

# International Rock Gardener

ISSN 2053-7557



Number 120

**The Scottish Rock Garden Club**

December 2019



### **Cultonomy of *Fritillaria* section *Petilium*, a new circumscription of the crop and a possibility to group cultivars**

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Published in IRG 120 December 2019, pages 3 – 24.

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**Summary** – The ornamental crop crown imperial, *Fritillaria imperialis* L., belongs to *Fritillaria* section *Petilium* (*Liliaceae*) and consists mainly of very old cultivars, the oldest being more than 400 years old. Recently, an increase in commercial breeding efforts within *Fritillaria* section *Petilium* resulted in new cultivars suitable for the garden and for cut-flower production. These new cultivars are not only produced within the species *F. imperialis* but are mostly interspecific hybrids between the four species of section *Petilium* (*F. chitralensis*, *F. eduardii*, *F. imperialis*, *F. raddeana*). As a result of this interspecific hybridisation the cultivars show a mix of characteristics of two or more species and a classification based on the taxon concept, necessitating the introduction of new hybrid taxa, does not seem desirable. For the existing cultivars (within species) and the new developed cultivars from interspecific hybridisation, a new classification based on the culton concept is developed. Fifteen morphological characteristics were observed for all four species of section *Petilium*, for most of the cultivars of *F. imperialis* and *F. eduardii*, and for the cultivars developed by interspecific hybridisation. From the results of these morphological observations it was clear that the cultivars of *F. imperialis* and the interspecific hybrids have the same morphological characteristics and belong to one crop. We discuss two ways to make Groups within this new crop and describe the present status of the *F. imperialis* cultivars which are still in culture.

**Key words** – cultivar, cultonomy, *Fritillaria*, Group, interspecific hybridisation, taxonomy.

#### **Introduction**

The genus *Fritillaria* L. is a geophytic perennial, distributed in Europe, Central Asia, China, Japan and North America, and comprises more than 100 species (Rønsted *et al.*, 2005). The crown imperial (*Fritillaria imperialis* L.) is a well-known member of section *Petilium* of this genus (Rix, 2001; Wietsma *et al.*, 2015). The section consists of four species: *F. chitralensis* (hort.) B. Mathew, *F. eduardii* A. Regel ex Regel with two varieties, *F. imperialis* L. with two varieties, and *F. raddeana* Regel (Wietsma *et al.*, 2011, 2015). In the wild, the species of section *Petilium* occur in a large area (*F. chitralensis*: Kashmir (Chitral), NE Afghanistan; *F. eduardii*: Kirgizstan, east Uzbekistan and west Tajikistan; *F. imperialis*: SE Turkey, Iran (Zagros Mountains), SE Afghanistan, central-north Pakistan and Kashmir, India; *F. raddeana*: south Turkmenistan and northern Iran. The distribution areas of the species of section *Petilium* do not overlap, making the existence of natural interspecific hybrids improbable (Wietsma *et al.*, 2015; Kiani *et al.*, 2017). Crown imperials possess a typical odour, a ‘foxy’ smell which makes them somewhat less suitable as cut-flowers but also deters moles from penetrating lawns (Helsper *et al.*, 2006). There is also an odourless *F. imperialis* variety, *F. imperialis* var. *kashmirensis* (Wietsma *et al.*, 2015). Wild populations of *F. imperialis* display orange-red, reddish-brown, red or seldom yellow flowers, the flowers of the *F. eduardii* varieties are purple red (var. *eduardii*) or shades of clear orange to yellow (var. *inodora*), *F. chitralensis* has bright yellow flowers and *F. raddeana* greenish-yellow flowers (Wietsma *et al.*, 2015). *F. raddeana* bulbs are frequently offered commercially, but no cultivars exist, while bulbs of *F. eduardii* are more rarely offered (only by specialised companies), and only two cultivars (‘Castor’,

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'Pollux') are mentioned in the RHS Plant Finder (Cubey *et al.*, 2018). *F. chitralensis* is very rare and no cultivars exist (Wietsma & van den Berg, 2018). Within *F. imperialis* cultivars are already known for many centuries. About 10 of these old cultivars are still offered frequently in the trade.



*Fritillaria chitralensis*



*F. eduardii* var *inodora*



*F. eduardii* var. *eduardii*



*F. raddeana*

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*Fritillaria imperialis* var. *kashmirensis* – photos are by Willem Wietsma, unless stated otherwise.

The crown imperial has a long history as a garden plant. The first crown imperials were introduced in Western Europe by the Flemish diplomat de Busbecq, who was ambassador in Constantinople (now Istanbul) in the period 1556-1562 and send bulbs to Vienna. It was Clusius who send crown imperials to Leiden, around 1576. The Hortus Botanicus of Leiden had them in its collection in 1580 (Alkema, 1982). Crown imperials are depicted on many paintings, e.g. a bouquet painted in 1603 by the Flemish painter [Jan Brueghel the Elder](#) (1568-1625). Most of the existing *F. imperialis* cultivars were introduced in the seventeenth and eighteenth century (Table 1). In the course of the time these cultivars developed several negative characteristics like

low yield and flower colour off-types due to degeneration.

These cultivars are nowadays also very susceptible to the disease *Fusarium* (in Dutch: het zuur), probably due to modern culture technics, such as the increase of nitrogen as fertiliser (Wietsma *et al.*, 1989, 1995). More detailed information about the *F. imperialis* cultivars (introduced between 1577 and 2005) can be found in Appendix 3.

Recent efforts in commercial breeding in *Fritillaria* section *Petilium* resulted in new cultivars suitable for both garden and the cut-flower industry. Crosses were made between *F. chitralensis*, *F. imperialis* and *F. raddeana*. Some of these interspecific hybrids were hybridized with *F. eduardii* to form complex hybrids. Even interspecific hybrids to which all of the members of *F.* section *Petilium* contributed occur. Of these new interspecific hybrids, more than 10 are on the market and are (or will be) protected by breeder's rights or registered by the Royal General Bulbgrowers' Association, KAVB. These new cultivars cannot be assigned to the species *F. imperialis* or to any other species of section *Petilium*. They have different genetic backgrounds and are morphological different from the species, which were used as parents. To avoid possible confusion in the market, the KAVB raised the question how these new interspecific hybrids should be registered. The KAVB is the International

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Cultivar Registration Authorities (ICRAs) for *Fritillaria* cultivars. The present paper is an attempt to address this question.

The members of *Fritillaria* section *Petilium* differ morphologically from the other sections in their leafless stem, at the top bearing a dense whorl of leaf-like bracts, with flowers nodding beneath (Clark and Grey-Wilson, 2003; Wietsma *et al.*, 2015) The four species within section *Petilium* are taxonomical distinguished by the size of the nectaries, while the two varieties of *F. eduardii* are distinguished by flower colour and flower shape and the varieties of *F. imperialis* by the presence or absence of odour, the so-called foxy smell (Helsper *et al.*, 2006, Wietsma *et al.*, 2015). These taxonomical characteristics are not suitable to distinguish the new cultivars created through interspecific hybridisation, because these new cultivars show a mixture of nectary sizes and flower colours and display variable levels of smell. Growers and the trade do not use these morphological characteristics but use 'user value' instead, criteria perceived as important by the end user, e.g. plant size (determining where to plant the cultivar in a border), flower colour and flowering time (determining how to mix the cultivar with other plants). Also for the purpose of classifying cultivated material in groups the utility of taxonomy (based on the observation of a large number of characters) is superseded by that of cultonomy where the classification is based on a few user-friendly characteristics to form easily recognizable groups. Since these groups consist of cultivars they conform to the cultivar-groups as defined in earlier versions of the ICNCP (van den Berg, 1999). For example, for *Aster* L. three cultivar-groups have been proposed based on typical user criteria like plant size and flower size (Hetterscheid & van den Berg, 1996). Hoffman (2008) proposed eight cultivar-groups for *Weigela* Thunb. based on plant size, leaf and flower colour. For bulbous crops cultivar-groups has been applied for a long time. For tulip, cultivars have already been grouped in Early-, Late- and Mid-season flowering since 1601 (van Scheepen, 1995, 1996). Other bulbous crops where cultivar-groups are used are: *Dahlia* (Royal Horticultural Society, 1996), *Galanthus* (van Dijk, 2011), *Hippeastrum* (Moerman *et al.*, 2007), *Lilium* (Matthews, 2007), and *Narcissus* (Kington, 2008). In these bulbous crops hybridisation between species, performed both in the past and more recently, is the foundation for the explosive increase in the production of cultivars. To manage this increase in the annual number of new cultivars, it is necessary to create systematic categories to accommodate these cultivars.

In the present study, we (1) investigate whether it is possible to accommodate the interspecific hybrid cultivars together with the members of the section *Petilium* and their cultivars into one crop, based on a study of their morphological characteristics and (2) discuss two ways to make groups within this new crop, one after consultation of users (bulb retail and exporting companies) and the KAVB (the Royal General Bulb Growers' Association), and a second more in line with the cultonomic principles as laid down in the recent versions of the ICNCP. We also describe the present status of the *F. imperialis* cultivars which are still in culture.

## Materials and methods

### Plant material

The plant material used belongs to the four species of *Fritillaria* section *Petilium*: *F. chitralensis* (hort.) B. Mathew, *F. eduardii* A. Regel ex Regel, *F. imperialis* L., *F. raddeana* Regel and their interspecific hybrids. For *F. chitralensis* clonal material was used; for *F. eduardii* a mix of seed and clonally propagated material was used, and we included two cultivars; for *F. imperialis* var. *imperialis* we only used cultivars, plant material from the wild was not available; *F. imperialis* var. *kashmirensis* was represented by seed and clonally propagated material; for *F. raddeana* three samples of clonal origin were used. Cultivars are always clonally propagated. Table 1 lists information on the source, synonymy, and year of description or introduction (if known) of the involved species, the *F. imperialis* cultivars and the cultivars derived from hybridization. In the present study many, but not all of this material was used because some cultivars were not available. The material was studied on the premise of the source, unless indicated otherwise in the footnotes of Table 1. Year of introduction for cultivars can be found for old cultivars before 1991 in the International checklist for Hyacinths and

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Miscellaneous Bulbs (van Scheepen J ed. 1991), or the [registration database of the KAVB](#) or the register of breeder's rights ([Rassenregister](#), [Raad voor plantenrassen](#)). Cultivars without a year of introduction will be registered or listed within 1-3 years.

**Table 1.**

**Table 1. List of species of *Fritillaria* (section *Petilium*), existing cultivars of *Fritillaria imperialis* and interspecific hybrid cultivars, synonyms and year of description or/of introduction. Not all accessions are used in this study.**

	Synonyms	Year of introduction <sup>1</sup>	Source <sup>2</sup>	Additional information
<b><i>Fritillaria</i>: species</b>				
<i>F. chitralensis</i> (hort) B. Mathew		1996 (1910)	VOFK	Kew 1970-4109
<i>F. eduardii</i> var. <i>eduardii</i> A. Regel ex Regel		1884	VOFK	Neotype: Wietsma 1, (WAG)
<i>F. eduardii</i> var. <i>inodora</i> (Regel) Wietsma		2011 (1884)	VOFK	Neotype: Wietsma 2, (WAG)
<i>F. eduardii</i> var. <i>inodora</i> 'Castor'		2015	VOFK	
<i>F. eduardii</i> var. <i>inodora</i> 'Pollux'		2015	VOFK	
<i>F. imperialis</i> var. <i>kashmirensis</i> Wietsma		2014 (1753)	HBL	Holotype: Wietsma 3, (WAG)
<i>F. raddeana</i> Regel		1887	VOFK (1)	origin: Van Tubergen, NL, 84011
<i>F. raddeana</i> Regel		1887	VOFK (2)	origin: Furse 792905, RBGE, UK
<i>F. raddeana</i> Regel		1887	HBL	origin unknown
<b><i>Fritillaria imperialis</i> L.: cultivars</b>				
Argentiovariegata		1771	HBL	
April Flame		unknown	-	
Aureomarginata		1665	HBL	
Aurora		unknown	HBL	
Duplex	Prolifera, Kroon op Kroon	1577	HBL	
Double Gold		1997	HBL	
Early Red		unknown	HBL	
Garland Star		2005	HBL	
Lutea	Flava	1665	HBL	
Orange Beauty		2011	VOFK	
Orange Briljant		unknown	HBL	
Orange Sweet		2010	VOFK	
Premier	The Premier	unknown	HBL	
Rubra		unknown	-	
Rubra Maxima	Maxima, De Jagers Favourite	1665	HBL	
Slagzwaard	Fasciata, Monstruosa	1771	HBL	
Striped Beauty		1999	-	
Sulpherino	Sulpherinus	unknown	HBL	
Sunset		2014	VOFK	
William Rex		1746	HBL	
<b><i>Fritillaria</i> interspecific hybrids: cultivars</b>				
Beethoven		2013	FaL	
Chopin		2013	FaL	
Early Dream		2016	VOFK	
Early Fantasy		2016	VOFK	
Early Passion		2015	VOFK	
Early Sensation		2017	VOFK	
Helena		2017	VOFK	
Red Beauty		2019	VOFK	
Satie		2015	FaL	
Sunrise		a <sup>3</sup>	VOFK	
Tsjaikovski		2013	FaL	
Vivaldi		2013	FaL	

<sup>1</sup> Year of introduction, see text

<sup>2</sup> Source, plant material obtained by FaL = Fa. Leenen, Voorhout, The Netherlands, HBL = Hortus Bulborum, Limmen, the Netherlands (Leijenhorst 2004); VOFK = V.O.F. de Keizerskroon, Midlum, The Netherlands. For species see Appendix for details about origin. For - is no source know, see tekst. Source is also the place where material is studied.

a<sup>3</sup>: will be applied for breedersrights in near future, see text

## Selection of useful morphological characters

The morphological characters were observed at the start of flowering time (February - April in 2015 and 2016). The morphological characteristics that could be suitable for making groupings were selected by literature study, field observations and discussions with growers. The following traits were evaluated at the beginning of flowering (at the moment when the first flowers open and the pollen is released): flowering time (defined as the number of days from the planting date until the first flower opens, with early flowering = ca. 163 days and late flowering = ca. 184 days from the planting date, which is usually around October 15<sup>th</sup>), height of the plant including the pseudo-umbel with flowers and bracts (cm), leaf length (cm), anthocyanin coloration of the leafless stem (part between lower stem with leaves and pseudo-umbel with flowers and bracts), number of bracts in pseudo-umbel, anthocyanin coloration of bracts in pseudo-umbel, flower length (mm), flower width (mm), flower colour on outside of the petal (RHS colour chart, 2015). Observations on capsules (length, width and anthocyanin coloration) were only made for the *Fritillaria* species, the cultivar *F. imperialis* 'Garland Star' and the interspecific hybrids (at the Hortus Bulborum all capsules were removed after flowering). Observations were made just before the capsules became ripe and turned yellow. During storage of the bulbs the odour was determined. The minimum bulb size was defined as the size at which >95 % of the plants flowered (e.g. size 18 means a periphery of 18 cm, and a diameter (Ø) of ca. 5.7 cm). These observations and measurements were made on five plants, in the field, minimum bulb size and odour were observed during storage.

## Results

The results of the morphological observations are summarised in Table 2. *F. chitralensis* is the first to flower, from the end of February to the beginning of March. About 7-10 days later *F. raddeana* starts to flower and a few days later a large group of interspecific hybrids and *F. imperialis* var. *kashmirensis*. Two of the interspecific hybrids, 'Chopin' and 'Sunset', flower later, almost at the same time as the *F. imperialis* cultivars. *F. eduardii* flowers in the same period as the *F. imperialis* cultivars. We can distinguish two major flower periods for the plant material used in this study.

In plant height there is a considerable overlap of the *Fritillaria* species, the *F. imperialis* cultivars and the interspecific hybrids. *F. chitralensis* and *F. raddeana* are smaller than the other plant material. For leaf length the *F. imperialis* cultivars and interspecific hybrids have a range of 10 – 19 cm, *F. chitralensis* has much smaller leaves, 6 – 9 cm, while *F. raddeana* and *F. eduardii* var. *eduardii* have almost the same leaf length as *F. imperialis*, and *F. eduardii* var. *inodora* has smaller leaves.

Absence of anthocyanin coloration of the leafless stem is found in *F. imperialis* 'Lutea'. For the other species, *F. imperialis* cultivars and interspecific hybrid cultivars a range of weak to very strong anthocyanin coloration was found.

The lowest number of bracts was found for *F. chitralensis* (2-5) and the highest number for the fasciated *F. imperialis* 'Slagzwaard' (70-85). The range of the number of bracts for the *F. imperialis* cultivars is 22-38, for the interspecific hybrid cultivars this is 10-22.

The interspecific hybrids always show at least some and sometimes strong anthocyanin coloration of the bracts, while *F. chitralensis*, 'Lutea', 'Argentiovariegata' and 'Aureomarginata' lack coloration of the bracts.

*F. chitralensis* and *F. raddeana* have the smallest flowers (resp. 45 x 30 mm and 35 x 60 mm (length x width), while within the *F. imperialis* cultivars the biggest flowers are found ('Rubra Maxima', 70 x 70 mm).

In the plant material used (the *Fritillaria* species, *F. imperialis* cultivars and interspecific hybrid cultivars) a range of flower colours is found, comprising green yellow, yellow and orange-red.

The minimum bulb size at which the plants produce flowers is for the *F. imperialis* cultivars size 18 to 22 ('Rubra Maxima'). The *Fritillaria* species and the interspecific hybrids flower already at smaller sizes (size 7 – 16), with *F. chitralensis* showing the smallest size (size 7).

For the capsules no striking differences were found.

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Comparing the *F. imperialis* cultivars and the interspecific hybrids, it is apparent that these differ in four characteristics: flowering time, number of bracts in pseudo umbel, minimum bulb size at which the plants are able to flower, and the extent to which the bulbs smell. The *F. imperialis* cultivars flower later than the interspecific hybrids, except 'Chopin' and 'Sunset'. The *F. imperialis* cultivars have a much higher number of bracts in the pseudo umbel than the interspecific hybrids. The interspecific hybrids flower in a smaller bulb size than the *F. imperialis* cultivars. The *F. imperialis* cultivars possess a much stronger odour (known as 'foxy' smell) than the interspecific hybrid cultivars, some of which do not smell at all while others smell only weakly.

Table 2, part 1.

**Table 2, part 1. Morphological characteristics of *Fritillaria* (section *Petilium*) species, *Fritillaria imperialis* and interspecific hybrid cultivars, see text for explanation.**

	flowering time	plant height (cm)	leaf length (cm)	anthocyanin coloration of leafless stem	number bracts pseudo umbel	anthocyanin coloration of bracts pseudo umbel	average flower length (mm)	average flower width (mm)
<b><i>Fritillaria</i> species</b>								
<i>F. chitralensis</i>	early	15-25	6-9	present	2-5	present	45	30
<i>F. eduardii</i> var. <i>inodora</i> *	late	50-60	10-14	absent - medium	20-33	absent	50	70
<i>F. eduardii</i> var. <i>inodora</i> 'Castor'	late	50-55	12-14	absent	15-30	absent	50	65
<i>F. eduardii</i> var. <i>eduardii</i> *	late	55-65	15-19	strong	11-15	absent	45	70
<i>F. imperialis</i> var. <i>kashmirensis</i> *	early	75-80	16-21	strong	8-15	weak to medium	60	65
<i>F. raddeana</i> **	early	35-45	13-20	very weak to strong	10-14	absent and present	35	60
<b><i>Fritillaria imperialis</i> : cultivars</b>								
Argentiovariegata	late	70-75	10-12	strong	25-28	absent	45	60
Aureomarginata	late	70-80	13-15	strong	25-30	absent	50	60
Aurora	late	65-75	12-14	very strong	22-26	medium	55	60
Early Red	late	70-80	17-19	very strong	25-30	weak	50	65
Garland Star	late	75-85	16-21	dark purple brown	28-35	medium	55	65
Lutea	late	70-75	14-16	absent	30-35	absent	50	50
Orange Beauty	early	80-85	14-17	strong to very strong	14-17	medium	60	70
Orange Briljant	late	80-85	15-16	very strong	33-38	weak	60	70
Orange Sweet	early	80-85	17-19	strong to very strong	17-19	strong	55	60
Premier	late	70-75	13-15	very strong	27-31	weak	60	80
Proliferate	late	70-75	13-15	very strong	24-27	weak	55	60
Rubra Maxima	late	90-95	17-19	very strong	32-38	medium to strong	70	70
Slagzwaard	late	70-80	15-18	very strong	70-85	medium	45	55
Sulpherino	late	70-75	15-17	very strong	24-28	weak	50	50
Sunset	late	60-65	14-16	strong	17-21	very strong	65	58
William Rex	late	60-65	11-12	very strong	23-25	medium	45	50
<b><i>Fritillaria</i> interspecific hybrid: cultivars</b>								
Beethoven	early	70-75	16-18	medium to strong	17-19	weak to medium	50	50
Chopin	late	55-60	14-16	strong	15-17	weak to medium	45	53
Early Dream	early	80-85	15-18	very strong	18-21	weak	55	70
Early Fantasy	early	70-75	15-17	very strong	12-15	strong	45	70
Early Passion	early	70-75	15-18	very strong	14-16	very strong	45	45
Early Sensation	early	60-65	17-19	strong	16-17	weak to medium	40	65
Helena	early	50-55	10-13	very strong	10-13	medium	45	45
Red Beauty	early	70-75	16-19	very strong	19-21	weak	55	55
Satie	early	50-55	14-16	medium to strong	15-17	medium	45	55
Sunrise	early	75-80	15-17	medium	20-22	very weak	40	90
Tsjaikovski	early	50-55	13-15	weak to medium	14-17	weak	43	58
Vivaldi	early	70-75	16-19	weak	16-19	weak	52	50

\* = seed propagated material

\*\* = observations of 3 accessions have been combined

\*\*\* =not observed, see text.

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Table 2, part 2.

**Table 2, part 2. Morphological characteristics of *Fritillaria* (section *Petilium*) species, *Fritillaria imperialis* and interspecific hybrid cultivars, see text for explanation.**

	flower colour outside petal (RHS)	flower colour outside petal	minimum bulb size	smelling of bulbs	capsule length (mm)	capsule width (mm)	capsule anthocyanin coloration
<b><i>Fritillaria</i> species</b>							
<i>F. chitralensis</i>	ca. RHS 7 A	yellow	7	weak			
<i>F. eduardii</i> var. <i>inodora</i> *	varies between 9 A - 25 A	varies between yellow and orange	16	absent	45	35	absent
<i>F. eduardii</i> var. <i>inodora</i> 'Castor'	ca. RHS 25 A	orange	16	absent	45	40	absent
<i>F. eduardii</i> var. <i>eduardii</i> *	ca. RHS 179 A	red -purple	16	absent	45	35	absent
<i>F. imperialis</i> var. <i>kashmirensis</i> *	varies between N25 B - 33 A	varies between light orange and orange red	14	absent	55	45	absent - medium
<i>F. raddeana</i> **	between RHS 4 D and RHS 1 D	yellow green	12	absent	35	35	absent - medium
<b><i>Fritillaria imperialis</i> : cultivars</b>							
Argentiovariegata	between RHS 28 A and RHS N30 A	orange	18	strong	-***	-	-
Aureomarginata	between RHS 28 A and RHS 30 A	orange	18	strong	-	-	-
Aurora	between RHS 28A and N30 A	orange	18	strong	-	-	-
Early Red	between RHS N25 A and RHS 30 A	orange	18	strong	-	-	-
Garland Star	ca. RHS N163 C	light orange	18	strong	45	52	green
Lutea	ca. RHS 9A	yellow	18	strong	-	-	-
Orange Beauty	between RHS N163 B and RHS 169 A	orange red	16	weak	48	50	weak
Orange Brilljant	between RHS 23A and RHS 24 A	light orange	18	strong	-	-	-
Orange Sweet	between RHS N163 B and RHS 169 B	orange red	16	weak	50	50	medium to strong
Premier	between RHS 25 A and RHS 28 B	orange	18	strong	-	-	-
Proliferate	between RHS 28A and RHS 30A	orange	18	strong	-	-	-
Rubra Maxima	between RHS 33 A and RHS 40 A	red orange	22	strong	-	-	-
Slagzwaard	between RHS 33 A and RHS 34 A	orange red	18	strong	-	-	-
Sulpherino	between RHS 14 A and RHS 24 A	light orange	18	strong	-	-	-
Sunset	ca. RHS 17 B	bright orange	14	weak	50	50	strong
William Rex	between RHS 33A and RHS 34A	orange red	18	strong	-	-	-
<b><i>Fritillaria</i> interspecific hybrid: cultivars</b>							
Beethoven	ca. RHS 169 B	orange red	14	absent	40	25	weak
Chopin	ca. RHS 169 D	red	14	absent	40	25	medium
Early Dream	between RHS N25 A and RHS N25 B	orange	14	weak	42	35	absent
Early Fantasy	between RHS 168 D and RHS 42 B	salmon red	14	absent	35	55	weak
Early Passion	ca. RHS 12 A	yellow green	14	absent	40	46	very strong
Early Sensation	between RHS 7A and RHS 151 D	green yellow	14	absent	38	42	weak
Helena	ca. RHS 5 A	yellow with green flush	12	absent	40	37	weak
Red Beauty	between 42 A - 179 A	red	16	weak	45	45	absent
Satie	ca. RHS 179 B	brown red	14	absent	35	24	medium to strong
Sunrise	between RHS 28 A - RHS N30 B	orange red	16	weak	50	50	weak to medium
Tsjajkovski	ca. RHS 15 C	yellow orange	14	absent	36	22	weak to medium
Vivaldi	ca. RHS 14 C	yellow orange	14	absent	45	25	weak

\* = seed propagated material

\*\* = observations of 3 accessions have been combined

\*\*\* =not observed, see text.

## Discussion

All the investigated plant material belonging to *Fritillaria* section *Petilium* show a leafless stem, a dense whorl of leaf-like bracts at the top, and nodding flowers (Clark and Grey-Wilson, 2003; Wietsma *et al.*, 2015). The results in Table 2 show that there are clear differences among the four species. *F. chitralensis* and *F. raddeana* differ from *F. eduardii*, the *F. imperialis* cultivars and the interspecific hybrids in plant size and flower size.

However, the differences between *F. eduardii* and *F. imperialis* cultivars are very small. In 1884 there was already a taxonomical problem involving *F. eduardii* and *F. imperialis* due to the small difference between the two species. In four articles published that year, Eduard Regel described and repositioned material that is now known as *F. eduardii*. In his first article he considered this newly discovered species as a new species, but closely related to the crown imperial (*F. imperialis*). In his second and third article he treated *F. eduardii* as a variety of *F. imperialis*, although it differed in the foxy-smell. In his last article in 1884 Regel introduced two colour variants, one with saffron-yellow nodding flowers and the other with purple erect or horizontal flowers. However, in this last article names on illustrations were mixed up. Wietsma *et al.* (2011) re-established the name *F. eduardii* for

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both colour forms. *F. eduardii* and *F. imperialis* are morphological very similar but differ in the size of the nectaries and in crossing-experiments they never produced seeds (Wietsma *et al.*, 2011). Recently, an increase in commercial breeding efforts within *Fritillaria* sect. *Petilium* resulted in new cultivars suitable for the garden and for cut-flower production. These new cultivars are not only produced within the species *F. imperialis*, but are mostly interspecific hybrids between the four species of section *Petilium* (*F. chitralensis*, *F. eduardii*, *F. imperialis*, *F. raddeana*). According to the International Code of Nomenclature for Cultivated Plants (ICNCP; Brickell *et al.*, 2016), article 1.4., there is the possibility to apply new botanical Latin names to hybrids of different taxa arisen in cultivation, but alternatively (or in addition), cultivated plants arising through hybridization may also be named as cultivars, Groups or grexes under the provision of this *Code*. Because the interspecific hybrids of section *Petilium* have arisen in cultivation and some interspecific hybrids consist of more than two species, a classification based on the taxon concept, necessitating the introduction of new hybrid taxa, does not seem desirable. Therefore we propose to apply a cultonomic approach to classify the cultivated material in *Fritillaria* section *Petilium*.

## Cultonomic treatments

When proposing changes in (cultonomic) classification and nomenclature, it is important to consult the end-users (the bulb retail and exporting companies) to discuss these changes. During a discussion organised by the KAVB branch organisation, the end-users noted that in future there will be more new cultivars on the market within *Fritillaria* section *Petilium*, both within species and based on crosses among species within section *Petilium*. The end-users agreed that these new cultivars look very similar to the *F. imperialis* cultivars and that all of this material could be combined in one crop, but that there should be a division into two Groups: one Group (the Crown Imperial Group) consisting of the historical *F. imperialis* cultivars, with the argument that these cultivars are well known and are already sold as crown imperials for a long time, and a second Group with the new *F. imperialis* cultivars and cultivars from other species and species hybrids within *Fritillaria* section *Petilium*. A name for this second Group has not yet been proposed. Together, the two Groups would constitute the crop (van den Berg, 2004), for which the end-users suggest the name 'crown', reserving the name 'crown imperial' for the cultivars belonging to *F. imperialis*. A summary of this cultonomic treatment is given in Appendix 1.

We are of the opinion that the approach of the end-users is not in line with the International Code of Nomenclature for Cultivated Plants (ICNCP; Brickell *et al.*, 2016) because Groups should only be formed on the basis of clear, observable differences, and it is not possible to distinguish the Crown Imperial Group from the second Group. Based on our research, we suggest a more modern, user-friendly cultonomic approach, based on morphological characteristics. Because of the overall similarity of all of the cultivated material within *Fritillaria* section *Petilium*, we suggest to extend the crop name crown imperial and apply it to all the cultivars derived from the species *F. imperialis* and all interspecific hybrids produced between this and other species (both simple interspecific hybrids between two of these species and complex interspecific hybrids involving more than two species). Within this crop we form four user-friendly Groups based on the characteristics early and late flowering and yellow and orange-red flower colour. In this proposal the cultivars will be divided over this four Groups regardless of their genetic composition. A summary of this cultonomic treatment is given in Appendix 2. It should be noted that the end-users reject such a classification with the argument that the low number of cultivars make Groups based on flower colour and earliness unnecessary.

At present, the major part of the bulbs produced are grown from historical *F. imperialis* cultivars (cultivars registered before 2000). The growers want to keep these separated from the new species hybrid cultivars. The KAVB is not against a new cultivar grouping, but at present it will follow the preference of the end users.

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Our cultonomic treatment, however, provides an approach that is able to accommodate the cultivars to be developed in the future, even those that might result from other fritillaries than the *Petilium* species.

## Acknowledgements

We are indebted to VOF. De Keizerskroon (represented by Doede de Jong) for supplying plant material for this study, Hortus Bulborum, Limmen and W.F. Leenen & Zn., Voorhout, for the use of their *Fritillaria* collections, Johan van Scheepen and Saskia Bodegom, KAVB for useful discussions and advice.



*F. imperialis* cultivars in the fields of Fa. Leenen, 2006 and 2011, photos Willem Wietsma.



*F. imperialis* cultivars and breeding stock in the fields of VOF. De Keizerskroon, 2016, photos Willem Wietsma.

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## APPENDIX 1

### Groups within the crop Crown

1. Crown Imperial Group: the historical *F. imperialis* cultivars, introduced before 2000.
2. Group (no name proposed): modern *F. imperialis* cultivars and cultivars from species hybrids.

Here we list the cultivars belonging to them:

1. Crown Imperial Group. Description: All cultivars belonging to *F. imperialis* (introduced before 2000). Standard cultivar: 'Aurora'.

Cultivars: 'Argentiovariegata', 'Aureomarginata', 'Aurora', 'Double Gold', 'Early Red', 'Lutea', 'Orange Brilliant', 'Premier', 'Prolifera', 'Rubra Maxima', 'Slagzwaard', 'Sulpherino', 'William Rex'.

2. Group (no name proposed). Description: Cultivars of *F. imperialis* or species hybrids within *Fritillaria* section *Petilium* (introduced from 2000 onwards). Standard cultivar: 'Early Passion'.

Cultivars: 'Beethoven', 'Castor', 'Chopin', 'Early Passion', 'Early Sensation', 'Early Fantasy', 'Early Dream', 'Garland Star', 'Helena', 'Orange Beauty', 'Orange Sweet', 'Pollux', 'Red Beauty', 'Satie', 'Sunrise', 'Sunset', 'Tsjajkovski', 'Vivaldi'.



'Aureomarginata', 'Orange Brilliant' and 'Slagzwaard' - photos by [Hortus Bulborum Limmen](#).

## APPENDIX 2

### Alternative proposal for Groups within the crop Crown Imperial

As all the investigated plant material belongs to *Fritillaria* section *Petilium* and all plant material show the typical morphological characteristics (a leafless stem and at the top a dense whorl of leaf-like bracts, with nodding flowers), they all belong to the extended crop crown imperial. In our research we found four main differences in characteristics within the *F. imperialis* cultivars and interspecific hybrids. Based on these four useful user-friendly differences, flowering time (early and late), differences in flower colour (yellow and orange red) we propose to make a subdivision in four cultivar-groups within the crop Crown Imperial.

### KEY TO THE GROUPS WITHIN THE CROP CROWN IMPERIAL

(Dutch: keizerskroon):

1. Early flowering.....2  
– Flowering mid-late or late.....3
2. Corolla yellow 1. Early Yellow Group  
– Corolla orange, orange red or red: 2. Early Orange-Red Group
3. Corolla yellow: 3. Late Yellow Group  
– Corolla orange, orange red or red: 4. Late Orange-Red Group

Here we formally describe the four proposed Groups and list the cultivars belonging to them:

1. Early Yellow Group. Description: Plants flower early (March) with yellow flowers. Standard cultivar: 'Early Passion'.

Cultivars: 'Early Passion', 'Early Sensation', 'Helena', 'Tsjaikovski'.



Left:  
'Early  
Passion'

Right:  
'Early  
Sensation'

Photos by  
Willem  
Wietsma.



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'Early Dream' - photo [Hobaho](#)



'Early Fantasy'



'Orange Beauty'



'Red Beauty'

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'Orange Sweet'



'Sunrise'

2. Early Orange-Red Group. Description: Plants flower early (March) with orange, orange-red and red flowers.

Standard cultivar: 'Orange Beauty'.

Cultivars: 'Beethoven', 'Early Dream', 'Early Fantasy', 'Orange Beauty', 'Orange Sweet', 'Red Beauty', 'Satie', 'Sunrise', 'Vivaldi'.

3. Late Yellow Group. Description: Plants flower late (April) with yellow flowers.

Standard cultivar: 'Lutea'.

Cultivars: 'Double Gold', 'Lutea'.

4. Late Orange-Red Group. Description: Plants flower late (April) with orange, orange-red and red flowers.

Standard cultivar: 'Garland Star'.

Cultivars: 'Argentiovariegata', 'Aureomarginata', 'Aurora', 'Castor', 'Chopin', 'Early Red', 'Garland Star', 'Orange Brilliant', 'Pollux', 'Premier', 'Prolifera', 'Rubra Maxima', 'Slagzwaard', 'Sulpherino', 'Sunset', 'William Rex'.



'Double Gold' - photo Hortus Bulborum Limmen



'Garland Star'



'Sunset' - photo Hobaho.nl

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'Premier', 'Prolifera' and 'Sulpherino' – photos Hortus Bulborum Limmen

### APPENDIX 3

#### The present status of the *F. imperialis* cultivars (introduced between 1577 and 2005)

There are only a few sources of written information on *F. imperialis* cultivars (Hortus Bulborum (Leijenhorst, 2004), the International checklist for Hyacinths and Miscellaneous bulbs (van Scheepen, 1991) and Crown Imperials (Clark & Grey-Wilson, 2003). This information is fragmented and sometimes contradictory. A well-preserved collection of these *F. imperialis* cultivars is maintained by the Hortus Bulborum, Limmen, NL. This collection preserves some cultivars which are not grown and maintained by growers anymore.

The oldest *F. imperialis* cultivar 'Duplex' dates back to 1594 (Table 1). Characteristic for this cultivar is that the orange flowers are situated in two whorls, or tiers of bloom, one sitting immediately above the other. Cultivars described with similar characteristics are 'Prolifera' (orange, second flower head on top of the first) introduced before 1613 (Besler, 1613) (probably 1577 but this date is uncertain, Leijenhorst, 2004). The cultivar 'Kroon op Kroon' is according to Leijenhorst (2004) and van Scheepen (1991) a synonym of 'Prolifera'. According to Clark & Grey-Wilson (2003) 'Kroon op Kroon' and 'Prolifera' are synonyms, but according to their description 'Prolifera' possesses an excessive number of small brick red flowers in a single whorl (this description better fits the cultivar 'Slagzwaard'). The cultivar 'Prolifera' is still found in the collection of Hortus Bulborum, but unfortunately the 'two whorls of flowers, one sitting immediately above the other' are not seen anymore. According to our previous work (Wietsma *et al.*, 2015) 'Prolifera' (from the Hortus Bulborum) is, based on AFLPs, similar to 'Rubra'. According to the RHS Plant Finder (Cubey *et al.*, 2018) bulbs are still offered. If there is still plant material available, we propose to use the first used name, 'Duplex' (in cultivation since 1594), for plant material with orange flowers arranged in two whorls, or tiers of bloom, one sitting immediately above the other. The names 'Prolifera' and 'Kroon op Kroon' are considered as synonyms. A kind of double crown in the flowers of the pseudo umbel, but in a spiral arrangement, is seen in the modern cultivars 'Early Dream', 'Early Passion', 'Orange Beauty' and 'Sunrise'. This spirally elongated crown is best seen in plants derived from big bulbs. The cultivar 'Slagzwaard' (in cultivation since 1771), synonym 'Fasciata' (synonym 'Monstruosa' is mentioned with a question mark (?), by Leijenhorst, 2004), is described with having a fasciated (broad flattened) stem with many orange red (slightly) smaller flowers (Table 2). In the accession of the Hortus Bulborum, only ca. 20-30% of the bulbs produce this fasciated stem.

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Also in previous work (Wietsma *et al.*, 2015) we concluded, based on AFLP (Amplified fragment length polymorphism) research, that the two variegated cultivars 'Argentiovariegata' (in cultivation since 1771, flowers red, leaves whitish variegated, van Scheepen, 1991) and 'Aureomarginata' (in cultivation since 1665, flowers red, leaves yellow variegated, van Scheepen, 1991) are genetically similar and we suspect that one is a mutant from the other.

According to Clark & Grey-Wilson (2003) the cultivar 'Rubra' (not present any more in the collections of HBL, FaL and VOFK, but still grown in the Netherlands) "has been treated as a 'dustbin' cultivar, with any red-flowered variant being included if it cannot be fitted into one of the other red-flowered cultivars". Mixtures like these are also still offered under the name *F. imperialis* 'Red'. Probably, traces of seed propagation can still be found in 'Rubra' and are responsible for these off-types. Propagation of the cultivars in the past was done in two ways: clonal propagation by planting a big bulb that was spliced in two halves or seed propagation. A disadvantage with this clonal way of propagation is that a rather big stock had to be maintained to produce marketable bulbs. A disadvantage of seed propagation is that the cultivars were mixtures of genotypes and require a lot of selection work. The older cultivars still have the tendency to split when a big bulb is planted, in such a way that often two bulbs, not of the proper size for selling, are produced (Wietsma, 1989). Propagation to maintain clonal cultivars these days is done by cutting big bulbs with a sterile knife (Alkema, 1976; Wietsma & van den Berg, 2018).

The orange red cultivars 'Aurora', 'Garland Star', 'Orange Brilliant', 'Premier', 'Sulpherino', 'William Rex' are still available in the RHS Plant Finder (Cubey *et al.*, 2018), cultivar 'Early Red' is only found in the Hortus Bulborum and is not in the RHS Plant Finder (Cubey *et al.*, 2018).

The red orange 'Rubra Maxima', introduced in 1665, synonym 'Maxima' (van Scheepen, 1991), and 'De Jagers Favourite' (Clark & Grey-Wilson, 2003) is the only tetraploid ( $2n=48$ ) cultivar and still available and mentioned in the RHS Plant Finder (Cubey *et al.*, 2018).

Clark & Grey-Wilson (2003) mention the cultivar 'Foremost' (flowers dull orange-red, stem 60-80 cm very early flowering (grown in North Cambridgeshire), this cultivar is not commercially available and not mentioned in the RHS Plant Finder (Cubey *et al.*, 2018).



*F. 'Rubra Maxima'* –  
photo Hortus Bulborum Limmen

In cultivation, there are three single flowered yellow cultivars known: 'Lutea' in cultivation since 1665, with clear yellow flowers, with faint purple veins, 'Flava' in cultivation since 1665, with yellow flowers and 'Maxima Lutea' (synonym 'Lutea maxima'), in cultivation since 1867, with large yellow flowers (van Scheepen, 1991). 'Maxima Lutea' is supposed to be tetraploid ( $2n=48$ ) and 'Lutea' is diploid ( $2n=24$ ), for 'Flava' no records of chromosome counts are available (van Scheepen, 1991). It is doubtful if the present 'Maxima Lutea' (in cultivation since 1876, van Scheepen, 1991) is the tetraploid form, it is probably a large diploid 'Lutea' (Wietsma & de Jong, 1989). The cultivar 'Flava' is not offered anymore and not mentioned in the RHS Plant Finder (Cubey *et al.*, 2018). Like cultivar 'Rubra', besides clonal propagation also seed propagation occurred.

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For 'Lutea' various accessions are in cultivation, different in their morphology (plant size, flower size and small colour differences in the yellow flower colour), but also within accessions of 'Lutea' morphological differences are found. These mixtures are also offered as '*F. imperialis* Yellow'. From crossing experiments (not published) we know that the yellow flower colour is based on one recessive gene.

There is one double flowered (12 instead of 6 petals) cultivar 'Double Gold' introduced in 1979, with clear citron-yellow flowers, greening towards the tepal basis. Since 2017 'Double Gold' is included in the collection of the Hortus Bulborum, but this cultivar never went into production and no suppliers are mentioned in the RHS Plant Finder (Cubey *et al.*, 2018).



*Fritillaria imperialis* cultivar tepal variation - photo by Laurence Hill, [Fritillaria Icones](#).

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In wild populations of *F. imperialis* (Iran) that flower in orange-red shades, very rarely a yellow colored plant is found (Alp *et al.*, 2009, Wietsma *et al.*, 2015, Kiani *et al.*, 2017). According to Alp *et al.* (2009) “The information regarding the yellow form of this species which is known as “Lutea” dates back to 1665 and is referred to hybrid of *F. chitralensis* and *F. imperialis*. There is no information regarding its origin. However, we found natural plants with yellow flowers in Anatolia. This shows that the yellow form is not a hybrid.” Kiani *et al.* (2017) agrees with Alp *et al.* (2009) that the yellow form is not a hybrid. The cultivar ‘Lutea’ and its synonyms could have originated from aberrant colour types in wild populations.



A selection of *Fritillaria imperialis* cultivars - photo by Laurence Hill, Fritillaria Icones.

On the website Fritillaria Icones (Hill, 2018) a photograph of cultivar ‘April Flame’ (638-April Flame) is displayed, with orange-red striped-speckled flowers, no suppliers are mentioned in the RHS Plant Finder (Cubey *et al.*, 2018). Cultivar ‘Striped Beauty’ is registered by the KAVB in 1999. It can also be

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found on the website [Fritillaria Icones \(Hill, 2018\) 157](#)-Striped Beauty, with light yellow orange flowers with red veins. In the RHS Plant Finder (Cubey *et al.*, 2018) 'Striped Beauty' suppliers are mentioned. Although we did not involve 'Early Red', 'Rubra', 'Striped Beauty' and 'Double Gold' in this study we suggest the inclusion of these cultivars (based on growers' information) in Appendix 1 (Groups within the crop crown) in 1. Crown Imperial Group: the historical *F. imperialis* cultivars, introduced before 2000. In Appendix 2 (Key to the Groups within the crop Crown Imperial) we suggest to include 'Early Red', 'Rubra' and 'Striped Beauty' in 4. Late Orange Group, and 'Double Gold' in 3. Late Yellow Group. For 'April Flame' we have no growers' information, only a photograph is known to us. When the year of introduction of 'April Flame' is known, it can be placed in Appendix 1 in Group 1 or 2 (variety introduced before or after 2000). In Appendix 2 'April Flame' could be placed in Group 2 (Early Orange-Red Group) or Group 4 (Late Orange-Red Group), depending on flowering time.



*Fritillaria* 'Helena'. A hybrid between *F. raddeana* and *F. chitralensis* - photo by Laurence Hill, of the informative Fritillaria Icones website.

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## ---Plant Description---

### **When did you last see your Dad? A new Chilean *Zephyranthes* and Argentinian *Olsynium* gifted to Darling Daughters by their step-mum and often absent father**

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Published in IRG 120 December 2019, pages 25-76.

#### **"What's in a name? ... a rose by any other would smell as sweet"**

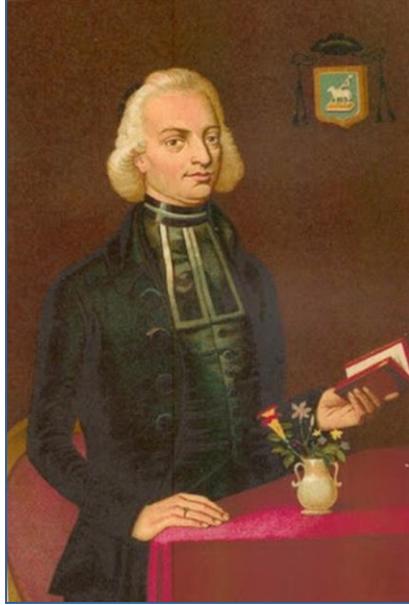
Believe it or not, the International Plant Names Index (IPNI 2019) is said to contain over 1,600,000 entries (GitHub 2019), although in fact no more than some 374,000 actual species are accepted (Christenhusz & Byng 2016). Latin epithets in current use span a continuous 266 years of publication, from Linnaeus (1753) to the present, when about 2000 new species are being described annually (Christenhusz & Byng 2016). These figures reveal that a vast number of published names are either below species level or new combinations and changes of rank, or are not accepted for some other reason, e.g. they may be synonyms, homonyms, or invalid, and so on. What might be the number of distinct epithets below genus level is impossible to guess, but it must be very considerable, even though common ones such as *vulgaris*, *acaulis* and *hirsuta* have been applied to species in any number of genera. We two have contributed our little drop in the ocean of 36 epithets between 1984 and now (excluding the two herein). At least 29 of those have never been coined for any plant before.

The majority of plant names fall into various distinct categories such as geographical location (e.g. *chinensis*, *peruanus*, *lesbiaca*, *bavarica*), habitat (e.g. *maritima*, *aquatica*, *alpinus*), duration (e.g. *annua*, *perennis*), basic form (e.g. *arborea*, *parasiticus*, *herbacea*), morphological features (e.g. *longipetala*, *succulentum*, *urens*), general overall physical or aesthetic appearance (e.g. *nanum*, *prostratus*, *pulchra*), similarities to other plants (e.g. *myrtifolia*, *pseudocanina*, *taraxacoides*), and of course ... people.

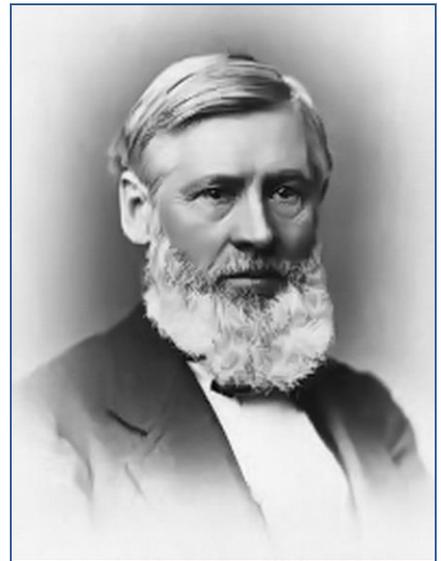
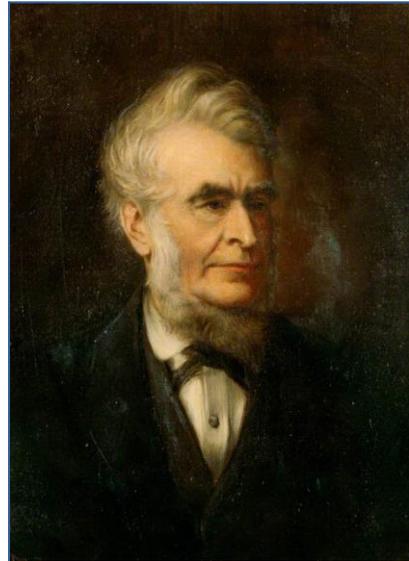
Now all except the last of those nominally tell you something about the plant itself, although large numbers are either completely vague, misleading, inadequate as regards to overall locations, or are subjective judgements. Only some will tell you anything that's relevantly exclusive to the plant concerned.

To turn to where we're heading - plants commemorating people, i.e. eponyms - some botanists dislike this option strongly. They consider an epithet should convey nothing but information about the plant in question. In our considered opinion this flies in the face of historical precedence. Almost without exception, major figures in plant taxonomy from Linnaeus [fig.1] onwards have 'scientifically immortalised' fellow humans and most have had plants named for themselves too. Herewith, in date of birth order, a handful of those authors following Linnaeus who are best or at least better known to us: Banks, Cavanilles [fig.2], Willdenow, de Candolle [fig.3], William Herbert, W.J. Hooker, Sweet, Kunth [fig.4], David Don, Gay, Bentham [fig.5], Philippi, Asa Gray [fig.6], Boissier, Ruprecht, Regel, J.D. Hooker [fig.7], Roehl, Sereno Watson [fig.8] (no relation!), Maximovich, Baillon, Engler [fig.9], Druce, Britton, Reiche, Hitchcock, Wilhelm Becker, Peter Davis [fig.10] (who kindly named *Arabis watsonii* for John) and Peter Raven [fig.11]. And that's barely scratching the surface. As a further point, the more taxa in a genus, the more difficult it becomes too to find any relevant non-eponyms that haven't been used before, sometimes also as a number of unknowing homonyms. Consequently, larger ones inevitably tend to have a higher percentage of eponyms.

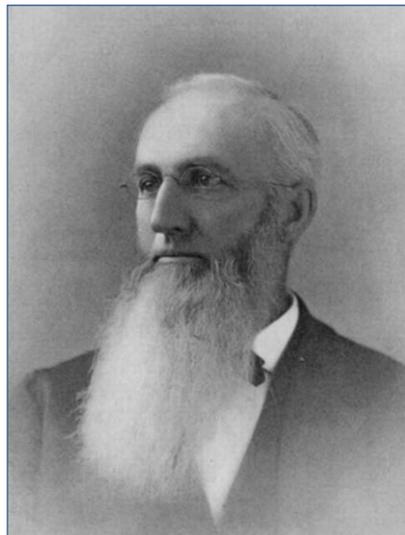
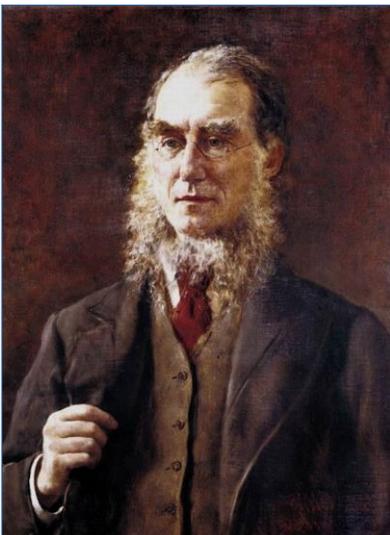
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figs 1, 2, 3: Carl Linnaeus (1707-1778), Antonio José Cavanilles (1745-1804), Augustin Pyrame de Candolle (1778-1841)

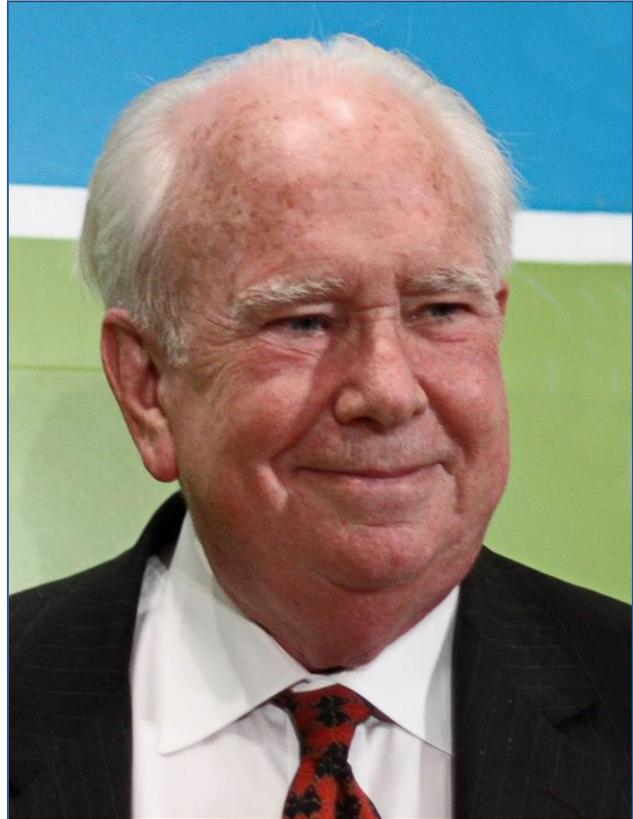
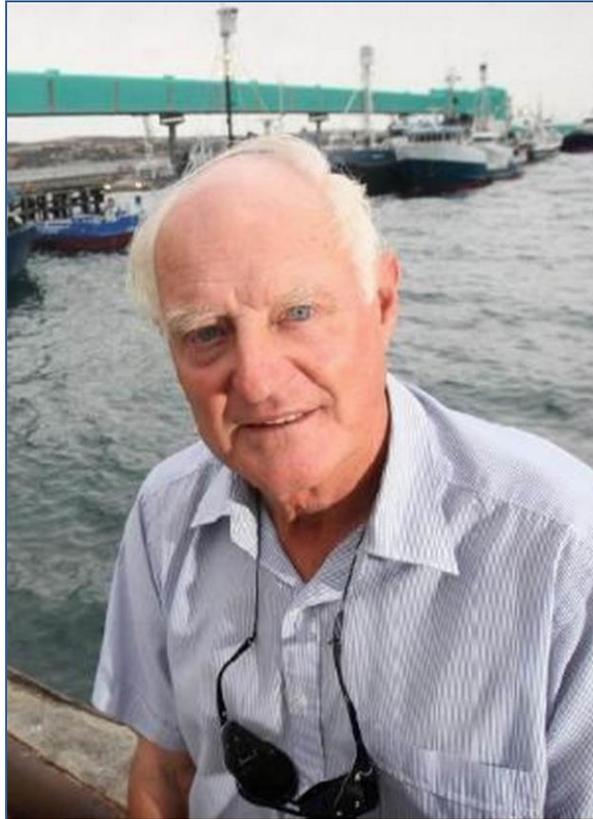


figs.4, 5, 6: Carl Sigismund Kunth (1788-1850), George Bentham (1800-1884), Asa Gray (1810-1888)



figs.7, 8, 9: Joseph Dalton Hooker (1817-1911), Sereno Watson (1826-1892), Heinrich Gustav Adolf Engler (1844-1930)

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figs.10, 11 Peter Hadland Davis (1918-1992), Peter Hamilton Raven (b.1936)

At this stage it's worth noting the formal requirements of a botanical name: it must be distinct for its genus and ranks, it should not be over-long or over-clumsy (not always followed!), must comply with nomenclatural rules and procedures, and has to be explained (Turland et al. 2018). Nothing else matters. As such it references and identifies the plant it's attached to, in much the same way as do people's names. Unless you somehow know or know of a person, their name will tell you next to nothing about them. The same applies to plant eponyms, but at least such legitimate Latin binomials are one-off, which is more than can be said for human ones!

So who gets to be monumentalized? Answer (in case you don't already know): collectors who discover the plants in question - other botanists, including relevant specialists - working colleagues - family - friends - financial donors - in fact anybody who might in some way be considered to be involved with the plant - and even others who are admired or have inspired the author of the plant's name. The dedicatee may be alive or dead at the time, and come from any period and place in history.

You might be astonished to know how many organisms carry the monikers of famous (and sometimes infamous!) people. A few unpleasant creepy-crawlies, usually slimy ones, even get named after unpopular leaders to insult them! To satisfy curiosity see Wikipedia (2019b) in the bibliography below. Most in that list are arthropods and lower, but plants also find their way onto it. Here are a few of the latter with well-known dedicatees: three for David Attenborough, who probably has more organisms named for him than any other famous person - *Blakea attenboroughii* (Melastomataceae), *Nepenthes attenboroughii* (Nepenthaceae), *Sirdavidia* (Annonaceae); four celebrating U.S. presidents - *Franklinia* (Theaceae), *Jeffersonia* (Berberidaceae), *Rooseveltia frankliniana* (Arecaceae), *Washingtonia* (Arecaceae); and also *Dendrophorbium chopinii* (Asteraceae), *Dudleyia hendrixii* (Crassulaceae), *Gaga* (Pteridaceae), *Maxillaria gorbatchowii* (Orchidaceae), *Pinus montezumae* (Pinaceae), *Rafflesia* (Rafflesiaceae), *Rebutia einsteinii* (Cactaceae), *Rubus x mussolinii* (Rosaceae) and *Victoria* (Nymphaeaceae).

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Having gone to that length to provide a background for our own considerable percentage of eponyms to date, sixteen in fact, who do those commemorate? Half record our indebtedness to friends and colleagues who collected and brought the pertinent plants to our attention, at times also having provided valuable information about their populations and environments, or who accompanied us when we found them. Four consist of admired botanists who've specialised in the plants concerned. One is to repay John's never-to-be-forgotten collecting partner. A greatly admired Chilean philanthropist is celebrated by another, while the remaining pair, together with both new species here, are dedicated to immediate family. As far as that last goes, here are two historic precedents:

Like John, Georg Hieronymus (1881) had a wife and two daughters. A German resident in Argentina for a good while, he discovered new violas there and set out to name one for each of them. He made it with *Viola flos-idae* and *V. flos-mariae* ('Ida's flower', 'Maria's flower'), but for some reason failed to complete the family set with *V. flos-evae* (Eva's flower'), where he got no further than writing its name on the specimen sheet. Nevertheless, Becker (1922) came across it at the Berlin Dahlem herbarium and eventually finished off the job formally for him - as *V. evae*.

With or without knowledge of Hieronymus, in order to commemorate fellow botanist Stange, another German, Paul Graebner (1906), called his small valerianaceous genus by the patronym *Stangea*. He then named its original five species after the four female and one other male member of his family: *SS. emiliae*, *erikae*, *henrici*, *paulae* and *wandae*. Thus these binomials are eponymous through and through!

A rose by any other name would indeed smell as sweet, but pretty plants can have no sweeter subjects to obtain their names from than the two as follow!

### **A debt repaid**

What exactly does that "... often absent father" in the title mean? Of course, in his dotage John is away from them physically always now, except on those all-too-rare occasions when they come to Chile or we go to England. But that's not the point. In 1971 and 1972, when Sarah [figs.41, 52, 53] was little more than a year old, he gaddled off to South America in pursuit of plants for the first time. By the time of his next gallivant; to Turkey in 1977, Nicola [figs.75, 90, 91] had arrived on the scene meanwhile. At least his conscience drove him to send them regular picture postcards from there. In addition to time spent abroad, the considerable period buried almost continually in post-trip work on specimens and the urgent need to distribute the spoils should not be forgotten.

Although permanently in England all the while, the full-time-plus demands of setting-up and running his ultimately ill-fated one-man Four Seasons Nursery from 1980 to the end of 1986 had the same effect. Often he would return from selling at distant county shows in the middle of the night, and was even lucky to get away with his life when he fell asleep at the wheel on a couple of occasions! Next to zero social and family life resulted, except both girls [figs.12, 13, 14, 92] would enjoy helping to sell the pots of flowering alpiners at occasional local sales events.

But the ultimate sudden and unforeseen demise of the nursery turned out to be a blessing in disguise, as it led to the 1987 and 1988 exploration of Patagonia, the consequent meeting between us two present writers, and from there to where we now are. Again, though, John was far less in touch with teenage Sarah and Nicola than any of them would have liked, and this continued up until the time they became independent adults.

These two humble dedications, therefore, are a small repayment for their lack of resentment, their devoted support during all that time and to the present, and the love the four of us share between us. Their mother, John's ex-wife Adrienne, will surely be gratified as well.

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fig.12: John with Sarah (R) and Nicola (L), now incredibly in their 40s (and bashful grandson Joe), enjoying a picnic at Alexander Park, Hastings. (7 Sep 2015. ARF)



fig.13: Anita with stepdaughters Sarah (R) and Nicola (L) on the seafront at La Serena, Coquimbo Region, Chile. (19 Oct 2009. JMW)



fig.14: Nicola (R) and Sarah (L) enjoying the Flowering Desert with us at the Buenos Aires Pass, N Coquimbo Region, Chile. (17 Oct 2009. JMW)

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## Even-stevens

Although neither of the two girls was involved in collecting their nominate species, they've both visited us in Chile on various occasions, during which we've travelled to both general areas concerned. Further than that, they've actually been with us when we did in fact collect two other plants new to science, one already described (Watson & Flores 2019b), the other on our waiting list. In fact, on various occasions we've been on short field trips together, so they're completely familiar with our work in situ.

The first priority for this project was to find two hitherto undescribed species which are not only attractive, but equally attractive. Far be it from us to initiate sibling rivalry! So yes: **equally** attractive. Section *Andinium* of *Viola*, our main focus of botanical study, seemed the obvious choice from the start, but for various reasons we've never managed to find a 'matching pair'. By the time this article for the IRG became a practical reality and we started to think seriously about it, we'd selected two clear candidates from our waiting list of novelties. Would you believe that when we began investigating them in depth, both turned out to have been published already! One was *Mutisia tridens*, a scarcely known species of this rather familiar genus. It looks like a showy pink *M. subulata*, and was described as long ago as 1832. The other is the dwarf Malvaceae illustrated here [figs.69, 70]. The second of those photos shows what we've always known as *Tarasa humilis*, a relatively common and quite widespread species, clump-forming as we'd always seen it, first published a year after the mutisia above. Fig. 69 will tell you you're apparently looking at a closely allied but distinct taxon; more prostrate, spread widely across the ground by rhizomes, and with almost stemless flowers of a somewhat different form and slightly reduced size. That was our intended subject.

By a stroke of good fortune, among our slowly dwindling number in need of publication there remain two potentially up for grabs which could hardly be bettered. Despite originally having other epithets pencilled in for them, they're now co-opted to further and complete this pre-eminent aspiration here and now.

The two species share the broad common factors of belonging to the temperate South American flora and both being petaloid monocots. Other than that they look completely unlike, come from different families and genera, and a glance at the map marking their general localities [fig.15] will show they inhabit different countries at different latitudes, Argentina and Chile, on opposite sides of the Andes. The environment of one is the Pacific coastal belt with its Mediterranean climate. The other populates the northern Patagonian upper steppe. But, most importantly here - they're new to science. Which to choose for whom though? For complete objective partiality, the decision was made by the spin of a coin, literally. So don't blame us - the money has spoken!



fig.15: South America, showing locations of *Zephyranthes sarae* (pink circle) in Chile and *Olsynium nicolae* (yellow circle) in Argentina.

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## Catch me by the seaside for Sarah

Someone has to come first of course, so as she's the elder, we'll start with Sarah's novelty.

In fact during 1973, years before we two authors here had met, that particular bulbous plant was first encountered in full flower by Anita and her father. It formed a very small colony somewhat inland and 190 km south of the type site, close to the road and near a community called Tambillo 30 km south of La Serena. The locality is indicated by the yellow circle on the map [fig.47]. Anita took John to see it shortly after they started working together.

In those days the South American amaryllidaceous group to which it belongs was considered to be part of the widespread *Hippeastrum* genus. Later, critical differences were detected and it was transferred to the more localised *Rhodophiala*. When that was found to be a misidentification recently, all its species were in the process of being transferred to the virtually unknown genus *Myostemma*. That has been halted in its tracks, however, because cytological studies revealed a very short time ago that these and other related genera actually belong within a genus which again is familiar and very geographically extensive, to boot: *Zephyranthes* (Garcia et al. 2019). It's to be fervently hoped this will prove its last name changing move!

Right from the start we appreciated it was clearly a new species which didn't accord with any others as described formally. Severe lack of time for paperwork back then due to almost constant fieldwork and seed distribution, not to mention our gross inexperience in describing new taxa, excluded the possibility of taking it under our wing. Further to that, botanical information on several species of its then genus was seriously deficient, leaving the collectivity as a whole difficult to understand (which it still is to a degree!). So we shelved it for intended future publication. Imagine our shock then to come across a collection of it later in the herbarium of the Santiago Natural History Museum with '*Rhodophiala ovalleana*' pencilled on the sheet by Pierfelice Ravenna! He was the outstanding authority of these amaryllids at the time. Even worse, if you check The Plant List (date) you'll find it listed there to this day as a reliably accepted species. This came close to destroying our hopes until we discovered that it was not named in IPNI (2019), let alone ever having been published anywhere. Quite unbelievably, it transpires that The Plant List acceptance was based on nothing more than it having been included by name only in an interim catalogue of the Chilean flora (Marticorena & Quezada 1985). Draw your own conclusions from that. So with a sigh of relief we're still on track.

fig.16: The Pacific semi-desert coastal habitat just S of Huasco, Atacama Region, Chile, which *Zephyranthes sarae* inhabits. (19 Mar 2010. ARF)

The type location [figs. 42, 47] is situated just south of Huasco, a small Pacific town in Chile's Atacama Region. The semi-desert coastline in this sector [fig.16] has a particularly biodiverse and attractive flora, fostered by cool mists off the sea, and climaxing now and then as the so-called Flowering Desert during the intermittent



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years of Southern Oscillation (El Niño) downpours. In fact shortly to the north of Huasco a 225 sq. km, national park has been established, the Llanos de Challe, based on the presence there of rare and emblematic *Leontochir ovallei* of the Alstroemeriaceae [fig.17]. Unfortunately, although it stretches inland for over 20 km, the area of the park was not extended to include Huasco and the littoral south of there, which in our opinion harbours an even richer and more variable flora. In fact the actual Pacific seafront covered by the park is a mere 5 km long. This from a total of around 100 km stretching roughly between 28°S and 28°52'S, with an impressive overall tally of vulnerable taxa, several of which are found nowhere else, and where others are still being described for science.



fig.17: Local endemic icon *Leontochir ovallei*, the 'garra de leon'. Llanos de Challe National Park N of Huasco was created to protect it. (9 Oct 2010. JMW)

Both of us, independently before we met, and later together, have visited the Huasco sector on numerous occasions. John's first enchanted sight of the flora there was during the El Niño effect of 1971, right at the start of his very first exploration in South America with Martyn Cheese and Ken Beckett. Its monocot flora was covered in our field guide to the Flowering Desert (Hoffmann et al. 2015), and, until the project was cancelled, the dicots were intended to follow. One or two shots we took at Huasco during our latest short foray there are included in an all-illustration IRG account (Watson & Flores 2017). Although the ultra-important type collection of the new zephyranthes was made during an earlier visit, our most memorable encounter with it took place during a special event.

Iron is mined inland of Huasco, and the ore-bearing rock lumps are transported by narrow-gauge railway to a squat peninsula on the southern environs of the town. The iron is refined to pellets there, and shipped from the port alongside. But the peninsula also contains a large coal-fired power station [fig.18]. The tall chimneys constantly belch out white plumes which follow the direction of the

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prevailing wind. This significant economic aspect almost certainly explains why there is no environmental protection, which could cause serious political conflicts over aspects such as persistent pollution, which in fact has already been documented. Despite this, any industrial expansion, as in fact envisaged from time to time for Huasco, has to be preceded by an obligatory environmental survey, in one particular case during 2010. By chance, a good friend of Anita's who happened to be conducting that survey together with a colleague, invited us to be (paid!) participants as specialist identifiers of plants also able to assess their conservation requirements [fig.19].



fig.18: The industrial complex adjacent to where *Zephyranthes sarae* grows, just S of Huasco, S Atacama Region, Chile. (23 Mar 2010. JMW)



fig.19: At Huasco, S Atacama Region, planning the day's ecological survey. Anita (L), Emma (centre), the leader, and her colleague (R). (24 Mar 2010. JMW)

The survey lasted for a period of nine days in the latter half of March. Now that month in the Southern Hemisphere is early autumn. It's getting late to find any plants in flower in central Chile, let alone along the Atacama coast, which peaks three to six months earlier.

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Much of our recognition of plants had to be based on fruiting material and foliage alone therefore, other than a handful of season stragglers and those few which flower naturally at the tail end of the season. By serendipitous chance, that's exactly the perfect time to catch our zephyranthes at its most abundant best.

It didn't take us long to notice obnoxious negative effects here, where no environmental protection has been legislated. Just south of Huasco a huge, open rubbish tip spread across the ground for hundreds of metres [fig.20]. Maybe it is indeed an ill wind that blows nobody any good though, because Dominican gulls and vultures were having the feast of their lives [figs.20, 21]!



fig.20: The ghastly open rubbish tip, presumably illegal, in an area of high biodiversity to the S of Huasco where the new zephyranthes grows. (20 Mar 2010. JMW)

fig.21: Dominican gulls, *Lara dominicana*, seeing off a turkey vulture, *Cathartes aura*, from their happy feeding ground, the Huasco rubbish tip. (20 Mar 2010. JMW)

To the south and further away from the habitations and industry we were at least relieved to find the landscape still unspoilt and containing our first few flowering records. *Tristerix aphyllus* [figs.22, 23], the remarkable bright red cactus mistletoe, with tall vigorous *Eulychnia acida* and *Trichocereus deserticola* as its hosts at Huasco, has already been introduced to IRG readers, including as a front cover, last year (Watson & Flores 2018a). Here it was ubiquitous, and reminds us that it's one of the mainstays of nectar for the common little green-backed firecrown hummingbirds which migrate to the coast in winter (unless we keep feeding them sugar-water on our patio at home!). Asteraceae is the largest plant family in Chile and many of its species flower late in the season. It was no surprise therefore to find an appealing one



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whose small upright flower heads resemble some kind of fanciful yellow tubular brushes. This is shrubby *Pleocarpus revolutus* [fig.24], like the red mistletoe an endemic of the more central regions of Chile.



figs.22, 23: The parasitic cactus mistletoe *Tristerix aphyllus* (Loranthaceae) invades the host's vascular system. Only flowers and fruits appear. (24 Mar 2010. JMW) A close up of *Tristerix aphyllus* flowers showing the elongated hummingbird-adapted corolla tube. Huasco, Atacama Region, Chile. (22 Mar 2010. JMW)

In the middle of the survey we were lucky enough to observe a quite sizeable herd of guanacos [fig.25], wild llama relatives, which are not uncommon in the vicinity, though not usually in such numbers. It was particularly gratifying, because these wild animals and others are often attacked and wounded or killed by packs of stray dogs. There's no legal control whatever over those in Chile, and it's even an indictable act to kill one. Consequently, park rangers throughout the country are helpless and at times despairing.

As there were so few species in bloom during the survey, we'll fill in at times here with some of the great majority which peak earlier, in springtime, to give a fuller idea of the diversity. Sand dunes, stable or otherwise, are the habitat of a surprising number of species from quite different families. One example is *Chorizanthe mieresii* [figs.26, 27]. It's hard to believe these compact, stiff little perennial Chilean shrublets with their rigid, evergreen, slightly spiny-tipped leaves and myriads of tiny white or pale pink corollas from prominent starry calyces actually belong in the same family as the knotweeds, sorrels and docks, Polygonaceae. Provided loose sand doesn't bury them entirely, they flourish as well there as on solid ground. The same can be said for *Cruckshanksia montiana* [fig.28], one of a small rubiaceous genus of dwarf species with colourful rounded floral bracts, others of which we've included in previous IRG accounts (Watson & Flores 2017, 2018b, Watson 2019).

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fig.24: The clustered yellow 'shaving brushes' of *Pleocarphus revolutus* (Asteraceae), a welcome late-flowerer during our survey at Huasco. (22 Mar 2010. JMW)



fig.25: The encouraging sight of a thriving small herd of the wild South American camelid *Lama guanicoe*, the guanaco, S of Huasco. (20 Mar 2010. JMW)



Above, right, fig.26 *Chorizantho mieresii*, a dwarf coastal shrublet of the Polygonaceae. It adapts readily to the loose, shifting sands of the dunes, as here. (13 Oct 2010. JMW)

fig.27: The tiny flowers of the recently described *Chorizantho mieresii*, a local endemic of the Huasco coastal sector. Atacama Region, Chile. (8 Dec. JMW)





fig.28: The striking *Cruckshanksia montiana* (Rubiaceae) with coloured floral bracts; a semi-desert coastal sand dune adapted local perennial. (11 Oct 2010. JMW)



fig.29: The coast near the habit of the second population of *Zephyranthes sarae* a few km further S from Huasco. (18 Oct 2010)

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fig.30: Chilean or black dolphins, *Cephalorhyncus eutropia*, crossing a bay S of Huasco, S Atacama Region, Chile. (16 Mar 2010. JMW)

Returning to the survey, on the first day we continued south along the coast [fig.29]. To compensate for the lack of plants in flower, we were treated to the sight of a pod of what we are almost sure were Chilean or black dolphins (*Cephalorhyncus eutropia*) crossing one of the bays [fig.30]. Exact identification is impossible from the photo, but from what visible evidence there is, they don't seem to conform to any other species recorded from temperate South American waters. If indeed they were, this is considerably further north than has been registered for this endemic Chilean cetacean. On one of the sparsely xeric vegetated sandy hills a bit inland [fig.31], John somehow or other managed by sidling carefully to get close enough to another creature to take a decent enough photo for identification. This was a shy, wary lizard, the pretty little *Liolaemus nigromaculatus* subsp. *nigromaculatus* [fig.32], a very restricted rarity known only from this, its type of habitat at Huasco, and as far as a short distance to the south (Donoso-Barros, R. 1964).



fig.31: Typical semi-desert sand dune terrain S of Huasco close to where the new *Zephyranthes* grows. Atacama Region, Chile. (22 Mar 2010. JMW)

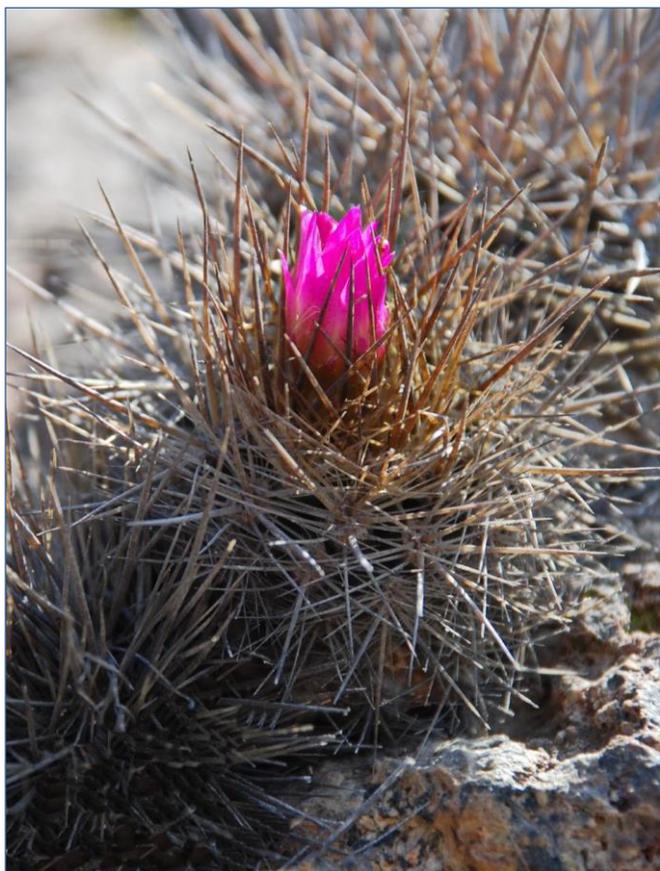
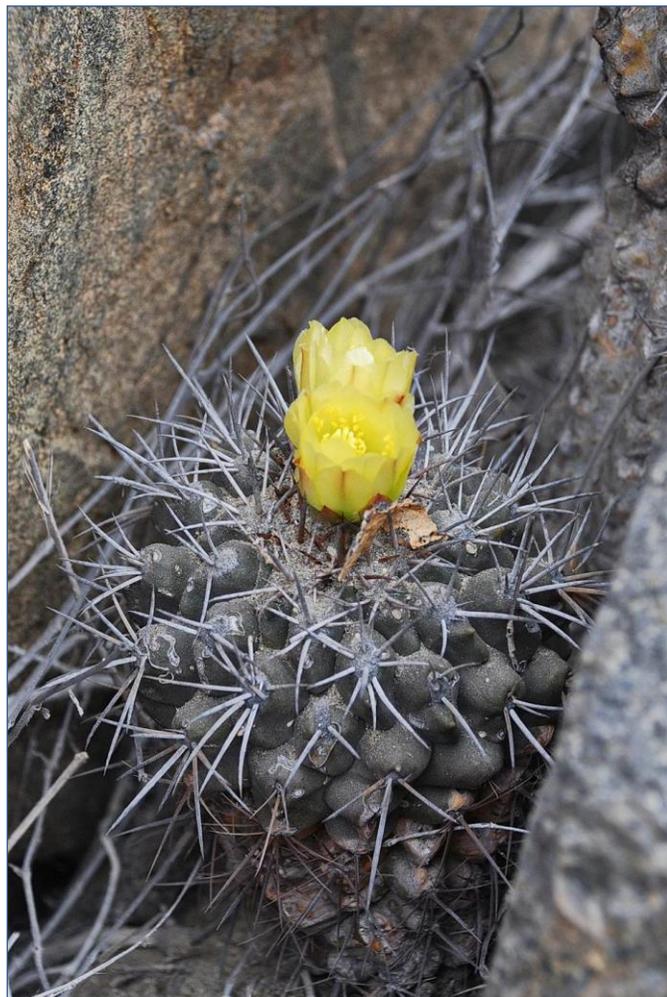


fig.32: *Liolaemus nigromaculatus*, a rare, endemic coastal lizard found only in the Huasco sector. S Atacama Region, Chile. 16 Mar 2010. JMW)

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fig.33: *Copiapoa humilis* subsp. *australis* snuggling down between rocks. The Atacama Region is the centre of the rich diversity of Chilean cacti. (16 Mar 2010. JMW)

But despite these distractions our cataloguing of plants continued steadily. Chilean cacti reach their richest concentration in Atacama Region, with 57 taxa listed in Hoffmann & Walter (2004), all endemic to the country, which is 20 more than in the numerically next highest region. Huasco has more than its fair share of them, and one or two were in flower during our survey. In general Cactaceae are over or on their way out by the end of spring here. There are fourteen photos from the desert coast in our date-indicated digital files which were taken from August to November, with as many flowering in October as the rest put together. So we considered ourselves extremely fortunate to find just one lumpy, spiny grey column of small *Copiapoa humilis* subsp. *australis* [fig.33] topped by two delicate yellow cups in perfect condition. That was probably owed to the fact of it being tucked right down in the shade of a small crevice between two large rocks.



One small Pacific littoral alliance of four species, the subgenus *Neoporteria* of the genus *Eriocyce*, does naturally flower late though due to being hummingbird adapted, as with the red mistletoe seen already. The flowers are always bright, strong pink, and a long, hollow interior nectar tube is formed by the base of the flower combined with the pericarp before the fruit develops. So it was no surprise to find a fair number of *Eriocyce villosa* [fig.34] during our work; the first time we'd ever seen it too. Considering its intended pollinators, it amused us the way its ferocious upper array of long, erect spines easily overtopped the not very large yet conspicuous flowers, and we imagined the little birds have to hover with great care in order not to get speared!

fig.34: Dwarf *Eriocyce villosa* cactus. These pink late flowering species help sustain hummingbirds when they migrate to the coast in winter. (24 Mar 2010. JMW)

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*Oxalis* is one of the half-dozen largest genera out of over a thousand in the Chilean flora. It's also interesting for its combination of broad similarities and contrasts as found in that country. Of the former we can instance invariably trifoliate leaves, immediately recognisable flower shape (as common for the genus everywhere), and their predominant yellow coloration, found in about 80% of the species. Among the more extreme differences are distribution from end to end of the country, habitats ranging from upper Andean elevations down to the coast, and consequent adapted forms from dense, dwarf alpine cushions to tuberous, succulent herbs, and shrubs with long, flexible, unbranched stems. For gardeners and small agriculturalists though, without doubt the most obnoxious contrast is the unspeakable alien weeds as opposed to always acceptably restrained natives. Two of those unspeakables infest our garden. The most ineradicable is prolifically bulbous pink *O. latifolia*, but at least it won't spread far if the ground is left undisturbed and seeds are removed. *O. corniculata* on the other hand has become uncontrollable for us. Enough said, to avoid upsetting fellow sufferers! On the other hand, although *O. articulata* and *O. pes-caprae* are classified as weeds, they behave themselves sufficiently to have become very acceptable elements of our ornamental garden flora. After all that's said and done, once more the big surprise presented by the neat, large-flowered little species at Huasco illustrated here [figs.35, 36] was to find throughout a period of a week several colonies of it in full flower so late in the season. Even more remarkable, it lacked any vestige of foliage, alive or dead. Our first tentative identification was *O. bulbocastanum*, based on published distributions for Huasco (Squeo et al. 2008). But identification of Chilean oxalis is notoriously difficult, and mistakes are made both by academics and amateurs. Nevertheless, a leading authority on the genus, Cristoph Heibl (2004), describes the sepals of that species as rhomboid and broad, whereas those of ours are linear and narrow. In addition, of the many relevant photos of this group we've revised in a range of sources, not one shows inflorescences without basal leaves. Heibl notes that there are surely undescribed species in the Chilean desert. Conclusion: we already have one new autumn flowering oxalis from this general area on our waiting list for publication, so it's not at all unreasonable to suspect this might be another.



figs.35, 36: A colony of the leafless and late flowering *Oxalis* sp. at Huasco which we've been unable to identify. It may be new to science. (22 Mar 2010. JMW)  
An attractive inflorescence of autumn flowering, possibly new, *Oxalis* sp. bejeweled with water droplets from Pacific coastal fogs. (16 Mar 2010. JMW)



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Moving on, we continue this small Huasco selection with a dwarf endemic Chilean bulbous plant, *Tristagma bivalve* [fig.37] of the Amaryllidaceae, which flowers in August, right at the other end of the season. So early in fact that it's hardly ever been recorded from this location, and wasn't included for Atacama Region in their list by Squeo et al. (2008). Nor is it known otherwise as anything but a common and widespread Andean species occurring between ca. 1500-2300 m. These circumstances, combined with its exceptionally showy inflorescence, caused us to suspect it as yet another unknown species. It isn't, however. In no significantly critical way does it differ from its mountain brethren.



fig.37: Totally unexpected *Tristagma bivalve* (Allioideae) down here in sand by the coast. It's only otherwise known from the interior Andes. (25 Aug 2004. ARF)

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Lastly, before coming to the new species, a dig into the rich and very localised *Alstroemeria* flora of this 100 km coastline on either side of Huasco. Martyn Cheese, Ken Beckett and John collected and photographed the very distinctive sand-dwelling *Alstroemeria werdermannii* [fig.38] in 1971, during that first visit. At the time it was still completely unknown botanically, and nobody was qualified to deal with the Chilean species until Ehrentraud Bayer studied them and published it sixteen years later (Bayer 1987). In 2005 John and Adriana Hoffmann recorded a solitary hybrid between *A. werdermannii* and lilac-pink *A. philippii* at Huasco. Although sharing roughly the same distribution, the latter is in fact much more common and diffuse than *A. werdermannii* with its very exclusive habitat requirement. Two infra-specific taxa have been described for *A. philippii*, both endemic within the bounds of our survey. One is a variety, the other the white or very pale pink subspecies, *adrianae* [fig.39], discovered by John and Adriana Hoffmann during that same visit, and later published by us (Watson & Flores 2010). Nothing could better epitomize the rarity and vulnerability of this sector's flora.



fig.38: F.&W. 8642. *Alstroemeria werdermannii* subsp. *werdermannii*, yet another local sand dune adapted species. Huasco, Atacama Region. (Dec 1997. JMW)

So where does Sarah's new zephyranthes fit into this picture? We already knew of a population right on the very southern outskirts of Huasco from having seen and collected it there previously during a visit in 2001 somewhat earlier in the season. It occupies an open area behind the industrial complex which lorries transporting the ore criss-cross constantly, and where the narrow-gauge railway passes though before entering the refinery. Despite a thorough search on day one of the 2010 survey, not a single inflorescence could be seen, and it appeared we must be too late. All was far from lost, however. We worked steadily south in the jeep from that point, and three days later a colony spread among the rocks alongside the rough vehicle track took our breath away with its beauty and local

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abundance [fig.40]. Being directly involved in an official survey we were unable to make a personal specimen collection then to supplement our photos [figs.43, 44-46]. As a consequence there is no alternative specimen for the type here to the one we made in 2001 by the factory. The full distribution of the species as known to us is indicated on map [fig.42]

fig. 39: Our rare new (2010) F.& W.10930 *Alstroemeria philippii* subsp. *adrianae*, found only at one site S. of Huasco, slightly further inland. (6 Nov 2004. JMW)



fig.40: Part of the large colony of the new *Zephyranthes sarae*, slightly further S of the type population. (19 Mar 2010. ARF)



fig.41: Sarah, an aficionado of motor scooters, rides a borrowed one outside our home at Calle Larga. (21 Oct 2009. JMW)

## Taxonomy 1

### **Zephyranthes sarae** J.M. Watson & A.R. Flores, sp. nov. [figs.40, 43-46]

**Type:** CHILE. Atacama Region, Huasco Province, 1 km S of Huasco town towards Playa Brava, 28°28'47"S 71°14'11"W, 65-90 m, 12 Jan 2001, leg. J.M. Watson & A.R. Flores, F.& W. 9586 (holotype SGO).

**Diagnosis:** For its combination of morphological characters *Zephyranthes sarae* is manifestly distinct from all others of its alliance, subgenus *Myostemma*. The subgenus consists of ca. 16 published and recognized species distributed in western temperate South America between 25°S and 40°S. It is characterized by free spathe valves, (usually) multi-flowered spathes and, with one exception, a trifid stigma. The unique aggregate of features possessed by the new species includes: bulb symmetrically globose, not ovoid or pyriform; anthesis always proteranthous: scape usually 2-flowered, only rarely 1- or 3-flowered; perianth with subfree tepals distinctly narrow, widely spreading, and reflexed: tepal colour and markings uniformly pink and longitudinally striped; mature anthers long.

**Note 1.** *Zephyranthes sarae* was included in our Flowering Desert guide (Hoffmann et al. 2015: 52, fig.6) as *Myostemma* species, illustrated by the painting reproduced here [fig.46] and with an informal outline description.

**Note 2.** The data on the subgenus *Myostemma*, as recently recombined and given a new status, are drawn from Garcia et al. (2019).

**Description:** *Plant* perennial geophyte ca. 12-20 cm tall. *Bulb* 4-5 × 4-5 cm, globular; *tunic*: several layers of thin, brittle, dark brown membranous coat, prolonged for up to 3 cm as neck of bulb. *Leaves* unknown. *Umbel* 5-9 cm high in floration, bivalved, (1)2(-3)-flowered. *Spathe valves* 4-5 cm, linear-tapering, acute; erect, brown and substantial at commencement of anthesis, becoming membranous and collapsing vertically. *Interior bracts*, number unknown\*, ca. 2 cm, narrowly ovate, thinly membranous and tapering to acute point. *Pedicel* 2-3 cm. *Perigonium* ca. 3 cm long × 6 cm wide, pale pink, multi-veined darker pink. *Tepals* 6 in two series of three, widely patent and recurved at maturity, fused at base for ca. 2 mm, free above; inner three 3-3.75 cm × 6-8 mm, narrowly oblanceolate, apex bluntly acute; outer three 3.5-4 cm × 5-6 mm, narrowly oblanceolate, apex apiculate. *Paraperigone* small denticulate corona 1.5 mm long encircling base of stamens. *Stamens* 6 in two series of three, pink; shorter series ca. 2 cm; longer series ca. 2.5 cm. *Anthers* dorsifixed, to 7 mm long, pollen bright yellow. *Ovary* 6-8 × 3-5 mm, inferior. *Style* 3 cm, somewhat upcurved at apex, pink. *Stigma* shortly trilobed, pink. *Fruits* and *seeds* unknown.

**\*Note:** The interior bracts are mostly concealed within the spathe valves, with one occasionally partly revealed. Due to there being only one individual specimen, the holotype, it was decided not to risk damaging the fragile structure by attempting to dissect the spathe.

**Field note:** The local environment in the littoral shortly behind the seafront consists of compacted stony, sandy soil punctuated by low rock outcrops. The plant community is composed mainly of scattered short xerophytic shrubs. *Z. sarae* formed a dispersed population in clearings between these.

**Other material studied:** As we were taking part in an official environmental survey, we did not take specimens on our own account of the second, larger population at Huasco. Nor, so far as we are aware, was any material collected as a reference component of the project. Our records therefore are derived from photographs we took together with notes of the position of the population. The formal

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register of these is as follows: CHILE. Atacama Region, Huasco Province, 4 km due S of Huasco town, 28°30'41"S 71°13'19"W, ca. 175 m, 19 Mar 2010, obs. J.M. Watson & A.R. Flores. [figs.40, 43-45]

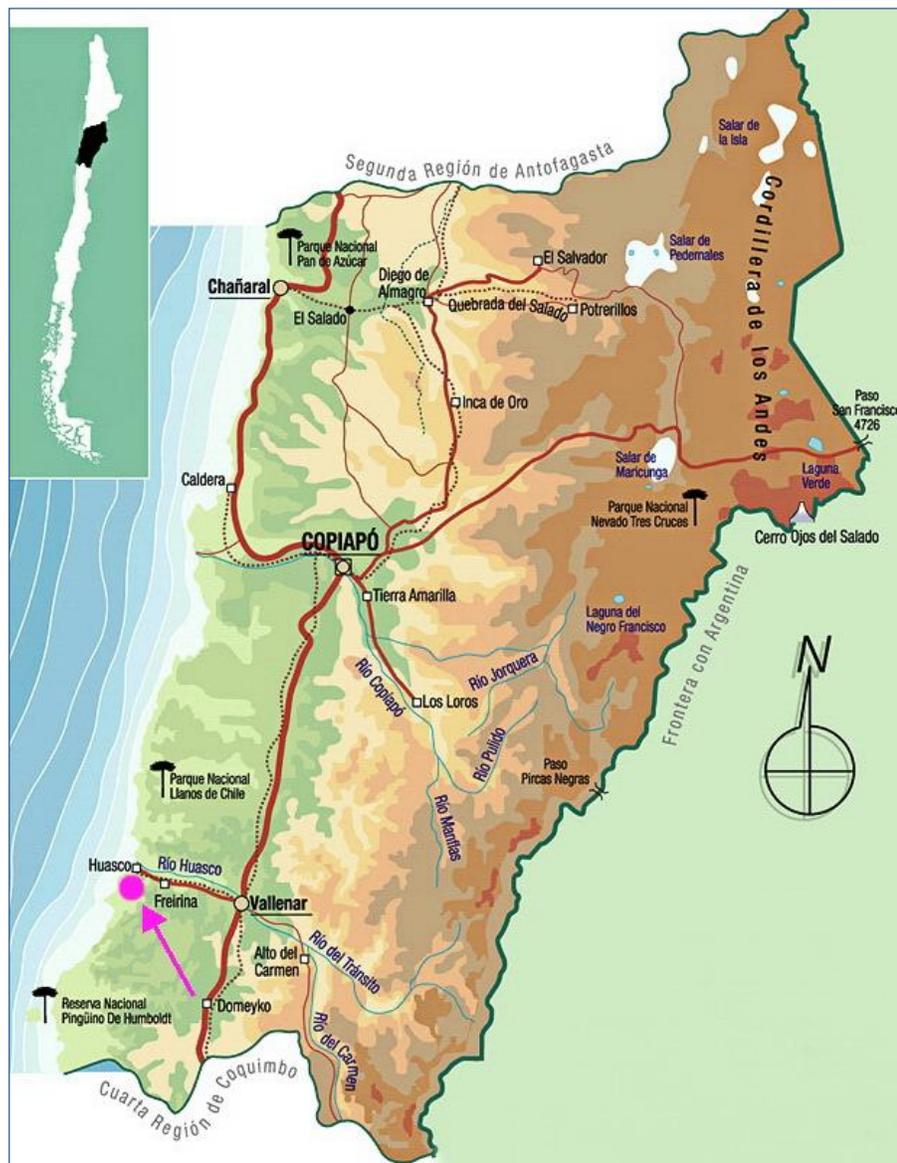


fig.42: Atacama Region showing the position of the type site of F.& W. 9586 *Zephyranthes sarae* marked by an arrowed pink circle.

**Distribution:** This zephyranthes is a Chilean endemic with a known range comprising two discrete locations which collectively comprise a total of three populations. The two adjacent larger populations to the north at Huasco, Atacama Region, contain the majority of plants. The third colony is 190 km distant and shortly to the south of La Serena in Coquimbo Region. [figs.42, 47]

**Overall environment and habitat:** The vegetation formation of the type sector is classified by Gajardo (1994) as 'Desierto Costero del Huasco' (coastal desert of Huasco), and his map shows it as covering the entire southern littoral of Atacama Region. However, he provides little information of use to us here beyond that, besides which we prefer to regard it as semi-desert

in view of the rich biodiversity present and the sustaining capacity of the regular dense sea fog (camanchaca). The list of representative species he gives is also very perfunctory considering the extensive total known for the sector. Important constituent genera such as *Alstroemeria* are omitted completely. The general surrounds where *Zephyranthes sarae* grows are not possible to cover in one description, as the varied and wide range of constituent flora changes considerably from place to place. The ground is predominantly packed or loose sand, often stony, with frequent stretches of low, weathered outcrops. The major overall components are low to dwarf xerophytic shrubs in variety, a wide generic range of cacti of all sizes, and drought resistant geophytes such as the new species. Annuals are also present.

The location of the other site in the north of Coquimbo Region is classified as coastal steppe matorral (Gajardo 1994). It experiences a Mediterranean climate modified by not infrequent humid Pacific mists and receives more winter rainfall on average than the Atacama habitat. The native vegetation of the sector is irrelevant to the habitat where the zephyranthes was recorded, as that is entirely under extensive cultivation, with a mainly introduced weed flora and only very few native species in the occasional unadopted patches. [figs.29, 31]

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**Phenology:** As known, *Z. sarae* begins anthesis in December and continues to the end of March or beyond. Although the seeding stage has not been observed, in accordance with other taxa of the genus seed is presumed to be ripe one to two months after flowering.

**Etymology:** The new species is named *sarae* for elder daughter Sarah. After leaving school she took an environmental course at London University. Her first employment on returning home to Battle after graduating was with the nearby local council at Hastings, where she specialised in recycling. She has continued in municipal work, although now only part-time. At present living near Hastings with her partner James, she has meanwhile built up and founded her own small professional foraging enterprise, Wildfeast, with its own website, and also writes on the subject and conducts small excursion groups. It goes without saying therefore that she is both drawn by wild flora and basically knowledgeable about it. Since we moved permanently to Chile she has flown over alone to pay us short visits in 2005 and 2019, and with sister Nicola during 2009 and 2012. On all those occasions we have travelled together in our jeep to locations of wildflowers we know, or explored others for the first time. The maximum distances covered from our home were 650 km to the north at the Atacama type site of her species here, and 800 km southwards, including into central and Patagonian Argentina. [figs.41, 52, 53]



figs.43, 44: Individuals of *Zephyranthes sarae* at the largest of the three populations, which lies S of the type site. Huasco, Atacama, Chile. (19 Mar 2010. JMW)

fig.45: Inflorescence of *Zephyranthes sarae*, again from the largest of the three populations, which lies to the S of the type site. Huasco, Atacama. (19 Mar 2010. JMW)



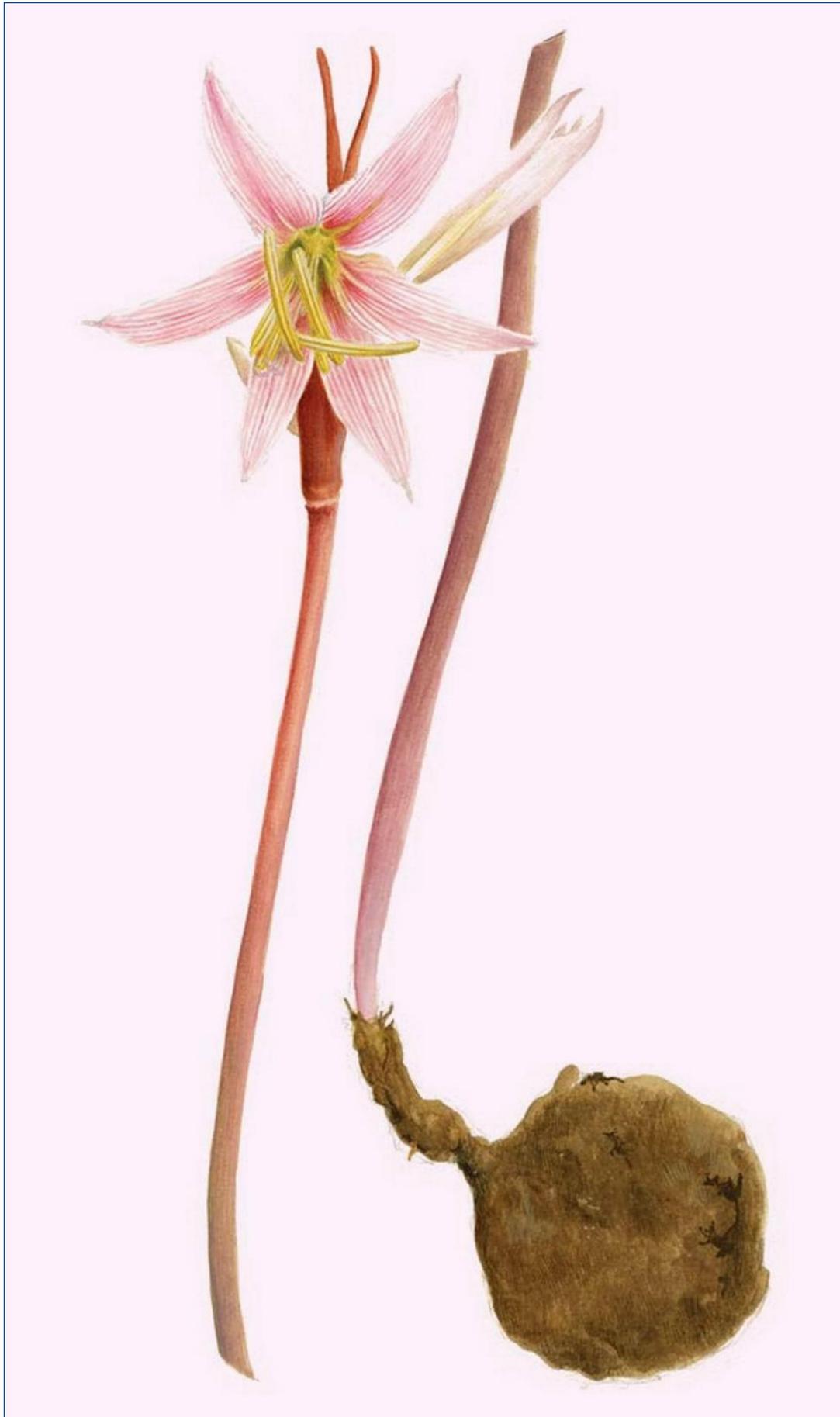


fig.46: *Zephyranthes sarae* painted by Andrés Jullian for our 2015 Chilean Flowering Desert mocots guide (as '*Myostemma* sp.')

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fig.47: *Zephyranthes sarae* global distribution. First known Coquimbo colony - yellow circle. Atacama type site and third population - green circle.

**Proposed conservation status:** A very limited numerical total of plants has been observed in the three known populations - two of those in close proximity and a third discrete at almost 200 km distant. When last seen in 1997, the latter contained no more than a very few scattered individuals, and was situated in small untouched clearings and along borders in an area of intensive agriculture. It has not been visited by us since to check whether it is still extant. These factors, coupled with a lack of any formal environmental protection where it grows, indicates that *Zephyranthes sarae* at least qualifies as VU, vulnerable (IUCN 2012).

### Illegitimate offspring, maybe!

During the March survey visit in 2010 to the general area where the new species has been recorded we encountered a small population of a distinctly variable zephyranthes [figs.48-50]. It did not fully conform to *Z. sarae* itself, or any other species of that genus known to us, although having features common to the former and several of the latter. The noticeable aspects that drew our attention were the perigone - from trumpet shaped [figs.48, 49] to somewhat flaring [fig.50], and the colour, pale whitish pink slightly tinged yellow [fig.50] to light, clear pink [fig.48]. It differed consistently from *Z. sarae* in being evidently more robust, having broader, unlined tepals, usually four flowers to each scape, and possessing a white, not pink, style and stigma. A character they noticeably shared was very narrow, solid, linear spathe valves. We did not dig up any to examine the bulb. An earlier flowering species, commonly seen in this very sector in numbers is *Zephyranthes bagnoldii* (Herb.) [fig.51] a species which frequently produces four or more flowers per umbel. Its tepals are wide and unlined, and the style and stigma are white without exception. Although it was not in flower during our March visit, we have seen both *Z. sarae* and *Z. bagnoldii* flowering concurrently and nearby to each other during December. At that time we have also seen undoubted hybrids south of Huasco between *Z. bagnoldii* and a red species there, which we suspect may be *Zephyranthes laeta* (Phil.) Nic. García. Although to our knowledge no specimen of the variable plant exists, all the in situ observations above and images of the taxon concerned convince us that it must surely be the natural hybrid *Z. bagnoldii* x *Z. sarae*.

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fig.48: Presumed wild zephyranthes hybrid coupling perianth quantity and form of *Z. bagnoldii* with colour and spathe bracts of *Z. sarae*. (13 Oct 2010)

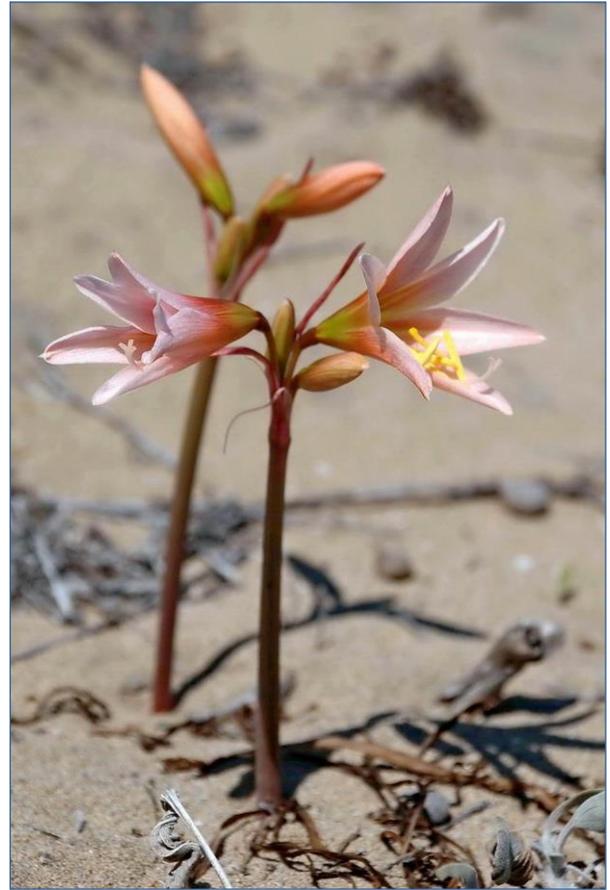


fig.49: Presumed zephyranthes hybrid, having the spathe valves and perianth aspect of *Z. bagnoldii*, but colour and striping of *Z. sarae*. (13 Oct 2010. JMW)



fig.50: Presumed wild zephyranthes hybrid with perianth quantity of *Z. bagnoldii* but spathe valves and flaring perianth of *Z. sarae*. (13 Oct 2010. JMW)

fig.51: *Zephyranthes bagnoldii*, a widespread yellow species present at Huasco which is considered to be the other parent of the hybrid. (20 Oct 2008)





fig.52: Anita with step-daughter Sarah on Cerro Catedral, Bariloche in Patagonia, where she saw Andean rosulate violas and other choice flora. (16 Jan 2005. JMW)

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fig.53: Dad John with daughter Sarah at the Hastings Food Fair. She gave a professional demonstration there based on her Wildfeast business. (20 Sep 2015. JMW)

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fig.54: Neuquén Province, Argentinian Patagonia. The general locality of *Olsynium nicolae* is arrowed violet.

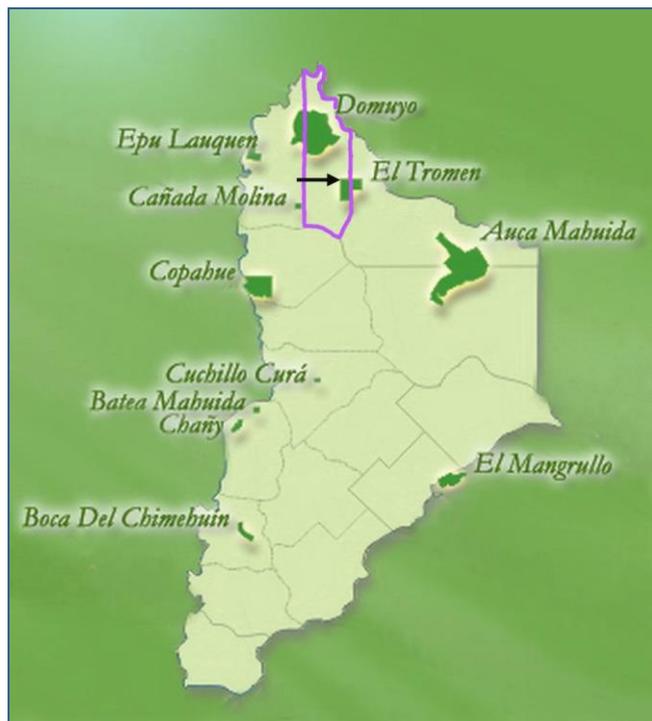


fig.55: Neuquén Province, N Argentinian Patagonia. National parks - darker green areas. Chos Malal Dept. - pink lined. *Olsynium nicolae* site arrowed.



## A steppe in the right direction for Nicola

Nicola's namesake plant herein comes from Argentina: to be precise, Neuquén, the last province at the upper end of Patagonia [figs.54, 55]. It's found nowhere else but in the El Tromen Provincial Park, a quite small local nature reserve covering 300 sq. km.

We've already outlined fairly comprehensively in two slightly earlier IRGs the landscape of this sector at the far northern tip of the province [fig.55] together with a representative selection of its biodiverse showier flora (Watson & Flores 2018c, 2019a). As it's the same setting for our new species here therefore, we shall do little more than attempt to expand that by providing photos and word pictures of several further notable species.

But to recap briefly first, the territory concerned is backed to the west by the main Andean chain, and delineated to the south by the Neuquén River. The main highway down to southern Patagonia lies to the east, and beyond it the flatter Argentinian pampas. To the north are higher and more continuous mountains, which extend down as a linear range dissecting the centre of the area and parallel with the bordering Andes. The important zone for us now is the southeast corner, where high elevation Patagonian steppe at around 2000 m is punctuated by impressive inactive volcanoes [fig.56]. Our *Olsynium* inhabits the level sector at the foot of two such major peaks, Volcán Tromen and Cerro Waylie. The latter happens to be the type site of our recently described *Viola abbreviata* (Watson & Flores 2019a).

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In fact, the area we have supposed until now was the Tromen Park covers the entire departments of Minas and Chos Malal combined, with the addition of a small section of Pehuenches Department to the east, as contained within the pink line of the map [fig.55]. Their total area adds up to some 12,000 sq. km, more than 35 times larger than the actual park, and it actually includes four protected areas as marked dark green on the map. Two are small, one large, and the actual Tromen Park is nothing more than the right-angle shape in the bottom right-hand corner of the pink-bordered area. To say we were grossly mistaken is to put it mildly! But at least our *Viola abbreviata* and the two known populations of the new *Olsynium* species fall within its boundaries ... for what that may be worth considering the appreciable grazing there that to a degree negatively affects the vegetation.



fig.56: The flat steppe between volcanoes the new *Olsynium* inhabits. Neuquén Province, Argentina. (16 Jan 2008. JMW)

### What keeps the *Olsynium* company?

Having set the records straight, let's get on with the flora. Any approximate comparative statistics of species numbers are derived from Chiapella & Ezcurra (1999), despite that review of Tromen's vascular plants being a little out of date by now. They collected 230 different taxa for their list, of which about one sixth are Poaceae, the predominant group in the area. They name six small trees or appreciable shrubs. We're more than a little suspicious of this total, however, as 50 of their total are listed as having a maximum elevation limit less than 1650 m, which is the lowest point we've been able to find within the true park itself. Never mind. Our aim is to draw from the somewhat more extensive surrounds of the steppe plain nearby as well, which allows us a wider choice of appealing species.

Predominantly yellow-flowered *Adesmia* of the pea family is the second largest genus represented after *Senecio*, with ten species. An excellent illustrated review of those in Patagonia can be found in Sheader et al. (2013). In form they range from absolutely prostrate mats to small shrubs, the majority of those rigidly spiny. We begin with one of the latter, *A. gracilis* [fig.57]. As can be seen, it could hardly be better adapted to resist grazing by the scattered herds of stock, mainly goats, sad to say, which roam over the whole area, despite it containing nature reserves.

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*Junellia* of the Verbenaceae was the genus which immediately caught our eye in the mid-1990s when we first drove across the high level steppe of that large sector we then believed was the park. The wide, dense mats of three quite similar-looking species in full bloom, with their tightly-packed tiny rosettes and masses of white or pale pink almost stemless inflorescences were to be seen in quantity, often clustered together in loose colonies.



fig.57: F.& W.10623 *Adesmia gracilis* (Fabaceae), one of the Tromen area steppe shrublets, and a very prickly one at that! (23 Dec 2002. ARF)

We'll continue our low shrubby flora first though with closely related *Mulguraea spathulata* (syn. *Junellia*) [figs.58, 59]. It's a 'very different kind of the same thing', with a structure not unlike a low, Spanish broom, and flat, compressed spikes of many light violet-blue corollas. *Ephedra chilensis* [fig.60], known colloquially by its attractive indigenous people's name of 'pingo pingo', brings to an end this trio of Patagonian woodies. If you think those shiny white bracteate fruits look temptingly edible, you'd be dead right! Start with a deliciously sweet, succulent mouthful and it's hard to stop. They remind John of the juicy red yew berries he once popped into his mouth, apparently ignorant of their deadly danger, in front of several others while studying horticulture in his 'formative years'. They looked horrified until he laughed and spat out the carefully separated, undamaged seeds, revealing the joke. Fortunately though, the black pips of the ephedra aren't poisonously lethal like *Taxus* should you bite them open, and like other parts of the plant are used in traditional medicines in various parts of the world.

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fig.58: Another of the low shrublets on the steppe, F.& W.10655 *Maulguraaea spathulifolia*, a close relative of the junellias. (29 Dec 2002. ARF)



fig.59: F.& W.11603 *Mulguraaea spathulifolia* inflorescences showing the Spanish broom-like growth. (16 Jan 2008. JMW)

In September's IRG 117 (Watson 2019) readers were informed of the recently combined and coined generic and specific names of the most common and conspicuous flowering bulb here, the amaryllid *Zephyranthes cuyensis* (formerly *Rhodophiala mendocina*). Its otherwise invariable form bears a scape 15-30 cm high of yellow - often quite pale - upright, trumpet-shaped perianths rather reminiscent of large colchicum or sternbergia flowers. So nothing took us more by surprise in this Chos Malal sector than to notice a solitary individual with two almost stemless flower scapes [fig.61] among a small, widely dispersed colony of the usual tall form. It was quite unique, we've never seen or heard of another like it, and inevitably raised unanswered questions. Was it capable of reproducing in the wild, or would any progeny merely revert to 'normality' if the other parent was like the rest of the colony and genetically dominant? If, consequently, it was doomed to die eventually as a 'freakish' one off, it could obviously at least have been

multiplied vegetatively in cultivation. So should we have dug it up and smuggled it back across the border to our garden in Chile? That possibility didn't even occur to us at the time.

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fig.60: F.& W.11602 the very dwarf form of *Ephedra chilensis* with its sweet and tasty bracteose fruits. (16 Jan 2008. JMW)



fig.61: F.& W. sin num. *Zephyranthes cuyana*, a remarkable 'one-off' almost stemless form. Pity about the elongated, straggly leaves! N Neuquén. (27 Dec 2002. ARF)



fig.62: F.& W.10622 *Junellia patagonica* showing the characteristic disposition of the inflorescences round the circumference. (22 Dec 2002. ARF)



fig.63: Close-up of the heads of F.& W.10622 *Junellia patagonica* flowers. Chos Malal parks area, Neuquén Province, Argentinian Patagonia. (22 Dec 2002. ARF)

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As we get to the higher, flatter parts of the steppe plants become dwarf, frequently prostrate as well, and it's time to introduce two of those three *Junellia* species which play an important role in that floral community. The third, *J. azorelloides*, has already been covered earlier in this periodical (Watson & Flores 2018c), so we'll continue with the aptly named *J. patagonica* [fig.62, 63]. It's easily told from others of similar appearance by the almost invariable tendency to produce all its inflorescences around the circumference of the mat, as also beautifully illustrated in Sheader et al. (2013: 261). For total contrast, between the two almost concolorous junellas comes next another incomparable mat or compressed cushion-forming species, which augments the biodiversity here. Widespread *Oreopolus glacialis* [figs.64-65], the sole remaining representative of the genus, has an intermittent range which extends down from the Andes of central Chile and Argentina via the Patagonian steppe to Tierra del Fuego.

fig.64: Golden F.& W.11539 *Oreopolus glacialis* brightens up the Andes and Patagonian steppe in many places, including the Tromen surrounds. (21 Dec 2007. JMW)



fig.65: A plant portrait of neat F.& W.11539 *Oreopolus glacialis* with its starry flowers. Paso Pino Hachado, Neuquén Province, Argentina. (21 Dec 2007. JMW)

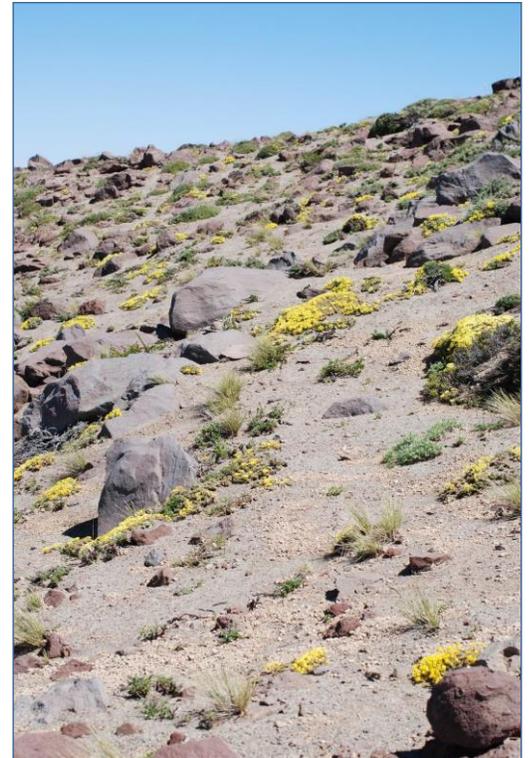


fig.66: F.& W. sin num. *Junellia micrantha* differs clearly from *J. patagonica* by the spread of inflorescences all over the surface of the mat. (27 Dec 2002. ARF)

It brightens up many an otherwise bleak extent of terrain with its galaxies of clear or softer sulphur-yellow stars. Hard to believe it's of the same family as the wretched goosegrass. *Junellia micrantha* [figs.66, 67] lacks an immediately obvious character to identify it, something similar to the peripheral flowers of *J. patagonica* say, but its

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densely 20-30-flowered inflorescences are only equalled by *J. congesta*, and in the case of doubt and it's worth the trouble, the former has 3-lobed leaves while the other's are entire.



fig.67: The massed, neat inflorescences of F.& W. sin num. *Junellia micrantha*. Chos Malal Department, Neuquén Province, Argentinian Patagonia (27 Dec 2002. ARF)

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Sheader et al. (2013: 260), report they haven't seen *J. patagonica* outside Santa Cruz Province in the extreme south of Patagonia, where the type specimen was collected. Our own observations do nevertheless confirm it without doubt in northern Neuquén. Although the botanical drawing in Flora Patagonica is unquestionably the true *J. patagonica*, Botta et al. (1999) made the observation that two forms exist according to their judgement, and describe the morphology of each. This supports the descriptions and differences first included in Sheader et al. (2013) where their *J. corralloides* (named for the variant which didn't conform to the type) was noted as under preparation, and was then published the following year Sheader & Sheader (2014). However, Botta et al. differ diametrically from both Sheader works in saying that among the many specimens they examined of *J. patagonica*, those conforming to what would become *J. corralloides* were few and far between, with the large majority identifying as the typical form.

## Taxonomy 2

### **Junellia morenonis (Kuntze) J.M. Watson & A.R. Flores, comb. nov.**

**Basionym:** *Verbena morenonis* Kuntze, Revis. Gen. Pl. 3(3): 256. 1898.

**Synonyms:** *Verbena thymifolia* Phil. ex Ball p.p. (*fide* Kuntze), J. Linn. Soc. Bot. 27: 497. 1891, hom. illeg., non Cham., Linnaea 7(2): 257. 1832. *Junellia corralloides* M. Sheader & A. Sheader, A trio of new species from the wilds of Patagonia. Alpine Gardener 82(2): 210. 2014, nom superfl.

Note 1: A fourth synonym, *Junellia patagonica* (Speg.) Moldenke forma *morenonis* (Kuntze) Moldenke was apparently proposed but not published. This is very likely (see Botta et al. in the previous paragraph), but we've not been able to find any support for it in the literature.

Note 2: While preparing this account, we incidentally uncovered a chain of evidence which convinced us beyond doubt that *V. morenonis* and *J. corralloides* are the same taxon. For that reason we've provided the combination above for the earlier priority specific epithet. On the other hand we feel equally sure that the yellow-flowered plant illustrated and described as *J. sp. aff. corralloides* in Sheader et al. (2013: 260-261) is indeed an undescribed taxon and probably warrants the rank of species. We know of no other yellow junellia geographically nearby, although that colour is exhibited by a few species of the related genera *Glandularia* and *Mulguraea*. Apart from any other morphological differences which might exist, it seems totally improbable to us that a pink species of this genus would have a bright yellow form or variety - unless intermediates were known.

In this context it's worth noting our surprising experience of observing hardly any junellias en mass in northern Neuquén again during various subsequent visits after that early first encounter, including at the same stage of the season. There was no obvious cause but we strongly suspect it may well have been herbivory, with goat grazing most likely. In that case - once more - so much for the protection of four national parks.

### **The one that got away ... and the one that hasn't**

As an interesting historical context, the El Tromen Provincial Park was established in 1971, not, as you might suppose, to protect its rare, diverse and vulnerable flora, but the birdlife Chiapella & Ezcurra (1999). To be precise the various waterbirds on the small Lake Tromen between the volcano of that name and Cerro Waylie, and also on another marshy-bordered stretch nearby, which are situated at the centre of the park [fig.79]. Any other benefits are purely coincidental. According to the province's official website of the park, a remarkable 41 species of waterbird have been recorded on

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the lake. Among them is one that nobody could possibly miss, the wonderful Chilean flamingo, *Phoenicopterus chilensis* [fig.68], to be seen in small flocks as they strut their unhurried, stately way across the shallows, and it would be worth the trouble of protecting those alone, if nothing else.

fig.68: A Chilean flamingo, *Phoenicopterus chilensis*, wading with dignity through the shallows. (Photo courtesy of Cornell University)



Among the most arresting, if not **the** most arresting plant in the vicinity of the Tromen Lake is a delightful dwarf Malvaceae, a *Tarasa* [fig.69]. When we first saw it we were familiar with published *Tarasa humilis* [fig.70] from a number of widespread locations in both Argentina and Chile. All those populations consistently produced a single rosette with a central close-set cluster of short-stemmed flowers, as exemplified in our fig. 70 illustration here. A magnificent plant of it in cultivation was exhibited at an Alpine Garden Society show in 2006. But as can be seen from fig. 69, the one at Tromen spreads by extensive rhizomes to form well separated small subrosettes, each with a few flowers, usually stemless, or almost so. Another notable difference between the two is the white centre of the Tromen plant's corolla. We were in no doubt this was a different species, even though others have identified it as *T. humilis*. It was therefore intended to dedicate this, not the *olsynium*, to younger daughter as *T. nicolae*. That is until we chanced to check photos of *Tarasa humilis* on the Internet for another reason when already underway and were shocked to see an apparent range of intermediates between the two. This requires full investigation for confirmation, but has shot our original plan down in flames. Lucky there was a substitute of equal quality standing by!

fig.69: The F.& W.10720 *Tarasa humilis* form we had planned to call *T. nicolae*! Tromen National Park, Neuquén Province, Patagonia, Argentina. (13 Feb 2003. ARF)



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fig.70: The usual F.& W. 11534 *Tarasa humilis* form for comparison. Note central cluster of stemmed flowers from axial rootstock. (20 Dec 2017. JMW)



So what was our reason for being there at all, and then examining the precise spot the rare new *olsynium* inhabits? We've already related how Anita's Argentinian botanist friend, Ricardo Rossow, failed to include an important *viola* in *Fora Patagónica*, then

located it later in the Tromén park and passed on to us the fairly precise, if not exact, locality where he found it (Watson & Flores 2018c). Essentially we knew from him that it grew in and among the close-set dense tussocks of wiry bunch grass there [fig.71].



fig.71: The bunchgrass habitat that held such treasure for us at Tromén near Chos Malal in Neuquén Province, Argentinian N Patagonia. (22 Dec 2007. JMW)

fig.72: Snuggling down in the bunchgrass, F.& W.10772 *Viola escondidaensis*, the reason for our intensive searches in the protected areas. (28 Nov 2003. ARF)

The first actual place we saw the 'missing' *viola* just happens to be in a crescent of that same vegetation within the edge of the black lava flow from Volcán Tromén between that peak and nearby Cerro Waylie [fig.79]. It proved to be not far short of hunting for a needle in a haystack. We were too early, and although at last we found



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one or two flowerless shoots, an even longer concentrated scrutiny was needed before we finally came upon a solitary stem with buds and a couple of flowers. It needed a visit earlier in the season for us to see *Viola escondidaensis* [figs.72, 73] in its full glory.



fig.73: At last! F.& W.10632 *Viola escondidaensis* as first seen in full bloom after our almost fruitless searches on previous visits. (24 Dec 2002. ARF)



fig.74: F.& W.10620 *Olsynium nicolae* in full bloom at the type site during our second visit earlier in the season. Tromen National Park. (22 Dec 2002. ARF)

During our original intensive quartering in search of the viola we'd chanced on one miserable small, yellow flower on the way out, its leaves eaten down almost to the ground like those of the other flowerless few scattered nearby. But it was enough to tell us which genus it was, *Olsynium*, and that there were two possible candidates for it, either of which would be exciting and valuable, so - like General Douglas MacArthur - we had to return, and a little earlier in the season for it as well as for the viola! And that we did, to triumphant effect [fig.74].

### ***Olsynium* and us**

The genus was initiated by the fascinating Rafinesque, a brilliant self-taught polyglot and polymath of mainly French descent, expert in geology and many fields of natural history, including botany. In 1815 at age 32 he moved permanently to the United States (Wikipedia 2019a). His prolific output includes 6,700 binomial plant names! Among them is an American iridaceous plant, which was published in 1838 as *Olsynium luteum* Raf., the new genus name being one of his lasting contributions to plant taxonomy. Later however, the species was found to be a synonym of earlier-published *Sisyrinchium luteum* Fisch. ex Link. (1822). Thus, as the rules oblige, his binomial became a mere synonym, but nevertheless with nomenclatural priority, so could not be repeated for another plant. Happily though, the name he'd given his genus was uniquely original and so remained available.

The next development occurred in 1864. The illustrious German botanist resident in Chile, R.A. Philippi, chanced to publish another new irid, *Chamelum luteum* Phil., a small species from that

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country which we shall meet again below. Its genus name had been coined by him the previous year. (That species too later acquired a short-lived illegitimate homonym - *Sisyrinchium luteum*, no less!) And so things might have remained had it not been for a phylogenetic analysis of the *Sisyrinchium* alliance by Goldblatt et al. (1990). As a result, the small genera *Chamelum*, *Ona* and *Phaiophleps*, all from South America, were united within Rafinesque's *Olsynium* along with a number of others previously published as *sisyrinchiums*. The single remaining existing and accepted species of the genus, North American *O. douglasii*, became the type. This sea change immediately required ten new taxonomic combinations, which Peter Goldblatt made in the same publication. Among them, *Chamelum luteum* was 'converted' to *Olsynium luteum*. But he failed to notice he'd been beaten to it by Philippi for that name, something we discovered shortly afterwards, accordingly publishing its new and current replacement name of *Olsynium chrysochromum* (Watson & Flores 1994). A further seven accepted species have been added to those since, either as recombinations or new species. The one described here will bring the genus total to nineteen.

The feature which unites all but one of them and distinguishes them clearly from *Sisyrinchium* and its immediate allies is their very narrow grassy or rush-like leaves. The 'odd man out', little *O. frigidum*, has broadsword-looking foliage (Sheader et al. 288-289). Otherwise, few if any would guess from just looking at this exceedingly disparate conglomeration of nineteen species that they all belong to the same genus. They can at least be sorted into four groups of closely related species. Out on its own is just-mentioned *O. frigidum*. The common and widespread *O. junceum* [fig.76] alliance, to which *O. douglasii* belongs, predominates, with *O. scirpoideum* [fig.77] as another frequently seen example. Very similar to these, but with a noticeably longer perianth tube, are a pair from the extreme tip of South America, *O. biflora* and *O. lyckholmii*. Lastly, and most importantly for us, we come to the *O. chrysochromum* quartet, subsect. *Chamelum*, to which our new one belongs, so will augment the ensemble to a quintet. These species have a distribution from the Andes of central Chile to southern Patagonia and may easily be identified by their very short stature and upright flowers close to the ground. Although quite characteristic of them, *O. bodenbenderi* [fig.78] differs most from the other four by its considerably more sizeable perianths of striking rich pink to white, these generally unmarked other than some having weakly pronounced parallel longitudinal stripes.

## Taxonomy 3

### ***Olsynium nicolae* J.M. Watson & A.R. Flores, sp. nov.** [Figs.74, 80-83]

**Type:** ARGENTINA. Neuquén Province, Chos Malal Department, El Tromen Provincial Park, 37°04'25.50"S 70°05'13.50"W, 2195 m., 22 Dec 2007, leg. A.R. Flores & J.M. Watson, F.& W.10620 (holotype CONC, isotypes SGO, herb. Flores & Watson).

**Diagnosis:** Of four related, described species comprising *Olsynium* Raf. subgenus *Chamelum* (Phil.) Ravenna, the new taxon is only closely related to one, *Olsynium chrysochromum* J.M. Watson & A.R. Flores. It differs markedly from one of the others, *Olsynium frigidum* (Poepp.) Goldblatt by plant structure, leaf and bract morphology and floral presentation. Distinct corolla size, shape and colour of another, *Olsynium bodenbenderi* (Kurtz) Goldblatt, also separates it clearly from *O. nicolae*. Recently described *Olsynium skottsbergii* M. Sheader & A.-L. Sheader has cylindrical, not flat, leaves and its tepals are fused at the base, not subfree; they are also white, with a yellow base surrounded by a zone of short purple pink dashes, not all-yellow. The novelty may also be told from its closest ally *O. chrysochromum* by the leaf characters as glabrous and plane, not pilose with a somewhat elliptic cross-section, and by the subacute, not bluntly rounded tepal apex.

**Note:** From the description and photograph of the plant from northern Neuquén in Sheader et al. (2013) and named as *Olsynium* sp. aff. *chrysochromum*, it seems to tally exactly with actual *O.*

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*chrysochromum* from central Chile, but clearly differs in leaf morphology and tepal outline from *O. nicolae*. The same illustration is repeated in M. & A.-L. Shearer (2014) with an almost identical description, and again the plant is identified by the same name. Resolving this situation is important, since it may provide a completely distant locality from *O. chrysochromum* as known in the Andes of central Chile, and one which is also geographically close to the *O. nicolae* sites. The probable ancestral lineage of them both might then be indicated. If characters are discontinuous but very close, the possibility of a new intermediate taxon then arises. Alternatively, albeit unlikely, if both morphologies appear in a Neuquén population coupled by a range of continuity, *O. chrysochromum* would then become a polymorphic species in several characters as well as having a remarkably disjunct distribution.

**Description:** *Plant* rhizomatous geophyte 1.5-3 cm high in flower and ca. 9-12 cm in dia. *Rhizome* 10-20 mm long × 2.5-3 mm thick, lignose, vertical to horizontal. *Roots* 3-12 mm, simple, filiform, fibrous. *Leaves* ca. 2-6 cm × 1-1.5 mm, ca. 5-8 per plant, ascending to recurved-recumbent when mature, plane, somewhat carnosely, green, glabrous, close-striated on upper surface. *Scapes* 5-8 cm, mostly subterranean, erect, solitary flowered to two successive flowered. *Peduncle* 2-3 cm, filiform, fibrous, subterranean. *Spathe bracts* three, with all but apices subterranean, amplexicaul for 2 cm, free above, acute, hyaline-membranous, close-striated; outermost 4 cm × 0.5 cm, broadly linear, tapering at apex to 6 mm rigid mucro; inner pair 2.5 × 0.4 cm, linear-ovate, subacute. *Perianth* with vertical contiguous tepal bases 1-1.5 mm high, radiating outer tepal spread ca. 2-2.5 cm dia. *Tepals* six in two series, 2.5-3 cm × 2.5-3.5 mm, free above contiguous bases, broadly oblanceolate to subobovate, gradually cuneate to 1.5 mm linear base, acute to subacute, unmarked homogeneous bright yellow. *Staminal column* ca. 5-6 × 1.5 mm, erect in throat of perianth, yellow. *Stigma*, trifid, just exceeding staminal column, yellow. *Anthers and stamens* three, adhering to staminal column, opposed to stigmatic arms. *Developing capsule* 10 × 5 mm, subterranean. *Seeds* unknown.

**Field note:** The immediate habitat is flat clearings of fine, granular soil mixed with larger grains and rock fragments at the western termination of a solid ancient lava flow. The dominant vegetation is closely adjacent tufts of bunchgrass (coirones), seen in the sterile state so not identified, but certainly a *Poa* or *Pappostipa* species. The new olsynium formed small colonies in the clearings.

**Further material studied:** The second and only other population is located in open terrain at 2020 m, 10 km SSW of the type site, the co-ordinates being 37°08'50"S 70°09'08"W. The habitat is flat and close to the vehicle track on its east side. It consists of a very sparse, low steppe flora, including *O. nicolae*. There is no bunchgrass in the immediate vicinity. The population is small in number with a very limited spread, for which reason we only made notes and did not collect reference specimens.

**Distribution:** As known the new species is a very narrow local endemic with two populations 10 km apart in the El Tromen Provincial Park, Chos Malal Department, Neuquén Province, Argentinian northern Patagonia. [figs.54, 79]

**Overall environment and habitat:** The climate of the Tromen Park is described as continental, with a mean annual temperature of 7°C and an average precipitation over the same period of 300 mm. 'Piso sub-andino', that is to say subandean level, which extends vertically from 1800 to 2100 m, is the classification given for the sector where the new olsynium occurs. The plant community as a whole at those levels consists of herbaceous mountain steppe dwellers interspersed with scattered low shrubs, the latter particularly at lower levels than the olsynium habitat. Asteraceae, Fabaceae and Poaceae are the dominant families, with the latter forming extensive areas of bunchgrass steppe. 273 species in 47 families have been recorded in the park at all levels, but with the majority on the steppe (Chiapella & Ezcurra 1999). In general the biodiverse dwarf herbs and subshrubby dense cushions inhabit flatter open areas not covered by continuous grasses, although

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there are a few exceptions which coexist with the Poaceae such as *Viola escondidaensis*, and part-exceptions as exemplified by *Olsynium nicolae*. [fig.56]

**Phenology:** *Olsynium nicolae* is at its peak of flowering in December. Nothing is known of its fruiting, which develops at the rhizome below ground. However, it is reasonable to speculate that the seeds probably remain at that point until snowmelt after the following winter, when they would be flushed to the surface and distributed by the flow.

**Etymology:** Younger daughter Nicola is the dedicatee of this species. Hence the specific epithet *nicolae*. Following secondary education she pursued leather-craft as a career, with saddlery the focus, continuing a growing passion for equestrianism which began early in her childhood. She completed courses and tests, ending with an important academic certificate. Over time this was augmented by more, as well as others recording top competition prizes up to national level. Ladies' side-saddles are her speciality, where she's among the top élite in this field. Once she set up on her own though, through advertising and displaying at shows, construction and repair of any and every kind of article, including all horse tackle, belts, wallets and even gun holsters, became obligatory to enable her to earn a living. She and partner Ben, a science teacher, also live near Hastings. In 2014 she presented us with a grandson, Joe, as featured in the previous IRG (Flores & Watson 2019c). Since then, caring for him full-time - and more due to his autism syndrome - has reduced her occupational work and ability to travel to an absolute minimum. Before she became a mother, like Sarah she flew down here: alone in 2002 and 2010, and with her sister in 2009 and 2012, during the latter together with Ben. She's seen wildflowers at some of the same far-flung places as Sarah, as well as at other locations, so also knows something of this temperate South American flora personally. [figs.75, 90, 91]



fig.75: Nicola's passion for horse riding led to taking up leather-craft for saddlery and other equestrian tack. Here at a show near Hastings. (6 Sep 2015. JMW)

**Proposed conservation status:** Due to its very restricted distribution as two populations with a total range of 10 km, the very small number of individuals observed, perhaps fewer than 100, and the presence of numbers of grazing stock, principally goats, which were seen to have eaten down the foliage, *Olsynium nicolae* should classify as nothing less than CR, critically endangered (IUCN 2012).

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fig.76: F.& W.12796 *Olsynium junceum*, most common of the main 'rush-leaved' vigorous species. Valparaiso Region, Chile. (6 Oct 2014. JMW)



fig.77:  
F.&  
W.12792  
*Olsynium scirpoideum*, another of the main 'rush-leaved' species. Valparaiso Region, Chile. (28 Sep 2014. JMW)



fig.78: F.& W. 10626 *Olsynium bodenbenderi* in the same section as *O. nicolae*. It's another Patagonian. Cerro Choique, Mendoza Province. (23 Dec 2002. ARF)

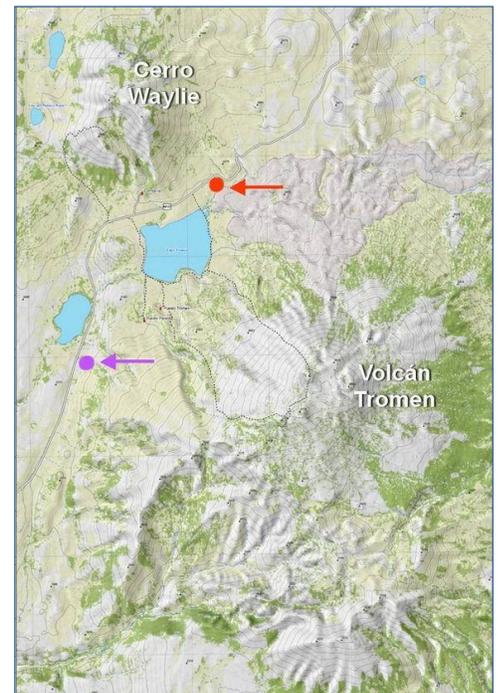


fig.79: Sector of Tromen National Park showing type site of F.& W.10620 *Olsynium nicolae* (red) and second population (violet). Cos Malal, Neuquén Province.

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figs.80, 81: F.& W.10620 *Olsynium nicolae*. Individuals of the type population. Tromén National Park, Chos Malal Dept., Neuquén Province, Argentina. (22 Dec 2002. ARF)



fig.82: F.& W.10620 *Olsynium nicolae*. Another individual of the type population. Tromén National Park, Chos Malal Dept., Neuquén Prov., Argentina. (22 Dec 2002. ARF)

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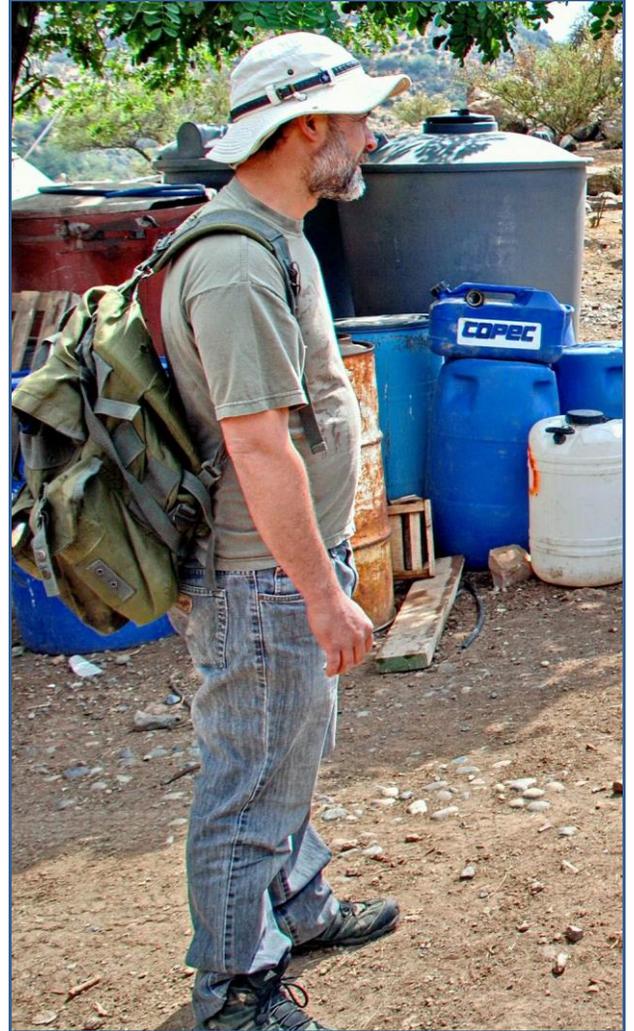


fig.83: F.& W.10620 *Olsynium nicolae* from the type population showing the diagnostic flat, glabrous foliage. Tromén National Park. (22 Dec 2002. ARF)

fig.84: Our late friend the amateur naturalist Carlos Celedón. He photographed *Olsynium chrysochromum*, which we have never seen. (30 Nov 2014. JMW)

fig.85: *Olsynium chrysochromum* for comparison. Andes of Aconcagua Province, Valparaiso Region. (11 Nov 2011. Carlos Celedón)



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fig.86: Freshly opened *Olsynium chrysochromum* flowers, before the stigma emerges and the colour at the tip fades. (11 Nov 2011. Carlos Celedón)

fig.87: *Olsynium chrysochromum* for comparison sideways-on. The Andes of Aconcagua Province, Valparaiso Region, Chile. (11 Nov 2011. Carlos Celedón)



fig.88: *Olsynium chrysochromum* from above. Note different tepal shape and coloration compared with same view of *O. nicolae*. (11 Nov 2011. Carlos Celedón)

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fig.89: *Olsynium chrysochromum*. The very different, hirsute foliage as compared with *O. nicolae*. (11 Nov 2011. Carlos Celedón)



fig.90: Nicola and partner Ben enjoying refreshments on our home patio during a visit with Sarah, when we saw a new species together. (25 Dec 2012. JMW)

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fig.91: Together at our home in Los Andes, Nicola with her dad, John. (Mar 2008)



fig.92: Seeing off the old fogeys! Sarah (L) and Nicola with our luggage at London Airport after our latest visit to them two years ago. (14 Nov 2017. JMW)

### Tailpiece

To round off the opening essay topic, the two commemorations here come close to winding up the great majority of folks we most dearly want to name plants for, if not quite all. Two are particularly outstanding still. Without the enduring tolerance, belief and support of his now long-departed parents, whom he's always regarded no less as wonderful friends, it's more than likely John would have ended up as 'something in the city', like numbers of his school contemporaries. A doting aunt and uncle

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who left him a small but significant inheritance which greatly helped to fund our plant hunting should also be remembered. Maybe we'll find new plants to commemorate those four and a couple of others to whom we're deeply indebted. Time will tell.

## Acknowledgements

Without having been invited to participate in the Huasco survey by Emma Elguita our coverage of *Zephyranthes sarae*, especially its illustrations, would have been distinctly more restricted. We must also beg Shakespeare's pardon for slightly modifying the "smell as sweet" quote from 'Romeo and Juliet' that forms the first subtitle.

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## ---Plant Portrait---

### Geranium subcaulescens and its Kin by Allan Robinson

At the age of ten I started working at our family nursery at Sidcup, Kent on a Saturday for some extra pocket money. My first task was to work through the thirty plus large frames that contained the rock garden plant section, removing weeds and learning names as I went. Two species, out of over a thousand varieties that resided in the frames, grabbed my interest. They were *Geranium subcaulescens* and *Erodium chrysanthum* and at that time I never realised that, several decades later, I would find them on the same mountain in Greece. The Geraniums found were very variable in leaf and flower while the Erodium was so different to the one in cultivation, I quickly realised we had been growing a hybrid under that name, along with everybody else.

Gaining information about *Geranium subcaulescens* was a slow and difficult process. I soon exhausted the supply from my family and very little was available in print apart from the odd mention in nursery catalogues. Then in the 1980's, Peter Yeo's book "Hardy Geraniums" broke the deadlock and some new information became available. This inspired me to focus my trips to Greece, selecting a mountain or two for each visit, gradually investigating most areas of the country.

Initially the Internet was of little use but in recent years it is now possible to gain facts and most importantly, photographs. Relying on others to visit distant mountains makes good use of their local knowledge and is a great saving in time and money.

Then in 1996, Carlos Aedo produced a revision of the Subacaulia Geraniums, allowing us an insight into the lesser known species in addition to the few already in cultivation.

The following text is a compendium of information derived from all the sources mentioned above, combined with my own experiences and observations of plants in cultivation and in their natural habitat. We are now about to visit Africa, Europe and Western Asia in order to view all the known species in the Subacaulia group.



Typical *Geranium subcaulescens* from the Peloponnese.

*Geranium subcaulescens* has a wide distribution compared to other members of the "cinereum" group (officially known as Geranium section *Subacaulia*). This species is definitely found in the mountains of Albania, Greece and various parts of what once was Yugoslavia. There are also reports that this species has been sighted in Italy over the years. Plant Hunter John Watson reported encounters with "subcaulescens" like Geraniums in the mountains of Turkey when he collected there back in the 1960's. John's team were there to collect seed of horticulturally interesting plants for introduction into cultivation, often they would see

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these Geranium plants in flower but would never get back in time for seed gathering. Taxonomist Carlos Aedo does not include Turkey in the distribution of *G. subcaulescens* although Peter Yeo does in his book "Hardy Geraniums".

Two species very similar to *Geranium subcaulescens* can be found in the north east of Turkey, these are *G. lazicum* and *G. ponticum*. John Watson's exploration often took him further south and these two species do not resemble the forms John spoke about. I do remember him describing a silver leaved colony with typical magenta-red flowers plus a number of other interesting types. No doubt other plant hunters will follow in his tracks at some point but this time armed with modern camera-phones. It is more than likely that many Turkish colonies of Geraniums in the *G. cinereum* group are still waiting to be officially discovered.

Taxonomist Carlos Aedo elevated all forms of the *Geranium cinereum* group to full specific rank in his "Revision of Geranium subgenus Erodioidea", a publication that also deals with *Geranium phaeum* and other species with Erodium type seed ejection. We still have to live with the nomenclatural history of *Geranium subcaulescens*. For many years it was considered a subspecies or variety of *Geranium cinereum*, a species found in and around the Pyrenees. To make matters worse, many nurseries and gardens in Europe (not the U.K.) still refer to *G. subcaulescens* as *G. cinereum* with no mention of "subcaulescens" at all. New hybrids that are now being sold under the *Geranium cinereum* banner are obviously deeply seeped in *G. subcaulescens* DNA and show little evidence of the pale pink, heavily veined flowers of the species they are meant to be related to. In addition, you may come across a very old book that discusses Geranium, it is possible the author will write about *Geranium humbertii*, a name now relegated to another synonym of *G. subcaulescens*.



A typical wild *Geranium cinereum*, as found in the Pyrenees.

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This photo shows the road leading to the Port de Boucharo in the French Pyrenees from where you can walk into Spain. In 1994 it was possible to drive on this rock strewn track but now only bicycles and pedestrians are allowed to use it. A huge colony of *Geranium cinereum*, (plant shown below), were growing on the high rocks seen top left. Pure white forms were in evidence as well as strongly coloured plants similar to *Geranium* 'Ballerina'. This mountain pass and the surrounding peaks are one mass of limestone, just what the *G. cinereum* group love to grow in.



The epicentre of *Geranium subcaulescens* is Greece and many mountains there are host to this species. It seems to have two major requirements when selecting a home, the mountain must be formed from limestone and it has to reach an altitude of at least 2000 metres (6000 ft) for this species to be happy. This group of *Geraniums* love the sun but dislike high temperatures which can be detrimental. They seek a cool home in the mountains and tend to grow at an altitude of around 6000 ft. As conditions vary from mountain to mountain, the chosen altitude may differ by several hundred metres. This *Geranium* has adapted its own version of the "Goldilocks Principle", so whether it is 1790, 1950 or 2100 metres that are chosen on a mountain, you can be sure they are comparable and "just right". When you reach the correct altitude at flowering time, the mountainside seems bejewelled with a plethora of magenta-red flowers, all varying to a degree. The plants will be found growing in sun or shade, it doesn't seem to matter. Neither does it matter if they are growing in turf, scree or rock formations – they are just happy to be growing on limestone at their preferred altitude. They become far more picky in cultivation in my experience.



Typical plateau of limestone at around 2000 metres with hundreds of *Geranium subcaulescens* in flower.

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There is variation in growth habit as well as flower colour between populations in the Peloponnese and those in Central and Northern Greece. Plants in the Peloponnese can have very dark magenta-red, black centred flowers in the main although in every colony there are variants. Pink forms do appear from time to time; they are not abundant and tend to be more common in the Peloponnese.

This is a particularly distinct "Pink" which is now named 'Eos', Greek for "Dawn" or the "Rosy Fingered Dawn"- discovered in the Peloponnese.

I did find a white form once, I took a cutting which rooted but alas the plant had a poor constitution. My discovery was white with a reddish centre but a white with a blackish centre was discovered some years later by others. A white form can be seen online, [here](#).

[Here](#) is a link to a typical form with an excellent blackish centre.

As you travel from the South to mountains in Central and Northern Greece, petal colour often becomes paler and the blackish centre can frequently disappear. In addition, white or very pale centres to the flowers become commonplace, so in truth, the species is very variable.

[This link](#) is to a form found on Mt. Ossa. The website [Greek Mountain Flora](#) is a useful one.

Leaves vary to a huge degree and in some cases where plants have to tolerate very strong winds; the leaves thicken, often with prominent hairs to enable a reduction in transpiration.

Leaf variation brings us to the cultivar *Geranium subcaulescens* 'Splendens', a well documented plant that Richard Clifton states was collected in 1936 by a J.Stormonth (see the Geranium Register). I would dispute that this plant was a wild collection for the same reason as "Giuseppii" mentioned below. In fact, George Arends in Germany listed this plant as one of his hybrid introductions between WW1 and WW2, along with another similar Geranium named 'Purpureum', much of his work being undertaken in the 1920's. This would explain the unusual leaf shape and petal coloration not found in wild populations although there is no record of the parentage for this hybrid. The link below shows that he introduced *Geranium subcaulescens* 'Splendens' around 1930 which would tally with Stormonth obtaining stock in 1936. The list of Arends's hybrids with dates of their raising disappeared from the Internet a while back, although the following list documents when the hybrids went on sale: see [http://www.georg-arends.de/historisches\\_archiv](http://www.georg-arends.de/historisches_archiv) then click on [Liste der Züchtungen](#) Some years ago I asked his Grand-daughter, who now runs the nursery, if records had been kept. The answer came back that the Allies had bombed the nursery twice during WW2 and destroyed any documentation. It would appear that Stormonth (who ran a nursery at the time) probably did no more than import some plants from Arends's nursery in the 1930's.

Both my Grandfather and Great Grandfather had grown this plant at their nursery in Eltham (then North Kent) as ***Geranium subcaulescens* No.2 Form** for many years, probably even before 1939



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but I am not sure of dates. It was definitely stocked soon after WW2 and remained under that name until I realised what it really was in the 1970's.

There is another complication regarding the cultivar 'Splendens' that I should mention, as it may not be obvious to anyone researching this plant in the future. Listed in Bloom's green wholesale catalogue, which I remember from the sixties to early seventies, was *Geranium subcaulescens* 'Splendens'. In actual fact it was a pale flowered form of the species that really confused the issue at the time. I have kept a small stock of the plant since then for historic interest although by today's standards it is not particularly exciting.



Another pink form, this time found on Mount Tymfristos, Central Greece.

The cultivar known as 'Giuseppi' was collected in Albania, but specimens in Central Greece do have the same type of mat forming growth and paler flowers. Mount Parnassus and Mount Ghiona are host to many 'Giuseppi' like forms, to my mind not one of the most attractive selections from this species.

*(In the Geranium Register and other places this cultivar is seemingly promoted to species rank as the name has been turned into a Latinised Male Commemorative by the addition of another i. There is no obvious reason for this addition as the two collectors must have been well aware they had not discovered a new species. The truth is probably that somebody corrected Giuseppi to Giuseppii in the past, assuming it to be a badly spelled latinised male commemorative.*

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In 1929 Dr. Paul Giuseppi went plant hunting with Walter Ingwersen to the mountains of Albania. I would consider it impossible for a plant or cutting to be kept alive for a journey back to England well before WW2. So I would assume seed was collected and Dr. Giuseppi would originally have had a number of *G. subcaulescens* plants, all different. No doubt this cultivar is the one that survived by reacting to nursery propagation more positively than the others or purely by having a better constitution).

In the north of Greece lies Mount Askion, a strange limestone mountain that is host to a close relative of *G. subcaulescens*, namely *Geranium thessalum*. It would appear as if some *G. subcaulescens* have become marooned on this isolated peak and evolved into a separate species over time. It is only found on this one peak in Greece but turns up on another mountain in Macedonia (formerly part of Jugoslavia), which is a puzzle. *Geranium thessalum* is not easy to grow and little seems to be known about it, only in recent years have a few photos turned up on the Internet. The flowers have a distinctive white centre, quite pronounced in some clones, a characteristic that will lead to some unusual hybrids in the near future.



*Geranium thessalum* growing on Mount Askion.



The summit of Mount Askion/ Siniatsikon.

Also known as Mount Siniatsikon, this peak reaches an altitude of 2111 metres with the geranium growing in the limestone ledges and scree at around 2000m.

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At the eastern end of the Gulf of Corinth (Korinthos) you will come across Mount Kitheronas which seems to almost rise from the sea. It has had similar names in the past, Kitheron being one and Cithaeron another. This area is famous due to a huge battle taking place close by in 479 B.C. between the Allied Greeks and invading Persians – the latter were seriously defeated.

Reaching the summit at only 1400 metres a colony of geranium were discovered, all flowering either pale pink or white and each with faint veining. The plants were mat forming in habit and even more surprising was the discovery that they entered summer dormancy around mid June; autumn rain would regenerate the foliage later.



On Mount Kitheronas

We have been told that this colony is *Geranium subcaulescens* but it does seem fairly unbelievable considering the differences. We had sent a Herbarium specimen to the “Flora Hellenica” team in Copenhagen many years ago and initially it was logged as just another *Geranium subcaulescens* form. Luckily in 2018, Kit Tan, the Head of the project scrutinised the specimen and realised it was actually *Geranium subacutum*.

Aedo had concluded that this *Geranium* was *subcaulescens* but with the loss of pigmentation that had become stabilised throughout the mountainside. With the running, mat forming habit, the summer dormancy that commenced as the seed was being produced and combined with pale pink or white flowers, alarm bells had started to ring regarding the original identification.

Theodor von Heldreich, the German Botanist who lived and worked in Greece for a large percentage of his life did make the same discovery in the 1800's. In fact Heldreich visited Mt. Kitheronas eight

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times between 1844 and 1889 and more than likely noted this *Geranium* well over 150 years before our 2000 visit. So far, I cannot discover under which specific epithet he described the *Geranium* but this news alters the status of *Geranium subacutum* as a Turkish endemic.

Until recently, *Geranium subacutum* had been considered a close ally of *Geranium subcaulescens* found only in a few locations in Turkey. The flowers range from white to pink (sometimes purplish according to Aedo) but lack the deep basal markings of *G. subcaulescens*. This species reaches north east Turkey in its distribution and does have some interaction with *Geranium ponticum* where they meet.



These three photographs were taken a few minutes apart on the 5<sup>th</sup> June 2008, showing the plants of *Geranium subacutum* entering summer dormancy shortly after flowering. By July, the whole population has totally vanished.

[\*Geranium subacutum\*](#) does not appear in cultivation in the U.K. but can be purchased in Canada and the U.S.A. at a few specialist nurseries, normally as white flowered clones. (I have a selected white cultivar from Mt. Kitheronas which is named *G. subacutum* 'Chione' – Chione is the goddess of snow in Greek Mythology).

[\*G. lazicum\*](#) from North East Turkey is unusual as it grows on granite, otherwise closely related to *G. ponticum*. Click [here](#) for a photo on [Pavelka Alpines](#) site.

[\*G. ponticum\*](#) is another species from the Pontic Alps, this and *G. lazicum* often appear for sale after plant collectors have visited Trabzon, the Zigana Pass and surrounding areas. May be best pot grown and kept under glass during the winter period, see [this](#) photo by Pavelka.

[This link](#) below gives some credence to John Watson's reports, here we have the silver leaves but without the dark magenta-red flowers. What we are viewing here I'm not sure, although they are very distinct and could well be one of John's sightings from his time in Turkey, probably yet to be described. The [Turkiyebitkileri \(Plants of Turkey\)](#) website is another useful source of photographs.

One of the gems of the Subacaulia group is *Geranium argenteum*. Distinct silvery – grey leaves give rise to heavily veined pink flowers. Used extensively as a parent by breeders for choice hybrids, this species makes an excellent pot grown specimen or alternatively planted in scree conditions. The deeper form 'Rubrum' sometimes offered for sale is no doubt a hybrid, this species hybridises readily with *G. subcaulescens* to form *Geranium x lindavicum*. Found in S.E. France, N. Italy and Slovenia.

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Photos are available [here](#) on the super Acta Plantarum site.

To the west of the Pyrenees in the area around the Cordillera Cantabrica in Northern Spain, resides another attractive member of the Subacaulia section, namely *Geranium subargenteum*. Walking in the Picos de Europa, you are more than likely to encounter this species along the way. The leaves are grey and the flowers are a deeper pink than *argenteum* and *cinereum*, the darker veining to the petals gives us another distinctive Geranium which is not easily obtained from nurseries at present. Photos may be seen in this Picos blog of Juan Manuel Pérez de Ana, [here](#) and this blogspot by Ignacio, [here](#).

Carlos Aedo does not mention Italy in his book when discussing the distribution of *Geranium subcaulescens*. However there are reports that *G. subcaulescens* has been sighted in mountains there and on investigating I think I have discovered the reason. A fairly closely related species, *Geranium austroapenninum*, does grow in Italian mountains and I'm sure this is just a case of mistaken identity.

Go to the blogsite of Pasquale Buopane - [here](#) - and the website, Acta Plantarorum, Galleria della Flora italiana - [here](#) - and see for yourself.

Several decades ago, Dr Charles Aitchison re-introduced the tiny *Geranium nanum* from Morocco, which he collected on one of his trips to the Atlas mountains. Although still uncommon in cultivation, Tim Lever is now offering it for sale at Aberconwy Nursery. As the name suggests, it is a small dome forming species producing white flowers (pale pinks are known) each delicately veined. Due to its diminutive size, this species makes a good subject for pot or pan cultivation. It also has the ability to hybridise with some other species in the Subacaulia section, producing some attractive hybrids. John Anton-Smith used Dr Charles Aitchison's wild collected seed to good effect years ago; some of the hybrids produced were outstanding. Unfortunately John's plants were either sold at Plant Fairs or given away, none managed to be propagated by nurseries for sale.

The species most likely to be encountered are mentioned above but it does leave a number that are very rare or absent in cultivation. A few years ago a Czech collector offered wild seed of *Geranium pisidicum*, after some detective work in the U.K. and U.S.A, it was finally identified by Aedo in Madrid. This dubiously named species turned out to be the rare *Geranium petri-davisii*, hardly known in cultivation up until now. If you purchased seed of *Geranium pisidicum* over the last few years, then you need to re-label your plants.

Then in 2005 another species was discovered in Turkey and was later described and named *Geranium kalenderianum*. ([Geranium kalenderianum \(Geraniaceae\), a new species from Turkey](#): A. İlçim & L. Behçet Annales Botanici Fennici 43(6):451-455)

This species has silvery foliage and another match to John Watson's observations half a century ago. Remembering John's comments, I would be surprised if no more species are found in Turkey in the next few years.

Other species still not mentioned in the text are very rare and little is known about them. Hopefully seed will be collected in the near future.

## Hybrids

Some hybrids do exist between a few species in the Subacaulia section. Plant hunter and hybridiser Dr Charles Aitchison commented that many species in the "cinereum" group are difficult to cross. Resulting crosses in many cases are weak and often develop yellowish or blotched foliage. Several species in this group give rise to some attractive hybrids, all seem to have a Chromosome count of  $2N = 28$  although Aedo mentions *G. subcaulescens* can be tetraploid in some cases. *G. argenteum*, *G. cinereum* and *G. subcaulescens* are the most reliable and compatible species to use. However,

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John Anton-Smith did produce some interesting crosses over twenty years ago, using *Geranium nanum* from Morocco as one of the parents.

A common hybrid encountered is *Geranium x lindavicum*, the original cross was made by Franz Sündermann in Lindau, Germany, early in the twentieth century. The parents of this hybrid are *Geranium argenteum* and *Geranium subcaulescens*, various attractive forms such as 'Alanah' and 'Lissadell' have been developed by others. There is a very attractive cultivar named 'Gypsy' raised in Dorset a few decades ago which is listed as a *Geranium x lindavicum* hybrid. One of the parents of this cross is *Geranium subcaulescens* 'Splendens' and unfortunately there is doubt regarding the status of this cultivar. Personally I do not believe it to be a wild selection of *G. subcaulescens* as its history as a George Arends's hybrid is well documented in Germany but completely overlooked in the U.K.

There are also crosses between *Geranium argenteum* and the true *Geranium cinereum* from the Pyrenees. The most common form in commerce is 'Apple Blossom', raised years ago at Blooms Nursery. Unfortunately now that *G. cinereum* and *G. subcaulescens* have been made separate species by Aedo, not all these hybrids should automatically come under *G. x lindavicum*. Sampson Clay in his 1937 book "The Present Day Rock Garden" tells us that *G. argenteum x G. cinereum* is in actual fact *Geranium x intermedium*, Knuth having described Franz Sündermann's crosses in 1912. Knuth did in fact describe *G. argenteum x G. subcaulescens* as *Geranium x lindavicum* and *G. argenteum x G. cinereum* as *G. x intermedium*. Unfortunately, there already was a species described as *Geranium intermedium* decades earlier, so therefore the coined epithet for this interspecific hybrid is invalid. Over time progeny from both interspecific hybrids have been labelled *Geranium x lindavicum*.

Two famous hybrids between *G. cinereum* and *G. subcaulescens* were raised by Alan Bloom at his nursery, these were *G. 'Ballerina'* and *G. 'Laurence Flatman'*. 'Ballerina' was the first to be introduced and was given a "Preliminary Commendation" in 1961 followed by an "Award of Garden Merit" some years later. 'Laurence Flatman' appeared in the 1970's, Alan Bloom having named the plant after his Alpine Department Foreman. Due to the fact they are fairly similar in appearance; they do get mixed or confused in nurseries. There is a simple way to tell the difference, during cool weather early in the flowering season you need to keep them moist for a week or so. If any develop a flush of reddish purple in the flower, then it is 'Laurence Flatman', hot or dry weather can render these two hybrids looking identical.

## Cultivation

If you have no problems growing *Geranium subcaulescens* then you are quite lucky in having some requirements already in place.

One problem that affects many Mediterranean climate plants is water, in actual fact; too much of it during the summer is detrimental. *Geraniums* in the "cinereum group", *Erodiums* and various other genera that are used to summer drought can collapse suddenly, often giving the impression they are dry. They then get watered to cure the problem although that is the last thing they really need and the situation deteriorates rapidly. In contrast, genera such as *Aubrieta* and *Helleborus* do enter a summer dormancy although they can tolerate watering during this period. Some *Geraniums* and *Erodiums* are unable to tolerate wet soil during the same period in summer.

I have taken dying *Geranium subcaulescens* from a friend's garden to Plant Pathology at RHS Wisley Garden in the past, in order to identify the problem. Pathology said they could not culture anything from them although the roots had turned reddish and had a putrid smell. From this I deduced that as there was no Pathogen affecting them, then in fact we were looking at a condition rather than a disease.

As an experiment I potted many items into terra cotta pots, these included *Erodiums*, European *Daphne*, cinereum group (Subacaulia section) *Geraniums*, *Penstemon* and various other genera known to have problems with summer collapse. These went under glass and were plunged into a sand bed so watering could be strictly controlled, not one died with this regime. Nothing was watered

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until the compost started to dry out. So it is fair to assume that these plants should not be kept amongst others that do need summer watering.

I find *Geranium subcaulescens* grows best when given a raised bed or rock garden conditions, growing at normal garden level does not allow enough drainage. I make sure the soil has a high pH as this species in common with many more in the group, prefer limestone rocks in nature. You will not normally find them growing in the wild if the mountainside is formed by an acidic rock, at least I have never seen them under those conditions. The species even rejected the limestone on Mt. Parnonas and on close scrutiny; we noticed lava plugs pushing upwards and distorting the limestone. Somehow heat had changed the composition of the limestone and wherever this had taken place, the Geraniums were absent.

I top dress with Cotswold or Purbeck chippings and also add the same to my compost, bags of "Diall" Cotswold Stone in various sizes starting from 10 mm, can be found at B&Q and are ideal. "Meadow View" crushed "Cotswold Buff" Stone from some Garden Centres comes in two useful sizes and can be cheaper than other brands. Use any dust in the bag to help raise the pH of your mix.

*(Many plants in nature seek limestone or a high pH to the material they are growing on. The micro-fungi and pathogens that can affect the plants in question cannot live in an environment with a high pH; I feel this is a factor that cannot be ignored. Modern nursery composts comprised of peat and similar products are gargantuan killers of many plants. Left around the roots at planting they can dry out in hot weather and even start to extract moisture from the plant. In very wet weather, the plant can sit in a soggy acidic mess. Shake off as much of these composts as you can from newly purchased plants to give them a chance in the future).*

One last point to mention is timing, in my experience I have found there are good and bad times to work on *Geranium subcaulescens* and its relations. Taking cuttings should be done as early as possible, the ratio of success drops as the summer progresses. Under glass March would be the time to start, even February in a mild season. See "The Gardener's Guide to Growing Hardy Geraniums" by Trevor Bath and Joy Jones, pages 59 and 61 for hints on *Geranium cinereum* group propagation.

Do not plant these *Geraniums* in the garden after June, as they can easily suffer the fate mentioned earlier. Wet compost / fresh soil can cause collapse at this critical point during the summer, wait until later when the plant would normally receive rain in the autumn. Spring planting is the safest in my opinion and gives the best results, it is far better to keep the plant in a pot until conditions are favourable.

Seed of many *Geraniums* and *Erodiums* will germinate early on the mountains where they are native. These seedlings will often start to move when the weather is still cold but the snow around them is melting during the daytime. It is this melting snow that triggers the seeds into life and their main initial task is to send down a taproot. Many *Erodium* species are far better at this practice than most *Geranium cinereum* group members but they all depend on this characteristic for survival. They must find a deep water source before the plant can produce masses of foliage. I have had true *Erodium chrysanthum* produce a taproot in cultivation of around four feet in length; I dread to think how deep they can go in their home environment. This will overcome any drought conditions on the mountain during high summer although the bulk of the plant will be subjected to it. This is why they cannot take wet conditions around the "crown" in summer.

If you are able, try sowing seed individually in prepared pockets on a raised bed or rock garden. Sow during the winter and mark with a label, to avoid weeding it out when it emerges. Plants grown in this way should be vigorous and give little trouble.

Raising plants in pots removes their ability to live a normal healthy life. Many growers will raise seed that are densely sown in a pot, then pull them apart and prick them out, finally potting them in a fairly small pot. It suits some garden plants but this process greatly reduces the chance of a taproot being formed but does promote masses of short, lateral ones. Short roots cause problems in summer drought; the subject has to be watered to save it but exposes it to detrimental conditions. I'm not

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saying that a plant will die unless you follow this advice but the more thought you give; the fewer plants will depart suddenly.

When viewing *Geranium subcaulescens* in the wild, it is fairly obvious that many plants are long lived. I remember my Father opening a letter from a customer in the late 1960's or early 70's and starting to laugh. The customer had written a mock complaint, saying that her *Geranium subcaulescens* had just died, after only 26 years. At a purchase cost of about one shilling, less than a ha'penny's worth of enjoyment a year had ensued.

## Full alphabetical list of species contained in Geranium section Subacaulia (cinereum group) with geographical locations.

**argenteum.** Pale to mid pink flowers which can be heavily veined. Silvery grey foliage. From S.E. France, N. Italy and Slovenia.

**austrorapenninum.** Deep pink to magenta-pink. Apennine Mountains, Italy.

**cazorlense.** From the Sierra Cazorla in Southern Spain, flowers white or pale pink, close to *G. nanum*. Seldom encountered in cultivation.

**cinereum.** Joy Hulme commented that she had found very deep flowered forms of the species, hardly distinguishable from 'Ballerina' while walking in the Pyrenees. White flowered forms are not uncommon. This species takes to cultivation well, for the rock garden, scree, trough or pot culture. Seldom seen in nursery lists but the cultivar 'Lizabeth' is very similar in appearance. Pyrenees, N. E. Spain.

**dolomiticum.** A pink flowered species found on Dolomite Rock in a very small area of North West Spain. Rarely, if ever, encountered in cultivation.

**kalenderianum.** White veined flowers, grey leaves. Binboğa Mountains, S. Central Turkey.

**lazicum.** Found very close to *G. ponticum* in N. E. Turkey.

**makmelicum.** This species was collected in the Lebanon by the late Ken Aslet when Superintendent of the Wisley Rock Garden Department, under the name of *Geranium cinereum* var. *obtusilobum*. No longer available in cultivation it seems. Flowers white or pale pink, foliage pale green.

**nanum.** White or occasionally pale pink. From the Atlas Mountains of Morocco.

**palmatipartitum.** Easily recognised by the elliptic leaf segments, according to Aedo. Flowers purplish pink. From N. Central & E. Central Turkey, presumed not in cultivation at present.

**petri-davisii.** Aedo informs us that this species is quite distinct from the others in this group, especially due to the large leaves up to 6.5 cms in diameter. Höbek Dag, Central Turkey.

**ponticum.** This and *G. lazicum* are closely allied to *G. subcaulescens*, being similar in appearance. N. E. Turkey (Pontic Alps)

**subacutum.** N. E. Central and S. W. Turkey and now confirmed in Greece, (Mt. Kitheronas).

**subargenteum.** Deep pink veined flowers, grey foliage. Cordillera Cantabrica, N. Spain. (Picos)

**subcaulescens.** Varies considerably throughout its distribution, very attractive individual clones can be found, as good as any variety introduced by breeders. Albania, Greece, Macedonia, Serbia. (Turkey ?)

**thessalum.** Mount Askion in Northern Greece plus another mountain in the Republic of Macedonia.

There are a total of 16 Species in this group at present. *G. kalenderianum* is a recently described species from Turkey, found geographically close to *G. subacutum* & *G. palmatipartitum*. Distribution areas may alter as new information arises plus there is always a strong possibility of a new species being discovered in Turkey in the future.

For those wishing to delve deeper into this fascinating section of *Geranium*, only one publication fits the bill. Carlos Aedo revised this group and raised all members to specific status. Published in August 1996 by the American Society of Plant Taxonomists as part of the Systematic Botany Monographs, (Volume 49). Titled the ["Revision of Geranium Subgenus Erodioidea \(Geraniaceae\)" by Carlos Aedo](#) (Real Jardín Botánico de Madrid).

A.R.