THE FRITILLARIA GROUP

The Fritillaria Group of the Alpine Garden Society
Journal 32 Spring 2013

Contents Spring 2013

Fritillaria affinis, cover photograph by Bob Charman

THE FRITILLARIA GROUP OF THE ALPINE GARDEN SOCIETY

Spring Meeting and Annual Show,
17 March 2013 at the Hillside Events Centre,
RHS Garden, Wisley, Surrey

PROGRAMME

9.00	Doors Open and Coffee. Plants and Bulbs will be on sale during the day.
10.00	Extraordinary General Meeting
10.30	Speaker: Ian Young "Bulbs in the Garden"
12.00	Lunch Break
14.15	Speaker: Helen Seal "Fritillaries in the Fens: the Cambridge experience"
15.30	Raffle
16.00	End of Meeting

All Visitors Welcome

Photographic display in the Main Hall. Spring Show in the Garden Room.

Membership details are available inside the Main Hall. Subscriptions: £6.00 per annum single membership and £7.00 per annum for family. Two newsletters are published each year in February and August.

Further information can be found on our website www.fritillaria.org.uk

Fritillaria: Commemorative Epithets and Those Who Named Them

Words and images by Brian Mathew

[This article is based on talk to The Fritillaria Group in October 2012.]

In order to have some meaningful arrangement I decided to go for a – at least in part – geographical sequence, starting in the Far East with a well-known species that commemorates Carl Peter Thunberg (1743-1828), a Swedish student of Linnaeus and early traveller/botanist who worked in Leiden. In 1771 Thunberg was commissioned to visit the Dutch colonies and Japan to collect plants. He travelled via South Africa and stayed for 3 years learning Dutch and collecting prolifically. As a result he is now sometimes known as the 'Father of South African botany'. Japan at that time allowed trade with the Dutch East India Company, which was confined to a small island off Nagasaki. That is where Thunberg was based from 1775, accepted by the Japanese as a Dutch trader. He had been ship's surgeon on the journey and contrived to exchange his medical knowledge for plants brought to him by the Japanese. He wrote a Flora Japonica (1784). Much later *Fritillaria thunbergii* was named in his honour by Friedrich Miquel, Director of the Rijksherbarium, Leiden, and there are many other plants named '*thunbergii*'.


Fritillaria thunbergii Miquel 1867

Staying in the Far East, another prominent botanist/plant collector was Carl Maximowicz (1827-1891) who became director of the St Petersburg Botanic Garden. Maximowicz travelled to the eastern provinces of Russia from 1853 onwards and also to China, Korea and Japan in the footsteps of Thunberg. He collected the plant described as *F. maximowiczii* by Freyn in 1903. Maximowicz described many plant species including *F. przewalskii* (1882) and *F. ussuriensis* (1882), the latter named after the Ussuri region and the former after General Nikolai Przewalski. He was another explorer of the region: Ussuri, China, Tibet and Central Asia. On a 3-year expedition (1870-1873) he recorded and collected extensively: some 5000 plant specimens, 3000 insects, 1000 birds and 200 animals including a 'new' horse and a gazelle, both of which were also named after him.

Fritillaria maximowiczii

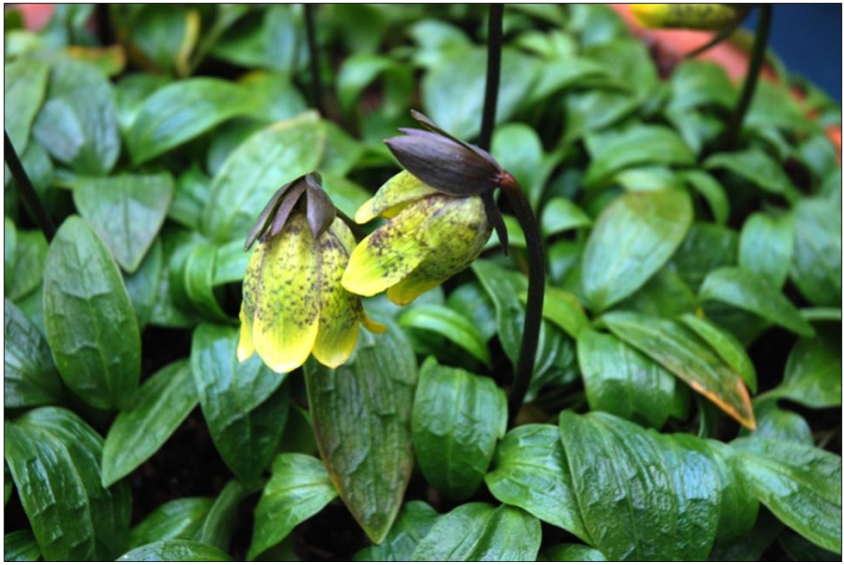
Fritillaria przewalskii

Fritillaria [*japonica* var.] *koidzumiana*

While in the region we should remember the rather later *F. koidzumiana*, named in 1937 by Jisaburu Ohwi after Genichi Koidzumi (b. 1883), a specialist on the Rosaceae and *Acer*. I shall also mention the even more recent *F. ayakoana* (1979), named after the wife – Ayako – of one of the botanists who described it. It is from S. Honshu, a very rare species related to *F. amabilis* but with a different nectary shape.

Fritillaria ayakoana

As we begin our journey westwards, we come to China and the territory of a string of great plant hunters of the 19th century. Here I pick out two, both French missionaries and avid collectors. Armand David (1826-1900) was a naturalist who collected 250 species new to science, often travelling under appalling conditions – for example taking 2 months to travel just part of the way up the Yangtse River and suffering from malaria and typhus. The genus *Davidia* is named after him and *Fritillaria davidii*, perhaps the most distinct of all the species. A contemporary was Jean Marie Delavay (1826-1895) who, although not a naturalist, was encouraged by the botanist Adrien René Franchet to collect for the Museum d'Histoire Naturelle in Paris and amassed some 200,000 specimens which turned out to include 1500 newly



Fritillaria davidii

discovered species. *F. delavayi* – another very distinctive species - was named after him by Franchet. The slightly later explorers of south-western China such as Henry, Wilson, Rock, Farrer and Kingdon-Ward had, in *Fritillaria* terms, been upstaged by the French and missed out on these two unusual species, although they did of course collect and introduce a huge number of other fine plants.

Before leaving the region we must stray to the Himalaya where the widespread *F. cirrhosa* is the most likely to be encountered, replaced in the western part of the chain by *F. roylei*. This commemorates John Forbes Royle (1798-1858), a surgeon working for the British East India Company. Royle studied the medicinal properties of plants and was in charge of the BEI Company's botanical garden. The species which bears his name was described by William Hooker in 1851.

Moving further westwards now into central Asia, we enter bulb-rich country and the realm of the 19th century Russian explorers following the great expansion of the Russian Empire into the region. The story, certainly from the *Fritillaria* angle, centres on St Petersburg Botanical Garden and Eduard Regel (1815-1892). Although of German origin he was involved with the

garden for 40 years, 20 of these as its Director. He was essentially a horticulturist but did much botanical work and described many new species – perhaps as many as 6000. He founded the prestigious journal *Gartenflora* as well as writing a monograph of *Allium*, a feat to be marvelled at! In the genus *Fritillaria* he named and described *F. raddeana*, *F. walujewii* and the genus *Korolkowia* with its species *K. sewerzowii* (now *F. sewerzowii*).

Fritillaria eduardii

Gustav Radde was a German pharmacist who founded the Caucasian Museum in Tbilisi and collected widely in the Caucasus and adjacent regions. Korolkow was a Russian General in Central Asia (several of the plant collectors were military men), while Sewerzow (various transliterations, such as Severtzov) was an explorer who published a book about the Tien Shan. Regel had many plants named after him including the *F. imperialis* relative *F. eduardii* (described by his son Albert) and *F. regelii* which was named later, in 1935 in the Flora URSS. The genus *Eduardoregelia* (related to *Tulipa*) combines both of his names. His botanist son Albert Regel also collected many plants on his travels while a physician on military service in Central Asia and sent them back to his father in St Petersburg. Fortunately a lot of these newly discovered bulbs found their way into cultivation as Regel was in close collaboration with Kew and various notable gardeners and researchers such as Michael Foster, John Baker and Ellen Willmott, as well as nurserymen like the Hoog family of van Tubergen and Max Leichtlin in Germany. *Fritillaria regelii* is sometimes treated as a subspecies of *F. olgae* and this species introduces another Russian botanist, Olga Fedtschenko (1845-1921). She travelled and worked with her son

Boris who became Director of St Petersburg Botanical Garden. Olga did name one species, *F. seravschanica* but never validly published it. Instead of validating this name, the prolific botanist Alexei Vvedensky, a monocot specialist, appears to have changed Olga's temporary epithet to *F. olgae* and formally described it in Boris Fedtschenko's *Flora Turkmenistan* (1932); perhaps this was at the suggestion of Boris in honour of his mum.

Heading westwards again, leaving central Asia we arrive in the rich bulb area of the Caucasus, Iran and Turkey. The flora of the Caucasus is inextricably linked with the name Alexander Grossheim, director of the Botanical Institute in Azerbaijan. He compiled the multi-volume *Flora Kavkaza*, still the essential reference for the region. Grossheim described *F. grandiflora* in 1919, now a subspecies of *F. kotschyana*, and *F. tatianae* about which little seems to be known. Losina-Losinskaya named *F. grossheimiana* in his honour but this is now considered a synonym of *F. crassifolia* subsp. *kurdica*. The Iranian *F. kotschyana* had been named much earlier, in 1844, by Dean William Herbert, one of our greatest 19th century 'monocot'

Fritillaria kotschyana

botanists. Curiously he named only this one fritillaria in spite of being extremely prolific in describing new species. This brings us to Theodore Kotschy, one of the greatest botanical explorers of the mid-late 19th century,

who collected some 300,000 specimens, had many species named after him and described a lot of new ones himself. Before leaving the Caucasus we should mention Alexander Fomin, a contemporary of Grossheim and a botanist at Tbilisi Botanical Garden. He described many newly discovered monocots in a range of genera: *Galanthus*, *Allium*, *Iris*, *Bellevalia*, *Muscari*, etc., and also wrote a Flora of the Caucasus. One of his new species was *F. michailovskyi*, collected by S. J. Michailovsky in Kars when Russia occupied that part of what is now north-eastern Turkey.

Travelling southwards we come to south-eastern Turkey, Iraq and western Iran, home to *F. straussii*. This was named in 1905 by Bornmüller after a German businessman Theodore Strauss who worked for an English firm in the export business for 30 years, based in Sultanabad (now Arak). Surprisingly he seems also to have been the English Vice-Consul in Sultanabad and collected plants for the German firm of Max Leichtlin in Baden-Baden. The specimen which became the type of *F. straussii* came from Mt Elwend; he also collected the original specimen of *F. chlorantha*. The photograph is of John Watson's 1966 collection of *F. straussii* from Hakkari. Staying in western Iran, we come to *F. reuteri*, described by perhaps the greatest name in Mediterranean/Near East/Middle East Botany, the Swiss Edmund Boissier. The species was named after his colleague at Geneva Botanic Garden,

Fritillaria straussii

Fritillaria reuteri

the French botanist Georges Reuter who ultimately became Director of the garden. He travelled widely with Boissier in North Africa, Spain and western Asia and co-authored many of his works and descriptions of new species.

Edmund Boissier (1810-1885) compiled the multi-volume *Flora Orientalis*, the indispensible reference work for the whole region. He described 15 *Fritillaria* species, some of them commemorating other botanists or collectors. The southern Turkish *F. elwesii* honours Henry John Elwes (1846-1922), a British traveller, sportsman and natural historian who travelled widely in Greece, Turkey, the Himalaya. If it is possible to pick out

Fritillaria elwesii

Fritillaria ehrhartii

specialisms of someone with such eclectic interests, he is perhaps best known for his books on trees and lilies. Christian Pinard collected in Egypt, Israel, Syria and Turkey (notably in Caria) where he found the plant described by Boissier as *F. pinardii*. It is of note that another of the species described by Boissier was *F. gibbosa*, the first collection of which had been made by Th. Kotschy at Persepolis in Iran. Boissier teamed up with Orphanides, a Greek professor of botany in Athens to name *F. ehrhartii*, after (obviously) Erhart who has proved to be a rather elusive collector, as does the individual after whom *F. rhodokanakis* is named. The epithet of the latter species in turn links up the names Orphanides and Baker and this leads us into John Gilbert Baker, Kew botanist of the second half of the 19th century and ultimately

Keeper of the Herbarium. His extensive survey of the enormous lily family in its widest sense (*Handbook of Liliaceae*, 1870) included a detailed classification of *Fritillaria*. This was a time when the British Empire was being explored extensively and botanical collections were pouring in, particularly to Kew. In addition Baker was in contact with people such as Regel and Leichtlin, further adding to the information available to him: networking is nothing new! Baker described hundreds of new species including 11 *Fritillaria* spp., five of which were named after people. Karelin's discovery of the species that was to bear his name, *F. karelinii*, was made in the 'steppes and deserts of the Indersky Sea' and was at first described as a *Rhinopetalum* by D. Don, then transferred to *Fritillaria* by Baker in 1874.

Guillaume Olivier (1756-1814), a French doctor/naturalist undertook a lengthy survey of the Ottoman Empire, starting in 1793 and visited Turkey, Persia, Egypt, Iraq, Syria and Lebanon, publishing a large tome on the subject. Among the plants and animals he collected as dried material was the species named *F. olivieri* by Baker and introduced to cultivation by Th. Strauss via Max Leichtlin. In 1874 Baker described *F. forbesii* to commemorate the Manx botanist Edward Forbes who, in 1842 was the naturalist aboard HMS Beacon. One of the expedition's aims was to bring the marbles from the ancient site of Xanthos back to Britain, a feat which failed because the ship was not up to the job. However, the collections made by Forbes were remarkable and represented several unknown species, one of them the fritillary which now bears his name, *F. forbesii*. He also collected the first specimens of *Chionodoxa*

Fritillaria karelinii

forbesii, also named by Baker. Forbes' 2-volume work *Travels in Lycia* make fascinating reading. Incidentally, a second expedition (presumably with a larger ship!) did extract the Xanthian marbles and they are now in the British Museum. Even earlier than Forbes' travels, John Sibthorp (1758-1796), professor of botany at Oxford, had set out in 1786 on a two-year expedition to collect and identify the plants included by Dioscorides in his 1st century herbal. He travelled via Vienna to view the unique manuscript of the herbal, the *Codex Vindobonensis*, and to take on the botanical artist Ferdinand Bauer to travel with him. Some 2000 specimens were collected, 300 of them representing previously unknown species. It was J.E Smith who named the 'frit' species after Sibthorp but as *Tulipa sibthorpiana*. It was Baker who formally made the transfer to *Fritillaria sibthorpiana*. In 1893 Baker described *F. whittallii* after Edward Whittall who had an export business in Smyrna (Izmir). He had a great interest in the plants – particularly bulbs – of Asia Minor and employed locals to collect for him. Many were exported to the trade and as gifts to Kew (hence Baker's involvement) and some were planted in a garden at the summit of a nearby mountain (Nymph Dag – Nif Dağ).

Fritillaria whittallii

[The article concludes with a description of the sources of more recently named species in the Autumn 2013 Journal.]

The Subgenus *Liliorhiza* (An Amateur Hobbyist's View)

Words and images by Ron Mudd

Introduction

I have long been fascinated by members of the genus *Fritillaria* and began attempting to cultivate them in the early 1980s. The number of species available to me at that time was limited, as was my ability to grow them. One species in particular, *Fritillaria camschatcensis*, proved to be consistently 'un-growable' for me, and so became my favourite plant! This seems rather silly today, when this species is so easily grown and readily available. The problem was the lack of good, easily available, cheap (was setting up first home) information. The common advice was that if it was a *Fritillaria* it needed to be kept bone dry in summer! Eventually I learned how to grow this wonderful, wandering Frit. My passion for growing these plants ignited, and my understanding that various growing regimes were required also grew, in line with my collection.

Today my focus has become the subgenus *Liliorhiza*. (I use this name, in what I believe is the common understanding, to cover all of the Northern American species, plus *Fritillaria dagana* and *Fritillaria maximowiczii*) These plants grow in widely different environments and conditions, and this is what makes this collection so interesting to me. Some grow as 'snow melt' scree dwellers, others occupy heavy clay soils that are both 'wet and sticky' and 'dry and hard' annually, some in amongst tall grasses, others in woodland environments and some in areas prone to flooding and submersion by salty water. The colour range of the flowers is wide, with red, orange, yellow, green, pink, purple, (almost) black, white and various browns and bronzes all represented. Flower markings are also very variable. Some species are only a few cm high, others are recorded as sometimes reaching over I metre . Flower numbers on a single stem range from one to over thirty!

In a series of short articles for this Fritillaria Group Journal, I hope to give a view of the history, distribution, environment and cultivation of each of these species, wherever it is possible for me to do so. I am in no way a botanist or professional scientist and am writing these articles, in a non-technical way, in the hope that they may inspire a few more people to

Fritillaria affinis tristulis in March 2012

persevere with these species, and enjoy them as much as I do. It is not my intention to produce a definitive manual for cultivation (I can only say how I grow them), nor to produce a classification for the *Fritillaria* or to challenge anyone's published view of how this should look. Some of the plants that I will write about as species are considered subspecies by some, possibly even hybrids. I like to appreciate the plants for what they are; their taxonomy becomes a convenient but constantly changing rack upon which various observations can be hung.

The plants that I will be considering as of the Subgenus *Liliorhiza* are,

Fritillaria affinis (Schult. & Schult.f.) Sealy
Fritillaria agrestis Greene
Fritillaria atropurpurea Nutt.*Fritillaria biflora* Lindl.
Fritillaria brandegeei Eastw.
Fritillaria camschatcensis (L.) Ker Gawl.

Fritillaria dagana Turcz.
Fritillaria eastwoodiae R.M.Macfarl.
Fritillaria falcata (Jeps.) D.E.Beetle
Fritillaria gentneri Gilkey
Fritillaria glauca Greene
Fritillaria liliacea Lindl.
Fritillaria maximowiczii Freyn
Fritillaria micrantha A.Heller
Fritillaria ojaiensis Davidson
Fritillaria pinetorum Davidson
Fritillaria pluriflora Torr. ex Benth.
Fritillaria pudica (Pursh) Spreng.
Fritillaria purdyi Eastw.
Fritillaria recurva Benth.
Fritillaria striata Eastw.
Fritillaria viridea Kellogg

Of these 22 species, 19 are only found in the western United States (all but two of these, *F. gentneri* and *F. camschatcensis* can be found in California). One species, *F. camschatcensis*, occurs in Washington state, British Columbia and Alaska, across the Aleutian Islands to the Kamchatka Peninsula and down into Japan. Two species, *F. dagana* (in the Khamar and Sayan mountains of Siberia close to Lake Baikal) and *F. maximowiczii* (Eastern Siberia and north-eastern China) are found in Eastern Asia. These latter three species are (traditionally) the stoloniferous ones.
I do not intend to reproduce detailed descriptions of each plant. If required these can be found at such excellent websites as http://www.efloras.org/

The bulbs are lily-like and scaly. They are all generally quite fragile and the scales are easily broken off from the main bulb. We can see three distinct forms to the bulbs.
1. The stoloniferous species (see above). Seed-grown plants of these species produce a bulb very close to the surface of the growing medium. Seed production low, vegetative reproduction high. (N.B. Some 'forms' of *F. camschatcensis* do not behave in this way, and it may be possible that other differences between plants currently grouped under this species could be quite dramatic).
2. Those species producing large numbers of 'rice grains' (e.g. *F. affinis, F. recurva, F. pudica* etc.). Seed-grown plants of these species produce a bulb

within a few inches of the surface of the growing medium. Seed production middling, vegetative reproduction high.
3.Those species producing few or no offsets (e.g. *F. biflora, F. liliacea, F. pluriflora* etc.). This group produces thick contractile roots to anchor themselves at the optimum depth for growth. Seed grown plants produce a bulb at a depth of around 25 cm where this is available. Seed production high, vegetative reproduction low.

Fritillaria biflora showing contractile roots

Seed germination is above ground for all species.
Flowering time, in nature, extends from February through July. In cultivation here, this can be December (*F. striata*) to July (*F. camschatcensis*).

Cultivation. Carl Purdy writes in 'The Garden' March 1897, "An English correspondent writes me regarding *Fritillaria recurva* as follows: "The bulbs when sent over grow and generally flower once, but they will not establish themselves, and, so far as I can find, they have never been established, possibly (as has been suggested) because the bulb after flowering splits into

several smaller ones". This is still a common comment to me today (but often without the flowering part!!). Purdy goes on to explain "Each year an entirely new bulb is formed by early summer, and the old bulb is seen as a thick scale on the bottom of the new one. The new bulb is larger or smaller than the old one according as the soil or other conditions have been favourable or otherwise. The largest bulbs are found on plants which did not flower that season. Only a small percentage of the total number of bulbs flowers during any season, and the largest percentage of flowering bulbs is to be found the year following a good season for bulb growth. Bulbs which have flowered are apt to be exhausted and to need several years of rest to recuperate their strength for another flowering ; this, be it observed, in their native homes. It is true that some do flower two years in succession, but that is where conditions are very favourable to bulb growth. Collectors soon learn to leave flowering bulbs alone, and to select such as have grown a large radical leaf.....It will be seen from the foregoing that the trouble of which my correspondent speaks is simply what will happen in the nature of the plant, and is unavoidable..... In nature the large bulbs are oftenest found in woodlands which have been burned over..... They are early growers and during their growing season the rainfall is heavy". 115 year-old clues regarding feeding and watering!

Fritillaria recurva, March 2012

I have found through trial and error, and a study of weather patterns and relevant geology, that a variety of growing conditions are required. It is not possible to give general cultivation guidelines that encompass the whole of the subgenus. It is a good 'rule of thumb', however, that the 'rice grain' species should be planted close to the surface of the growing medium, and the others more deeply, if planting freshly purchased bulbs. Seed of all species should be sown on the surface of the chosen growing medium and covered with the thinnest achievable layer of mulching matter. Obviously those grown from seed will find their own correct depth at which to form the bulb, dependent upon moisture, temperature, etc. Specific requirements will be dealt with in each species article. In the main my growing medium is based on heavy loam and smooth grit. The heavy loam I use is the kind commercially available for the planting of aquatic plants.

Suffice to say that the comments of Carl Purdy are still good today, but with careful watering and feeding we can flower our plants most years. However, the only way to **guarantee** flowers each year is to grow lots and lots of plants!!

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Ron begins his series on the Subgenus *Liliorhiza* with a look at *Fritillaria glauca* in the Autumn 2013 journal of the Fritillaria Group. Here is a photograph of it in the wild, just to whet your appetite. The photograph was taken by Mr John V in Jackson County, Oregon.

Fritillaria milasense – a name for *F aff. bithynica*

Words and images by Bob Wallis

We have grown a superb little fritillary for more than 20 years labelled *F. carica* and, more lately, *F. aff. bithynica* after Martyn Rix saw it in our collection and corrected us. The stock originated to the south west of Denizli, Turkey on Ak Dag and we had two colour forms, a greeny yellow one and a more vigorous brown one, striped with a yellow fascia. The latter has won two Farrer Medals in its time but we were never too happy about the name. In 2001, Martyn drew our attention to a paper (1) which described a new species which is essentially a split from *F bithynica*, but although it had been found a long way west of Ak Dag, it seemed to be similar except that it only had striped flowers. In 2011, we went to investigate.

We aimed first of all for the type locality, to the north of the town of Milaş in Muglha Province and many kilometres before we arrived there, we saw many thousands of little striped fritillaries growing near the roadside in sandy soil and this manifested all the way to the aimed-for site.

Fritillaria milasense grows in large numbers under sparse Umbrella Pine (*Pinus pinea*) forest on sandy soils in Katranci, SW Turkey

They grew on north facing banks in clearings between small shrubs and particularly in the light shade cast by immense, extremely elegant, Umbrella Pine (*Pinus pinea*) trees. The flower colour varied considerably although there was a preponderance of striped flowers (see inside back cover). At the second site we visited, there were many more, again in the Umbrella Pine forest with the added bonus of last year's capsules which were unwinged.

Tekşen & Aytaç distinguish *F milasense* from its closest relative, *F bithynica*, by the following characters and with the exception of the flower colour, all the 50 or so specimens we photographed fit all of the criteria.

	F milasense	*F bithynica*
Bracts (i.e. uppermost leaves)	1 (-2)	(1-)3(-4) in a whorl
Flowers	Purple with a clear yellow strip outside and inside or, yellow with a purplish-brown stripe and with a yellowish apex outside.	Outside glaucous green, inside yellowish-green, shining green.
Capsule	unwinged	winged

Fritillaria bithynica, Datca

Fritillaria milasense, Katranci

It seems like we now have a name for the *Fritillaria aff bithynica* with unwinged capsules. In the course of many trips we have taken in and around this area, we have seen such plants in several places but all are within about 20 km of the Menderes Depression on the hills which subtend the valley and all the way east to Ak Dag which is just west of Denizli where the bedrock is limestone and the pines are *P brutia*.

We have also investigated some places where there are clear *F bithynica*. These all have three bract leaves in a whorl and wherever we can see the developing, or some old, capsules, these have wings.

Distribution: Endemic to western Turkey. Muğla, Kastamonu and Denizli Provinces. We have found it on both the north and south sides of the Great Menderes River (Bűyűk Menderes Depresyonu) from the Geyik Resevoir; via Samailli, N of Nazilli to; Ak Dag, S of Denizli. We found no *F bithynica* (*sensu stricto)* in this area in spite of the fact that it bisects the wide distribution of the latter.

(1) Tekşen M & Aytaç Z. New *Fritillaria* L taxa from Turkey. Israel J Plant Sciences 52: 347-355 (2004)

Fritillaria eduardii in Tajikistan

Words and images by Doreen Mear

In rural New Zealand there's not much to spend your money on: you don't need posh clothes and your car doesn't rust, so my big extravagance is an annual foray to see flowers growing in the wild. I've been fortunate over the years to get as far afield as Japan, Canada, China and several American states including Alaska. This year it was Central Asia, more specifically, the former Soviet states of Tajikistan and Uzbekistan, sandwiched between the Caspian Sea and Russia to the west and north, China to the east, and Iran, Afghanistan and Pakistan to the south. We were a small group of five, focussing particularly on Juno irises and tulips, but we also had three frits in our sights, *FF. bucharica, stenanthera* and *eduardii*, and it's the hunt for this last species I thought might be of interest. Our tour leader Chris had done a recce of the area the previous year and made a beeline for his first site, a small village not far from the Tajik capital of Dushanbe. This involved a bit of an uphill slog alongside a pipeline out of the village, followed by a rather challenging scramble onto an overhanging cornice where two plants were in bloom right on the edge. Not surprisingly, there was quite a bit of camera-shake in the resulting photos!

Fritillaria eduardii is closely related to the familiar Crown Imperial *F. imperialis* and the pale yellow- flowered *F. raddeana,* which is, in fact, thought by some to be a hybrid between the two. The flower stems of *F. eduardii* carry whorls of leaves almost from top to bottom, in contrast to the virtually bare stems of *F. imperialis.* It has attractive soft orange coloured flowers, rather more widely flared than those of *F. imperialis* and is said to be unscented, without the usual pungent "frit niff". I have to say, I was way too far away from the edge of the cornice to check this out.

Fritillaria eduardii

The following day, from our moving car, sharp-eyed Chris spotted a flash of colour at the roadside, and went to investigate, asking permission from the surprised occupant of a small dilapidated hut to go and explore his rubbish dump, where a handful of the plants were growing. How and why these plants came to be growing in a roadside rubbish dump is a mystery, but the memory of picking our way through the refuse (and its stench!) will linger for a very long time.

Later in the day by pure chance we saw *F. eduardii* blooms by the hundred, unfortunately not growing wild, but being offered for sale by boys at the roadside. Quick-thinking Chris pulled over and offered one of the boys US$20 to take us to wherever it was he'd found the flowers, so there followed a "mile-long" trek up through the woods and crags to the site. Be warned, a Tajik mile must be about five times longer than an English statute mile! There were already mutinous murmurings amongst us when two youths came down the track towards us and hurried on past, both carrying huge armfuls of the orange blooms.

Nonplussed and decidedly shocked, we wondered if there would be anything left for us, so Chris went on ahead with our young guide to reconnoitre, and in due course came back with the answer, sadly, no, the site was cleaned out, with only two bent blooms able to be salvaged. Making the best of a bad job, we "planted" these two blooms artistically in a crevice and photographed them, wishing that we'd got there just a few hours earlier!

We shouldn't begrudge the locals selling their wildflowers to supplement their incomes, but it was so sad to see. Although we tried to console ourselves with the fact that they were only picking the flowers and the bulbs remained, there would be no renewal by seed, and one couldn't help but wonder how long it would be before the boys started to dig up the bulbs and sell those too. Hopefully our young guide – and our other guides and drivers who, though mystified, enthusiastically joined in our plant-hunting efforts – will realise there's a living to be made taking people to the flowers rather than taking flowers to the people. We hope so.

Tips, Tricks and Technology, Pt 2

By Paul Cumbleton

Perched Water Tables

Next I used a sponge to illustrate the concept of a "perched water table". Soaking the sponge with water then holding it up and letting it drain, only a portion drained leaving the bottom 3cm still soaking wet. I explained this happens in a pot too – there is always a bit (even in very well-draining mixes) at the bottom that does not drain and stays soaking wet. So at the bottom of pots is a layer where ALL the pores are filled with water. This is called a perched water table. It happens because when you water into a pot and excess starts coming out of the bottom, it is coming out due to a mix of gravity pulling on it and the weight of water above pushing down on it (the "hydraulic head"). There is a point at which neither gravity nor the hydraulic head are sufficient to pull or push any more water out, leaving the bottom 3cm or so soaking wet. This may be one reason to choose a long tom pot - a taller pot will have a greater proportion of well-drained, well-aerated compost before you get to the soggy bit at the bottom.

The Old Myth

How many times have you heard the advice to "Put a layer of grit or other coarse material at the bottom of pots for drainage"? This advice is very common in books, on television programmes etc. It has been passed down for generations as a bit of horticultural folklore. But it is quite simply wrong – it not only does not work, it actually does quite the opposite of what you planned and it *hinders* drainage! Next time someone tells you to do this, ask the person giving the advice as to exactly how they think this will work. I can almost guarantee they will not know, it's just something they have always done because they have been told to. If they do have an explanation, it is usually to point out that coarse materials have large air spaces that drain more easily than small air spaces. This is of course correct as we saw earlier. So surely if you put a layer of coarse grit at the bottom of a pot, when the water draining down the pot gets to the grit it will just fall through it, as we saw in the earlier demonstration? Actually, no it will not. The reason for this is that this applies to the materials *when used alone*. It's quite different if start putting materials *in layers*. Here, different physics applies due to what

are called "boundary conditions". What actually happens is that water tends to accumulate at the boundary between the two layers.

This happens because as we learned earlier, small pores hang on to water more strongly than large ones. Because of this, when you have a medium with smaller pores above one with larger pores, the water has difficulty crossing the boundary from the small pores where they are held strongly, to the larger pores beneath. So drainage slows down at the boundary until a sufficient hydraulic head has built up above to force water over the boundary. So drainage is slower. There is also a second effect - the natural "perched water table" we learned about has now been forced to form higher up the pot giving what is called a *raised* perched water table. This leaves even less of the volume of the pot which contains well-drained and well-aerated compost. So "**The drainage must be in the mix**", not somehow added as a separate layer. Simply make a well-draining compost and fill your pot with it. Don't add anything else in layers.

I illustrated the practical outworking of all this by pouring water through a pot of pure John Innes compost and a pot with a mix of 50/50 John Innes and 6mm grit. The latter drained far better!

Removing the Perched Water Table

The effects we have been talking about are actually quite small and most plants will cope with having perched water tables and even raised perched water tables in a pot. But a few which are particularly sensitive to moisture levels may suffer, so it would be nice if there were a way to remove perched water tables from pots so that the entire pot is well drained with no soggy bit at the bottom. This can be done by plunging pots in a sand plunge – but the effect only works if there is contact between the sand in the plunge and the compost in the pot via the drainage hole. So do not put for example a broken crock over the drainage hole or you break this contact! A piece of cut up shading netting can be used instead if you want something over the hole – this still allows contact between the sand and the compost. The effect works because the sand in the plunge has smaller pores than the compost above (the reverse of what happens if you put a layer of grit at the bottom of the pot), so water moves readily out of the compost into the sand and just keeps on moving down until the perched water table forms at the bottom of the plunge instead of in your pot. Removing perched water tables

from pots is one of the primary reasons for plunging pots in sand, a fact that was well known by the old alpinists but which seems to have been lost in more recent times.

Water Quality & Fertilisers

Next I illustrated the usefulness of a conductivity meter for measuring the strength of fertilisers. Using the meter we got the following readings (in microsiemens which are simply a unit of electrical conductance):

Local Tap Water:	650
Rain Water:	50
Typical, full strength, fertiliser:	2500

Some plants, especially orchids, are sensitive to fertiliser levels so it is important to get the strength correct. For example the genus *Disa* is especially sensitive and will be damaged by fertiliser levels applied at strengths much above 150 microsiemens. You can see the problem of water quality here – our local tap water starts at 650 microsimens before adding any fertiliser! So for these, starting with rain water is essential.

Light levels

I used a light meter to illustrate the huge difference between sun and shade, which equates to the light energy falling on the plants. The meter measures in units called Lux. Typical figures might be:

- Living room 500 Lux
- Outside in shade 5000 Lux
- In full sun (winter) 50,000 Lux
- In full sun (summer) 100,000 Lux

This shows why for example a plant evolved for shade does not do well in sun – it's getting 20 times the amount of light energy that it is designed to cope with!

Dormant Bulbs & Temperature

I briefly mentioned that most bulbs do not require the "summer bake" that once used to be advised. While many bulbs are from areas that get hot in summer, the bulbs themselves are often buried deeply where temperatures are much cooler. In our shallow pots, even if plunged, they can get very hot if left in the sun and this can either cook them and/or desiccate them unduly. So I cover my dormant bulbs with sheets of polystyrene to reflect the sun and keep them cool.

Sowing Depth for Bulb Seeds

Finally I passed on some information first made widely known by Ian Young in his Bulb Log on the web. When growing bulbs from seed, some need to be sown on the surface but others do much better if sown deeply. This is because of differing methods of growth evolved by different plants. With some bulbs, when the seed germinates, it sends down a long root and the new bulb forms at the end of this. These types need to be surface sown and the new bulb will develop at the depth it is happy with once the root gets deep enough. Other bulb seeds send out a root but the new bulb develops near the top of this, near the same level the seed is at. These types need sowing deeply. They have evolved to be distributed by animals such as ants which take the seed underground, so they germinate already at the depth the new bulb wants to be at. If sown at the surface, they will spend much of their energy in the first year or two pulling themselves down into the soil until they arrive at the correct depth – rather than using this energy to increase in size. So these types are best sown a third to a half way down the pot. Don't worry if this looks deep – they have evolved to be adapted to this and the new shoot can easily get to the surface from such depths. Here are a few examples of which bulbs want which treatment:

Deep Sowing: *Crocus, Colchicum, Narcissus, Tecophilea,* and *Ipheion.*
Surface Sowing: *Fritillaria, Tulipa, Erythronium* (some)

This talk thus covered a wide and varied range of subjects, of which I hope at least some are of practical use to you.

"The flower colour varied considerably although there was a preponderance of striped flowers." Variation within one population of *F. milasense,* N of Milaş, SW Turkey. *Photographs by Bob Wallis.*

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