

# LILIES

and Related Plants

2011-2012





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## Lilies and Related Plants

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**Back cover:** *Lilium fargesii* (see pp. 43-46)

**Half title:** *Fritillaria camschatcensis*

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Editor  
Alan Mitchell

The Royal Horticultural Society  
LILY GROUP

# Royal Horticultural Society Lily Group



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# NOTES ON AUTHORS

**Martyn Rix, VMH**, is an authority on the genus *Fritillaria*. At Cambridge he did a doctoral thesis on Turkish fritillaries. He was for many years a Botanist at RHS Wisley, and contributed significantly to *The European Garden Flora*, *Flora Europaea*, *The Flora of Turkey* and many other scientific publications. With Roger Phillips, he is also the co-author of the very popular *Pan Garden Plants* series of books. His monograph on *Fritillaria* is eagerly anticipated.

**Barry Francis** has been interested in gardening as a hobby for most of his life. After reading a biography about Luther Burbank he got the urge to try plant breeding and decided on lilies. His initial success with lilies has motivated him to learn more about the genus *Lilium*.

**Richard Dadd** has been a member of the Lily Group for over 40 years and served for 15 years on the Lily Group Committee. He is interested in a wide range of plants, especially lilies and alliums.

**Anurag Dhyani** was a student at the High Altitude Plant Physiology Research Centre, Srinagar Garhwal, Uttarakhand. The focus of his and his colleagues' research was *L. polyphyllum*, which they were studying for its medicinal properties.

**Barbara Small** has loved lilies since she was a teenager. She and her family often went backpacking in the Sierra Nevada, California, and it was during one of these trips that she spotted the most beautiful red-orange flower she had ever seen. She had no idea of its name, but has since learned that it was *Lilium parvum*. This, and other encounters with native lilies, has committed Barbara to a lifetime of loving lilies.

**Darm Crook** was first attracted to lilies when he was growing up on a farm. He started growing lilies after he got married in 1965. For some time now Darm has set himself the goal of growing a new species every year. While he finds lilies easy to work with, the requirements of different species can still present a challenge.

**Brian Mathew** said when awarded a medal by Kew in 1992, "bulbs were in my blood from a very early age..." As a young student at the RHS in the 1960s, he organised a plant-hunting expedition to Iran after winning a Bowles Scholarship travel grant. Many other expeditions followed, along with a career in the Herbarium at Kew Gardens. Although primarily a botanist, Brian Mathew has published many books aimed at the non-scientific gardener.

**Rimmer de Vries** grows rock and alpine plants as well as lilies. He has an eclectic collection of hybrid and species lilies, but is particularly fond of North hybrids. Modestly, Rimmer feels that any success he has had with lilies is because he stands on the shoulders of giants who have graciously mentored and encouraged him along the way.

**Dr Markus Hohenegger** is a Botanist who was born in Austria in 1970. Special aspects of the symbiotic propagation of terrestrial orchids was the subject of his thesis. After obtaining his diploma, he changed career and now works in medicine. Although still interested in orchids, he finds lilies fascinating. This led to his most important project, i.e. the creation of the website [www.the-genus-lilium.com](http://www.the-genus-lilium.com). In 2002 and 2009 he established his own breeding programme using species lilies, including the 'new' ones from China.

**Carolyn Richards** lives in Alresford, Hants. The soil is flinty with pockets of clay, which is why she grows lilies in pots. Carolyn is drawn to lilies, both species and hybrids, because of their grace and fleeting beauty.

**Andree Connell** and her husband Michael live near Victoria, which is on Vancouver Island in British Columbia, Canada. The climate is more or less maritime. Andree and Michael grow species and hybrid lilies, some of which they have grown from Lily Group seed.



**Dr Nuala Sterling**, a niece of the market gardener and author Ethelind Fearon, almost chose Horticulture in place of Medicine. A short spell at Rohamsted was followed by a lifetime in medicine. Nuala enjoys growing plants from seed (bulbs to trees) and found joining the RHS Lily Group, in 2004, a revelation, inspiration and education.

**Kimito Uchikawa** retired in 1999. Thereafter, his interest in lilies led him to attempt to cultivate all of the indigenous lily species of Japan from seed. His love for his native lily species overcame his lack of botanical knowledge, and the scepticism of his botanical friends, and enabled him to raise almost all of Japan's lily species within a period of five years.

**Susann de Vries** first became interested in lilies when she discovered that the meaning of her name was lily. When her husband became interested in gardening she encouraged him to grow lilies, partly because they were her namesake, but mostly because of their spectacular beauty.

**Alan Mitchell** is an optimistic amateur gardener with a passion for growing lilies. He finds their difficulty a challenge and their diversity and beauty engaging and therapeutic.

**Caroline Boisset** is Secretary of the RHS Lily Group, having edited *Lilies and Related Plants* from 1997 until 2007. She is currently Editor of the International Dendrology Society's yearbook and is constructing a new garden in Bradford-on-Avon, in Wiltshire.

**Madeleine Tinson** describes lilies as the perfect plant, in that they are diverse, intriguingly beautiful, a challenge to grow and can fill the air with wonderful perfume.

**Břetislav Mičulka** became interested in lilies when he moved into his own house in 1970. He was intrigued by their beauty and the possibilities of hybridization, so he soon started crossing lilies even when few lilies were available to him. He was also interested in the nomenclature of cultivated plants, which allowed him to organize the registration of the variety names of lilies in the RHS register.

**Jim McKenney** was in his teens when an older friend gave him her copy of the original 1939 edition of *America's Garden Book* by Louise and James Bush-Brown. The chapter on lilies nourished his enthusiasm and guided his early efforts. His first lilies were *L. regale*, *L. henryi*, *L. candidum* and the tiger lily. Now, more than half a century later, Jim still remembers with great fondness that friend and wishes that she were still here so that he might thank her for the gift of his love of lilies.

**Paige Woodward** is the co-proprietor of Pacific Rim Native Plant Nursery in British Columbia, Canada ([www.hillkeep.ca](http://www.hillkeep.ca)). She grows species from around the temperate world and occasionally organizes study tours led by prominent botanists.

**Harris Howland**, a past chairman of the Lily Group, has been interested in lilies for over 40 years and now maintains a relatively good collection of lilies and fritillaries. He also collaborated with Michael Jefferson-Brown, on the authorship of the book entitled *The Gardeners Guide to Growing Lilies*.

**Dr Johnny Randall** is the Assistant Director for Natural Areas and Conservation at North Carolina Botanical Garden, University of North Carolina. He is particularly interested in ecosystem rehabilitation and restoration.

**Mohammad Sadegh** loves all plants and finds their green colour and vibrancy delightful. He is especially attracted to lilies and would like to breed a hybrid lily, which would be suitable for gardeners in Iran, using *Lilium ledebourii*.

**Pontus Wallstén** has been growing lilies in Switzerland since 1999. After completing his first degree he is now studying for a Masters Degree in Journalism. He has a small nursery – Pontus Wallstén Plants – where he focuses on growing and propagating lilies and south African bulbs. Photography has been one of his main passions since the age of 8.

# The genus *Fritillaria* in China: a summary

*In his article **Martyn Rix** reviews the many *Fritillaria* species that grow in China and how collectors of medicinal plants have made finding plants in the wild very difficult.*

## Introduction

China covers as much area as Europe and Turkey combined, from tropical to almost arctic climates at sea level to the highest mountains in the world and from desert to rainforest, so it is not surprising that it contains a lot of different plant species. What is rather surprising is that there are so many *Fritillaria* species, when *Fritillaria* are primarily Mediterranean bulbs, and it is in Mediterranean climates such as Turkey and California where they have reached their maximum diversity.

The *Flora of China*, which takes a rather conservative view of the number of species, covers 24 species; for comparison, *Flora of Turkey* contains 31 species and several subspecies, and a few more have been described since the account was written.

Links for the Chinese Flora online are:

<http://flora.huh.harvard.edu/china/PDF/PDF24/fritillaria.pdf>

[http://www.efloras.org/florataxon.aspx?flora\\_id=2&taxon\\_id=113029](http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=113029)

This outline is based on the Flora, with some modifications and explanations.

[http://fritillariaicones.com/info/names/pub\\_names\\_a.html](http://fritillariaicones.com/info/names/pub_names_a.html)

One great difficulty in the study of the Chinese species is that they are often very difficult to find in the wild; this is because they have been exterminated in the more accessible areas by collectors of medicinal plants. Fritillary bulbs, called in Chinese, Bei Mu, are one of the most popular Chinese traditional medicines. All the species seem to be used, and seem to have much the same properties, to soothe the throat and lungs, and to lessen spasm. Coughs and colds are one of the chief ailments over large parts of China, and until recently most of the major cities were desperately polluted by the burning of very sulphurous coal. In Chengdu in the 1980s there were very few cars, but about a million bicycles, and even then to breathe the open air was to cough...now there are a million cars and the air is cleaner.

Medicinally Chinese *Fritillaria* are divided into six main groups:

1. Zhe beimu from cultivated *F. thunbergii*.
2. Yi beimu from *Fritillaria walujewii* and *F. pallidiflora* from Xinjiang.

3. Ping beimu from *Fritillaria ussuriensis* from NE China.
4. Chuan beimu from *Fritillaria cirrhosa*, *F. sichuanica*, *F. unibracteata* and *F. przewalskii* from Yunnan and the Himalayas.
5. Hubei beimu from *Fritillaria hupehensis*.
6. Anhui beimu from *Fritillaria anhuiensis*.

Many new species have been described from central China, by workers who were cultivating and studying local *Fritillaria* for medicinal purposes, and this accounts for some of the large numbers of synonyms listed under some species such as *F. monantha*. Other workers, such as the Duans have described lots of varieties, which are not recognised by the flora and are listed as synonyms. I expect detailed study of the Duan's varieties will confer wider recognition.

Mr and Mrs Duan, their collections in the wild and their fritillary farm in the mountains of Xinjiang, are described in more detail in *Curtis's Botanical Magazine* vol. 26, parts 1 & 2 (2009), under *Fritillaria yuminensis*. This article covers Chinese medicinal fritillaries in general, and the work done by Christine Leon at the Chinese Medicinal Plants Authentication Centre (CMPAC), based at Kew.

Botanically, China can be divided into four areas. Recent DNA studies at Kew indicate that the species have evolved relatively recently, and that most of the geographical groups are also related biologically. Similarities in flower shape have evolved several times in response to similar pollinators, such as bumble bees, solitary bees or dung flies. This is particularly striking in the Japanese species, recently covered in a *Fritillaria* Group lecture by Laurence Hill.

In contrast to this, one or two species and groups are very isolated: *Fritillaria davidii* is not closely related to any other species, and *F. karelinii*, which just reaches Chinese territory in western Xinjiang, is related to the other species of subgenus *Rhinopetalum*, which are found from Iran eastwards.

The species may be grouped as follows (numbers from *Flora of China* are in brackets):

### **Xinjiang**

Here there has been a remarkable diversification of species in a very small area, particularly in the mountains along the border with Kazakhstan. Around 10 species are recorded, and more are still being discovered, particularly by the Duans, who described *Fritillaria. yuminensis*, *tortifolia* and *albidiflora*:

*Fritillaria karelinii* (Fischer ex D. Don) Baker (21). Deserts, *Artemisia* scrub, saline clay soils; from north of the Caspian to northwestern Xinjiang. Short upright stems with up to 10 (rarely more) starchy pink spotted flowers. Capsules not winged.



*Fritillaria pallidiflora*



*Fritillaria karelinii*

*Fritillaria meleagroides* Patrín ex Schult. (2). Dryish places in bogs and moist steppes, in peaty soils; from Romania and southern Russia, across Siberia to northwestern Xinjiang. Tall stems, nodding at the top, with narrow leaves and a solitary blackish or yellow rounded flower. Capsules not winged.

*Fritillaria ruthenica* Wikstr. In thickets and rough, grassy places. From southern Ukraine, eastwards to Kazakhstan, on the border with western Xinjiang, so may be in China, too. Tall stems with the upper leaves in a whorl of 3, forming tendrils. Flowers blackish, heavily tessellated, with a linear nectary. Capsules winged.

*Fritillaria pallidiflora* Schrenk ex Fischer & C. A. Meyer, (1). Alpine meadows, margins of *Picea schrenkiana* forest and *Juniperus* scrub in the mountains, 1300-2500m, in peaty and loamy soils, from Kazakhstan in the Dzungarian Ala-tau to the Borohoroshan in western Xinjiang; commonly cultivated for medicine. Broad alternate leaves and one to several very large pale green or yellowish, squarish flowers, lightly tessellated with red. Capsules winged.

*Fritillaria verticillata* Willd. (11). Alpine meadows and scrub, in dryish peaty soils, in the Altai in Russia, Mongolia and Kazakstan, just extending into northern Xinjiang. Narrow opposite or whorled leaves and usually a large solitary pure white squarish flower. (This is the form which Janis Ruksans calls 'Urdzhar'.)

*Fritillaria tortifolia* X. Z. Duan & X. J. Chen (13). Dry scrubby and grassy hills, with *Paeonia anomala*, *Primula veris* var. *macrocalyx*, *Corydalis nobilis* etc. in stony loam, in Xinjiang south of Yumin. Lowest leaves opposite, c.15mm wide, the rest usually paired or in a whorl of three; flowers very broad, white, tessellated with crimson, especially inside. Capsules winged.



*Fritillaria ferganensis*



*Fritillaria yuminensis*

*Fritillaria yuminensis* X. Z. Duan (15). Dry scrubby hills, with *Juniperus* etc. in dry, peaty loam, in Xinjiang south of Yumin. Lowest leaves opposite, c.10mm wide, the rest usually paired or in a whorl of three; flowers almost flat to bell-shaped, pale pink or mauve, not tessellated; nectary inconspicuous; style undivided. Capsules winged.

*Fritillaria albidiflora* X. Z. Duan & X. I. Chen. Very dry, scrubby hills, often among *Artemisa*. In Xinjiang, in the Tar Bagatay mountains near Tacheng, Emin and Tuoli. Lowest leaves opposite, c.10mm wide, the rest usually paired or in a whorl of three; flowers almost flat, white; nectary conspicuous, 3mm above the tepal base; style divided at the apex for c.3mm. Capsules winged. ('Kara-Sumbi' is similar to this, but has more angled flowers, in which the lower part of the tepal is somewhat reflexed and the nectary is probably deeply indented. It was found in eastern Kazakhstan.)

*Fritillaria walujewii* Regel (10). Dry grassy slopes in the mountains and in juniper bushes. From Uzbekistan to western Xinjiang above Urumuchi in the Tien Shan. Lowest leaves opposite, the rest whorled, the upper ones curled; flowers large, square, greyish outside, heavily tessellated dark red inside; nectary narrow, deeply indented.

*Fritillaria ferganensis* A. Los. Rocky screes and steep mossy slopes on limestone and in scrub. Uzbekistan, Pamir-Alai; in the Turkestanskiy range west of Tashkent, in the Alayskiy range south of Ferghana, and in the Zaalayskiy range on the border

with Tadzikistan, growing on shady rock ledges on limestone and in scrub. Recorded from China, in the region of Kashgar. Lowest leaves opposite, the rest whorled, the upper ones curled; flowers square, greenish outside, tessellated with pink; nectary large 6-8 × 3mm and shallow, not deeply indented.



*Fritillaria dagana*

*Fritillaria thunbergii* Miq (12). Rocky slopes? Widely cultivated for medicine; probably native in the Tar Bagatai mountains in north-east Kazakhstan on the border between Kazakhstan and Xinjiang; found wild and probably an escape from cultivation in Japan and in East China in Anhui, Jiangsu and Zhejiang, below 600m, in bamboo forests, shady and moist places. Lowest leaves opposite, the rest opposite or whorled, the upper ones curled; flowers small, rounded, bell-shaped, creamy-yellow with green veins. Nectary narrow, 3-4mm long, forming a groove.

### **Manchuria and northeast China, including eastern Siberia**

Four species, very different from one another. Is *F. camschatcensis* the link between the Asiatic and American species, or was there an earlier migration of a *dagana*-like species?.

*Fritillaria maximowiczii* Freyn (23). Broad-leaved deciduous forests, moist and sandy places on forest margins, thickets, grassy slopes; 1400-1500m. Hebei, Heilongjiang, Jilin, Liaoning. Bulb of several small scales. Leaves in a basal whorl of 3 to 6, usually 5, with 1 bract leaf. Flowers large, solitary, purplish, heavily tessellated, the margins of the petals irregularly fimbriated.

*Fritillaria dagana* Turcz. ex Trautv. Alpine meadows near Lake Baikal: (not known from China at present). Bulb of several, c.6, small scales and with stolons. Leaves in a basal whorl of 3, with 1 bract leaf. Flower rather small, greenish tessellated with brownish-purple.

*Fritillaria camschatcensis* (L.) Ker-Gawl. Meadows, bogs, streamsides; from eastern Siberia and Japan along the Kurile Islands to Alaska. Bulb of several scales on a solid base, with numerous rice grains. Leaves whorled. Flowers often several in an umbel, green, very heavily tessellated with black (or yellowish), with numerous parallel ridges from base to apex.



*Fritillaria ussuriensis*



*Fritillaria delavayi*

*Fritillaria ussuriensis* Maxim. Ex Trautv. (14). Forests, thickets, meadows, streamsides, shady and moist places along the Ussuri river; near sea level to 500m. Heilongjiang, Jilin, Liaoning, eastern Siberia, Korea. Leaves 14-17, very narrow, the upper coiled on an extension above the flowers. Flowers square, very heavily tessellated, appearing blackish. Capsule not winged.

#### **The central mountains, east and north of the Sichuan Plain**

This can be thought of as old China, containing the cities of Xian, Wuhan, Nanjing. Four species:

*Fritillaria anhuiensis* S. C. Chen & S. F. Yin (22). Forests, thickets, grassy slopes; 600-900m. Anhui, Henan. Dabeishan. Bamboo forests, shady and moist places; near sea level to 600m. Anhui, Jiangsu, Zhejiang. Loosely scaled bulbs with many smaller, rice-grain bulblets inside. The stems tall, the rather broad leaves usually in whorls; the flowers 3-5cm long, are purple and white tessellated or sometimes all white or all purple. Nectary conspicuous, deeply indented.

*Fritillaria thunbergii* var. *chekiangensis* (12b). C. Zhejiang (Dongyang Xian). Cultivated in Zhejiang for its bulbs, which are used medicinally. Smaller than the usual *thunbergii*, with 3-scaled bulbs, shorter stem, less than 30cm, and leaves mostly opposite.

*Fritillaria taipaiensis* P.Y. Li (5). Hill thickets, grassy slopes; 2000-3200m. Gansu, Hubei, Shaan-xi, Sichuan. Leaves many, opposite or whorled, the uppermost curved but not coiled; flowers 2.5-5cm long, yellowish-green, irregularly blotched and mottled with purple-brown rather than tessellated.

*Fritillaria monantha* Migo (9). Forests, moist places on limestone hills, flood lands; 100-1600m. Anhui, Henan, Hubei, Jiangxi, Sichuan, Zhejiang. Very leafy plant, leaves whorled, the uppermost sometimes coiled. Flowers large, narrowly bell-shaped, square at the base, tessellated with purple or brownish; nectary large and projecting; style with long branches, 3-8mm long.

### **Southwest China**

This has a Himalayan flora, which goes north into Sichuan and Gansu west of the Sichuan plain. Eleven species: it is still not clear how distinct some of these species are: in the case of the species close to *F. cirrhosa*, the flowers seem to get smaller and narrower towards the north and west, ending in the deserts of Qinghai.

*Fritillaria fusca* Turrill (20). Moist and gravelly places, open flood lands; 5000-5100m. S Xizang, north of Lhasa. A very small, broad-leaved plant with blackish flowers.

*Fritillaria delavayi* Franchet *syn. F. bhutanica* Turrill (19). Sandy and gravelly places, flood lands; 3400-5600m. Qinghai, Sichuan, Xizang, Yunnan, Bhutan, Sikkim. Short stems with overlapping, broad, greyish leaves; greyish, rounded flowers, slightly tessellated inside: recorded from Bai Ma Shan and from Lijiang.

*Fritillaria sinica* S. C. Chen (8). Open thickets, hill grasslands; 3400-3600m. W Sichuan; on Erlang Shan. Short stems to 30cm, with few (3-8) leaves, mostly opposite. Flower solitary, tessellated, like *F. latifolia*.

*Fritillaria dajinensis* S. C. Chen (18), *syn. F. lixianensis* Y. K. Yang & J. K. Wu. Thickets, meadows; 3600-4400m. NW Sichuan. Flower yellowish-green, dark spotted near the base, very narrowly campanulate; style undivided. (Flower like *F. ehrhartii*.)

*Fritillaria crassicaulis* S. C. Chen, *syn. F. omeiensis* S. C. Chen (7). Forests, bamboo thickets, alpine grasslands; 2500-3400m. SW Sichuan (Mt Omei), NW Yunnan (Zhondian plateau, Lijiang). Leafy plants with 10 to 18 lanceolate leaves in 3 or 4 whorls of 3 to 6. Flowers large to 5.5cm, green, tessellated with brown (Yunnan), or yellow, lightly tessellated (Sichuan).

*Fritillaria cirrhosa* D. Don (4). Forests, alpine thickets, meadows, flood lands, moist places; 3200-4600m. Gansu, Qinghai, Sichuan, Xizang, Yunnan. Leaves narrow, the upper in a whorl of 3, coiled at the tips. Flowers green or yellowish, tessellated with brown, sometimes very heavily tessellated so as to appear black,



sometimes all pale yellow. Nectary usually ovate, 2-5mm long.

*Fritillaria sichuanica* S. C. Chen, *syn.* *F. cirrbosa* var. *ecirrbosa* Franch. (3). Hill thickets, grassy slopes; 2000-4000m. S Gansu, S Qinghai, W Sichuan. Similar to *F. cirrbosa*, but with slightly smaller, narrower flowers and upper leaves usually solitary, without coiled tips. Nectary 4mm long, 2mm wide, tear-shaped.



*Fritillaria yuzhongensis* G. D. Yu & Y. S. Zhou (6). Grassy slopes; 1800-3500m. Gansu, Henan, Ningxia, Shaanxi, Shanxi. Very similar to *F. cirrbosa*, but with slightly smaller (2-4cm), usually yellowish-green flowers; nectary round, 2mm across.

*Fritillaria unibracteata*

*Fritillaria unibracteata* P. K. Hsiao & K. C. Hsia (17a). Thickets, meadows; 3200-4700m. S Gansu, SE Qinghai, NW Sichuan. Similar to *F. przewalskii*, but flowers small, blackish; sometimes grows with *F. przewalskii*, but sometimes they are in separate populations.

**Var. longinectaria** (17b) Thickets, meadows; 3200-4700m. NW Sichuan. Chang xian. Differs in having a very long, narrow nectary, 6-11 cm long, deeply impressed.

*Fritillaria przewalskii* (16) Thickets, grasslands; 2800-4400m. S Gansu, E Qinghai, NW Sichuan (above Woolong). Leaves narrow, all alternate. Flowers yellow, slightly tessellated, narrow bell-shaped; style divided at apex for 1mm. Nectary small.

*Fritillaria davidii* Franchet (24) *Betula alnoides* forests, grassy slopes, loose peaty soil with ferns, rocky moist places along streams, mossy cliff ledges; 1600-2600m. W Sichuan. Bulb solid, with numerous rice-grains. Leaves growing direct from bulb in autumn, flowering in spring; stem leafless except for 1 or 2 small bracts. Flowers large, purplish-red at the base, yellow at the apex, regularly scattered with fat glands. Nectary small and round; capsules unknown.

#### Footnote

This article was first published in Journal 27 of The Fritillaria Group of the Alpine Garden Society (2010) and is reprinted here by kind permission of the Society.

# A novel cross between *Lilium philadelphicum* and *Lilium catesbaei*

*Lilium philadelphicum* and *Lilium catesbaei* are not the easiest lilies to grow, so it will be interesting to discover if **Barry Francis** has produced a hybrid that will be more amenable for garden cultivation.



**Figure 1.** Left, *Lilium catesbaei*, right, *Lilium philadelphicum* and centre, the 2<sup>nd</sup> hybrid to flower.

## Relationship of parents

The parent species appear to be closely related yet are distantly related to the other North American *Lilium* species. Both have strongly clawed upward facing red to red-orange flowers, usually one flower per stem, but they grow under conditions which are almost polar opposites. The pod parent of this cross is our native prairie lily, *Lilium philadelphicum* var. *andinum*. *L. philadelphicum* is very cold hardy and locally it grows in slightly alkaline prairie soil among grasses and other prairie plants. *Lilium catesbaei* grows in coastal plains in the southeastern United States from Virginia to Florida, then west to Louisiana. *L. catesbaei* seems to be essentially a bog plant that grows in nutrient poor acidic soil. It is probably safe to say that *L. catesbaei* can grow in wet conditions which would normally kill any other lily. The variety from Florida was used in this cross. I doubt that it would survive our harsh North Dakota winters where temperatures can get down to minus 40 deg F. There are other contrasts between these species. I have been told that *L. catesbaei* is fast growing and short lived compared to *L. philadelphicum* and that *L. catesbaei* flowers in late summer while *L. philadelphicum* starts to flower in late June.

## Could this be the first flowering of this particular cross?

To my knowledge, no one else has made this cross and then managed to flower

the seedlings. However, the cross required little effort and this could have been done before. All that would hold someone back is lack of access to the two species. The 1950 North American Lily Society, NALS yearbook has an article titled *Lilium Catesbaei*, by Samuel L. Emsweller, which indicates that the reverse cross, *L. catesbaei* × *L. philadelphicum*, was made but no seed was obtained. A slightly different account is in Ed McRae's book, *Lilies, A Guide for Growers and Collectors*, where on page 123 it states: "There is no verified record of *Lilium catesbaei* being used in hybridization, although Emsweller obtained seed by crossing it with *L. grayi*, *L. philadelphicum* and *L. superbum*".

*L. catesbaei* is not commercially available and *L. catesbaei* seed is hard to find. It has a reputation of being one of the most difficult of the North American lilies to grow. *L. philadelphicum* is occasionally offered commercially and seed is easy to find, but plants can be tricky to grow from seed, slow to reach maturity, and losses are often high. Not too many people grow either of these species and even fewer would have access to both species.

### **Why make the cross in the first place?**

I have a special interest in *L. philadelphicum*. It is native to my home state of North Dakota. I became intrigued with the plant and wanted to learn more about it. I am slowly learning some of the tricks of growing this lily, yet in many ways it remains a mystery. Making crosses is part of the process of trying to figure things out. I tried to cross *L. philadelphicum* with Asiatic species such as *L. dauricum*, *L. amabile*, and *L. pumilum* and to various Asiatic hybrids. I also crossed *L. philadelphicum* with a few North American species and hybrids. I was limited to the pollen I had on hand so this was sort of hit or miss, so I had no success. In due course I located someone who was willing to collect *L. catesbaei* pollen and mail it to me. The next year I made the cross. The cross proved to be easy to make, pods were full of good seeds, and all the seedlings that have flowered are obvious hybrids. Now I have to figure out what this hybrid is good for. I am not sure where to go from here other than to start the next generation of seeds to see what kind of variation shows up in the F2 generation.

### **Obtaining pollen, and raising the seedlings**

The internet allowed me to locate and obtain pollen from Nearly Native Nursery in Fayetteville, Georgia. Pollen was collected from several different plants and used on 6 *L. philadelphicum* growing in a 'natural' area of my garden. Each seed pod was full of seed with almost no chaff. I got at least 500 seeds from the 6 seed pods. I was not sure how to grow these seedlings but I had previous experience with starting various lily seeds *in vitro* and found this approach was an excellent way to get *L. philadelphicum* off to a good start with very few



**Figure 2.** *Lilium philadelphicum* × *Lilium catesbaei* in jars of culture medium.

losses. Consequently, the *in vitro* approach seemed to be the way to go and most all of the hybrid seed went directly into tissue culture. I kept the plants *in vitro* for as long as possible with material moved to fresh culture medium about every 4 to 6 months. After 18 months (February of 2011) a few bulbs put up stems in the jars and everything had to come out of culture. Well, almost everything. It is difficult to get these fragile tangles of bulbs out of jars without breaking off scales or even shattering bulbs. Those left over bits and pieces went back into tissue culture.

### **Cultural requirements**

I have not had these hybrids that long, so I cannot make definitive statements about cultural requirements. A few of the F1 plants flowered this year and most should flower for the first time next year. The bulk of my material is growing in pots and will be kept inside over the winter. These do not get any special care. I have been using a light garden soil in the pots (which I use for most lily seedlings) and the plants are doing well in pots and have been quite easy to grow. So far there have been no problems. This is surprising as most lilies, including *L. philadelphicum*, eventually get over watered and start to rot when I grow in pots. I speculate these have inherited a resistance to bulb rot from *L. catesbaei*.

About 25 seedlings were planted into my garden this July to test cold hardiness and garden worthiness. So far the plants are still growing in the garden but this winter will be the real test. I also shared about 100 of the tissue culture plants and vernalized bulbs with perhaps a dozen individuals who will evaluate these hybrids in their own gardens. Others grew these from seed. Everyone has different growing conditions and different ideas for growing these. It will take a year or two for most of this material to become flowering size plants. At some point I hope we can all compare notes.

So far I understand that one person managed to flower one of the seedlings. The lily came out of tissue culture as a small plant in 2010 and flowered in 2011. It



**Figure 3.** Seedlings in 5 inch pots of soil.

flowered more quickly than expected. Another planted his seedlings in a bog garden and I was surprised to hear that they are doing well under those conditions. I wonder, could these be adaptable to the full range of soil conditions that the parents would grow in? A couple of people reported that some seedlings overwintered in their garden, so perhaps there is some cold hardiness in the seedlings.

### **Characteristics**

The photos give an idea of the variation seen in the F1 hybrids. The hybrid seedlings grow faster than *L. philadelphicum* and are quick to flower. The flowers are generally intermediate between the two species in size and shape. The red colour of the flower is on the surface with a yellow base, making the colour elusive as it changes with lighting conditions. Reflected light gives a strong red effect; whereas transmitted light gives more of an orange red effect.

Two of the 19 plants were quite spidery and less attractive. The first hybrid to flower was like this, but the flower was stunted and perhaps deformed because the flower bud did not develop correctly. The bulb produced a stem in vitro, and there was some trouble getting this plant hardened off. The flower bud was stunted and should have dropped off, but it flowered anyway. Figure 10 (see p. 17) shows the more interesting of these two, which has a rather large region of greenish yellow at the base of the tepals.

The stems are very slender, weak looking, and so far get up to 1ft tall, more or



Figure 4. The 2<sup>nd</sup> seedling to flower.



Figure 5. The 3<sup>rd</sup> seedling to flower.



Figure 6. *Left*, the 5<sup>th</sup> seedling to flower, and *right*, the 6<sup>th</sup> seedling to flower.



Figure 7. *Left*, the 7<sup>th</sup> seedling to flower and *right*, the 9<sup>th</sup> seedling to flower.



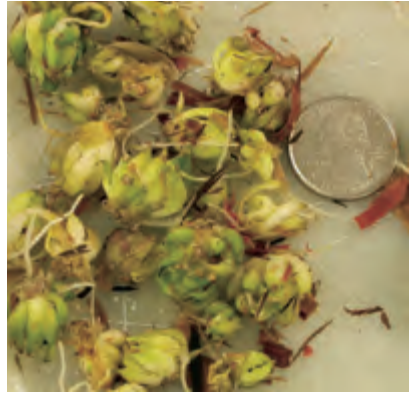
Figure 8. *Left*, the 10<sup>th</sup> seedling to flower and *right*, the 11<sup>th</sup> seedling to flower.



Figure 9. *Left*, the 12<sup>th</sup> seedling to flower and *right*, the 13<sup>th</sup> seedling to flower.



**Figure 10.** The 4<sup>th</sup> seedling to flower was spidery.



**Figure 11.** Bulbs taken out of tissue culture, trimmed and vernalized in damp cedar chips.

less. The bulbs are up to 1 inch across, fragile, with scales poking out into harm's way. The scales are jointed in 1 to 3 locations and break off with little effort. Those tiny bits of scale generate multiple bulblets when put back into tissue culture. *L. philadelphicum* var. *andinum* has long and narrow seed pods which are quite uniform while the hybrid seed pods are fatter and shorter and shape and size varies from plant to plant. Like *L. philadelphicum*, these can set lots of good looking small seeds with very little chaff although I only got a dozen or so seeds from one pod. A couple of pods contained over 200 seeds.

### **A few final thoughts**

I expect the F2 generation will produce a wider range of variation. F2 seed has already been obtained and will be sent to the RHS and NALS seed exchanges this year. This seed is the result of intercrossing the plants shown in the photos. I would like to encourage others to grow these hybrids from seed and to share the resulting plants and seeds with others to ensure long term survival of this material. The seed should be easy to start if exposed to light and moisture. There is no need to start seed in vitro but I would like to mention that the in vitro approach is a good way to start the seed. This approach gives near 100% germination with few losses, it gets plants past the juvenile stage where damp off and such can strike down the seedlings, and plants initially grow faster than they would in soil. A full account of this in vitro approach can be found in the June 1, 2011 issue of the North American Lily Society Quarterly Bulletin (Vol 65, No. 2, page 19), the article is titled, An *in Vitro* Germination Experiment with *L. philadelphicum* and *L. philadelphicum* × *L. catesbaei*. If anyone has additional questions about the hybrids or about growing from seed, or comments in general, feel free to contact me at [bfncs@bepc.com](mailto:bfncs@bepc.com).





David Parsons and his wife Mary.

## David Parsons, an appreciation

*Few can have led such a varied and challenging life as David Parsons.*

***Richard Dadd**, who knew him for forty years, celebrates his life in this appreciation and the contribution he made to the Lily Group and the cultivation of lilies.*

David Parsons, who has died at the great age of 94, will be remembered especially by older members of the Lily Group. He served on the Lily Committee from 1972 and was Vice Chairman from 1975 to 1990 (jointly with Mrs Martyn Simmons from 1979 to 1982). His charming and urbane manner was evident when he was introducing Lily Group meetings or lectures. He would often lead the traditional discussion on 'Lilies in the Show' that took place on the Tuesday afternoon of the July flower show when lilies predominated. Alas, those days have long passed. Later in the year he would conduct the bulb auction, adding snippets of information about the particular species and cultivars being offered. He also contributed articles to the *Lily Year Book* from time to time.

Each year from 1932 until 1971 (excluding the war years) the RHS had published a lily year book. They were expensive to produce and by 1972 the RHS could no longer afford them. But to many in the Lily Group not having a year book was unthinkable. David and Derek Fox stepped into the breach and edited a modest replacement entitled *Lilies 1972 and Allied Plants*, and over the next ten years this gradually matured into the now familiar *Lilies and Related Plants*.

David had led a colourful, bohemian, and very varied life. Actor, soldier, amateur naturalist, pig farmer, lily grower: he was all of these—and more. He was born in

1915 to the actress and singer Viola Tree (a daughter of the famous actor manager Sir Herbert Beerbohm Tree) and the theatre critic Alan Parsons. He was educated at Eton and then, following the family tradition, trained as an actor with the Oxford Repertory Company. In the 1930s, taking his mother's surname, he moved into films, appearing as David Tree in a string of mostly small parts the most notable of which was Freddy Eynsford-Hill in *Pygmalion* (1938).

Just as an acting career seemed assured war was declared and he enlisted in the Royal Artillery. After rising through the ranks, he was sent to North Wales for officer training and stayed on to become an instructor. It was whilst demonstrating home-made hand grenades that one exploded prematurely blowing off his left hand. Surprisingly, he was not invalided out but was accepted by SOE (Special Operations Executive) to command a training school in a remote part of Scotland for agents who were destined to be dropped behind enemy lines in Europe.

At the end of the war, like thousands of others, he had to readjust to civilian life. He had abandoned the thought of continuing his acting career, fearing that with one hand his range of parts would be too restricted. He always wore a brown leather glove to disguise his missing hand. He spotted his future wife on VJ day whilst travelling home on leave on the London Underground. In his entertaining autobiographical book *Pig in the Middle* he describes how he was instantly smitten and how he discovered her identity in the brief moment he had whilst ascending the escalator. She was Mary Vick and in a few months they were married.

Aside from £2,000 in the bank he had one other asset: his mother had, in a moment of affluence before the war, purchased a derelict property in Broxbourne consisting of an old Victorian school and two tumbledown cottages set in four acres of scrubland. His ambition was to create a smallholding, but as the land was not in good heart he had to think of something else. His old commanding officer persuaded him that he would make a good teacher, of which there was a great shortage at the time. However, David discovered that he would first need an honours degree. Two years later he returned with this from Oxford, but then could not find a teaching post to his liking. It had to be the smallholding after all.

It was hard going. Over the years he and Mary tried various schemes—salad crops, fruit, bees, ducks, poultry, Saddleback pigs—all with varying degrees of success. At the same time the schoolhouse, and then the tumbledown cottages and garden, were transformed into an attractive home for their large and growing family. It was named Baas Manor after the 15th century manor of which it once formed part. However, it was only when they acquired some Danish Landrace pigs to breed from that their fortunes really turned. At the Royal Show of 1959 they swept the board in first prizes for their pigs which were subsequently auctioned for a total of 12,000 guineas.

By a strange quirk it was the Landrace pigs that fired David's interest in lilies.

Sandy Best, a well-known Canadian pig breeder, had settled on four of David's pigs to take back with him—but he said he would make it five if he could pay for the extra one in lily bulbs—which, it transpired, were his main line of business. This was agreed, and ultimately led to David establishing a lily nursery. His aim was to supply home-grown bulbs in the autumn when the ground was still warm and lilies could make new roots. Many nurseries imported their bulbs in the winter which was the worst possible time to plant them. He also wished to breed lilies suited to our climate. His best known introduction was a class 1(a) yellow spotless Asiatic seedling aptly named 'Marilyn Monroe'.

However, the lilies were not profitable. In letters to a correspondent David wrote that the lily business was doubtfully lucrative, but that they carried on with it in the hope they were giving a service to British gardeners. Indeed they were since David would not charge for postage and packing. In another letter he said that they were still evaluating the seedlings from Stone and Payne of four years ago. They had some lovely things but whether they were in fact better than those S & P had registered was another matter.

By 1977 their main enterprise had become the production of beef calves for export to Canada and the USA. David wrote, "We have cut down on our lily-bulb production considerably, so that I have more time for the cattle, which are much more lucrative. But I still enjoy the lily work—and cannot resist dabbling pollen here there and everywhere." David also had a lifelong interest in natural history, and a particular love of butterflies for which he created a wild flower meadow and other suitable habitats.

David was awarded the Lyttel Cup in 1972 for his work with lilies. In the following year his acting career was briefly resurrected when he played the headmaster Anthony Babbage in Nicholas Roeg's macabre film *Don't Look Now*. The house and the lake at Baas Manor Farm were also used for the opening sequences of the film.

David is survived by Mary, a son, and three daughters (another daughter having predeceased him).

**Ian David Parsons, actor, soldier and farmer.**

**Born 15th July 1915, died 4th November 2009 aged 94.**



# Phenology of *Lilium polyphyllum* in Garhwal Himalaya, India

*In this article Anurag Dhyani et al record the results of studying the phenology of Lilium polyphyllum.*

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## Keywords

Bulb, climatic variables, high altitude, phenophase, temperate.

## Abstract

Phenological progression in *Lilium polyphyllum* was observed under two climatically different natural habitats i.e. temperate and high altitude. In nature, radicle emergence was observed after 75 days of sowing at 17-19°C soil and air temperatures. A bulblet was developed after 25 days of germination in July, but emergence of the first true leaf was delayed until the next year, 277 days after germination. This juvenile phase continued with development of aerial parts as well as the bulb and remained for more than 4 years. The juvenile phase was followed by the virginal phase during which an above ground shoot, without flower, was produced annually for 3-4 years, after which the reproductive phase began. The flowering period lasts for 15-20 days and was at its peak when air and soil temperatures ranged from 11-19°C and 15-17°C respectively, in both regions. Initiation of flowering was earlier in the temperate than in the high altitude site. Seed setting was initiated during August and continued for two months to mature. Thereafter, seed dispersal occurred until mid-November. Underground bulbs also showed marked variation in size, number of scales and roots during different phenophases. Since phenophases are the best indicators of plant responses to the environment, seasonal timing of events can be critical for survival of life and reproduction.

## Introduction

The study of the temporal behaviour of a species is generally termed phenology, and it means the study of seasonal appearance and the timing of the life cycle events of a plant. Some species are strongly adapted to the long prevailing climatic pattern, while others are vulnerable to the slightest change. Data from



*Lilium polyphyllum*

phenological studies can provide evidence of the effects of climate change on species and help in assessing the impact of future changes in climate. Air and soil temperature are known to control different phenophases (Diekmann, 1996), and they vary with latitude, altitude, type of community, and growth of plant thereby influencing the distribution of species.

In the past six decades, a large volume of work has been published on seed dormancy and germination (Baskin and Baskin., 1998; Fenner and Thompson, 2005). However, most of these reports have dealt with a limited number of environmental factors, or have been laboratory based. Thus, a holistic picture of germination requirements remains confused. One way to gain insight on seed dormancy and germination of a species is to determine its germination phenology under natural conditions.

Altitudinal gradients are among the most powerful natural experiments for testing ecological and evolutionary responses of biota to geophysical influence (Körner, 2007). Rare and endangered species are important to be considered in the context of sensitivity analysis of climate change, as they are already facing reproductive stress and habitat degradation. Therefore, observations on different phenophases of these species in existing natural habitats along an altitudinal gradient are needed to assess the role of environmental factors in ex situ conservation and domestication vis a vis to evaluate the threat of global warming

on their survival. Relatively few attempts have been made to understand phenological progression of the sub-alpine plants of the North West Himalaya (Nautiyal et al., 2001). Certainly, no studies have been done on *Lilium polyphyllum* D. Don ex Royle—a threatened and highly valuable medicinal species.

*Lilium polyphyllum* D. Don ex Royle is a perennial, bulbous herb of *Liliaceae*. The species is found in the North-west Himalaya in India, westward of Afghanistan, between 2200-3200m asl. The species in Garhwal Himalaya was found in two extreme climatic conditions, temperate and high altitude. Due to climatic variation, morphology as well as phenology of the species was observed during the course of this study. However plants of species of both habitats were found morphologically more or less similar, but species may have variability at genetic level. Bulbs of this species contain various medicinal properties viz., refrigerant, galactagogue, expectorant, aphrodisiac, diuretic, antipyretic and tonic (Dhyani, 2007) and also used for culinary purposes (Dhyani et al., 2009).

The aim of the present study was: 1. to observe germination phenology of *L. polyphyllum* in its natural habitats i.e. germination type, time period, dormancy; 2. to record vegetative and reproductive phenophases viz., juvenile, virginal, flowering, fruiting, senescence phases; and 3. to record bulb morphology at different phenophases with respect to climatic variables, i.e. air temperature, soil temperature and humidity.

### **Material and methods**

The study was conducted in two regions viz., Dhanolti; a temperate region (2200m asl; 30°.25'N, 078°.15'E) and Gangotri; a high altitude region, (3200m asl, 30°.59'N, 078°.56'E) in Garhwal Himalaya, Uttarakhand, India. The climate of the two sites is very different, although topographically both sites are more or less similar (north-east aspect with slopes angles of 30-34°), having the dominance of similar tree canopy (*Cedrus deodara*). Owing to the proximity of the glacial zone, the high altitude region experiences heavy snow fall for almost 4-5 months (December-April), while the temperate site receives comparatively low snowfall during winter. However, intensity and duration of snowfall may vary year to year.

To observe the germination phenophase, seeds of *L. polyphyllum* were collected in October 2006 from Dhanolti and 100 seeds in triplicate were directly sown in a net-covered demarcated plot. Another lot of seeds were shade dried and stored in a refrigerator at 1-5°C. The moisture content of seeds was monitored at three month intervals during storage. After six months of storage, seeds were again sown in natural conditions with three replicates of 100 seeds as mentioned above. Seeds were observed fortnightly. Emergence of the radicle was considered as an indication of seed germination.

To observe detailed phenology, three plots of approximately 10m<sup>2</sup> sizes at both

sites were marked and 10 individuals were selected randomly. The beginning, (shoot emergence) and the end of the vegetative period (senescence), budding, flowering, fruiting, seed setting, seed dispersal and senescence (after reproductive phase) and morphological characters, viz plant height, leaf length, leaf width, the number of leaves flowers and capsule, were recorded. A particular phenophase was considered to have started when 10% of the individuals were in that particular phase and completed when only 10% of the individuals remained in that phase. To record seed setting, 10 flowering individuals of *L. polyphyllum* were tagged at both sites and observed for capsule maturation fortnightly. Final dimensions of seeds were recorded after full ripening of capsules. Similarly, bulb growth and its morphology were also measured during the shoot emergence, flowering and senescence phases of the annual growth cycle.

## Results

There was no radicle emergence in seeds that were sown immediately after collection (October) partially because of natural consequences. Seed storage study reveals that seed moisture content was 12.85% initially, although it decreases after six months to 11.54% and finally after 12 months to 8.88%. The radicle had emerged during June from the seeds sown during April. During radicle emergence, air and soil temperature was recorded as 19°C and 17°C and relative humidity (RH) 44%. During July, 25 days after germination, the radicle produced bulblets. At the time radicle and bulblet length were  $1.9 \pm 0.9$  and  $0.6 \pm 0.1$  cm, respectively. In addition, bulb diameter was  $1.8 \pm 0.2$  mm, 60mg fresh weights with two roots of  $1.6 \pm 0.7$  cm size at that time. After 45 days of germination the radicle withered from seeds. However, the bulblets gained 56% more in length with 44% increment in diameter. The number of roots also doubled with 60% increase in length by the end of the active growth season.

After the commencement of the next favourable season (March-April) when air-soil temperature was 14°C, bulblets produced the first true leaf. Seedlings at the time had 2-3 roots and attained approximately  $7.6 \pm 3.1$  cm length with 70mg fresh weight. This stage continued until June, subsequently the leaf withered during July-August. If the favourable condition prevails, bulblets may again produce the leaf during September followed by senescence. Observation suggests that the juvenile phase in *L. polyphyllum* may continue for more than 4 years in temperate regions.

The emergence of the first elongated shoot above ground was an indication of the beginning of the virginal phase. Shoot emergence was observed during March at 11-13°C soil-air temperature in the temperate region. Shoot emergence was delayed for 45 days in high altitude as soil and air temperature was still 5°C and 9°C, respectively. Vegetative growth was at peak during June-July at both sites. Subsequently plants entered into the senescence phase at the end of

season (October - November). The virginal phase in *L. polyphyllum* may last for 3-4 years in temperate and 3-5 or more years in high altitude regions depending upon suitability of the climate and soil conditions.

The reproductive phase starts with bud formation (the first week of May) in the temperate region and is postponed for 60 days at high altitude. Flowering was observed during mid June in the temperate region and after a delay of 15-20 days at high altitude. However, flowering duration remained similar (15-20 days) in both elevations. Following pollination, seed setting was earlier at high altitude during mid August almost 10-15 days ahead of the temperate site indicating climatic adaptation therefore suggesting genetic variation among two populations of the species. Plants bear two capsules and it takes two months for maturation. Leaves remained green until mid-August, gradually turning brown and ultimately are shed before seed dispersal. On maturation, capsules split along the three sutures and globular seeds are dispersed.

Observation on bulb morphology reveals that at high altitude the bulb was located deeper in the soil than in the temperate region during the shoot emergence (vegetative growth phase). Since, underground bulbs are the only means to ensure next year's growth during the vegetative growth phase, plants tend to protect bulbs against frost/adverse conditions. This feature may be attributed to adaptation strategies of the species to cope with a harsh climate at high altitude. However, the bulbs at the temperate site were phenotypically superior. Notably, bulb diameter was reduced along with weight during flowering period at both sites.



*Lilium polyphyllum* with impressive inflorescence.





Close up of *Lilium polyphyllum* flower.

### **Discussion**

Observation reveals that seed germination in *L. polyphyllum* was hypogeal and it takes nearly 100 days to develop bulblets after sowing. Contrary to this, Baranova (1977) reported 45 days for bulblet formation in other *Lilium* species. Subsequently, the bulb of *L. polyphyllum* increased considerably in size as the reserve of food is mobilized from seed and uptake of water by roots for the next three months. This was followed by stratification during the winter season (November-February) which helps vernalization of bulblets in nature. As a result, bulblets readily produce the epicotyl (first true leaf) at the commencement of a favourable growth season in March. Observations suggest epicotyl dormancy in *L. polyphyllum*, therefore it requires two growth seasons to produce the first leaf. It is one of the seven types of morphophysiological dormancy (MPD) of the seeds. Seeds with MPD require a warm and/or cold stratification to break the physiological dormancy and promote growth of the embryo (Baskin and Baskin, 1985). Besides, exposure of bulblets to winter stratification, the quantity of stored food material is also a detrimental factor for the formation of first foliage leaves as reported in a high altitude species (Lattoo et al., 2001).

As the first green leaf appears the plant totally depends on it for the photosynthesis and this may be the reason of slow juvenile growth. At this stage, the plant usually has one or two scales along with a single leaf, in *Lilium* species, as

reported earlier by Baranova(1977). In the first year, seedlings of *L. polyphyllum* only develop the main root for two or three months. Later on, many adventitious roots are developed which last for 2-3 years. In the subsequent years, the number of roots increases with increasing leaves and the bulb scales as reported by Baranova (1977). After sufficient food reserve was built up in the bulb, the terminal growing point on the basal plate of the bulb forces its way upwards and forms a shoot above ground. Snow melting and continuous temperature rise in February-March, acts as a powerful trigger to terminate the bulb dormancy of *L. polyphyllum*. Most lilies require an exposure to low, non-freezing temperatures to accelerate shoot emergence and flowering. Consequently, the virginal phase commences as the first shoot emerges during March-April. Finally, aerial parts start their growth and the plants ultimately have their final appearance without a flowering stem. In the subsequent years, the number of the leaves on each shoot increased until it was enough for flower formation. This period may last from one to several years as it depends upon the growing conditions and the species as reported by Baranova (1987).

The time of initiation for a particular phase often varied considerably from place to place and to a lesser degree, between years at a given place (Holway and Ward, 1965). Investigations have shown temperature to be the prime controlling factor. However, in present observations besides altitude, the proximity to snow of high altitude sites may determine the duration and fate of the different phases. Also, different phenophases of plants are generally determined by an interaction of both genetic and environment factors (Diekmann, 1996).

Snow cover duration was longer (December-April) at high altitude than in the temperate region (January-February). Consequently, bud formation of *L. polyphyllum* was earlier in the temperate region and was delayed due to late growth initiation at the high altitude site. However, the duration of bud development was shorter at the high altitude than at the temperate site. Flowering is determined by the photoperiod along with temperature, humidity and at high altitude by timing of snowmelt (Kudo and Hirao, 2006).

Our observation of *L. polyphyllum* reveals that it took more than 7-8 years to flower from seed in the temperate region. Baranova (1987) reported 1-8 years for flowering in other *Lilium* species. In *L. polyphyllum*, flowering appeared when an average 40-45 leaves had developed on shoots at both regions. However, Baranova (1987) reported 100 leaves in *L. pyrenaicum* and eight leaves in *L. pumilum* at the time of flowering. *L. polyphyllum* is self incompatible like most of the lilies and pollinated by insects (Dhyani et al., 2009). Low seed setting in *L. polyphyllum* at high altitude regions may be due to hailstorms and frosting, resulting in delayed maturation and seed abortion. The claim was also supported by Kudo and Hairo (2006).

It is imperative to understand the morphological variations of the under-

ground bulb at different phenophases of plant life as it ensures next year's sprouting. In addition to adventitious roots, bulbs also possess contractile roots. These roots are longer and have the primary function to anchor and pull bulbs deeper into the soil during harsh climatic conditions. Temperature fluctuations at the surface determine how long the contractile roots will continue (Waisel, 1998). Every year the bulb produces new scales and the old scales dry and die off. In young plants the number of newly formed scales is greater than the number of dying scales, as a result the bulb increases in length and weight. During flowering, the outer scales of the bulb are completely depleted thus, resulting in reduced diameter and weight.

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# *Lilium parvum*

*Barbara Small* has been attracted to *Lilium parvum* since she was a young girl. Is it because ‘parvum’ means ‘small’ or is it because of the beauty and variety of this dainty lily? To find out read on...

“Columbine and larkspur grow on the dryer edges of the meadows, with a tall handsome lupine standing waist-deep in long grasses and sedges. Castilleias, [Indian Paintbrush] too, of several species make a bright show with beds of violets



*Lilium parvum* plants growing in a wet spot.



A single bloom lit by the sun shows the delicate beauty of *Lilium parvum* to full advantage.

at their feet. But the glory of these forest meadows is a lily. The tallest are from seven to eight feet high with magnificent racemes of ten to twenty or more small orange-coloured flowers; they stand out free in open ground, with just enough grass and other companion plants about them to fringe their feet, and show them off to best advantage. This is a grand addition to my lily acquaintances, a true mountaineer, reaching prime vigour and beauty at a height of seven thousand feet or thereabouts... [It took] many centuries of Nature’s care planting them and watering them, tucking the bulbs in snugly before winter frost, shading the tender shoots with cloud drawn above them like curtains, pouring refreshing rain, making them perfect in beauty, and keeping them safe by a thousand miracles ...”<sup>1</sup>

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<sup>1</sup> Muir, John. *My First Summer in the Sierra*, 94.

John Muir's eloquent description of *Lilium parvum* makes the image of this beautiful lily and its lush surroundings come to life. According to Edward A. McRae, the word *parvum* means small.<sup>2</sup> This term could certainly be misleading since some of the plants are quite tall; however, the flowers are among the daintiest of the North American species lilies. The plant was first identified in 1862 by Albert Kellogg, botanist and founder of the California Academy of Sciences. Since that time, eminent British botanist William Stearn (1911-2001) identified the first sub-species variety *crocatum* in 1947 and another sub-species, variety *hallidayi*, was named after Geoffrey Halliday. Yet a third type (certainly not a sub-species)–interestingly named the “Ditch Lily”–may be found in the Central Sierra Nevada.

The bulbs of *Lilium parvum* are small, about half the size of a lime; the older, single-jointed scales are dark cream in colour while the newer ones are white or light cream. All references that I have checked state that the bulb is “shortly rhizomatous” and Elwes shows the bulbs multiplying,<sup>3</sup> but very seldom have I seen two or more bulbs side-by-side as occurs with *Lilium pardalinum* whose bulbs are so rhizomatous that they are not only side-by-side but often even atop one another. Rather, individual plants are usually a foot or more from each other. Depending on age and elevation, the stem may be anywhere from one to eight feet high. Younger plants' leaves are usually scattered, while those of older plants are whorled at the bottom and scattered at the top. Young plants may have only one flower while more mature ones may carry as many as 30 flowers. Flower orientation is most often out/down-outfacing, but occasionally flowers may be upfacing or even completely downfacing. The flowers are bell-shaped, recurving toward the tips of the tepals. The tepals are usually rounded



*Lilium parvum*, from Elwes's *Monograph of the Genus Lilium*.

<sup>2</sup> McRae, Edward. *Lilies: A Guide for Growers and Collectors*, 175.

<sup>3</sup> On the net, type “Elwes parvum”.



but occasionally pointed. *Lilium parvum* usually contain a few spots in the lighter-coloured throat, but some of the lighter-coloured orange flowers may have no spots and the colour may be consistent. The 'normal' colour is usually yellow-orange, orange or red-orange. The variety *crocatum* (Stearn) is yellow-orange with very small spots. Curiously, *Lilium maritimum*, which grows close to the Pacific Ocean, and *Lilium grayi* from the east coast, are almost dead ringers for *Lilium parvum*. The flowers are pollinated by hummingbirds, western tiger swallowtails, pale swallowtails and various bees. Seeds germinate hypogeaally in autumn and show their first leaves the following spring. Among the west coast lilies, *Lilium parvum* is the quickest to flower from seed, generally taking only

three years before its dainty bells appear. All plants are fertile and the very small seeds are plentiful.

The variety *ballidayi* occurs in Kings Meadow, a private, gated property in Eldorado County north east of Placerville. Here are varying shades of pink, purple and everything in between. The centres are often much lighter, even white, and spotting is more pronounced. For a while, I believed that this meadow was the only location for the variety, but a study of detailed maps makes me think that there must be other locations nearby. From the meadow, Slab Creek runs west and then south west, eventually joining the south fork of the American River. Farther north, Stumpy Meadows Lake drains west and then west-northwest, part of it being diverted into the Georgetown ditch which provides its residents with water. The two streams never meet. However, it is obvious that some, if not many, seeds of *Lilium parvum* var. *ballidayi* have floated down the stream from Stumpy Meadows Lake, germinated, and then cross-pollinated with the local orangish forms of *parvum*. Along the ditch grew lilies in all combinations of colours: light pink, pink, coral, yellow-orange, orange, red-orange and dark violet. These are the lilies called “Ditch Lilies.” Several years ago, I asked permission from the Georgetown Water District manager to hike upstream alongside the ditch to determine where the ‘normal’ *parvum* grow and to find the source of variety *ballidayi*. The manager paused, looked me carefully up and down, and then told me that such a hike wouldn’t be safe. After much evasion, he led me to believe that not only was the area good for *parvum*, but also for marijuana. Now that I have more gray hair and wrinkles, I might try again since the farmers wouldn’t fear me. The word ‘grew’ refers to the fact that the Georgetown ditch had literally been a ditch which leaked precious water into the surrounding areas, making a perfect place for wet lilies. Since California has been experiencing more and more drought-like conditions, the Georgetown Water District decided to cement the bottom and sides of the ditch. The last time I visited the area, I found only purple flowers.

Ed McRae and I often discussed the various west coast lilies, and he agreed that many of the descriptions of these plants and their locations have simply been copied from previous literature. This article is my attempt to describe *Lilium parvum* and its habitat from first-hand experience.

Just where might this delicate lily be found? Various authors disagree about its northern boundaries. *Hortus Third* (1976) reads “Mts. California” and on the net, Calflora Plant Observation Library cites two studies that state it is “endemic (limited) to California alone [Lum/Walker].”<sup>4</sup> Derek Fox was at least forthright: “The precise range of distribution is not too easy to define in its northern limits at least. It is as far south as Fresno County and is found along the Sierra Nevada on both

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<sup>4</sup> On the net, type “Calflora parvum”.

sides of the range to Lassen County. Some literature states that it is also found in the Cascades of southern Oregon, but Purdy said 'it is found only in the Sierra Nevada.'"<sup>5</sup> Michael Jefferson-Brown and Harris Howland (1995) wrote that its location is "up the Sierra Nevada of California to the Cascade Mountains of South Oregon"<sup>6</sup>, a statement to which Ed McRae (1998) agreed.<sup>7</sup> On the net, Wikipedia states "...it is native to the Sierra Nevada of California and Nevada." Calflora is probably the most accurate, listing the counties where *Lilium parvum* has actually been seen: Alpine, Amador, Butte, Calaveras, El Dorado, Fresno, Inyo, Kern, Lassen, Madera, Mariposa, Nevada, Placer, Plumas, San Bernardino, Sierra, Tehama, Tulare and Tuolumne

*Lilium parvum*, also known as the Alpine Lily or the Sierra Tiger Lily, may be described as one of the wettest of the 'Wet Land Lilies.' All of them may be found along very small streams or in wet meadows surrounded by Yellow Pine, Lodgepole Pine or Red Fir. Derek Fox wrote 'Snow lies until June or July and there is plentiful moisture but by the end of the dry season the soil is bone dry.'<sup>8</sup> This statement may be true for those lilies at elevations above 8000 or 9000 feet, but most of the *Lilium parvum* that I have seen grow in perpetually wet areas. Most of them are not watered by snow melt but by springs which feed the meandering creeks. When I collect seeds in the fall, the streams are still running and the ground is moist. *L. parvum* is never found by larger streams or rivers as the current would dislodge not only the season's seeds but in some cases the bulbs themselves.

The elevation of these plants is also in dispute. Calflora states that the lily grows "between 4000 and 8000 feet [Calflora 2004 feet],"<sup>9</sup> Ed McRae wrote "4900 to 9800 feet"<sup>10</sup> and Brown and Howland state "5000 to 10,000 feet."<sup>11</sup> The lowest elevation that I have observed is near Georgetown, CA at 2,654 feet, and the "Ditch Lilies" are not much higher. I suspect that *Lilium parvum* grows at lower elevations in the very northern counties such as Lassen. While hiking in the Sierra Nevada, I once came across a *parvum* at just under 10,000 feet in Yosemite National Park.

Finally, I must dispute Vollmer, cited in Fox, concerning the relationship of colour and elevation: "beginning at an elevation of about 4500ft (1370m), it is pure yellow, but as one ascends the mountains it becomes orange, and at the higher elevations it is dark red, and all are spotted maroon."<sup>12</sup> I have seen yellow-orange,

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<sup>5</sup> Fox, Derek. *Growing Lilies*, 176.

<sup>6</sup> Brown/Howland, *The Gardener's Guide to Growing Lilies*, 68.

<sup>7</sup> McRae, Edward, *Lilies: A Guide for Growers and Collectors*, 175.

<sup>8</sup> Fox, Derek. *Growing Lilies*, 178.

<sup>9</sup> On the net, type "Calflora parvum".

<sup>10</sup> McRae, Edward, *Lilies: A Guide for Growers and Collectors*, 175.

<sup>11</sup> Brown/Howland, *The Gardener's Guide to Growing Lilies*, 68.

<sup>12</sup> Fox, Derek. *Growing Lilies*, 178.



orange and red-orange at varying locations, all at vastly different elevations. The most wonderful place I have ever found *Lilium parvum* is at Alpine Meadows, a favorite ski area located off Highway 89, just south of Squaw Valley, base elevation 6835 feet. Our daughter Laura secured a key to the chain across the road, and we hiked up and to the right of the lodge to find ourselves in an area with at least five or six small streams making their gentle way downward. Here are literally hundreds of *parvum* of every colour—yellow, orange, red and everything in between—growing together happily. What a sight! Vollmer surely reported what he saw, but his generalization is certainly mistaken.

So, to find these wonderful lilies by yourself, you must be at the correct elevation—best results will be around 5000-7000 feet, and somewhere in the Sierra Nevada or southern Cascades (the very north-east part of California). It is not easy to see where springs or small streams might be located, so the first clue is to look for Quaking Aspen (*populous tremuloides*). These delightful trees are often found in canyons (where the water will be flowing too fast for *Lilium parvum*), but they are sometimes located on side-hills and meadows. Patches of level space on the side-hills and the meadows are what you want. Surrounding these meadows you may first see Yellow Pine or Lodgepole Pine; you will find Red Fir if you search above 7000 feet. The Sierra Nevada acts as a barrier for rain and snow, so moisture coming from the Pacific is limited on the east side of the Sierra. I have located *Lilium parvum* in a few sites to the east of the Sierra crest, but unless there are springs, your best bet is the west side of the mountains.

The only source for *Lilium parvum* is Pacific Rim Native Plant Nursery which sells the bulbs for \$30.00. They have a waiting list for variety *ballidayi*. Since the seeds flower in such a short time, you are probably better off starting from seed. However, if you garden in one of the warmer climates, just enjoy the pictures of this dainty lily—I killed several of them trying to make them grow in zone 9. Not only do they need lots of water, but they also enjoy a snow cover during the winter and (according to the literature) they detest areas with high humidity.

Are *Lilium parvum* in danger? Many of the “Ditch Lilies” are gone. *Lilium parvum* used to grow in the marshy areas to the west of Donner Lake, just north of Lake Tahoe, but now houses have replaced the native plants. Many grew in Coldstream valley, south of Donner Lake, but bulldozers have changed the course of the meandering creek to provide a place for a paved road, so the lilies are gone there too. Fortunately, most of John Muir’s “true mountaineers” grow in areas inaccessible to bulldozers and cars. They remain, so far kept safe by “a thousand miracles.”



# Growing *Lilium* species in the Northwest Territories of Canada – a geographically cold area

*Growing fifty species lilies in the far north of Canada might seem incredible, but after reading this article by **Darm Crook** you will know how it's done.*

Growing *Lilium* species north of the 60<sup>th</sup> latitude, in Zone 1 on the Canadian scale, has been a project of mine for well over twenty years. So far each *Lilium* species I've managed to grow has had a unique simplistic beauty of its own which I have yet to see matched by any hybrid I've grown. My favourite *Lilium* species changes from year to year, but it tends to be the newcomer, i.e. the one that has never flowered in my beds before. Some years that's a hard call when there are two or three new ones that flower; in that event it will usually end up being a species with pendent flowers.

This past summer (2010) forty five different *Lilium* species plus thirty seven of their varieties grew and flowered in my lily beds. There are others that are still at the un-flowered seedling stage. When this project was embarked on a personal goal was set, which was to flower at least one new, to my garden, *Lilium* species or variety per year. So far there has been no disappointment, with some year's as many as three new species or varieties flowering. Probably the hardest part of

*Lilium superbum*



*Lilium monadelphum*





*Lilium bulbiferum* var. *chaixii*



*Lilium cernuum*

achieving this goal was at the very start when it was almost impossible to find *Lilium* species seed and if found to pry them loose from those that had the seed. Who in their right mind would want to send *Lilium* species seed to a guy that thinks he could grow them in a Zone 1 environment north of the 60<sup>th</sup> latitude? Everybody knows *Lilium* species can't be grown that far north. After retirement in 1999, and learning how to turn on a computer, I found out that Societies like the RHS and NALS had lily seed exchanges, which made the task of finding seed much easier.

In the Northwest Territories of Canada, which is where I live, reliable snow cover provides the required winter mulch. This area receives anywhere from 61cm (24 inches) to 122cm (4 feet) of snow each winter. The type of snow is light and fluffy and because of a lack of wind at ground level it doesn't wind-pack or form a surface crust. By the time real cold weather sets in there is an adequate supply of mother nature's white mulch. With 61cm of snow at -40°C (-40°F) the soil's surface temperature only drops to a -2°C (+10°F). Snow is almost always here to stay by the end of October and at that time the soil will usually only have a crust of frost on its surface. The spring snow melt helps thaw the soil quickly and gives the bulbs in a raised bed a quick drink to start their seasonal growth. Without raised beds the soil is totally saturated for at least two weeks. With the *Lilium* bulbs in raised beds only the soil below the beds is saturated. A well drained soil even in early spring disperses the excess water.

Just because a *Lilium* species grows well here does not mean each of its varieties will do the same. An example of this phenomenon is found with *L. lancifolium*. The diploid form and several triploid varieties do well but varieties *flaviflorum* and *flore-pleno* struggle to survive. With *L. maculatum* the varieties *monticola* and *dauricum* do well but the type (late form) and variety *flavum* do not.



*Lilium kelloggii*



*Lilium parvum* var. *hallidayi*

You have probably heard the view that “growing species lilies is hard if not impossible to do”. In my opinion that is not the case. In fact they are not that much more difficult to grow than any other genus of plants. Each genus has its own needs and species within each genus can all have differing needs. The view that growing lilies is very difficult has probably served to scare off a lot of potential growers of *Lilium* species without any sound rational reasoning behind it. However, I would admit that to be able to grow *Lilium* species successfully you cannot be afraid of hard work and—if your memory is not reliable—be ready to keep records of what does and does not do well in meeting each *Lilium* species’ needs.

Most *Lilium* species seem to be perfectly cold hardy and able to survive a Canadian Zone 1, i.e. very cold, winter. And although winter, in a Zone 1 area, might be thought to be the most obvious proverbial straw that broke the camel/lily’s back, it really isn’t the major demon that destroys lilies. There are other perhaps more important reasons that *Lilium* species don’t survive in cold and short seasoned growing areas, or any other geographic areas for that matter, and those reasons are fundamental. I’m a firm believer that if a *Lilium* species, or hybrid, is given the right foundation, which is the soil they grow in; they will survive. Most mature *Lilium* species, and even hybrids, do not survive being moved from a warmer Zone to a colder Zone—specifically Zone 1—but seed grown lilies adapt to the climatic conditions they grow up in. Some species are lost the first or even during the second or third attempt to grow them from seed. Therefore, when I obtain seeds I never plant all of them that year. The first or several seed sowings could be lost trying to ascertain the seeds germination method. Only a third, if twenty four or more seeds are obtained, are planted during each attempt to grow a new *Lilium* species. If the first attempt succeeds, providing there is room to

grow them, the following year the rest of the seeds are planted. Another essential is patience, as some lilies can take anywhere from four to seven years from seed to first flowering, without enduring patience a person will be sorely disappointed, but with the required patience will be richly rewarded.

The learning curve is steep, so before heading out on a project to grow *Lilium* species it's best to get to know lilies in general and the signs they will give you if the soil and other growing conditions are not totally to their liking. You can do this by practising on hybrids. Learning to decode what a lily is telling you is something that can only, in reality, be learned by experience. You can read some books on the subject and they will describe symptoms, but they won't teach you what's happening until you actually observe what the lilies themselves are telling you. A book can describe a virus symptom as curled or twisted foliage and random streaking. A late frost can create foliage conditions that match that description, but with experience the two can be told from one another. This knowledge is probably required more in a cold Zone area than in moderate ones, such as Zones 2 or 3. In Zone 1 if the signs the lilies are giving a person are not read correctly—and acted on—the lilies will be lost. Sometimes that loss can't be helped, but lessons from those particular lilies need to be learned, so the problems can be overcome with the next planting. There are also a few other points to consider, such as:

- when to start the seeds
- required dry soil
- control of foliage disease
- high humus soil
- fertilizing - can soil be too rich for some lilies?
- well drained soil
- required wet or constantly moist soil
- length of growing season
- pH of soil
- dealing with late spring frosts

In my experience, if each *Lilium* has the right conditions, as covered in the points listed above, they will survive, flower, set seed (if the growing season is long enough for them to do so) and continue to grow in the garden for year—excluding of course species such as *L. formosanum* which are not cold hardy. Even in an environment that has a growing period which is too short for some lilies there are still ways to obtain seed, such as ripening the pods off with the stem plunged into a potato.

Let's examine the points listed with some information on each:

### **When to start the seeds**

The seedlings have to be mature enough to survive their first winter under a snow bank. At the same time they can't be started so early that they senesce in the middle of summer. Through trial and error a seed planting time of mid November

has worked well in Zone 1 for most *Lilium*. There are a couple of exceptions where these *Lilium* species naturally senesce early, i.e. *L. philadelphicum* var. *andinum* and *L. nanum*. Starting these two species should be done in mid-January. To start most of the other *Lilium* species, or hybrids, in mid-December or later will lead to their loss during the first winter, unless you want to grow them for two years before planting them out. Starting delayed hypogeal seeds in early November gives them a 4 month incubation period and a twelve week dormant (cold) period by planting out time, i.e. late May to early June.

### **Well drained soil**

The need for a well drained soil is paramount for any lily, even those that like or need plenty of moisture. If the soil isn't naturally well drained it can be achieved with raise beds. The soil needs to drain water nearly as fast as you apply it and should leave the bed moist not wet. A 1.2m (4 feet) × 2.4m (8 feet) bed by 26cm (10 inches) deep should be able to take 95 litres (15 gallons) of water in a couple minutes and within 5 to 10 minutes have just moist soil. Most *Lilium* species will do exceptionally well in raised beds and a high humus content well drained soil, as long as the pH is set to their specific needs. The high humus soil should be at least 26 cm (10 inches) deep.

### **Some lilies require a dry soil**

*L. tsingtauense* needs a dryer soil than the average Asiatic hybrid. If *L. tsingtauense* is watered with the same amount as Asiatic hybrids require, the foliage will turn yellow, the bulb will become loose and be lost during the winter. *L. papilliferum* needs even dryer growing conditions, so if the soil is as moist as Asiatic hybrids need the roots and then the bulb, of *papilliferum*, will simply rot within about a month. A moist well-drained soil is too wet for these two species, a well-drained dry soil is what they need. That is achieved, in my area, without watering, as meteorologically this area is considered to be a desert due to the small amount of summer precipitation that is usually received. In other areas, it may be achieved by planting these lilies on an inclined surface so most precipitation can simply drain downhill from the lily.

### **Some lilies require a wet or constantly moist soil**

*L. canadense* and *L. superbum* require a consistently moist, but still well drained, high humus acid-based soil. *L. canadense* will survive with Asiatics but not do well, as an Asiatic bed will be a little on the dry side for *L. canadense*. Planted in an area where these two species can be watered often will allow *L. canadense* to perform as well under cultivation in a Zone 1 environment, as it does in its natural habitat. *L. superbum* will also perform almost as well as it does in its natural habitat.



*Lilium canadense*

### **Disease control**

Perhaps in moderate temperatures a lily can withstand being struck with botrytis more than two years in a row. In Zone 1 if botrytis hits two years in a row and isn't controlled the lilies will be lost during the second winter. Some won't even withstand a one year attack, but those lilies also have other problems growing in Zone 1.

### **Length of the growing season**

Oriental lilies have problems in the North, as the growing season is simply too short and over a 5 to 7 year period they gradually decline. Oriental species if struck with botrytis that isn't controlled

are lost that winter. Oriental lilies will not survive in dappled shade in this area and the bulbs will not tolerate a soil that the sun beats down on, so they need companion plants to shade the soil.

Trumpet species like *L. sargentiae* don't fare well in a short growing season, but they continue to survive for years. However, they may never flower. A greenhouse heated, as required, between early March and early November is the solution for these types of trumpets, as it extends their growing season. It won't work for the Orientals as it simply gets too hot in a greenhouse for them. *L. maculatum*, late form and variety *flavum*, have settled in to flower once every second year. *L. rosthornii* the year it was planted had not senesced by autumn, so it froze still green and in growth mode and then was buried by snow. To my surprise, the next spring it simply thawed out and kept right on growing as if it had never been frozen. *L. rosthornii* flowered in the third year and has settled into a routine of flowering every third year. The experience with these lilies indicates that some *Lilium* can adjust their flowering habits to accommodate a short growing season, while others cannot.

### **Soil pH**

It is broadly reported that some lilies are indifferent to the soil's pH. This may be the case, but not with reference to my experience of *L. bulbiferum* and *L. duchartrei* and others. In a Zone 1 environment, in acidic soil, *L. bulbiferum* struggles to survive and *L. duchartrei* doesn't survive. However, in an alkaline based soil both of these *Lilium* species perform well. From my observations it is obvious that the

borderline seasonal growing conditions dictate the need for the soil to be totally suited to the lilies needs, whereas in a more southerly growing area lilies, like the aforementioned species, may indeed tolerate an acidic *or* alkaline based soil. *Lilium martagon* and its varieties will survive and do reasonably well in an acidic soil, but never be at their best, whereas in an alkaline based soil it is simply amazing how much better they will do.

### Soil too rich

Some lilies especially most west coast North American (WNA) *Lilium* cannot successfully grow in a high humus



*Lilium michiganense*

soil. But yet they still need a well drained soil. The WNA species' requirements were the hardest ones to figure out. On the fourth attempt it appears what is being tried is working. Acidic soil, high humus four parts amended with two parts silt made up of a light clay and sand mix. Currently this is working with *L. kelloggii*, *L. wigginsii*, *L. vollmeri* and some west coast hybrids. I hope this formula will work with more lilies, as an attempt to grow other North American west coast species is tried. *L. pardalinum*, *L. columbianum* and *L. parvum* do well in straight acid-based high humus soil. *L. philadelphicum* variety *andinum* is an anomaly all to itself. In nature when compared to other *Lilium* species it grows over one of the largest geographic areas, second perhaps only to *L. martagon* and its varieties, yet in a garden setting it is a difficult lily to grow. It will survive for a while in acidic soil, it will survive for a while when grown like other west coast North American *Lilium* species and it will grow in high humus alkaline soil, but it will never do well. In some cases, even in a natural setting, this lily will be stunted, have weak stems and only flower every other year with one maybe two buds at most, but where the soil is to its liking it will flower every year with strong stems and an inflorescence with a high bud count. In cultivation it grows and does very well in beds that have an amended soil as follows: pH7.5, high humus well-drained soil and beach sand mixed fifty/fifty; this mix is by volume not by weight and in raised beds 26cm (10 inches) deep. In these beds some stems, or maybe in some cases it is the original stems clones, have grown for at least twenty years and still produce an inflorescence of 3 to 5 buds each summer. In an attempt to improve the vigour of this lily crosses between stems of *L. philadelphicum*, grown from seed collected in various wild



colonies, are being made on a yearly bases. At this time there are mature stems from crosses among nine different geographically dispersed colonies being used in this breeding effort. I believe improvement in vigour is being seen, instead of 6 or 7 years from seed to first flower it is happening in 4 to 5 years.

### **Late spring frosts**

Many *Lilium* hybrids as well as species can withstand severe late spring frost although cellular damage does occur which makes them very susceptible to botrytis later in the year. There have been years where the lilies are growing and get hit with -8°C, but have gone on to flower nicely and settle in for their next winter under a warm snow bank. Two *Lilium* species grown here do not suffer late spring frost well at all they are *L. bansonii* and *L. michiganense*. Having suffered a late frost they take a couple years to recuperate. If they are hit with such frosts two years in a row they are lost. The solution was to find a spot where they could grow by sprouting a couple weeks later then they did where they were growing originally. That spot is in an area of my garden that still has some snow cover for one and a half weeks after all other areas have melted. It is an area shaded from the afternoon spring sun, but which gets good summer sun once the sun has reached it peak. *L. leichtlinii* followed closely by the *martagons* and *L. dauricum* is the most durable late spring frost *Lilium* grown here.

### **Fertilizing**

The only fertilizing the lilies growing here get is a generous serving of bone meal at the time of planting. It is mixed into the soil about 2cm (1 inch) below where the bulb will be set.

If they are seedlings being set out, the bone meal will be placed about 15cm (6 inches) down. The only other time fertilizing occurs is when a lily says it's hungry. By knowing your lilies you can tell if a lily needs to be fed, because it's foliage will simply not have a good healthy look. To over fertilize means soft bloated bulbs that produce *Lilium* stems that are susceptible to disease and the bulbs have trouble wintering. A lean bulb is firm for the winter and produces a healthy disease resistant stem during the growing season.





## My experience with *Lilium fargesii*

*Lilium fargesii* was given a bad press by E. H. Wilson, but **Rimmer de Vries** begs to differ in his article about this not unlovely little lily.

*Lilium fargesii* is a woodland-edge lily from central China that was first mentioned by Franchet in the French language Journal of Botany in 1892 and named for Guillaume Farges (1844 - 1912) a 19th century French plant explorer in China.

Farges' Lily is perhaps the smallest *Lilium* of the genus, growing for me to about 35cm (14") in a pot with the bloom opening to the size of a US Quarter, then, as it aged shrinking to about the size of a US Nickel.

I obtained three bulbs of *L. fargesii* in the fall of 2008 from Chen Yi as L-10 offered as *L. pumilum* (Chen Yi lists *L. fargesii* as L-09, so they must have been mixed up). Because the bulbs arrived so late in the year (late November/early December) and I live in Michigan, I potted them up in a typical mix suitable for rock garden plants, then put the pot in a pit house, or cold frame, and forgot about it.

Last summer in mid July when several of us lily nuts returned from a trip to Robert Griesbach's wonder garden in Wisconsin, we noticed a tiny green lily, in flower, growing in the corner of my cold frame and speculated on what it was. I posted a photo on the email *Lilium* group: [Lilium@yahoogroups.com](mailto:Lilium@yahoogroups.com) and both Calvin Helsley and Joe Nemmer responded that I had bloomed *L. fargesii*, a not so easy lily to flower, Wow!

The first year two stems came up each with a tiny bloom, and this second year each of the two stems had two blooms; however the two plants flowered in succession,



the first plant having bloomed out before the second plant's buds opened.

I do not recall what the bulb looks like, but a review of the literature says the bulb is white and ovoid, 2cm high 1.5cm diameter, scales lanceolate, stem 20-70cm tall and leaves scattered on the middle and upper parts of the stem. See Haw (1986) or Woodcock & Stearn (1950) for more description or just look at my photos.

This is how I grow *L. fargesii*: My cold frame is located on the south corner of my house between a concrete driveway and the concrete foundation and is adjacent to a crevice garden made of upturned sandstone slabs that I previously used for stepping stones in the garden. This is a hot and bright area in the summer. The pot is somewhat plunged in fine sand and the top sits at about the level of the surrounding soil grade, so the soil is relatively cool and the pot is somewhat sheltered by the walls of the frame (made of 2"×12" lumber) that are submerged partially below grade. This part of the frame is open to most weather except in March when we get too much rain and no evaporation. In the deep winter I fill it up with snow and put on a top light cover made of 2"×4" lumber wrapped with clear plastic painter's drop cloth (4 mil?) with a sheet of the large size 1" bubble wrap between the plastic layers to maintain the interior air space. The frame freezes in winter but warms quickly in sun. Crocuses were blooming in the north side of the frame in February when we had 2 feet of snow outside.

I think the most important cultural aspect is well drained soil made from similar sized components for maximum air space or porosity and quick drainage. My soilless mix is approximately 2 parts Sunshine LFT (or dry sieved peat moss can be used): 1 part perlite: 1 part coarse vermiculite: 1 part Turface (a fired clay product used to top off the baselines and pitcher's mound in baseball fields—also



**Above left**, A *Lilium fargesii* flower prior to opening.

**Centre**, *Lilium fargesii* pods approximately three weeks after peak bloom.

**Right**, Seed capsules of *Lilium fargesii*.

**Opposite far left**, *L. fargesii* plant in cold frame.

**Opposite left**, *L. fargesii* in bud.

used in bonsai soil mixes). The components of the growing media all have about the same sized particles except for the peat moss which will break down. These are essentially sterile so some feeding is required, but I rarely fertilize. If I do think of fertilizing I use rain water with dilute 20-20-20. After reading about this lily I wonder if decayed leaf mold mixed with an aggregate would be better.

Hybridizing? In 2009 I crossed my *L. fargesii* with pollen from *L. henryi* and pods formed. Seeds were collected from the green pods in late August and put into test tube culture. The test tubes were left outside on my porch during the fall of 2009 to experience the typical daily temperature fluctuation and cooling temperatures and sometimes even direct sun, and the seeds germinated outside in the cool. In late autumn the tubes were brought inside and kept under lights during the winter. The seedlings seems to respond to being left outside on my open porch in the spring and summer heat and are still growing well but slowly. Who knows if the cross was successful or if the seeds are just *L. fargesii*? But I think anything from these pods should be interesting.

In 2010, a pair of seed pods formed on the earlier blooming plant, only not from any effort on my part or possibly from the other *L. fargesii* plant. The photo (above, centre) taken July 27, 2010, shows the pods about 20 days after peak bloom.

In October 2010 I put about a dozen candled brown dry open-pollinated seeds from these *L. fargesii* pods in a small pot under a mulch of vermiculite, watered well, let drain, placed in a plastic baggie and set out on the porch for the fall temperature fluctuations to do its thing. The pot was in occasional morning sun and experienced slightly freezing temperatures. Before the real cold prolonged sub-freezing days, I brought the pot inside and placed it in a cool basement (55-60F) under lights for about two months. Frustrated with no visible results by mid-late December, I put the pot on top of a fluorescent light and forgot about it. In early January 2011, I occasioned a peek while on a phone call to Charlie Kroell and

there was a tiny seed on top of a cotyledon! It had to be *L. fargesii* and not a weed! I put the pot under the lights and within one week two cotyledons had germinated. Farges' lily seems to like cooling temperature fluctuations to germinate; however, the seed in the potting soil decided to germinate after experiencing a slightly warming condition.

E. H. Wilson didn't think much of *L. fargesii*, considering it a lily that would only interest collectors. But I, and others, disagree, as the delicacy of this lily combined with the unusual green flowers, with their cristate projections like frosted papillae, suggest that a reappraisal of this lily is long overdue.

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## Edward Forbes' Fritillary and others

*Brian Mathew uses an informative and interesting historical perspective, in his article, to describe the circumstances surrounding the discovery and naming of Fritillaria forbesii.*



The story of *Fritillaria forbesii* begins with the arrival of a small ship in south-western Turkey, HM Surveying Ship *Beacon*, which 'visited the coast of Lycia in the beginning of January 1842, for the purpose of conveying away the remarkable remains of antiquity discovered at Xanthus [Xanthos] by Sir Charles Fellows'. Captain Graves, and his crew were charged with the task of excavating and removing the marbles, now in the British Museum. In addition to the crew the ship carried The Rev. Mr E. T. Daniell, who had a keen interest in the Lycian countryside and its antiquities, Lieutenant T. A. B. Spratt the 'assistant surveyor' and a naturalist, Prof. Edward Forbes, then of King's College, London.

In the two-volume work by Spratt and Forbes, *Travels in Lycia* (1847) it is noted that 'Although the journey was commenced with sanguine expectations of success, the results exceeded the hopes entertained by the travellers; for no fewer than eighteen ancient cities, the sites of which had been unknown to geographers, were explored and determined, besides many minor sites'. Sadly Daniell 'fell a victim



Type specimen of *Fritillaria forbesii*.



*Fritillaria forbesii*.

to the malignant malaria fever of the country...by lingering too long among the unhealthy marshes of the Pamphylian coast' but not before the trio had undertaken some remarkable exploration.

The nearest suitable port selected as the base for this expedition was Makri—now Fethiye. In March 1842 the Beacon left Lycia to collect supplies from Malta, leaving behind Forbes, Daniell and Spratt, Forbes to survey the whole region: Forbes to record the natural history, Daniell the antiquities and Spratt in charge of geography and mapping. This they did with enthusiasm and in the two-volume book the two survivors of the trio give an extraordinarily thorough account of the richness of the region: plants, animals, insects, fishes, seaweeds, Lycian language and inscriptions and of course the ancient sites themselves. From the book it is difficult to pin down exactly where Forbes collected the fritillary that was to become *F. forbesii*. The field notes on the type specimen in the Kew herbarium state: 'in dumetis rupestribus ad Macri', Forbes 626. It was this collection that was studied by the Kew botanist John Gilbert Baker and named the species in honour of Forbes in 1874 (*Botanical Journal of the Linnean Society* 14: 264).

For several months Forbes and his companions travelled in Lycia, including on May 27<sup>th</sup> an ascent of the mountain block near Fethiye known as Cragus and Anticragus, now Mendos Dag and Baba Dag. On this mountain range Forbes collected a small

squill (which he noted as *S. bifolia*): ‘whose exquisitely blue flowers contrasted with the snow masses in the clefts’. This must be the plant that was later named and described by Baker as *Chionodoxa forbesii*, for *S. bifolia* could never be described as ‘exquisitely blue’ and *C. forbesii* is common on this mountain. A ‘beautiful Fritillary of small size, but bearing a large tessellated flower’ has been identified as *F. crassifolia* subsp. *crassifolia* (Forbes 672). Near the site of Cybira on the mountain now known as Rahat Dag another ‘beautiful little fritillary, with rich orange and brown flowers’ can probably be referred to *F. pinardii*. Forbes also saw the species later described (in 1846) as *F. acmopetala*, although this was based on a specimen collected by Aucher-Eloy; he possibly also *F. elwesii*, described by Boissier in 1884 after its collector Henry Elwes. Another was noted by Forbes as having flowers ‘striped in broad flames, with purple, yellow, and green, but never tessellated’. The expedition recorded a large number of species, quite a number of which were the first collections of the species, for example plants we now know as *Cyclamen alpinum* [*trochopteranthum*] and Forbes’s ‘beautiful yellow *Trichonema*’ which is *Romulea crocea*. It must have been a naturalist’s paradise for he notes ‘not infrequent in the Lycia mountains is the leopard’ and ‘bears and wolves are frequent... Jackalls are abundant and make known their presence by their detestable yelling as soon as the night sets in’.

The holotype specimen of *F. forbesii* is well preserved in the Kew herbarium for posterity. In my early days in the ‘monocot section’, c.1969, one of the tasks was to clear the bundles of old unmounted specimens from the basement, identify the contents and get them mounted and incorporated into the herbarium.

Imagine my surprise when a bundle of surplus Forbes specimens emerged, particularly when *F. forbesii* proved to be among them, in embarrassingly large quantities—a conservative estimate would be 50-100 individuals. These isotypes (duplicates of the type) were duly despatched to various other herbaria as gifts or exchanges. Fortunately many did not have bulbs attached and it seems that the species suffered no ill effects and can still be found in the Marmaris and Fethive area!

As a postscript to the story, it was found that the *Beacon* was not large enough to transport the Xanthos marbles and two other ships, the *Monarch* and the *Medea*, were called in to complete the removal.

#### Footnote

This article was first published in Journal 28 of *The Fritillaria Group of the Alpine Garden Society* (2011) and is reprinted here by kind permission of the Society.



# Nothing succeeds like Lily Group seeds

*In this article three Lily Group members, **Carolyn Richards, Andree Connell and Nuala Sterling** reflect on their success in growing lilies from seed obtained from the Lily Group Seed List – perhaps the most appreciated and admired aspect of the Lily Group’s activities.*

I have long held an interest in species lilies and I am always on the lookout for anything different or rare for sale. Joining the Lily Group really opened my eyes to the amazing diversification these beautiful plants produce.

When I first received a seed list I ordered randomly, not appreciating the necessary conditions for growth lilies demand. In my innocence, I just sowed all the seed in small pots of multi-compost, grit and vermiculite with a good covering of sharp grit to finish. I labelled and placed them all outside in mostly shade and stood back awaiting germination.

The results were varied: I soon learned the difference between hypogaeal and epigeal, though fortunately I kept all the non-sprouting pots for two years or more. The excitement when a little seedling appears never goes away. A sense of achievement is a wonderful feeling. Knowing you are actually growing a lily that is hard to find, especially when it has been maybe a year or two since the seed was sown is very rewarding.

Martagon types seem, at first, to grow on quite well for me. I do have to grow all my lilies in pots at the moment, so this is more of a challenge. The importance of keeping the pots cool whilst the heads of the lilies are in sun is something I have gradually realised to be very important, so now they are all grown together with a couple of rows of box plants (in pots as well), shading the lilies. Growing the bulbs this way gives me more freedom with regard to positioning the lilies to achieve optimum growth. I can, for instance, control how much sun my lilies get, in line



A lovely hybrid, *L. canadense* x *L. grayi*.





*Lilium canadense* hybrid.



*L. martagon* flowers of various colours.

with the requirements of different species. I can also ensure that soil mixtures are designed to reflect specific lily habitats. The cruelties of two harsh winters have taken their toll on several species. One pot of martagons had a nasty surprise for me when I repotted the bulbs this spring. The larger bulbs had perished leaving only small offsets huddled under a mushy bulb. Perhaps this is nature's way of protecting its young? I have also found that lilies do not reach flowering maturity at the same time, as some pots of lilies, dating from 2005/06, contain bulbs that are still a long way from flowering, whereas others, planted at the same time, have been producing flowers for three years or more.

There is always an element of surprise when growing lilies from seed and martagon lilies are no exception. The colour is so unpredictable, one batch labelled *Lilium martagon* pink/white stripes sown in march 2006 has this year produced flowers for the first time, ranging through pink, white and an interesting yellow/pink confection! No stripes yet though. Also this week a pot of bulbs marked as *L. canadense* × *grayi* has produced three single flowering stems of a yellow/orange colour; a very elegant flower and everything I had hoped for.

The very process of producing something from seed to flowering size is very

rewarding, as it is this process that teaches and guides you (with lots of accidents along the way). I would recommend anyone with little or no experience of sowing seed to just do it to see what happens.

**Carolyn Richards**



I can indeed provide a few comments about the Lily Group seeds I have grown. I'm not quite sure why I haven't written about this subject previously, but the request, in a recent newsletter, has encouraged me to reflect on my experience and, hopefully, other Lily Group members will follow my example.

May I begin by expressing my utmost appreciation for the exemplary Lily Group Seed Exchange. It is so useful to have a seed exchange deadline in December which enables latecomers to donate seed. Also, as one with eclectic taste, I have found some precious items on offer that are not available elsewhere. *Cornus* 'Norman Haddon', *Mutisia* 'Glendoick' and the dark spotted *Arum italicum* come to mind, along with assorted *eucomis*, *agapanthus* and nerines, which so far seem undesirable to the rabbits.

To grow *Lilium cernuum* has been a lengthy endeavour. The flowers from the first bulbs, acquired from a run of the mill mailorder catalogue, turned out to be what looked like wishy-washy hybrids and certainly not the vibrant graceful blooms I was expecting. True bulbs were then acquired from a lily specialist, but at that point I was only just learning the geology of my new acreage, so the choice of location and soil preparation were ill-advised and the bulbs just did not thrive. However, with bulbs produced from Lily Group seed I achieved the luxury of growing and flowering three to five *Lilium cernuum* bulbs, in different locations, and look forward to a better show from these bulbs each year. I haven't yet noted any discernible differences between *Lilium cernuum* seeds from LS '06 or Arakawa 7070605, but I'm working on it.

Seeds #166 from the 2004 distribution, ex L. Blackcurrant Mousse grew well but were aesthetically a disappointment, as they turned out more like 'Ginger Mousse' so I passed them on to my niece who likes orange shades.

The plants from seed of the Smithers' lily 'Vico Queen' seem to be finding conditions difficult, so they are a mere shadow of the 8' to 10' descriptions I have read about, but charming nonetheless and may yet make progress before a move to better conditions becomes a priority.

*Lilium lankongense* has been a superb plant in varied conditions. Some I have identified as 'CLD 425' from LS # 81 2004, some just as 'LS '04'. One thing my attempts at identification have taught me is to be more particular and accurate with regard to my notes and labels.

*Lilium washingtonianum* I stupidly left behind when I moved house and seem



**Above, *Lilium cernuum*, same species, but different shades of pink.**

to be having problems re-establishing. I obtain good germination, but have either mis-managed the seedlings or if planted out they seem not to re-appear. A new crop awaits for me to try again.

In order to put the information, above, into perspective perhaps I should mention that on my property the major enemy is tree roots, mostly from huge Douglas Firs, Garry Oaks, *Arbutus* & *Acer macrophyllum*. Beyond that comes the general old age, ill health, ineptness and scattered interests of the gardener, who moved far too many plants from the previous property, and still struggles to tear out 40 year old junipers, hypericum, ivy etc. in order to plant them here. The expectation is that it will all come together in the end, but in the meantime elements of ‘tough love’ seem inevitable, and bulbs are great survivors, especially those grown from Lily Group seeds!

**Andree Connell**

★ ★ ★

I have always enjoyed lilies in the garden, so when I was given seed of *Lilium regale* by a botanist friend and encouraged to try my luck I was quite keen. Initially, I sowed the seeds in 5cm square pots (in a cool greenhouse) and then transplanted the seedlings into one litre pots. I realised after two years in pots that those lilies by now in flower were trying to send me a message, which was it was time to plant them out into the garden. Survival ensued for a few years, much to my enjoyment, and then my lilies gradually waned on my heavy clay soil and with a water table 3" below the surface.

An article in *The Garden* about the RHS Lily Group stimulated my interest, so I joined just before the 2004 Conference. I was impressed by one of the most stimulating conferences I had ever attended. Hooked and encouraged, my horizons were widened, but my learning was just beginning. The next phase—the



**Above,** Two photographs of *J. L. rosa trumpet* × *Holubice*

receipt of the Seed List – was an added stimulus to learn more about the cultivation of lily species and hybrids.

In preparation for recording the fruits of my enthusiasm, I bought a 15 column Guildhall accounts book, which enabled me to note the names, dates, survival and progress of my lilies. However, you do not always record what later seems useful. Enchanted by the variety of shapes and colours of the tiny bulbs, I have now added those details to my records. I also learned from one of my local nurseries how important labelling is, the simplest method being to use a 2B pencil on white labels, named and dated with two submerged at the edge of each pot, because there they are less easily disturbed and always readable.

Losses are a familiar trial to amateur enthusiasts, but losses caused through adverse weather, delayed transplanting, lily beetles, slugs etc can provide a useful learning curve. An added personal dilemma of spending three months away from my garden in three of the last five years is a neglectful approach my plants could have done without. The hard winters of 2008/9 and 2010/11 took their toll, so most of my two year old seedlings perished. But a few survived despite it all, although the others ended in a sorry mess. Why that should have been the case I'm not sure? This experience has, however, prompted me to provide better winter cover for my growing pots. Lilies in the older pots survived better and this summer there were a few surprises. To my delight the two seedlings of *Lilium J. L. rosa trumpet* × *Holubice* from John Lykkegaard (Denmark), flowered for the first time. The repotting stage was even more rewarding, as it presented me with a fine 5cm deep red concentric bulb and two small bulbs.

In conclusion, if my experience is anything to go by, and you want to maintain your collection of lilies, then you should keep growing a succession of younger plants from seed – hopefully obtained from the Lily Group Seed List.

**Nuala Sterling**

# *Nomocharis gongshanensis* Y. D. Gao et X. J. He sp. nov. – a new species from western China

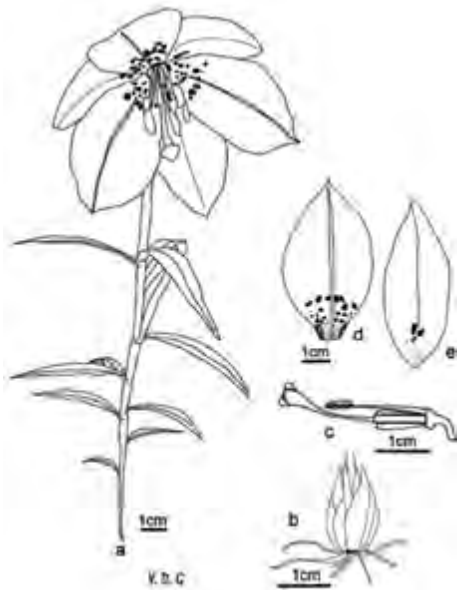
*Markus Hohenegger et al present the essential information about a new species of Nomocharis in the following article.*

## Original article

Plant Systematics and Evolution, DOI: 10.1007/s00606-011-0524-1

*A new species in the genus Nomocharis Franchet (Liliaceae): evidence that brings the genus Nomocharis into Lilium.* Yun-Dong Gao, Markus Hohenegger, A. J. Harris, Song-Dong Zhou, Xing-Jin He and Juan Wan.

<http://www.springerlink.com/content/m3191640n1582v16>



**Figure 1.**  
*Nomocharis gongshanensis* sp. nov.  
(Gao G09003)

Habit: (a) upper part of plant, (b) bulb,  
(c) gynoecium and one stamen,  
(d) inner tepal, (e) outer tepal.

*Nomocharis* is a genus of *Liliaceae* with some of the most beautiful plants in the whole lily family. The genus comprises only a few species, which are distributed in the mountainous forest areas and slopes of west China, Tibet, and north Myanmar. The flowers, which in general have pink and white basic colours, are mostly held horizontally—resembling a flat open lily. Several lily species have been initially classified as *Nomocharis*. However, *Nomocharis* can be distinguished from lilies by the small swellings at the base of the inner petals, a feature totally absent in *Lilium*.

During an expedition, to the west Chinese Gaoligongshan Mountains, a *Nomocharis*-like new lily with very pretty yellow flowers was discovered. Liang (1984: Studies on the genus *Nomocharis* (Liliaceae). Bull Bot Res 4: 163-178) had mentioned a yellowish form of *N. aperta* without fleshy swellings on the tepals' bases,



**Above**, Habit during flowering and **inset**, showing front view of flower.

but it was not further identified then. In this publication, the authors were able to clarify the systematic position of this yellow *Nomocharis* and described it as *N. gongshanensis* Y. D. Gao et X. J. He sp. nov. In addition, the evolutionary relationships within the *Lilium-Nomocharis* complex was evaluated at DNA-level with a much larger sample number than in earlier studies.

**Short description of *N. gongshanensis* Y. D. Gao et X. J. He sp. nov.**

On first sight, the plant resembles a smaller yellowish form of *N. aperta*. The bulbs are about  $3 \times 1.5$ cm, with yellowish-white scales and produce a stem about 50cm tall. The leaves are lanceolate, ca.  $40 \times 6$ mm, alternate. The flowers appear mostly solitary, but also specimens with up to 6 flowers have been found. They are cup-shaped with a diameter of ca. 6cm, pale-yellow with purple-red spots at the bases of the tepals. Besides the colour, the flowers differ from *N. aperta* in having no swellings at the base of the nectaries, which normally distinguishes *Nomocharis* from true lilies.

Although the flowers resemble a plant intermediate between *Lilium* and *Nomocharis*, the phylogenetic analyses showed clearly that the species belongs to



*Nomocharis gongshanensis* habit during flowering.

*Nomocharis*, even though distinct from *N. aperta*. However, the data indicated a possible hybrid origin of *N. gongshanensis*, whereby the maternal ancestor might have been an extinct or undiscovered *Nomocharis*-like, and the paternal ancestor a *Lilium*-like plant.

### **Phylogenetic relationships within the *Nomocharis-Lilium* complex**

The main findings from the molecular phylogenetic analyses were:

- *Nomocharis* is nested within the genus *Lilium*.
- The *Nomocharis* clade includes all *Nomocharis* species and *Lilium nepalense*.
- Sections *Sinomartagon* and *Leucolirion* are paraphyletic.
- There are two independent clades of mixed *Daurolirion* and *Sinomartagon* species.
- *L. bulbiferum* appears to be a part of *Sinomartagon*, not of *Liriotypus*, which is monophyletic.

Currently, no plant material, i.e. seeds or bulbs, are available of this new species.



# Eight wild lily species native to Japan

*In this summary of his book **Kimito Uchikawa** provides information and expresses his views about some of the native species lilies that grow in Japan.*

I began the ecological study of the 15 species lilies, which are native to Japan, in the year 2000. At that time I lacked any knowledge of lilies.

To begin with I decided to raise all 15 species from seed, so I started to collect seed from wild lilies. Where lily species were not available in the wild, near where I lived or in areas I could reach easily, I bought lily bulbs to obtain fertile seed in successive years. I was also given seed of some lily species. Within five years I had raised almost all of the 15 native species in flowerpots or in the garden. Seedlings were planted in a nursery garden to establish experimental populations.

I learned the ecology of wild lilies from natural populations by locating their preferred habitats. It is a fact, unfortunately, that many of Japan's 15 species lilies are suffering because of rapid and destructive environmental changes. This has resulted in them being included in the *Red Data Book*, together with so many other species of different families. The decline of agricultural societies has led to depopulation in wild lilies, as well as all other endangered species. To deal with the decline in wild lily populations details of the life history of these lilies should be studied, through the observation and conservation of natural populations in their respective habitats. Regrettably, most Japanese people show limited interest in wild lilies, so I propose what might be called "respective liliology" to be taken into consideration, as "respective liliology" would include personal responses according to individual sensitivity and discernment. Perhaps Japanese people would become more interested in the fate of their native lilies if the results of their respective observations and comparisons of natural lily populations were made public. According to the above thinking, I compiled the knowledge accumulated over 10 years in my book *Eight Wild Lilies Indigenous to Japan Today* (Liliaceae; *Lilium*).

In the first, introductory chapter of my book, I consider the species lilies of the world relying on the intrageneric classification of the genus *Lilium* by Comber (1949). It is well known that plants of the genus *Lilium* come from the northern hemisphere. The southernmost lilies are represented in Section 6 *Leucolirion*, Subsection 6a *longiflorum-philippinense*, which are distributed north of the Tropic of Cancer (N23°27'). Two species, *Lilium philippinense* Baker and *L. neilgherrense* Wight are known from much more southern locations than the





*Lilium japonicum* on the cover of my book, *Eight Wild Lilies Indigenous to Japan Today*. B5, 217pp. ca. 60 refs., ca. 350 photos.

above southernmost distributional limit of the genus *Lilium*. In these cases, the two lilies grow at a comparatively high altitude to compensate for the southerly latitude.

The main species lilies of Japan belong to Section 4 *Archelirion* that includes, exceptionally, a lily of Chinese origin, *Lilium brownii* (Brown) Mieliez. I consider it better to split section 4 into Subsection 4a for *Lilium brownii* and *Lilium speciosum* Thunberg and Subsection 4b for the remaining 6 species of Japanese origin.

Section 7 *Dauroilirion* comprises at least two species, *L. dauricum* Ker-Gawler and *L. maculatum* Thunberg. These two species very easily hybridize with those of Section 5 *Sinomartagon*, but, even so, Section 7 should be valid because of the unique form of their flowers.

The scientific names of the 15 Japanese species lilies were given by western botanists by 1897, before the publication of the *International Rules of Botanical Nomenclature of Vienna 1902*. Furthermore, western botanists had no knowledge of the fact that natural populations of Japanese species lilies, in their native sites, had been accurately described and drawn or painted under the influence of Chinese culture. Several Japanese botanists tried to determine more valid names for some species by consulting the current *International Code of Botanical Nomenclature (Vienna Code)*. However, the names proposed by such the Japanese botanists did not always prevail over the names given by western botanists. With regard to these circumstances, I list the most valid names of the 15 species lilies native to Japan, together with some scientific names of varieties and/or forms. I continue to have some doubts about the validity of the name *Lilium alexandrae* (Wallace) Coult (1934), so I intend reading all of the original descriptions of this species, with the aid of RHS Lindley Library, London, in the hope of being able to propose a more appropriate name.

The second chapter of my book deals with the ecology of eight Japanese species lilies in four groups. The first group comprises *Lilium longiflorum* Thunberg (1794), Ukeyuri (Japanese name *L. ukeyuri* Veitch (1893) or *L. alexandrae* Wallace (1893), and *L. nobilissimum* (Makino) Makino (1914), all of which are found on some of the Nansei Islands within the southernmost distributional range of



*Lilium alexandrae*. Ukesima, Amami, 05.06.15.

the genus *Lilium*. Morphologically, it is interesting that all three species have fragrant, non-papillate trumpet flowers on the tips of stout and rather short stems, which are common among wild lilies indigenous to small islands. Of the three species, only *L. nobilissimum* is restricted to a limited rocky stretch of Sodegaura, Kakerojima—among the Tokara Islands. This lily is also interesting because it has heavy seeds. I have never been to the native sites of these three species and all the photographs of these wild lilies, in the first subheading of the second chapter of my book, were taken by Dr Seisaku Hattori of Amami Laboratory of Injurious Animals, The University of Tokyo.

The second subheading includes *Lilium auratum* Lindley (1862), *L. japonicum* Houttuyn (1780), and *L. rubellum* Baker (1897), which are the main members of Section *Archelirion*. These wild lilies are mainly distributed on Honshu and are characterised by diversely coloured flowers. Wild populations of the three species are on the decline, owing to the reduction of the preferred habitats of these lilies, that is, “Head in the sun, feet in the shade (McRae, 1998)”. *L. auratum* (which has a life-span, in the wild, of approximately 10 years) grows on rocky mountains in areas like Nagano Prefecture, Central Honshu. Growth of this lily is rapid. The largest number of flowers per stem can be as much as 23, so this lily can produce significant quantities of seed. *L. japonicum* occurs in such grassy



*Lilium rubellum* on Gorin-Daira, Shitada, Niigata Pref., 05.06.07.

habitats as ski slopes, roadsides, gardens around houses, cottages in mountainous regions and the floors of open forests. The maximum number of flowers I have so far observed is 7. *L. rubellum* is distributed within restricted boundary areas in Niigata, Fukusima and Yamagata Prefectures. *L. rubellum* populations grow in large groups and as a species it is long lived. I have observed as many as 13 flowers on a single stem. Shape, perfume of the flowers and the leaves of *L. japonicum* and *L. rubellum* are much appreciated in Japan. Bulbs of *L. auratum*, *L. japonicum* and *L. rubellum* have long been used as food and for herbal medicine, so farmers, botanists and amateur and professional horticulturists have often been concerned with the cultivation of these three species lilies. A few experienced people have noticed the occurrence of dormancy or diapauses and/or resting in the life cycle of *L. auratum* and *L. rubellum*. The same characteristic is evident in the life cycle of *L. japonicum*. This botanical/ ecological characteristic, which occurs with all three species, is useful in locating native populations and, further, in designing a working hypothesis for the conservation of these lilies.

*Lilium japonicum*, has a famous variety, *L. japonicum* var. *abeanum* Kitamura (1952), which is native to the serpentine zone of Tokushima Prefecture, Shikoku. There is a remarkable natural hybrid of *L. japonicum* Houttuyn × *L. auratum* Lindley, which ?(is) grows on the southernmost part of Izu peninsula,



**Above**, *Lilium japonicum* var. *abeanum* Kitamura, Kisawa Vilage, Tokushima Pref., 05.05.31.

Shizuoka Prefecture. Since Japanese people find it difficult to access these hybrids in the flowering season I have tried, in my book, to show as many unfamiliar flowers as possible.

The third subheading is dedicated to a single species, *Lilium platyphyllum* (Baker) Makino (1914), thriving on the Izu Islands ranged from N32°28' to N34°45'. The stout stems, like those of *Lilium ukeyuri*, *L. nobilissimum* and *L. longiflorum*, indicate *L. platyphyllum* is likely to have had its speciation on some small islands. This wild lily, that produces the largest flowers and biggest bulbs, has been used as a source of food and herbal medicine for a very long time. Although the range of *L. platyphyllum* is widespread, that is because such useful lilies as *L. platyphyllum* and *Lilium auratum* are likely to have been artificially introduced in many parts of Japan. However, so far no one has fully explored the native islands where *L. platyphyllum* grows.

**Below**, *Lilium platyphyllum* from Izu Islands (cultivated at Matsumoto), 04.07.26.



*Lilium maculatum* Thunberg (1794) is the eighth wild lily, indigenous to Japan, representing group four of chapter two in my book. This lily grows on Izu Islands, along the coast of eastern Honshu, on Sado, Awashima and Tobishima Islands in the Japan Sea. Upright flowers are characteristic of this



**Above** , Example flowers of the natural hybrid *Lilium japonicum* x *Lilium auratum* (cultivated from seeds at Matsumoto), 09.07.11-16.

species. Even when the stems hang down the flowers are erect because of their basal structure, which is unique to Section *Dauroilirion*. Japanese botanists have considered that *L. maculatum* lilies on the Pacific shore and those on the Japan Sea shore are somewhat different from each other. Lilies on the Pacific shore generally flower a month later than those on the Japan Sea shore. Morphological differences of leaves are also prominent among local populations. The germination pattern is typically immediate epigeal for the seed from Izu Peninsula, but not yet determined for the seeds from Oyashirazu population that are the westernmost *L. maculatum* population of the Japan Sea shore. It is necessary to learn more about the variations among geographically different populations to be able to

**Below**, Marvelous *Lilium platyphyllum* population on N. Haruki's garden, Izu-Ohshima, 07.07.19.



discuss the ranking of these variations.

There is a misleading name, *Lilium wilsonii* Leichtlin (1868) that should be named *L. xelegans* ( $\times$  *elegans*) or be dealt with as a synonym of *L. maculatum* Thunberg. *L. maculatum* var. *bukosanense* (Honda) Hara (1963) was found in a limestone area on Mt. Bukosan, Saitama Prefecture, but extensive excavation of limestone caused its extinction through habitat destruction. However, records of *L. maculatum* var. *bukosanense* growing in the basaltic zone should be re-examined.

*Lilium maculatum* var. *monticola* Hara (1963), originally insufficiently described, has been accepted as an inland variety. Characteristic morphology appears on the stems, leaves and inflorescence of fully grown plants, as is shown in the photographs in the 3<sup>rd</sup> chapter of my book and here, below.

All of the comments, in this summary of my book and in my book itself, are based on my own observations and in relation to 350 photographs, which show the morphology and provide an insight into the ecology of the eight Japanese species lilies I have dealt with. People may have objections to or agree with the observations. My aim is to create in many Japanese people the desire to carry out their respective liliology on local wild species lilies. There are seven other wild species lilies, not dealt with in my book, and the population dynamics of each of them should be assessed as soon as possible.

My respective liliology has made gradual progress for 10 years. It is proved that propagation of wild lilies by seeds is indispensable for the conservation of

**Above**, *Lilium maculatum* var. *monticola* Hara. Characteristic feature of leaves (shown left) and inflorescence (right), 07.06.05(a)-21(c).





**Above,** Stable *Lilium japonicum* population on H. Furihata's Rock garden, 10.06.22.

endangered species, because Japan is suffering from environmental disruptions, including ecocides, due to labour shortages in rural societies, by ageing and depopulation. It was a custom for rural people to naturalise wild lilies near them, in their gardens and/or farms. Such naturalised lilies last for several years, but then they deteriorate. However, I found an exceptionally long lasting population in my friend H. Furihata's small Japanese rock garden, which has both grace and dignity. There *Lilium japonicum* lilies keep flowering after more than 50 years without his special care. With regard to small species lilies, such as *L. concolor* Salisbury (1806), *L. callosum* Siebold et Zuccarini 1839, *L. maculatum*, *L. dauricum* and *L. longiflorum*, which grow rapidly to flower within 2 to 3 years, stocks should be conserved through repeated reproduction of the species listed in this sentence.

While collecting material for my book many people provided pertinent help and advice, as recognised in the acknowledgements section of my book. Additionally, I am indebted to Jeff Coe, Webmaster, RHS Lily Group, who provided me with useful advice and sent me valuable information about the botanical classifications of the genus *Lilium*, Alan Hooker, Seed Distribution Manager, RHS Lily Group, for kindly providing me with information about the nature of Japanese lily seeds and Alan Mitchell for his editorial help with this article.



## Spousal acceptance factor: living with a lily enthusiast

*Wry bemusement might describe the tone used by **Susann de Vries** in this transatlantic article about her spouse's gardening obsessions.*

'Eros'

Our modest urban lot is literally chuck-full of plants. What little sod we have in the back yard is a result of pleas on behalf of our two canine family members. I enjoy all of the vegetation, but I am not willing to *work* for all of it—at least not to the extent my husband does. I do have an interest in gardening, but more along the undemanding lines of herbs, beans and a few pretty flowers. My interest and support is merely peripheral. Gardening is “his thing”.

As the spouse of a gardening devotee, what surprises me the most is that when people walk by and comment on the plants in our yard, they often assume that as a woman, I am the caretaker. They think that the herbaceous and woody plants are beautiful and will mention how much they enjoy walking past our property. If I am feeling devilish, I will smile sweetly and say “thank you!” (and take all of the credit). On the days I judge myself as being more pious, I will mention in passing that my husband is the gardener and his fervent devotion provides the four-season interest they enjoy.

Supporting your other half with his/her botanical ventures can be physically and mentally challenging. The physical challenges are obvious. Surprisingly, it is the mental encouragement that can be more demanding. Fortunately there are plant societies and list serves\*.

### List serves and Phases...

A spouse is okay to talk with about plants and new varieties, but we only half-listen with an occasional “oh yeah?” From time-to-time we sporadically circle pictures in plant catalogs so our spouse feels like we have made some sort of contribution in planning the garden. List serves are a blessing to a spouse and take off some of the pressure for mental support. They connect aficionados and feed (not referring to NPK!) spouses through their various plant phases.

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\* List serves: A set of email addresses for a group in which the sender can send one email and it will reach a variety of people.



First there was the *Rose Phase*. I diligently helped water the roses (only at the bottom!), sprayed bug stuff, deadheaded spent flowers and gathered leaves to prepare the tender shoots for the winter deepfreeze. After all, we were in a borderline area where our particular zone for the rose type was a little iffy. But who could resist trying? Dieback and the onslaught of Japanese beetles ushered in the...

*Prairie Phase*. Native plants could survive the winters and were easy to separate and divide. Piet Oudolf influenced my spouse during this phase with the publication of his books and I think the cute, friendly nursery person who sold plants at the local farmers market had some persuasion as well. While we had good intentions of keeping plants from spreading (and thankfully a small yard), that led us to the...

*Bulb Phase*. With the combination of historical interest in broken tulips and the burning hunger for spring color after a long winter, who could resist bulbs? Of course you have to keep color in the garden all summer long...

### **Enter: Lilies**

I thought digging up tulip bulbs during the summer (to keep rot out) and replanting them in the fall was insane, but with lilies my spouse has taken plants to a whole new level. Now I have to contend with packages of plant “stuff” in my refrigerator and the basement looks as if a mad scientist has taken residence. With grow lights, test tubes and plant trays all over, I seriously wonder if our neighbors think we are growing something illegal down there. Did I mention the *groans* you hear when a furry little creature has sampled the most rare and treasured cultivar in the garden?

What is particularly significant of the bulb phase is that it has brought us into the world of plant societies. These groups are comprised of wonderful people with a passion and excitement for their particular plants of interest. They are an invaluable source for camaraderie and knowledge. WARNING: as a partner of a lily enthusiast, it is *really* difficult to retain a state of nonchalance in the plant world when you hit this level of involvement. Now there are meetings and conferences that help plan your calendar and summer vacations. That being said...

The plant world has been a wonderful ride. My spouse’s interest has connected me with remarkable people from around the world. My life has been enhanced and I am always surprised to learn how much information I have picked up through osmosis. Of course he is always dabbling with different plants and is starting to introduce alpine plants into the garden. His vision is to hire Fred Flintstone as a consultant to create some sort of escarpment on our flat, city lot in order to grow daphnes and dwarf conifers. I truly wonder how we are going to get rid of all of those rocks if we ever move and have to sell the house. For now, I am going to stick to my favorite line when people walk past our house and inquire about the garden, “You are going to have to ask my spouse; I only bring out the lemonade.”

# Lilies of the Julian Alps

*In this article Alan Mitchell writes about the lilies he found and the one he missed when he revisited the Julian Alps in 2010.*



*Lilium carniolicum*

The Julian Alps stretch from the north east of Italy to Slovenia and, as the name suggests, are named after Julius Caesar. A large part of the Julian Alps is included within the Triglav National Park, which contains Slovenia's highest mountain, Mt Triglav (2,864 metres). The best place from which to explore this area is Bohinj, or to be more precise one of the villages that lie beside Lake Bohinj, e.g. Ribčev Laz.

Three species lilies are found in the Triglav National Park: *Lilium carniolicum*, *Lilium martagon* and *Lilium bulbiferum*. However, when I first visited this area almost thirty years ago my objective was to climb the highest mountains not to search for lilies of which I knew nothing, although a brief encounter with what I now know was *L. carniolicum* did stick in my mind. Almost thirty years later, in July 2010, I decided to revisit the Triglav National Park to see if the added years would defeat an attempt to climb Mt Triglav again and whether I could find flowering plants of the species lilies that grow within the Park's boundaries.

On the first day my route, through the Triglav National Park, would lead north from the village of Ribčev Laz (the location of my hotel) up the Voje valley by way of Vodnikov Dom (1,817 metres) and Dom Planika (2,401 metres), where I would overnight. On the second day my route would take me to the top of Mt Triglav (2,864 metres), then south west to a stark plateau called Hribarice and then down into the valley of the Triglav lakes, then south east to the Komarca crag where a steep descent would lead to the western end of Lake Bohinj and from there I would travel east to Ribčev Laz (and my hotel). I should mention that a Dom is a mountain hut, but not in the Spartan style of a typical bone-chillingly damp, dank Scottish mountain bothy, but frequently in the style of an attractive hotel with similar facilities.

On the first day of my foray into the Triglav National Park I set out from my hotel at 7am. Impatient to get on I strode down to the lakeside, but then my pace was slowed by the threads of early morning mist reflected in the still



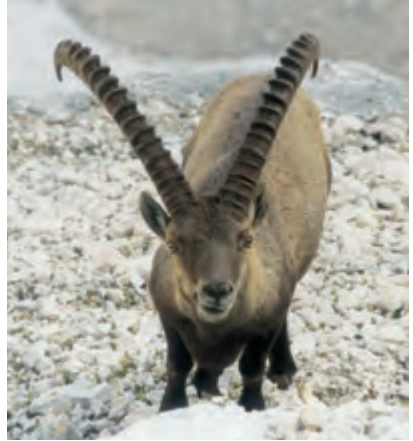
A group of *Lilium carnolicum* in their suntrap.



*Lilium carnolicum* var. *albanicum* before it ceased being a relative of its former orange cousin to become *L. albanicum*.

surface of the lake and the shoals of languid trout swaying in the unhurried movement of water in the river that flowed out of Lake Bohinj. Snapping out of my reverie, I headed with more purpose towards the Voje valley and the entrance to the Park. Although early morning, it was already hot so I welcomed the shade provided by the Beech woods that clothed the lower reaches of the valley. As I walked through the woods, the crunch of my boots on desiccated leaves was the only sound that disturbed the silence. Quite soon my thoughts drifted back through the years to my encounter with *L. carnolicum*. It is no exaggeration to say that this lily literally stopped me

dead in my tracks, as I had never seen anything so exotic looking and so vividly coloured. The shape and waxy texture of the flowers also intrigued me. However, impatient to get on, I neglected to take any photographs, but made a mental note



My insouciant friend the male Ibex.

**Left**, Mt Triglav (2,864 metres), in the background, from the plateau that leads to the valley of the Triglav lakes.

instead of where this lily was growing, should I ever pass that way again. Years later after I was bitten by the lily bug, not beetle (of which more later), I purchased two bulbs of *L. carniolicum* var. *albanicum* (now *L. albanicum*). I lost one, but the other bulb survives and produces clear lemon flowers in early June. In his book *Growing Lilies*, Derek Fox writes, “As a garden plant it overrides *L. pyrenaicum*, so in the early lily season there is no yellow turkscap available to trounce this one. It would benefit any plantsman’s garden.” I wouldn’t claim to be a plantsman, but I do agree with Derek’s assessment. Having tried and failed to source bulbs of the orange type, I have been reduced to brooding impatiently over some very tardy seedlings I have had growing in a pot for what seems like too long. Hence, as I scrunched my way up the path I felt keen to reacquaint myself with the *L. carniolicum* plants I hoped awaited me, but before that I had a mountain to climb and a long way to travel.

Growing bored with the dark and airless wood, my attention was suddenly arrested by the appearance of a Chamois. As he wasn’t too far along the path I could appreciate his sturdiness and heraldic bearing. I wanted to capture his image, but I knew the second I reached for my camera he would disappear, which, inevitably, is what happened. I say “inevitably”, but an encounter with an Ibex—also in the Julian Alps—ended quite differently. Having stalked the Ibex across a rocky slope, and positioned myself close enough so that I could take photographs that would be recognisable as an Ibex rather than as a small fuzzy brown blob, I literally had to

throw stones to attract my quarry's attention. Whereupon this creature lifted his head, which was adorned with extremely impressive horns, and gave me a bored look while ruminating, I imagined, on how tiresome tourists were for insisting on taking his photograph.

Eventually, I emerged from the claustrophobic woods into the light, a light of such unexpected intensity that I felt I was taking part in Aldous Huxley's experiment with mescaline, which he wrote about in his book, *The Doors of Perception*. (Mescaline is a hallucinogenic drug derived from a cactus, *Anhalonium Lewinii*, which grows in south west America and Mexico and has been used for centuries by indigenous peoples to heighten awareness during religious ceremonies.) During Huxley's experiment, in 1953, he recorded that, "Visual impressions are greatly intensified and the eye recovers some of the perceptual innocence of childhood." I found myself walking through one of nature's effortless gardens, where the colours of the *Clematis*, *Aquilegia*, *Trollius* and *Cypripedium* flowers seemed to pulsate in the super-bright sunshine. But, signs of *LL. carniolicum*, *martagon* or *bulbiferum* there were none. Too soon, however, I left the garden of sensory delights and climbed into a more austere terrain of low growing rhododendrons and limestone rock. It was now early afternoon so I was relieved to see—toy-like in the distance—Vodnikov Dom, where I could get something to eat and drink. Although, as mentioned earlier, many Doms are quite palatial, I was cheered to discover that Vodnikov Dom had changed little since I last visited. The fare was rustic, i.e. bread, soup and a large pivo (beer) and substantial, like the cost, which made me nostalgic for the presumably subsidised prices that existed when, on my first visit, Slovenia was part of Yugoslavia.

By the time I could see Dom Planika—a speck high above me under the three tops of Mt Triglav—the pivo I had drunk at Vodnikov Dom had long since evaporated. The sun was unrelenting and my mouth was parched, so I had to drink from what was left in a bottle of mineral water I had hurriedly purchased before starting out. This was neither thirst quenching or pleasant, as the vile liquid tasted of sulphur. However, I had a stroke of luck. While stunned by the sun and resigned to enduring the steep climb to reach Dom Planika, my resolute trance was interrupted by the sound of running water, the source of which was soon found. It was with great pleasure, and relief, that I emptied the dregs of my mineral water and replaced it with the fresh snow-melt water that was trickling nearby. With my thirst quenched, I resumed my resolute trance until I reached Dom Planika, where I booked a night's accommodation. Afterwards, I sat outside the Dom and watched some climbers pounding their way down a snow slope, while drinking a pivo I convinced myself was for medicinal purposes, i.e. to reverse my dehydration. Gradually, the heat of the sun abated and the surrounding mountains became bathed in a soft golden light. I could see the way that would take me into the



*Lilium martagon*

valley where the *L. carniolicum* grew, but that was part of tomorrow. Before then I had to get a night's sleep and then climb Mt Triglav.

Sleep was fitful, so it wasn't a hardship to rise at 5.30am. I ate some chocolate and drank some water and then set off. As I headed for the snow slope, which I had watched the climbers descend yesterday, I was concerned that the freezing over-night temperatures might have turned the slope into a tricky obstacle. However, fortune smiled on me as yesterday's footsteps had hardened into a staircase, which quickly took me onto the rocks above. It was cold in the shadow of the mountain, but this spurred me on, as I could see the warming sun wasn't too far away. In exposed areas via ferrata (cables fixed to the rocks) also assisted progress. When I reached the main ridge I was met by the rising sun and immediately benefited from its restorative warmth. I felt elated by the superb clarity of the morning and that the summit of Mt Triglav was but an hour's distance away. The view from the summit was spectacular. The Austrian Alps, more than forty miles to the northwest as the Chough flies, were clearer than crystal and the mountains that surrounded me, including Škrlatica (2,740 metres) where I encountered the insouciant Ibex, were a compelling study in dramatic rock formations softened here and there with delicate wreaths of vaporous clouds. Nothing is guaranteed in the mountains, so I felt very lucky to have witnessed the panorama that Mt Triglav had given me. The question was, would my luck hold as far as discovering any lilies was concerned? The answer would be found, hopefully, during the long walk that lay ahead.

After walking south west for a number of hours I reached Hribarice, which is a high plateau of rock, snow and little vegetation. Before I lost sight of Mt Triglav, I took a photograph which, in retrospect, seems to capture its scale and grandeur quite well. Having crossed the plateau, I descended into the valley of the Triglav lakes. I was enjoying the morning and thinking about finding lilies when a very furry cat crossed my path. Fortunately, it reappeared briefly before disappearing among the rocks, so I was able to confirm it was a feline. A moment's thought convinced me that it couldn't be a local moggie, as there was no settled habitation for miles, so I concluded it must be a wild cat, a creature I have never encountered in almost forty years of hillwalking in Scotland. The next few hours were uneventful and pleasant as the sun was warm, but not as hot as the day before. Then, as the altitude dropped, the vegetation became more lush and varied and suddenly I was surrounded by dozens of plants of *L. martagon*, which, unfortunately, were



**Left, *Lilium carnolicum* with unwelcome company, a.k.a. the Lily Beetle.**

a week or two away from flowering. My first encounter with *L. martagon* was in the Asturias Mountains in northwest Spain, then in Austria and then in Slovenia, but I would have to explore many areas and travel a long way east, literally to the pacific coast of Siberia,

before I had covered the immense distribution of this lily.

As the walking was easy, I was covering the miles fairly quickly while anticipating my encounter with *L. carnolicum*, which apart from growing in Slovenia is also found in north east Italy, western Romania, western Bulgaria and south to Montenegro. Having entered a fairly dense forest of conifers, broken by open spaces of grassy slopes under limestone outcrops, my memory told me I was near the location where I had encountered *L. carnolicum* many years ago. Then I found them, not the small group in my mind's eye, but dozens and dozens of them, flowers glowing deep salmon-scarlet in the sun. The situation would have been ideal for just about any lily i.e. sloping ground, facing south west with a protective backdrop of rock, which created a veritable suntrap. At a distance the stems, leaves and flowers looked vibrantly healthy. Then as I made my way among the plants, to get the best photographs, I noticed that many of the leaves and flowers had suffered insect damage. I thought it must be caterpillars until I discovered the real culprit—the lily beetle—which is as resplendently coloured as *L. carnolicum*, but somehow out of place in this sanctuary of beauty. Then having spotted one beetle I spotted dozens. It depressed me to contemplate the damage these pests were inflicting on these beautiful plants. I hoped nature might soon provide a corrective, in the form of a beetle eating bird or mammal, to bring these little red monsters under control. As I walked away from my second encounter with *L. carnolicum* I felt elated about finding this lily again, but saddened by the depredations being perpetrated by a creature that everyone dreads finding in their garden.

When I reached the top of the Komarca crag I considered taking a less direct route back to my starting point, Ribčev Laz, in the hope of finding more *L. carnolicum*, *L. martagon* (hopefully in flower) and the elusive *L. bulbiferum*. However, the day was wearing on and my feet were wearing out, so I promised myself I would explore the area I thought might contain more lilies after a day's rest.

Day's rest over, I set off in pursuit of lilies. Heading northwest out of Stara Fužina a few hours easy walking brought me to an impressive Dom with a more impressive view of a bowl shaped lake with a backdrop of conifers, which in their



The one that got away, *Lilium bulbiferum*.

perfect regularity of shape and distribution looked like the work of man but were assuredly the work of nature. Beyond the Dom I started to encounter grassy slopes and limestone outcrops, so I felt hopeful of finding lilies. Fixing on one likely location, I found two *L. martagon* plants in flower, which was untypical. The flowers were mauve with generous purple spotting. Further along the path I found a small number of *L. carniolicum* in flower mixed with some plants of *L. martagon* which were not yet in flower. From what I saw in the Triglav National Park, *L. carniolicum* appears to flower a week or two before *L. martagon*. Fortunately, the local lily beetles had not yet discovered the lilies beyond the Dom, although they were within flying distance from the site of destruction I had visited two days previously.

As I returned to Ribčev Laz, and my hotel, I tried to convince myself that finding two out of the three lilies of the Julian Alps was better than finding one or none. However, not finding *L. bulbiferum* irked me, especially as its distribution ranges from the Pyrenees in the west to Poland in the east, so, looking at things literally, it shouldn't be too hard to find. Then I chided myself for being churlish, as I had found, a few years ago, flowering plants of *L. bulbiferum* in an extensive alpine meadow beside the Passo Gardena in the Dolomites. However, as an obsessive—a common characteristic of lily growers—I promised myself I would return to the Julian Alps to find my missing lily, but without the lapse of so many years for obvious reasons!



# Timothy Whiteley, OBE, DL, JP

*Caroline Boisset writes about the recipient of  
the Lyttel Cup for 2011.*

On 29 March 2011 the President of the Royal Horticultural Society, Elizabeth Banks, presented the Lyttel Cup to Timothy Whiteley. Tim was for ten years chairman of the Lily Group during which time he oversaw the International Lily Conference held by the Group in London in 2004. He is also one of the few lily specialists in the country to grow (mostly) species on a large scale in a natural setting. With the event of the Lily Festival that is held annually at his garden, Evenley Wood in Northamptonshire, he is contributing significantly to the understanding and popularity of the genus.

Tim's garden is no ordinary garden in the conventional sense of the word but rather one that has been hewn out of woodland. Over the years the garden has spread over the 60 acres that Tim purchased in 1980. One of the aspects about the woodland that made it an attractive proposition to a gardener, was that the pH ranges from just below 5 to just above 8, the 10 acres of acid land being the only acid land for miles around. He knew that he would be able to grow just about any plant he wanted; it was several years before he was able to acquire it but his patience was rewarded. His main interests are trees and bulbous plants and his aim has always been to have plants of interest throughout the year, perhaps one of the reasons he came to growing lilies as he found that after spring there was little else that flowers in a woodland setting.

Tim Whiteley has been interested in plants and gardening since he was a child. At both his prep school and at Eton he had his own garden and he told me when I visited him recently at his home, that the headmaster of his prep school (which had moved to Bideford, in Devon, during the war) turned a blind eye to his tree climbing because he knew that he wouldn't be able to stop him!

He grew up in the area he still lives in, the youngest of three boys. His maternal grandfather, H. G. Tetley, was the chairman of Courtauld and responsible for the growth of the company from a faltering manufacturer making black crêpe to the large international company it became with the advent of the manufacture of artificial silk. It was due to this link with the Courtauld family that Tim celebrated his 21<sup>st</sup> birthday at 11 Downing Street, when R. A. (Rab) Butler was Chancellor of the Exchequer and had married Sydney Courtauld.

His father came from Yorkshire but was elected MP for Buckingham in 1938. Tim remembers that he used to grow daffodils—Tim to this day can identify old daffodil cultivars better than the more modern ones—and had a rose garden in Bletchley. Although he had a head gardener, it was his father who pruned the



Jane and Tim Whiteley  
with lily 'Conca d'Or'.

roses indicating how important they were to him. At the outbreak of World War II he declined to go into government and was mobilised in the Territorial Army as Commanding Officer in the Royal Artillery before going to India to be Field Marshall Wavell's Deputy Chief of Staff. In 1943 Brigadier John Whiteley was killed in the plane that crashed just after take-off from Gibraltar that was also carrying, among the 16 who died, Victor Cazalet and General Sikorski.

After Eton Tim went to study economics at Cambridge but was too busy doing what students do to do any gardening and it was not until he went to Rhodesia as ADC to Lord Llewellyn, Governor General of the Central African Federation, that he was able to enjoy gardening again at Government House.

After marriage in 1955 to his wife Jane he moved into his mother's house, Mixbury Hall, near his present property where he managed a farm.

In the 1960s he was asked to chair the new Water Board that had just been created for the counties of Oxfordshire and Berkshire. He was to become Chairman of the Finance Committee of Thames Water—charging for water was his area of expertise and in that capacity he travelled extensively advising the World Bank, the US government and the European Commission in Brussels, which he found very interesting. He was also appointed Chairman of the Water Research Centre Company, an aspect of the industry that he found fascinating.

Tim is the sort of person who accepts any task he is asked to do, as he said himself, his life has "gone the way the wind has blown, the doors were always open and I have had a lot of fun." He has taken successes and disappointments with equal quiet equanimity and a solid dose of philosophy.

He was, for example, when Ted Heath introduced VAT, asked among ten other people to go round the country explaining VAT. He has been Chairman of the Bench, a dressage judge, got involved with country things, including starting and

running a hunt supporters club and Church things, among many—of all these achievements he modestly says that he has never climbed to the top of very big trees but only medium sized ones! He was nevertheless awarded an OBE in 1984 for his services to the Water Industry.

He stayed with Thames Water until just before privatisation in 1986, at which point Robin Herbert who was then President of the Royal Horticultural Society asked him to join Council and later, on the advice of Alan Hardy, became Chairman of the Lily Group. He feels that he has never looked back since then. Through his interest in trees he joined the International Dendrology Society in 1987 when he was asked to be Treasurer in which capacity he served until 1993 and in 2003 until 2010 he was Vice-President for Great-Britain. He served on Council of the IDS throughout most of this period.

Until he purchased Evenley Wood Tim had grown a collection of bulbs at Mixbury Hall but had never felt that he would stay so he didn't extend his gardening activities. The first time I visited Evenley Wood was nearly 30 years ago and the project was in its infancy but it showed great promise and in characteristic style he led the group I was with round the woodland with great enthusiasm. In the 1994-1995 edition of *Lilies and Related Plants* is an article, he wrote, outlining the rules he had set out for himself from the start, his aims and the plants that he grew then. The main genera of woody plants grown are *Magnolia*—he is conducting a trial of the species on alkaline soil for the RHS—*Quercus*, *Malus* and *Euonymus*. This latter genus is now perhaps the largest collection, in cultivation, of species and forms in Europe and when I visited in the autumn to my question of “why *Euonymus*?” he showed me the plant that started it all—the common *Euonymus europaeus*. He knew nothing of the genus when he spotted it in the woodland the first time, started to read about it and became interested.

Over the years he has trained himself to have a good eye and among the plants he has named are a form of *Quercus rubra* ‘Aurea’, *Quercus* ‘Evenley Gold’ and *Acer campestre* ‘Evenley Red’, which he spotted growing in a hedgerow and tied a piece of string round it so as to be able to observe it.

He has also become increasingly interested in wild apples, pear, plums and rowans. Among the rarest he grows *Malus sieversii*, a wild apple native of Central Asia from which almost all cultivated apples come. *Pyrus regellii pinnatifida* which he grew from seed, *Sorbus porrigentiformis* from Cheddar and *S. pseudobupehensis* which has pinkish-white fruit, and *Prunus sogdiana* which is described in *New Trees* as “a pretty, hardy little tree with abundant white blossom, followed by tasty plums”.

Inevitably such a wide range of plants and careful management has meant that Evenley Wood has become a haven for birds, butterflies, insects, mosses, liverworts and fungi, with surveys being made for each—a source of great pleasure for Tim.

In the 1994 article he wrote about some of the bulbous genera he grew—these have, over the years, become huge attractions; snowdrop time (the genus *Galanthus* flowers from October to April, with a late flowering *G. plicatum*) is a highlight with some 80 different named varieties (he also supplies the trade with large quantities of plants); he has planted a scilla river (which starts with a pond and crosses the whole woodland) which is spectacular in April, and more recently some white *Narcissus* ‘Thalia’ dotted in a matrix, as he saw and admired in an orchard during a stay in Italy, rather than en masse and is planning a pink-bell wood.

Over the years Tim has flowered some 45 lilies species and among them he finds the most spectacular is the North American *Lilium canadense*.

When I visited in the summer at the height of the lily-flowering season, the highlight for me was his recent introduction *L.* ‘Garden Society’ of which the seed parent is *L. occidentale*. I was also treated to *Lilium pardalinum* by a stream, *Lilium martagon cattaniae* that flowers some two weeks after *L. martagon* and have marvellous shiny purple flowers, the North hybrid ‘Eros’, a sweetly scented *L. wardii*, a Judith Freeman cultivar ‘Last Dance’, a large stand of *L. superbum* that is 20 years old and the scented oriental ‘Conca d’Or’ in clumps of lemon yellow. *Lilium monadelphum* had finished flowering as had the martagon hybrid ‘Theodor Haber’ the extensive stand of which stood erect and proud and, in flower must have been a beautiful sight. There were still many more to flower, the season lasts from June to October, and they are obviously a huge asset to the garden.

For years Tim was the head gardener with part-time people and volunteers helping but in the last four years he has had a head gardener, Mike Fisher, which has made a huge difference. He still does the mowing which gives him a chance to look around and see what needs attention. He endeavours to ensure that every plant in the garden is named and has, over the years, compiled a complete catalogue of the collection (it includes over 3,000 taxa), which is a useful reference for historic purposes and is a huge help when a label gets lost. Now in his 80<sup>th</sup> year Tim knows that he cannot do as much as he used to although it was difficult to imagine as we marched up the 300-yard avenue of *Tilia cordata* that links the house to the woodland and he wryly commented that he had planted every single tree with his own hands.

Although he is usually self-effacing and modest about his achievements, it is perhaps the fact that he has created his woodland garden with his own hard work which gives him so much pleasure, that and the fact that he loves having people round the wood and talking to them. He told me that he and his wife Jane had met countless people they would never otherwise have met and these last 30 gardening years of his life have given him huge satisfaction.



'Pan' and 'Orestes'

## The beginnings of a national collection

*Since writing the following article, **Madeleine Tinson** has achieved her ambition to become a National Collection Holder of North hybrids.*

Back in 2007 I had no idea that I had just taken the first step on my journey to becoming a National Collection Holder for The Mynefield Lilies, also known as North Hybrids. I had seen a 'host' of Norths flowering at Branklyn Gardens in my home town of Perth, Scotland. Being a lover of lilies, I wanted to grow some in my own patch. With some considerable difficulty and the help of Branklyn's Head Gardener Steve McNamara, I tracked down a supplier, who had sold out her stock and ceased trading. I managed to buy what was left: 10 cultivars, many of the bulbs only pea-sized. To my delight a few of the larger ones flowered. That was me well and truly hooked, and I wanted more. With the use of the Internet, and by reading as many publications on the late Dr Christopher North as I could find, my quest stepped up a gear in 2010. I am so pleased to have mastered the use of a computer, as sending emails has been such a boost to making contacts. Joining the RHS Lily Group and Plant Heritage has also put me in touch with so many helpful, kind and generous people. My collection has increased to 20, and I now have another one in my sights.

Collection Holders have to be dedicated, and have a passion for their chosen genus. As you start to seek out the plants it helps to be very focused on your goal and not be easily put off. There have been so many dead ends I have followed, but there has, somehow, sometime later, been a breakthrough. Never fail to follow up an offer, be it a plant or information, as you can never be sure what the outcome will be. I am sure I have developed a 'thick skin' when it comes to my quest. So,

when I was recently given the chance to appear on Beechgrove Gardens, a BBC Scotland TV program, I said yes.

A six-minute feature on my collection took all day to film. It was a day to remember, full of thrills and new experiences. On the day of the broadcast I was not sure I would be able to watch myself, or would have to 'hide behind the sofa'. All turned out well and many compliments have come my way, as well as two people who

contacted me after my appeal for the elusive cultivars I would like to trace. It has been said that I 'must be a little mad'. Well, if driving a round trip of four hours to





collect a plant is that, then I put my hand up, as guilty!

Now I have reached the final hurdle: my application form to become a National Collection Holder. Even the form is daunting, but I can understand why. Plant Heritage needs to be confident that the applicant will be dedicated to the task. I hope it's accepted. Then my work will really begin, having the care of a unique and unusual collection of lily hybrids.

Read any book on lilies and the chapter on 'Diseases' reads like a horror story. But my outlook on it is: Forewarned is forearmed! It also helps to think that all life has an inbuilt will to survive. When it comes to the North Hybrids, one of Dr North's criteria for his lilies was that they would tolerate the Scottish climate. As it has turned out, many have lived up to this. Others are a little more 'precious'.

As I found just sourcing Norths difficult from day one, they have all been precious to me, so I have always been aware and devoted to their needs. It's only in the last few years that I have felt secure in planting some into the open ground, always keeping a reserve in pots. The bulk of my collection is kept in clay pots using a multi-purpose compost with added John Innes, to which I add plenty of extra grit and sand. I would love to be able to tell everyone a full-proof way of growing lilies, but all that I can suggest is to arm yourself with a good book and use it as a guide. I am not a lover of chemicals, so only use a soft soap solution as a spray to see off greenfly. As yet, fingers crossed, touch wood, no 'red coated' aliens (I can't bring myself to write its name) up our way!

#### **Footnote**

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# Classifying lilies into botanical-utility sections using DNA properties

*The potential for classifying species lilies more accurately using their DNA has attracted a lot of attention in recent years. In the following article **Břetislav Mičulka** presents his thoughts on this important area of research.*

The Genus *Lilium* is classified into species according to certain identical morphological and genetic characteristics. Other properties can generate varieties and minor variations may constitute forms. These taxonomic categories, for lilies, are known, botanically, as taxa.

Plants of one species may be more or less successfully interbred with another, but plants of different species of one genus only with difficulty and rather rarely. Kinship and morphological resemblances of different botanical species are preserved in their phylogenetic development, which can be determined by DNA. Relationship is often cited according to Comber 1949, who worked mainly with morphological characteristics. Recently, however, similarity is assessed with greater emphasis on the genetic makeup by İkinci et al. 2006 (M. Hohenegger 2008) and especially by Van Tuyl et al. 1996. Botanical names are managed by the International Code of Botanical Nomenclature (ICBN).

The genera of plants that have become culturally useful by crossing and selecting plants to reinforce and build the required properties have formed another taxonomic category called *culta* as cultivars (varieties) and groups. The same is true of lilies. Names in this case are governed by the International Code of Nomenclature for Cultivated Plants (ICNCP), which was first issued in 1953, the last edition being published in 2004 (C. D. Brickell et al.).

With the development of growing lilies, their crossing and intersection have also developed. In gardening practice in particular this has led to the need to sort hybrid lilies into sections, mainly for exhibition purposes by their evaluation. Therefore, well-known grower and breeder of lilies Jan de Graaff through the use of the botanical classification of Comber, has only divided hybrid lilies into sections, (in English literature incorrectly divisions), where the included species, taxa and *culta*, are capable of mutual intercrossing, at least to some extent. When the first edition of the *International Registry of lilies* (Peterson 1960) was published it became the basis of De Graaff's classification in cooperation with the two largest lily societies—North American Lily Society (NALS) and Royal Horticultural Society—Lily Group (RHS—LG).

Seven sections of hybrids were created with designated origins (I to VII)



supplemented with a section of non classified hybrids in these previous sections (VIII), and a section of botanical taxa, including intraspecific cultivars (IX), such as in ILR 1982 (A. C. Leslie 1982):

- |  |   |
|--|---|
| I : Asiatic hybrids                                    | VI : Trumpets and Aurelians<br>(Chinese hybrids, now too)     |
| II : Martagon hybrids                                  |   |
| III : European hybrids<br>(now Euro-Caucasian hybrids) | VII : Oriental hybrids  |
| IV : American hybrids                                  | VIII: Not placed hybrids                                      |
| V : Longiflorum hybrids<br>(now Longiflorum lilies)    | IX : Botanical taxa and intraspecific<br>cultivars and groups |

In the new edition of ILRC (Matthews 2007) section III was renamed as **Euro-Caucasian** hybrids and section V as **Longiflorum lilies**, where not only hybrids are classified, but also intraspecific cultivars mainly of *L. longiflorum*, of which there are many. There were obviously commercial reasons for their producers to make this alteration. However, the unity of the system was thus destroyed, where previously it had been the basis of looking at the division of all lilies in terms of cultivation and practice within a related system.

In terms of practical use the largest drawback of the aforementioned division is that related lilies, which mutually intercross relatively well, are usually scattered in two sections, namely some in hybrid section I-VIII and botanical section IX (for example a combination of ‘Marhan’ (IX) × ‘Claude Shride’ (II) or when crossing ‘Lambada’ (I) × *L. bulbiferum* var. *croceum* (IX)). Similarly, when crossing *L. canadense* (IX) × *L. martagon* ‘Lush’ (IX) – originally hybrids of section II. The second defect is the limited number of 7 defined hybrid sections.

The solution to these problems is to create the botanical-utility sections required to be used, more particularly in breeding practice. This question was dealt with earlier in the first proposals to amend the registration of lilies (Mičulka 1996) and realized in the publication Growing lilies (Mičulka 2001) and elaborated further in the publication and CD-R: *Varieties of the world's lilies* (Mičulka 2008). With minor modifications it is represented in the following botanical-utility system for plants in agriculture (including horticulture) and forestry. The need for a refinement was suggested in the new edition of the *ILRC 2007* with the division into sections of hybrid cultivars along with intraspecific cultivars in section V, which was renamed **Longiflorum lilies**. New section names were chosen according to the approximate range of botanical lilies in the classified section. Botanical species mentioned in the sections were taken from Matthews (2007). Hybrid species with the Latin name, e.g. *L. ×aurelianense* are part of the section, in this case, section 6 – Chinese lilies.

In the sections are included the taxa and culta of lilies, such as in section **1, Asiatic lilies**:

botanical species ( <i>L. davidii</i> and others), taxa :	<i>L. davidii</i> var. <i>willmottiae</i> , <i>L. dauricum</i> f. <i>rebunense</i> ,
“hybrid species” :	Scottiae Group,
intraspecific hybrids and cultivars :	(‘Rex’),
interspecific hybrids and cultivars :	(‘Apricot Glow’),
intraspecific groups :	(Davimottiae Group),
hybrid cultivars :	(‘Carol Jean’),
hybrid groups :	(Symphonietta Group),
intraspecific hybrids, cultivars :	(‘Cinnabar’), (Citronella Group) et cetera.

### **Botanical-utility system of lily sections**

- 0 Uncategorized lilies** (0) with species, their taxa as well as intraspecific cultivars and interspecific hybrids: *L. nepalense*, ‘Kushi Maya’, etc. Sections of species and their taxa, intraspecific and interspecific cultivars, and groups et cetera:
- 1 Asiatic lilies** (As) with the origin in species and their hybrids: *Ll. amabile*, *bulbiferum*, *callosum*, *cernuum*, *concolor*, *dauricum*, *davidii*, *lancifolium*, *lankongense*, *leichtlinii*, *pumilum*, *wardii* and *wilsonii*.
- 2 Eurasiatic lilies** (Ea) from species and their hybrids: *Ll. bansonii*, *martagon*, *medeoloides* and *tsingtauense* (M).
- 3 Euro-caucasian lilies** (Ec) from species and their hybrids: *Ll. candidum*, *chalcedonicum*, *kesselringianum*, *monadelphum*, *pomponium* and *pyrenaicum*.
- 4 American lilies** (Am) from the species and their hybrids: *Ll. bolanderi*, *canadense*, *columbianum*, *grayi*, *humboldtii*, *kelleyanum*, *kelloggii*, *maritimum*, *micbauxii*, *micbiganense*, *occidentale*, *pardalinum*, *parryi*, *parvum*, *philadelphicum*, *pitkinense*, *superbum*, *vollmeri*, *washingtonianum* and *wigginsii*.
- 5 Formosan lilies** (F) from species and their hybrids: *Ll. formosanum*, *longiflorum*, *philippinense* and *wallichianum*.

6 **Chinese lilies** (Ch) from species and their hybrids: *Ll. brownii*, *henryi*, *leucanthum*, *regale*, *rosthornii*, *sargentiae* and *sulphureum*.

7 **Oriental lilies** (O) with species and their hybrids: *Ll. auratum*, *japonicum*, *nobilissimum*, *rubellum* and *speciosum*.

Abbreviations of names of lily hybrid sections are placed after the names. The name of the sixth section was changed to Chinese lilies, because it includes the species *Ll. henryi* and *rosthornii*.

The system can be also be extended and utilized for intersectional and multisectional hybrids, known by the English abbreviations.

#### **Intersectional hybrids:**

11 - FAs-hybrids ( $5 \times 1$ ) - (now LA-hybrids),

12 - OCh-hybrids ( $7 \times 6$ ) - (now OT-hybrids),

13 - OAs-hybrids ( $7 \times 1$ ) - (now AO-hybrids),

14 - FO-hybrids ( $5 \times 7$ ) - (now LO-hybrids).

**Multisectional hybrids:** derived from three or more sections:

21 - AsChO-hybrids ( $1 \times 6 \times 7$ ),

22 - AsChFO-hybrids ( $1 \times 6 \times 5 \times 7$ ).

#### **The arrangement of the register with reference to a botanical-utility system of lilies**

In an alphabetical register names of cultivars and groups are critical. Other botanical information, including intraspecific cultivars and groups should be given after the variety or group name. Therefore, not *L. ×kewense* 'White Henry' as with the description, but the description after the variety name 'White Henry', because such a register is needed and works primarily for horticultural practice.

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# Some thoughts on the infraspecific nomenclature of lilies

*In his article **Jim McKenney** explores the implications of the emergence of the modern species concept for lilies.*

Several years ago I acquired a plant of *Lilium canadense* which, when it bloomed, proved to have very attractive red bell flowers. The following year it was even better, and I toyed with the idea of exhibiting it at a local show. Although this species still grows wild in all of the states of the United States and provinces of Canada within its historic range, many lily growers have never seen it in the wild or, in my part of the country (the greater Washington, D.C., USA area), on a local show bench. Who knows, if the public came to realize that such a beautiful plant grew wild in the area, it might help conservation efforts.

As I leaned in the direction of showing the plant a dilemma arose: what should I call it? Red-flowered *Lilium canadense* have been grown under several names over the years: *rubrum*, *coccineum* and *editorum* all spring to mind. I eventually opted for showing it under the name *Lilium canadense*, and why I made that decision is what this piece is about.

When it comes to questions about the nomenclature of the wild lilies, most lily enthusiasts are content to accept the pronouncements of the experts. Names in long usage, such as *rubrum*, *coccineum* and *editorum* as applied to *Lilium canadense*, are, once launched, difficult to dislodge. Few amateur lily growers are probably aware that a subtle yet fundamentally important shift in the philosophy of taxonomy took place during the second half of the twentieth century. It was then that the modern species concept emerged.

How does the modern species concept differ from the older concept of species? Until the beginning of the twentieth century, the primary (and essentially only) criteria for distinguishing species were morphological. Late in the nineteenth century the discipline of genetics was born in the experiments of Gregor Mendel. Genetics was to provide the insight which in effect overturned the primacy of morphology in distinguishing species. Early in the twentieth century the concept of the gene pool emerged. The metaphor of the gene pool became the basis of the modern species concept. In the modern species concept, sexually reproducing organisms which interbreed to produce viable progeny are said to be a species.

Note that the criterion is the ability to interbreed and produce viable progeny, not some morphological criterion such as leaf width, flower shape or color and so on.

To old school taxonomists, two organisms were members of the same species



*Lilium canadense*

because they looked alike. In the modern species concept, two organisms are members of the same species if they are capable of interbreeding and producing viable progeny. Here's another way to put it: two organisms are not members of the same species because they look alike; it's the other way around—they look alike because they are members of the same species and share the same gene pool.

What does this have to do with my *Lilium canadense*? Old school taxonomists established a number of infraspecific names for this species based on nothing more than flower color. This fits right into the way most gardeners think taxonomy works: it's widely believed by the gardening public that the yellow ones should be called *flavum*, the white ones called *album*, the red ones called *rubrum* and so on. This is an example of old school pigeon holing taxonomy, where one of the goals is to name every minor variant.

Modern species concept is not concerned with morphological details such as minor structural variations. It is concerned with interbreeding populations. If the minor structural variations are characteristic of a discrete interbreeding population, then that population merits taxonomic distinction. But if the minor structural variations are the sort which occur randomly here and there in a greater population and do not correspond to discrete populations, then they do not merit taxonomic distinction.

Here's an example of this. It is a basic premise of taxonomy that the members of a given group are more closely related to one another than they are to any other organisms in groups of equal rank. Take the case of a very widely distributed species. If a taxonomist names a white-flowered example from one geographic extreme of this species as subspecies or variety *album*, what are we to call a white-flowered example from an opposite geographic extreme of the same species? Surely the white-flowered plants at one geographic extreme are more closely related to other plants of normal coloration growing in the same area than they are to white-flowered plants growing in some opposite geographic extreme. To the old school pigeon holing taxonomist, both were variety *album*. I'll stick my neck out and say that in terms of modern species concept neither white-flowered

plant deserves taxonomic recognition. On the other hand, if those white-flowered plants had formed discrete interbreeding populations, then they would deserve taxonomic recognition.

This has significance for the taxonomy of our lilies. Keeping in mind that the names should correspond to discrete interbreeding populations, we have no reason to retain such names as *Lilium canadense* var. *rubrum*, *L. canadense* var. *coccineum*, *L. canadense* var. *editorum*, and *L. canadense* var. *immaculatum* (to cite the best known names from early twentieth century lily books). And what should we call them? If the plants in question are clones, the sensible solution is to give them clonal vernacular names as is done with other garden plants. If they are not clones, then the term Group is available for use until the significant clones are sorted out. This term Group has no taxonomic rank and does not imply relationship from a common ancestor.

Thus, instead of calling a plant *Lilium canadense* var. *immaculatum*, if the plant has been raised from seed call it *Lilium canadense* Immaculatum Group. Note that Latin form names published before 1952 may be used; after that date vernacular names must be used.

Other lilies which need the same treatment are the yellow-flowered forms of *Lilium henryi*. An old name is available here, the name *citrinum*. It was published early enough that it passes the date test, but since no one can authoritatively say which yellow-flowered *Lilium henryi* is the original clone, the name *citrinum* ought to be eschewed as a source of confusion. These yellow-flowered plants may be correctly called *Lilium henryi* Citrinum Group, but again the better solution is to sort them out and name each clone separately.

As an interesting aside, note that the name *Lilium leichtlinii* is based on a yellow-flowered mutation and is not based on a discrete yellow-flowered population. As such, these yellow-flowered plants do not merit separate taxonomic distinction. Yet they were the first named members of their species, and so the name applied to them becomes the name of their species (most of which are orange-flowered). Orange-flowered plants and the aberrant yellow-flowered plants of this species are equally simply *L. leichtlinii*. If, as gardeners, we need to distinguish color forms, we should resort to clonal names or Group names.

Now back to my red flowered *Lilium canadense*. One of the names I considered was *Lilium canadense* var. *editorum* (the name was published as a variety and later as a subspecies). Many liriophiles would not hesitate to call my lily *Lilium canadense* var. *editorum*. But if you have followed the explanations given above, then you know where I'm going with this: such a thing as *Lilium canadense* var. *editorum* as a discrete sexually reproducing population does not exist.

What are the plants sometimes called *Lilium canadense* var. *editorum*? One can see an image of Fernald's type specimen on-line, and the first thing which

stands out is that the tepals do not reflex much on the type specimens. Yet the name *editorum* has been freely applied to lilies with strongly reflexed tepals. Here's my take on this: if *editorum* were to be recognized as a real subspecies (I'm not suggesting that it should), then the name should be restricted to those plants with tepals which do not reflex.

Fernald himself appears not to have realized what he had done: his type specimen is clearly of a plant which has tepals which do not reflex much if at all. Yet he later applied the name *editorum* to plants with reflexed tepals. If (and there is no evidence for this if) these plants with non-reflexed tepals formed a discrete sexually reproducing population, then the name *editorum* would be available for them.

To understand what these plants are, one must take into consideration the type locality of Fernald's plants. The type locality of *editorum* is Giles County, Virginia. In this part of southwestern Virginia *Lilium canadense* and *L. grayi* are in a species-like relationship. One interesting aspect of this is that *L. grayi* south of this area shows little if any sign of hybridization. But around the Virginia-North Carolina and Virginia-Tennessee borders, all sorts of intergrades appear, and the farther one moves from this area northward, the more the *L. canadense* characteristics prevail. The genes of *L. grayi* are now scattered throughout populations of what are nominally *L. canadense* far to the north. Even in Pennsylvania and New Jersey plants appear with the short stature, red flowers and the barely reflexed tepals of *L. grayi*—and the foliage of *L. canadense*. Has typical *L. canadense* captured old relic populations of *L. grayi* in these areas? Or has some pollinator such as hummingbirds been responsible for the gradual northward expansion of characteristics which seem to suggest *L. grayi* well into the range of undoubted *L. canadense*?

Among the lilies of eastern North America, *Lilium canadense* and *L. grayi* have long been considered to be most closely related. When Sereno Watson named *L. grayi* in 1879, Asa Gray himself expressed doubts that it represented a species distinct from *L. canadense*. If they shared a common ancestor, then the interaction of these two species in southwestern Virginia is an example of what is sometimes called reticulate evolution: the phenomenon in which an ancestral species diversifies into two or more species (perhaps geographically separated), only to merge into a single species in the future when the formerly separated populations meet again.

So, if you have considered the possibilities sketched out above, you will understand why I called my lily simply *Lilium canadense*.

In the accompanying image (see page 86) you see it paired with another eastern North American native, *Delphinium exaltatum*. They make a handsome couple, don't they?



*Lilium columbianum* in seed towers above its rhizomatous companion, *Prosartes hookeri* and *inset*, shown in flower.

## Good companions: *Prosartes* and *Streptopus*

*Paige Woodward* feels that *Streptopus* and *Prosartes*, both members of *Liliaceae*, deserve to be more widely known and grown. In the following article she extols their virtues.

True lilies have long found good companions in their frond-like, rhizomatous cousins: *Polygonatum*, *Uvularia*, *Maianthemum* and so on. I'd like to suggest why frondy companions work so well and then spotlight a couple of other rhizomatous genera—*Prosartes* and *Streptopus*—whose representatives in western North America deserve to be more widely grown.

Of course it helps to choose companion plants with similar needs in the first place. Light, pH: Bring on the variables. But beyond what we gardeners decide, plants have their own tactics. Many groups, including true lilies and their cousins, can share nutrients and water through several related fungi linking their roots, a form of mutual aid called mycorrhiza. Achieving such underground connections with each other, and sometimes with other plants nearby, is one definition of a transplant's settling in.





*Above, Prosartes hookeri* two year old seedlings en masse.

*Below, P. hookeri* fruits.



Rhododendrons, so often planted with true lilies, have fungal associations very different from those of lilies, by the way, as do some other groups of plants. This makes it harder to be allies from the ground up.

On the rainswept mountain in southwestern British Columbia where I garden with my mother, the case for fronds is circumstantial but persuasive. *Lilium columbianum*, the western tiger-lily, still grows wild here, along with *Trillium ovatum*, *Clintonia uniflora*, *Fritillaria affinis*, *Prosartes (Disporum) hookeri* and three species of *Maianthemum*: *dilatatum*, *racemosum* and *stellatum*, the latter two sometimes still called *Smilacina*. *Erythronium oregonum* and *E. revolutum*, native close by, are naturalizing amid the trilliums.

All these plants sort themselves according to their needs. Swathes of one species grade into swathes of another.

Rising from this liliaceous salad, scattered stems of *L. columbianum* bloom on every hillside, 8ft (2.5m) tall in full sun, 3ft (1m) tall in shade.

But some of these companion plants are ephemeral. *Erythronium* and *Trillium* are beautiful, we rejoice in them, and just when *Lilium* is far enough along to need shade at its foot, they're gone.

Frond-like genera, on the other hand, tend to last from spring till frost. They may even shade the space above sleeping ephemerals. (This is also a move to take over, but since the roots often settle at different levels in the soil, and the soil is rich, and I am busy, I seldom interfere.) Fronds make good companions for *L. columbianum* and, it is turning out, for all the other lilies in our garden.

Now on to the companions I'm promoting: *Prosartes* and *Streptopus*. Both genera make handsome garden specimens on their own. But as companions, I recommend *P. hookeri* for most lilies and *S. amplexifolius* and *S. lanceolatus* for martagons and a few other shade lovers, such as *L. auratum* and *L. japonicum*.

*Prosartes*, or Fairy Bells, always branches, and it flowers only at the ends of those branches. Its name (Greek "fastened") apparently refers to how its fruits



**Above**, *Prosartes hookeri* rivals 'Molly the Witch' (*Paeonia daurica* subsp. *mlokosewitschii*) in height.



*Streptopus amplexifolius*

*Streptopus lanceolatus* flowers.

and flowers dangle. *Streptopus*, or Twisted-stalk, may branch or not, depending on the species, but its flowers and fruits all hang down its stems.

*Prosartes* contains the five North American species once treated as *Disporum* section *Prosartes*; *Disporum* is now a purely Asian genus. The differences that justify the split are “micromorphological, karyological, phytochemical and phylogenetic,” to quote the *Flora of China*. Invisible to the naked eye, in other words. But these differences are currently seen as enough to put the two in different families: *Prosartes* in Liliaceae, *Disporum* in Asparagaceae with, as it happens, *Streptopus*. (That’s what Kew’s Plant List: [www.theplantlist.org](http://www.theplantlist.org) said as I finished these notes. If you don’t like the taxonomical weather, wait a while. Or as my friend the botanist Adolf Ceska is fond of saying, “Plants don’t care what we call them.”)

Three of the five *Prosartes* are broadly similar in appearance, with white bell flowers dangling below their drip-tips in spring and scarlet berries in late summer. I have grown all three.

*Prosartes bookeri*, robust, beautiful and by far the easiest to grow, in my experience, is named for the botanist William Jackson Hooker (1785-1865), first director of the Royal Botanic Gardens, Kew, and father of the even more celebrated botanist Joseph Dalton Hooker.

In the wild it prefers moist, low-elevation woods and forest edges from BC and Alberta south to California and Montana. In our garden it frequently attains shrub-like dimensions, thriving not just in open sun and rich humus, but in damp, shaded clay and even in dry shade under maples.

Dwarfs and other interesting variations of *P. bookeri* have been noted. In the Siskiyou Range, in Oregon, a few years ago I saw a condensed form with red stems that I wish we had in our gardens.



*Streptopus amplexifolius* fruits showing kinked peduncles.

*Prosartes smithii* is named for James Edward Smith (1759-1828), botanist and first president of the Linnean Society in London. It is fairly uncommon, native to moist, dappled forests at low elevations west of the Cascade Range from BC to northern California. Its long, narrow white flowers flare only slightly, near the mouth, so that the stamens are scarcely visible. Unusual in *Prosartes*, the stems and leaves are essentially hairless.

*Prosartes trachycarpa* (“rough-fruited”) has berries covered with tiny bumps. Otherwise resembling *P. bookeri*, but more condensed, leathery and hairy, it is native to rich, moist forests, both deciduous and coniferous, in the western interior of North America from Alberta to Manitoba and south to New Mexico.

The other two *Prosartes* are native to eastern North America; they are beautiful but I know much less about them.

*Prosartes lanuginosa* (“woolly, downy”), or Yellow Mandarin, has red berries but pale green, often spidery-looking flowers. It grows mainly in the Appalachian and Ozark mountains, though its range extends just into Ontario. It prefers damp,



*Above, Streptopus amplexifolius, Lysichiton americanum.*



*Left, Streptopus streptopoides in fruit in a trough.*

rich soil in deciduous forests at low elevations. I have never grown it, though I'd like to.

*Prosartes maculata* ("spotted"), or Nodding Mandarin, has larger, more open, cream flowers speckled with purple, and pale yellow fruits. It is difficult to grow outside its narrow, mainly Appalachian range because it requires duff of mature, ancient deciduous forests. I have lost it several times.

*Streptopus* was named from the Greek *streptos*, "twisted" and *pous*, "foot". Sounds like "sprained ankle" but in fact the name alludes to the kinked, wiry

stemlets – peduncles – that dangle this plant’s lovely fruits before the creatures who will devour, distribute or at least photograph them.

There may be 10 *Streptopus* species, give or take a taxon in Asia. They all look broadly similar and dwell in wet, temperate climates (I was taken aback recently to learn of *S. chatterjeeanus*, S. Dasgupta 2003, described from the Himalaya, but it turns out to grow at rainy elevations).

In North America there are just three *Streptopus* species, all easy to grow, in my experience.

*Streptopus lanceolatus* (“lance-leaved”, formerly *S. roseus*) is the only species with pink flowers, and quite variable. Its berries ripen red to purple and it may branch or not. Widespread in the northeast and in the far west, it prefers moist, lower-elevation woods. On montane trails Near Whistler, BC, several beautiful color forms of this species occur. I keep meaning to go back there and select not only for color but for height and branching pattern.

*Streptopus amplexifolius* (“clasping-leaved”) is just as variable, with many forms worth selecting. Its flowers are green to beige with red markings, its berries ripen to purple-black and it always branches. Common in much of the east and west, its range excludes the centre of the continent and the southern United States.

*Streptopus amplexifolius* in our garden grows perhaps 18in (50cm) tall. On the west coast of Vancouver Island, in damp old forest along the Clanninick River, it attains a similar height. In a wetland in the very rainy Columbia Mountains, however, near Revelstoke, BC, I was astounded to see crowds of *amplexifolius* towering above stupendous, 5ft (150cm) skunk cabbages (*Lysichiton americanum*). Again, as a service to horticulture, I simply must go back.

*Streptopus streptopoides* (“Streptopus-like indeed”) is a charming, unbranched creeper, usually shorter than your thumb though occasionally it bolts to 8in (20cm). It has red berries and small, wine-and-green flowers that resemble flattened turbans. Var. *streptopoides*, with hairless leaf margins, grows in scattered, damp coniferous sites in an arc from BC through Alaska to Siberia and northern Japan; var. *japonicus*, with hairs on its leaf margins, is native to northern and central Honshu, Japan’s main island. I have grown var. *streptopoides* in a trough with rock plants, but it should do well with rain loving lilies and frits too. For scale, I think I’ll try the dwarf form of *Fritillaria camschatcensis*.

This was a bad year for seed of *Streptopus amplexifolius*, but I’m sending lots of seeds of *Prosartes bookeri* to the lily-group exchange. Watch for them.



*Lilium mackliniae*

## A guide to basic lily growing (for those who love lilies)

*In this article **Harris Howland** shares his experience of growing lilies through a practical guide to growing his favourite plants.*

It became apparent when talking to Lily Group members, and others, at the September 2010 RHS Wisley Flower Show, that these lily growers were looking for basic information to help them cultivate lilies more successfully. The following information, which could be described as a general purpose guide to lily cultivation, is my response to their requests.

Before we start, please note that lilies grow in the wild in many different conditions in the northern hemisphere (none originate in the southern hemisphere) with some species requiring very special conditions and attention. However, luckily, very many lilies, particularly hybrids and some species, are quite happy to grow in the open garden.

To begin at the beginning... the preferred time for planting lily bulbs is the autumn. Lily stems are dying down and the bulbs enter a period of semi-dormancy, but, unlike many bulbs, lily bulbs are not totally dormant, so they will be conserving their energy and establishing their root system in preparation for growth in the

spring. A note of caution when purchasing new bulbs: many commercial lily bulb suppliers list their lily bulbs for spring planting. This is not the best time, but it may not be possible to avoid planting then. It would, however, be wise to give these late purchases a little extra tender loving care, at least initially.

### **Planting**

The old adage is still true when seeking a good planting position—feet in the shade—head in the sun. Lilies require a cool root run with good drainage, the latter probably the single most important point to successful lily growing. A site amongst other plants is recommended as they will provide the shade for the roots and use the moisture from the ground. The lilies will grow above them and so be in the sun. Dig out the site making sure not to create a sump—a hole with clay in the bottom which will restrict drainage and thus hasten the end of many a fine lily. Fill the hole with compost or peat (dare that word be mentioned!). Fine grit and leaf mould are also beneficial. Never use animal manure! As I feed, I tend to use slow release granules at planting, but a liquid tomato fertiliser, e.g. Tomarite, during the growing period. (A word of caution—in my experience bonemeal attracts foxes to dig up the bulbs to get at the bonemeal.) It is also advantageous to dust or dip your bulbs in a fungicide before planting. Plant your bulbs so that there is approximately 10 cm (4 inches in old money) between bulb tip and soil surface. The only exception to this is *L. candidum* which should be planted with its ‘nose’ barely under the surface. Next mark the site! Lily stems just under the surface do not take kindly to having a size nine on their heads – or indeed any other size!

### **Watering and Feeding**

Spring, when the lily stems are just beginning to emerge, is the time lilies will require watering and feeding and this should continue throughout the growing period. A regular feed of a liquid fertiliser is recommended. Many lilies can grow quite tall so may require staking, particularly if your garden is sited in a windy ‘neck of the woods’. Hopefully your lilies will now grow happily and give wonderful blooms and perhaps an exquisite perfume.

I do not intend to explore pollination or seed production until later in this article. However, if your stems do develop seed capsules, after flowering, keep only two capsules if you want seed. Producing seed uses up energy, so allowing more than two capsules to develop could deplete the strength of your bulb. You should aim, therefore, to direct as much of the plant’s energy, as you can, back into the bulb for next year. This also applies when cutting flower stems. Cut only up to one third of the stem and never cut the entire stem until it has died right down and turned brown. Then the stem should be cut off as low as possible. Remember to burn everything you cut off, as this helps to keep viruses at bay.





A Ryirube hybrid



*Lilium primulinum*

### **Growing Lilies in Pots**

Lilies do lend themselves to pot culture, but be aware that lilies require a cool root run, i.e. feet in the shade, and pot culture does tend to produce higher compost temperatures. One way to avoid this problem, particularly for outdoor growing, is to grow hostas in pots and employ the hosta leaves to shade your lily pots.

I prefer Long Tom Pots, because I believe I can place the bulb high in the compost where it tends to be drier, but its roots can probe down for moisture. This brings us to the 'clay or plastic' debate. I prefer clay. However, clay pots are more expensive, heavier and require more watering. On the other hand they do allow the transition of moisture through the clay, which creates a temperature drop and therefore a cooler root run. Plastic pots are the opposite, i.e. they are cheaper, lighter and do not require as much watering as clay pots.

### **Pests and Control**

Lilies are not without their problems, the worst of these is the dreaded lily beetle (*Lilioceris lili*).

Lily beetles spend the winter in the soil and extra vigilance is required in the spring when they emerge. It is then they can be caught, crushed or sprayed. They are easier to catch early in the season and early in the morning when they climb up the lily stems to sun themselves before flying off.

Spraying is a more sure way of getting the little critters. The aerosol spray Provado is very effective. Provado is also available as a water soluble preparation, which can be applied to the lily plant and around its base, thus killing the beetles in the ground and being absorbed by the plant. This keeps the beetles and their sticky black grubs off your lilies. However care must be taken where bees may be present.

The Vine weevil (*Otiiorhynchus sulcatus*) is another pest that can give problems, mainly in pots and greenhouses. Therefore, a solution of Provado, in water, applied in spring and autumn should be used to control this pest. There is also an effective biological control available.



*Lilium majoense*



A Richard Hyde hybrid, 'Kushi Maya'

### **Diseases**

*Botrytis elliptica*, is a fungus that forms elliptical spots initially, and mainly, on the leaves. This disease is usually present in close humid conditions. Fortunately, the air is generally buoyant where I live, so *Botrytis* is less of a problem for me/my lilies. In my experience the fungicide Rovral deals with *Botrytis* effectively. Other growers use alternative fungicides to treat *Botrytis*.

### **Pollination**

Why do we pollinate or cross pollinate lilies? I have been careful to say cross pollinate not hybridize. This is because in some cases we are looking for pollen of a species. This will involve using the pollen from one lily with another lily, usually a species, to produce seed of that species. Several Lily Group members have been advocating cross-pollinating as a conservation measure to increase the numbers of species lilies, by increasing the availability of their seed through the Lily Group Seed List. This measure could enhance and extend the range of species lily seed offered and that, in turn, could increase the value of the Seed List, which is already the Lily Group's main source of income.

Some lily growers confine their activities to growing and propagating species lilies. Then there are those among us whose approach is, if it is a lily we will try and grow it. However when it comes to hybridizing one cannot be sure what one is going to get, which for some of us is part of the attraction. Now, I am particularly interested in the trumpet lilies and their perfume, but unfortunately many of the trumpets of the flower are held in an umbel, i.e. all the pedicels adjoining the main stem are in the same place which detracts from their attractiveness. However, while pursuing a well-spaced inflorescence I am still aware of the importance of colour, shape and strength.

A further line of hybridizing I am pursuing is with some of the American lilies, particularly the West Coast species. Much of my work on these lilies centres around *L. pardalinum* var. *giganteum*. The reason for this is that it is a robust

lily and does well in my garden. I am trying to introduce different colours but with the strength of *L. pardalinum* var. *giganteum*. If you are going to hybridize plan a certain goal. But also remember lilies are fickle and you are never sure what you are going to get!

I will always remember a lovely misquote by Dr Arthur Evans when I attended the NALS Lily Conference in 2000. He said to me that when you begin hybridizing remember you will have to kiss a lot of frogs before you get the princess.



*Lilium leichtlinii*

### **Producing seed**

Growing lilies from seed is the much preferred method of producing lilies, as seed does not transmit any diseases carried by the parent plant.

### **The Structure of the Lily Flower**

To understand seed production we must first consider the structure of the lily flower and pollination. The lily flower is made up of three true petals and three sepals, which lie immediately behind the petals. The petals and sepals may be referred to as tepals or as perianth segments. In botanical terms an ovary in front of the petals is known as superior, unlike the daffodil ovary which is behind the petals. Rising out of the ovary is the style and on the end of the style is the club-like stigma. These are all the female parts of the plant or the receptors. Around the base of the ovary are six filaments that carry the anthers which in turn carry the pollen. These are all the male parts. As the flower opens the anthers also open and become hinged allowing the pollen to dry and ripen.

### **Methods of Pollination Collection and Transfer**

The transfer of pollen from one lily flower to another will hopefully create seed. Producing seed from a species lily, where both flowers are of similar size, should not present problems.

When transferring pollen I prefer to use a pair of tweezers which are easier to clean after applications. Many books recommend a brush but this method requires many brushes or a lot of cleaning. I remove the whole anther and wipe this over the stigma and, if necessary, I use more than one anther. Then I carefully

wipe the tweezers on a tissue.

The stigma of the lily to receive pollen should be covered by a shield made by rolling kitchen foil round the end of a pencil, or something a little larger in the case of some trumpet and oriental lilies, which have very large stigmas. The end of the foil tube should be flattened and the tube placed over the stigma, the other end of the tube being gently pressed around the style. This is to protect against contamination from unwanted pollen before the desired pollination takes place. Some pollen dabbers completely emasculate the lily to be pollinated, cutting off the petals, filaments and anthers before it has



'Peggy' North

opened. This does create easier access and all that is required is for the shield to be removed and the pollen applied to the stigma and the shield replaced. Where one is attempting to create a hybrid a little more attention to size may be required. When the pollen is applied to the stigma a microscopic filament travels along the style to the ovary. If the seed parent has a longer style than the pollen parent then the filament may not reach the ovary. So try to select similar size parents or one may have to adopt the cut style technique. This involves cutting the length of the style to suit the pollen parent's size. Make the cut with a scalpel so that the cut is at an angle with the cut area facing upwards. This not only gives a larger surface but also an easier area to apply pollen. It can also be beneficial to apply the sticky secretions from a clean uncontaminated stigma of another lily. Trumpet lilies produce a lot of this fluid. However this is going to extremes which hopefully you will not have to resort to.

A further aid to successful pollination is raised temperature, so if at all possible move the lilies into a greenhouse for cross pollination. Or choose good weather, which is easier said than done. Remember to keep all pollinations covered before and after executing.

Hopefully your pollinations will be successful and your lily seed pods swell with ripe seed. Keep your eye on the pods. An indication of ripe seed is little slits appearing at the top of the pod which can then be harvested. Harvested pods do not have to be opened immediately. The seed will continue to ripen if left in a warm dry environment. Do keep a watch on any pods left on the plants, as I have experienced Blue Tits stealing the seed from pods—little darlings!

### Lily seed

Lily seed is transparent and is very roughly ovate. The individual seeds are comprised of three elements:

1. the outer section or wing
2. the inner section or endosperm
3. the embryo

The endosperm is the food package that sees the embryo through germination. The embryo is the little squiggly line sitting in the endosperm. These elements can be clearly seen if the seed is held up to the light or alternatively by placing the seed on a thin plain piece of white paper held over a torch. This process is also used for checking the viability of seed before sending to the Lily Group seed list. This process is called 'candling' because originally a candle light was used.

When listing hybrid seed the seed parent always comes first followed by the pollen parent. So we have: 'A' the lily from which the seed derived × 'B' the lily which provided the pollen.

Now that we have bred ourselves loads of viable seeds the next step is to sow them. The method I employ, when sowing lily seed, is to use a proprietary potting compost and very fine grit. Having filled a pot almost to the rim, I then distribute the seed and cover said with a thin layer of compost and cover that with a thin layer of fine grit. Then I water the pot and keep my fingers crossed.

### **Lily Propagation using vegetative means**

The propagation of lilies can be achieved by sowing seed or by vegetative means. Vegetative propagation for the amateur involves the use of one or all of the following:

1. Stem bulbils
2. Bulblets
3. Scaling

There are other methods, such as micro-propagation, whereby lily bulb scales are cut into many small cubes and individually placed in test tubes on an agar growing medium to develop into larger lily bulbs. This requires strict sterile conditions only suitable for the laboratory. All these vegetative methods of propagation produce material that is identical to the parent lily bulb. This includes any defects and diseases eg. virus.

There are currently available, from commercial sources probably originating in Holland, lily bulbs that have been raised using micro-propagation methods but,

whilst providing good garden plants, in all probability they will not cross with each other. They will probably cross with a different type of lily which would of course create a hybrid. However, if one wishes to cross these micro-propagated bulbs one may have to try two different sources so that with a bit of luck one acquires material from different micro-propagated batches. I did exactly that when in 2010 I acquired some bulbs of *L. parryi*. I knew these to be micro-propagated and unlikely to produce seed. So I acquired some bulbs from another source and used the pollen from the first purchase on the flowers of the second purchase. This did the trick and I got the seed I wanted.

**1. Stem bulbils** Using stem bulbils is probably the easiest method for increasing your lilies. Stem bulbils form in the axil, where the leaf joins the main stem. Some bulbils will even develop roots while still attached to the parent plant. Bulbils can be carefully removed and potted up to be grown into mature bulbs. *L. lancifolium* (formerly *L. tigrinum*), *L. sargentiae* and *L. sulphureum* are three species lilies that produce stem bulbils.

**2. Bulblets** These are small bulbs produced on or below the surface of the ground on the parent plant. They are usually larger than stem bulbils and usually have roots from a small size. More care is required when removing these but they can be potted on to grow to maturity.

**3. Scaling** This involves carefully removing a scale from the parent bulb and attempting to break it off as near as possible to the base plate of the bulb. The scales are then placed in a plastic bag. A common sandwich bag is ideal for this purpose.

The plastic is very thin and it does permit the passage of some air. A handful of vermiculite is placed in the bag and very slightly moistened—but not made too wet! The scales are then placed in the vermiculite. It is advisable to lightly dust the scales with a fungicide before placing in the bag. The bag can then be sealed and placed in an airing cupboard. Keep a regular check on the scales and hopefully you will see small white bulbs forming along the bottom edge where the scale was broken off from the base plate. When they develop into a manageable size they can be potted up.

### **Concluding remark**

Undoubtedly, some seasoned lily growers will approach the cultivation of lilies using different methods from those outlined in this guide. However, the less experienced lily grower should find sufficient guidance to enable them to achieve a greater measure of success when growing lilies.



Mike Kune and Wade Hall (*right*) scout for lilies.

## Recovery of the Sandhills lily – *Lilium pyrophilum*

*In his article **Johnny Randall** writes about the steps being taken to both protect and conserve *Lilium pyrophilum*, a recently recognised new American species.*

Thanks to the generous North American Lily Society (NALS) Research Trust Fund grant, we are rounding the bend in our first year of Sandhills lily recovery work. Recovery in this sense means that we are striving to determine if we can create substantial populations that can buffer the negative effects of inbreeding and that can produce enough seeds for natural regeneration. Another important part of our project is to collect and store seeds from all known populations. The long-term storage of seeds off-site (ex situ conservation) provides insurance against extinction in the wild and can provide a seed resource for scientific research for those who might do legitimate on-site (in situ) restoration.

But before I go any further—first some background. The Sandhills lily, *Lilium pyrophilum*, is only a recently recognized species that was described by Skinner and Sorrie in 2002. This lily species has masqueraded until now as the Carolina lily (*L. michauxii*), but according to genetic analyses it is most closely related to the turk's-cap lily (*L. superbum*) of the mountains. We at the North Carolina Botanical

Garden (NCBG) are not the only ones interested in this species. Phylogeographic studies—those that analyze the various factors that have shaped Sandhills lily distribution coupled with genetic relationships with close relatives—are under way in addition to those analyzing demographic features (e.g., size, growth, density, and age distribution).

The Sandhills lily is also a narrow endemic, as it is only known from 42 sites in 17 counties in the Sandhills region of southern Virginia, North Carolina, and northern South Carolina, with most populations containing fewer than 10 individuals. Its habitat preference is not fully understood, but most populations occur within the longleaf pine ecosystem in sandy, wet to dry semi-open habitats associated with the heads of streams, in seeps, swampy streams, and in wet utility rights-of-way (that are probably tolerated rather than being a preferred habitat).

As its scientific name implies, *L. pyrophilum* is “fire-loving.” Like many fire dependent plants throughout the US, it has remarkably found refuge within the bombing ranges of military bases where fires are common. And because it has only recently been officially recognized, it is not listed as a federally endangered species, although it is state-listed as endangered and is considered “globally imperiled.”

For our recovery study, we proposed to: 1. collect and store seeds from all known populations in VA, NC, and SC; 2. establish or confirm seed germination and bud scale propagation protocols; 3. identify pollinators and pollination effectiveness in natural populations; and 4. increase the number of individuals within small populations by augmenting select natural populations with seedlings and bulb scale derived plantlets.

Progress toward our goals to-date includes the collection of 2771 seeds from 6 populations (8 sites). A portion (1106 seeds or 39%) of these were desiccated to 18% relative humidity, sealed in airtight foil envelopes, and stored at -180°C. Seeds not stored were either planted directly into two existing population or pretreated using North American Lily Society (NALS) germination protocols for lilies with hypogeal germination. The collections at all sites followed a conservative protocol to minimize damage caused by over collection at any one particular site. In the fall of 2008, a total of 16 populations were visited for seed collection. No collection was made at ten of the populations for one or more of the following reasons: herbivory of flowers or seed capsules, aborted/malformed capsules, seeds already dispersed/too few seeds for a conservative collection, or unable to attain permission to access private property.

On November 6, 2008, we planted 700 seeds at three different natural populations: 2 plots of 100 seeds each at North Carolina Plant Conservation Program (NCPCP) Eastwood Preserve, 2 plots of 100 seeds each at the Ft. Bragg Military Reservation small stream swamp, and 3 plots of 100 seeds each at the Weymouth Woods State Park. Seed plots were established using a 1m<sup>2</sup> frame





*Lilium pyrophilum* bulbs.

divided into 10cm<sup>2</sup> cells, where one seed was planted in the center of each cell. Each corner of the frame was marked so that we can precisely monitor each seed for germination, survivorship, and growth. The seeds were sown in situ during the fall to mimic the conditions when *L. pyrophilum* seeds are naturally distributed.

In the winter of 2008, we began the germination of 965 seeds following NALS seed germination protocol. Progress is being made, but we are unable to report on statistics due to the slow hypogeal germination of Sandhills lily seeds. Our protocol uses sphagnum-filled plastic jars instead of bags and we hope that the separation of the developing bulb/roots from the sphagnum is not problematic.

In the summer of 2009, these seedlings will be transferred to individual growing cells and placed in our shade house. When fully established in the growing cells, 700 of the seedlings will be planted into the same three populations, as were the seeds (also using the 1m<sup>2</sup> frame method). This seed/seedling comparison study will be closely monitored to determine which method is most effective, but also noting which of these is most time and labor efficient.

In March 2009, we collected (with landowner permission) three whole plants from a site that is due to be impacted from construction. From these three plants, we were able to divide 210 bulb scales for the comparison of bulb scale propagation. The scales were sorted into size classes of small, medium and large for further comparison of success and were stored cold on moist peat prior to planting. One-

half of the scales, randomly selected from all size classes, were planted directly in a natural population approximately one mile from the parent population within one week of initial harvesting. The other half of the scales were placed in sphagnum-filled plastic bags following NALS protocols and are currently being cold stratified. And although there are no final data to



*Lilium pyrophilum*

report, many of the scales have formed bulbs. The new bulbs will be placed in pots and transferred to our shade house. We will plant bulb scale-derived plantlets after one season's growth into the same site as the directly planted bulb scales.

In order to help ensure that our augmentation work has the greatest chance to succeed, all of our research sites are located in permanently protected areas that receive regular fire management. Fire-managed areas are also less likely to contain invasive plant, pathogen, and pest species such as the Red Lily Beetle. But predation by deer and poaching are always potential problems when working with plants that have tasty buds and foliage or are valuable in the horticulture trade.

In addition to the aforementioned activities, in 2009, we will continue to visit populations to assess and collect seeds. We will also visit all seven seed plots, the bulb scale plots and begin/continue pollinator observations.

This once obscure species is already in the early stages of recovery thanks to those who recognize that the loss of a lily species is unacceptable. And we at NCBG feel confidence from our early success with seed germination and bulb scale growth that our augmentation project will enable the Sandhills lily to thrive in its natural habitat. So stay tuned for updates on our project.

### **Acknowledgements**

First and foremost, we thank the North American Lily Society for supporting our recovery project. We also thank NC Plant Conservation Program, Weymoth Woods State Park, Ft. Bragg Military Reservation/DoD, Moore Co. Board of Education, NC Wildlife Resources Commission, and private landowners for permission to visit populations, collect material, and establish research plots.

### **Footnote**

This article was first published in the North American Lily Society (NALS) Quarterly Bulletin (September 1, 2009) and is reprinted here by kind permission of NALS.



## In search of *Lilium ledebourii*

*Information about Lilium ledebourii growing in the wild is quite rare, so this article by **Mohammad Sadegh** provides a useful update on this lovely lily's habitat and status.*

### **Background**

*Lilium* Species are a valued part of the *Lilium* world and their cultivation is one of the main projects for experts in many countries. One reason *Lilium* species are important is because in some countries they are rare and endangered. This makes obtaining information about the cultivation and propagation of such species essential to any project that aims to conserve these lilies to keep their wild nature beautiful and alive for people in future.

*Lilium ledebourii* is one of the rare and endangered species of *Lilium*. This species is a diploid ( $2n=24$ ) and is generally classified in the *candidum* section of lilies and is a relative of the other species in that section, e.g. *L. monadelphum*, *L. ponticum* and *L. pomponium*. However, further studies are needed to find all of the closely related species of *Lilium ledebourii*.

*Lilium ledebourii* grows in some areas of north and north west Iran and also in the south of the Azerbaijan Republic. The north west of Iran (Ardabil Province) and the south of the Azerbaijan Republic are partners in hosting forests for the protection of *Lilium ledebourii*. The climatic conditions in the north of Iran are



The beauty of *Lilium ledebourii*.



A bulb and scales of *Lilium ledebourii*.

similar to those in the south of the Azerbaijan Republic, with cold winters. However, the growing zone in the north of Iran is not very close to the *Lilium ledebourii* growing zone in Ardabil Province. *Lilium ledebourii* has not been cultivated yet, in different parts of Iran, and is still endangered and protected, because of forest destruction.

Some research about the micropropagation of *Lilium ledebourii* has been done, but not published. Therefore, little public information about cultivating this species is available. In my online research, about this species, I found that it is not easy to cultivate for ordinary gardeners, but I have not found the reason for this. My main goal is to cultivate *Lilium ledebourii* in different conditions and in different states of Iran by propagating this species with a clean and disease free technique like Tissue Culture.

Visiting the natural habit of *Lilium ledebourii* (a species that is difficult to grow) could provide information about how to cultivate it by establishing what its requirements are; that is why I decided to do it. With this plan in mind, I approached my colleague, in our Agricultural Organization, and asked him to accompany me to a forested area in the hope of finding this species growing in its natural habitat. An important aim of our visit was to obtain some seeds and bulbs for propagation purposes. Unfortunately, we did not find any flowering lilies, as it was too late in the season (we visited the area in late summer), but we did find some black and dried stems and one seed capsule full of seeds. This visit was very short, because these forests contain wild animals such as bear, boar and wolves, but the trip made it worth accepting these potential difficulties.

I should stress that the forest we entered is protected, i.e. under the control of the forestry service, but we were authorized to take a few bulbs from the forest, enough to achieve our goal.

In its natural habitat, *Lilium ledebourii* lives under trees. In the forest we visited all of the trees were short and they formed a dense cover, which made it



*Lilium ledebourii* seeds.



A growing seed of *Lilium ledebourii*.

difficult to see what was under them. This made finding lilies, or evidence of lilies, very difficult. The top soil around the main stems of the trees is made of decayed leaves and grasses and is very well drained, like cocopeat wool or peatmoss wool, and the underground soil is heavy and tangled with the roots of trees.

The bulbs occur at quite a shallow depth, i.e. about 5cm deep, in heavy soil. This is overlaid with about 10cm of a top soil/mulch of decayed leaves and grasses. My colleague and I found several bulbs, of good size, under the trees and dug up nine bulbs in total. The bulbs had thin scales which were clean and white with no signs of disease. We were surprised that no underground stem bulblets were found around the mature bulbs. Each bulb was growing in its own location with some distance separating each bulb. This suggests the bulbs grew from seed, i.e. were not asexually propagated. The absence of stem bulblets would also point to seed as the source of natural propagation. The seed capsules we found were black and wet (because of rainy weather). The capsules contained about 100 seeds with good embryos and only a little chaff. The seed germination, of *Lilium ledebourii*, is delayed hypogeal.

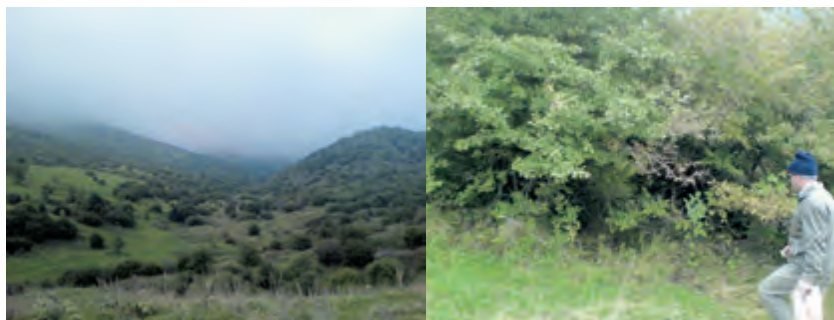
**Note:**

Different conditions may induce plants to do something they don't do naturally, so *Lilium ledebourii* may be able to produce stem bulblets in different growing conditions. Hence, further research is needed to learn more about the ways in which this species propagates itself (in cultivation and in nature).

**The climatic conditions in which *Lilium ledebourii* grows**

The climate in *Lilium ledebourii*'s natural habitat is as follows:

- spring conditions vary, i.e. it can be cold, cool and wet, or dry;
- summer months are very dry;
- autumn can be cool or cold and, depending on rainfall, may be wet or dry;



Habitat of *Lilium ledebourii*.

- winter is either cold or very cold, with snow cover of one to two metres, but the covering of trees protects the lily bulbs from very heavy snow.

### **The natural habitat of *Lilium ledebourii***

*Lilium ledebourii* grows in forests under a covering of short trees. The possible reasons for this lily occurring in this type of habitat are as follows:

- All *Lilium ledebourii* plants are seed grown and seeds need a humid and shaded location that protects them from direct sunlight and also enables them to germinate and short trees provide these conditions for *Lilium* seeds to germinate.
- *Lilium ledebourii* needs a shaded location and can't survive in direct hot sunlight, except at high altitude, i.e. 1000m above sea level.
- Wild animals, e.g. boar, eat their bulbs or damage plants when *Lilium* grow in exposed, unprotected areas.
- *Lilium ledebourii* is not heat tolerant during the hot summer outside the forest.

Cultivating *Lilium ledebourii* in gardens should provide more information about the conditions this lily prefers.

### **Concluding remarks**

The reason for writing this article has been to provide readers with information about a rare and exceptional lily, *Lilium ledebourii*, which grows in Ardabil province, in north west Iran, and only a few other places. By describing the conditions this lily prefers I hope readers will be able to grow it, so they can admire its beauty and help to keep it in cultivation around the world.





*Lilium parryi*

## Lilies in kodachrome

*In this age of digital images **Pontus Wallstén** recounts the sad demise of kodachrome, which many camera users considered to be unparalleled in producing the perfect colour photograph.*

In June 2009, Kodak announced the end of kodachrome, after over seventy years in production. Renowned for its sharp, highly saturated colours, and pastel tones, and used by famous photographers from all around the world, notably for *National Geographic* magazine, kodachrome had come to an end.

The fantastic colour rendition and other complex colour layers of the film gave it unique properties, unequalled by any other colour film ever made. However, the photographic quality it produced was at a cost. To produce this film was not cheap, and in recent years, with the arrival of digital photography, film sales had dropped dramatically, and kodachrome only accounted for a few percent of Kodak's sales. Therefore, Kodak decided to cease production of this unique film. Film was still available in a few specialist camera shops, and later on, from professional photographers as well as through eBay and other websites. *Dwayne's Photo* in Kansas still processed the film until the end of 2010. This meant that I was able to use kodachrome for a year and a half before it was totally gone.

To find people who would pose for me in colourful clothes and other similar





*Lilium duchartrei*



*Lilium nepalense*

situations was not an easy task, as I quickly realised! However, the summer of 2010 would, as I was to discover, provide me with the perfect target for my rolls of K64 and K25 (the two main variants of kodachrome still available), and the targets could not have been more colourful and more graceful! They were of course my lilies! Realising that kodachrome rolls were becoming scarce, by May 2010, I quickly stocked up on a number of rolls before summer, thus ensuring I would have enough to spare for a few pictures, per film, of my lilies. I was considering the possibility of an article with some pictures for the next issue of *Lilies and Related Plants*. In 2010 my lilies were growing well and it proved to be a good season for some very rare species, which I had not managed to get to flower. These included some Japanese beauties, such as *Lilium japonicum* and *Lilium rubellum*. Also, I finally had flowers, for the first time, on the fabulous *Lilium parryi*, an American species which can be quite hard to grow.

I was also able to do some night photography, under artificial light, of some oriental lilies as well as *Lilium nepalense*. The results of this endeavour turned out to be quite interesting.

As I write, in November 2011, kodachrome has been gone for almost a year; indeed it is almost exactly a year from now since I shot my last kodachrome picture. Kodachrome may be gone, apart from a few rolls here and there in museums and on shelves in the homes of collectors such as myself, but it leaves behind almost a century of unforgettable colour photographs, surely numbered in the millions. I am definitely not the first to have photographed lilies in kodachrome, but who knows, maybe I was the last?..

For more kodachrome pictures and more information about plants, please visit:  
<http://pontus.smugmug.com> and <http://pontuswallstenplants.smugmug.com>

# About the RHS Lily Group

*www.rhslilygroup.org*

The Lily Group is organised under the auspices of the Royal Horticultural Society in order to promote interest in lilies and related plants.

The principal benefits to members of the Group are:

- The **Seed List**. Members of the Group and others, at home and overseas, send their surplus seed from lily species and hybrids, other Liliaceae and many other garden plants and these are offered to members early each year. This distribution has become a major factor in increasing the availability of such plants.
- The **Bulb Auction**. Members' surplus bulbs of lilies and other plants are auctioned in October each year at different venues around the country.
- **Meetings and outings**. Meetings for lectures or discussions are held each year at venues around the country. Outings or week-ends are arranged each year for members to visit gardens of interest to lily enthusiasts.
- **Newsletters**. Three newsletters are distributed to members each year with short articles, correspondence and news of current events in the fields of interest of the Group.
- **Lilies and Related Plants**. Articles on plants, gardens and people associated with the Lily Group appear in a booklet which is published every two years.

Details of the current subscription and any of the above are available from the Group Secretary. See opposite the content page for a list of officers and committee members and key contact details.

- The **Lyttel Lily Cup** is awarded annually by the RHS Council, on the recommendation of the Lily Committee, to a 'person who has done good work in connection with lilies, nomocharis or fritillaries'.
- The **Lily Bowl** is awarded by the Lily Group for the most meritorious single exhibit in a July co-operative display of lilies at an RHS show.
- The **Paul Furse Cup**, first awarded in 1992, for the best fritillary or other plant related to lilies but not of the genus *Lilium* exhibit as part of a Lily Group Co-operative stand at an RHS show.
- The **Voelcker Cup** is awarded to a person in recognition of our international role in promoting lilies.

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# Guidelines for authors

Contributions for publication in the Royal Horticultural Society Lily Group yearbook, *Lilies and Related Plants*, are invited on any aspect of lilies and related plants—growing, cultivation and breeding, species and cultivars, history, people who have made a significant contribution to the subject and nurseries or gardens. Any questions concerning articles can be addressed to the Editor, Alan Mitchell at: [massiec@tiscali.co.uk](mailto:massiec@tiscali.co.uk) or at Hallfield, Star of Markinch, Fife, KY7 6LB, UK; telephone +44 (0)1592 759255.

It is a condition of acceptance that contributions are the original work of the author(s) and that the Editor should be notified if they have been previously published or are under consideration for publication elsewhere. The Editor reserves the right to refuse any contribution and to make minor textual changes without reference to the author.

Contributions can be submitted in any format, hand-written, typescript, double-spaced on one side of the paper, or, preferably on floppy disc or CD-rom, in formats compatible with Windows (Word) or Mac (Quark/InDesign); if in the latter format a hard copy should also be supplied.

High quality illustrations, colour transparencies, prints (in colour or black and white), or A5 high-resolution digital pictures (these should be at least 300 lines, dots or pixels per inch) are welcome. Authors must remember that it is sometimes necessary to print an illustration in black and white at the discretion of the Editor. Maps, diagrams and line drawings are also welcome and should be drawn clearly in black ink within a minimum base line width of 110mm. If artwork and illustrations have previously been published elsewhere or are the property of another, it is the responsibility of the author to obtain any permission needed for reprinting, and to forward a copy of the permission to the Editor. Authors should also be aware that, as the lead-time for an issue can be up to two years, any illustrative material may be in the care of the Editor for a long period of time.

The present Editor's policy is to publish the author's original words as far as possible but should any changes be necessary the author will be consulted. Proofs will not normally be sent for approval prior to publication.

References should be cited in the text referring to a list of references at the end of the article.

Where the Editor considers it necessary he will refer manuscripts to members of the Lily Group Committee for their consideration and advice.

