent of work there is still to do for scientific and conservation organisations to gain a better understanding of biodiversity in this 'hotspot.'

More than 26,000 herbarium specimens have been collected, with an average of 6 duplicates per specimen. In total therefore, 150,000 specimens have been divided between the institutions involved.

Conclusion

A great achievement of this project has been one of collaboration. The international collaboration was between a number of conservation and scientific institutions encompassing three continents. This resulted in a project that helped survey and inventory the whole biodiversity of a most precious ecosystem. The information generated from this project will provide the basic knowledge necessary for sound management and conservation decisions affecting