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Some plants from Crete and another report on the violas of South America are our focus in this IRG. Vlastimil Braun, with Zdeněk Zvolánek, gives us some idea of the wealth of plants which can be enjoyed in the Mediterranean island while John and Anita Watson continue their descriptions of the rosulate violas. For so many of us, for whom such distant travel is out of the question, these articles on the South American treasures are of particular value and interest. Happily, Crete is a tad more accessible to camera-toting visitors. Whether a reader is seeking information on what they might themselves see, or just enjoying the vicarious travel, we appreciate the efforts of our authors to share their knowledge. If you

feel you may wish to write an article for the pages of IRG - about a favoured area in nature or plants which fire your passion – you are welcome to submit it to the Editor, [using this email address](#).

Cover photo: F.& W.11534 *Viola trochlearis* photo John M. Watson

---South American Report---

Triple alliance: new and rediscovered species of *Viola* section *Andinium* from Argentina

John M. Watson & Ana R. Flores, Casilla 161, Los Andes, Valparaiso Region, Chile.
john.anita.watson@gmail.com

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Abstract

We recognise here a very closely interrelated group of three rosulate violas from the southern sector of temperate South America. Two are endemic to Argentina and have not been formally published previously. The third is a new record for the flora of Argentina. The alliance is defined, and we describe the new species as well as providing a key to differentiate all three. A possible symbiotic relationship with ants is also considered.

Key words: Ants, Argentina, Chile, endemic, Linares, Neuquén Province, Patagonia, rare, *Viola* section *Andinium*, vulnerable.

fig.1: South America with Argentina (green print). All three rosulate violas described herein were found in that country and are new records for its flora.



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fig.2: The Argentinian province of Neuquén, north Patagonia, where all three *Viola* species are situated, two as endemics.



fig.3: The two provincial departments in Neuquén province and one location in Chile the violas inhabit, showing the recorded populations of each species.

Resumen

Reconocemos aquí una estrechamente interrelacionada agrupación, que consiste en tres violas rosuladas del sector sur de América del Sur templada. Dos son endémicos de Argentina y no han sido formalmente publicados previamente. La tercera es un nuevo registro para la flora de Argentina. Se define la alianza y describimos las nuevas especies, además de proporcionar una clave para diferenciar las tres entre sí. También se considera una posible relación simbiótica con las hormigas.

Palabras claves: Argentina, Chile, endémica, hormigas, Linares, Patagonia, Provincia de Neuquén, raro, *Viola* sección *Andinium*, vulnerable.

(Ecological, floral and personal backgrounds to all three violas described below may be found in IRG 105, September 2018.)

Introduction

Viola L. is the largest genus of 22 recognised in the *Violaceae* (Wahlert et al. 2014). Although many of its taxa are still under assessment, the latest authoritative and carefully estimated counts indicate that it contains a total of 610-650 known and accepted species, both published and undescribed, in 16 sections (Wahlert et al. 2014, Watson & Flores ined.). The greatest number of these, 146, constitutes the exclusively South American section *Andinium* (Watson & Flores ined.), the so-called Andean

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rosulate violas, although some of its taxa also inhabit levels down as far as the Pacific littoral, and a very few do not form rosettes (Watson & Flores 2007). The distribution of section *Andinium* extends from the equator in Ecuador to central southern Patagonia in Argentina and Chile. Its main centre of biodiversity is concentrated between approximately 33°S and 41°S, where 65 species are known (Watson & Flores ined.). These include the present two novelties as well as other unpublished but confirmed and well-defined taxa.

In 1860 the leading Chilean botanist-explorer Rudolph (Rodulfo) Philippi, a German citizen who had left Europe and migrated for political reasons to live permanently in Chile, collected a section *Andinium* viola in the Cordillera de Linares, Maule Region, central southern Chile. He recognised it as hitherto undescribed, wrote the intended name of *Viola rugosa* on its one and only specimen sheet. He then dispatched it to the German herbarium at Berlin (B), as with all his first specimens of any collection at the time, although shortly after he did deposit his priority collections in the Natural History Museum at Santiago (SGO). For some reason he never described and published it, which was realized 62 years later by the all-time historical authority of the genus *Viola*, Wilhelm Becker (1922). Becker discovered it in the B collection and gave it the name Philippi had intended. After the death of Becker in 1928 nobody resumed the study of section *Andinium* in its entirety until we Watsons adopted it in the early 1990s. Meanwhile, almost all the violas which had been accumulated at B during Becker's time, probably then the most important collection anywhere, were destroyed by an allied bomb in World War II (Hiepko 1987, Haageman & Zepernick 1993). The losses included the holotype and only specimen of *V. rugosa* from the location explored by Philippi, where it has never been encountered since. This means the world of botany is left with Becker's customary meticulous description as the only source of information on the type.

From that we can obtain by translation the following description:

Viola rugosa Phil. ex W. Becker.

Rootstock vertical, smooth, the upper part (i.e. caudex) (leaf-)scarred and reddish. *Plant* solitary to multi-branched with densely foliate rosettes, these 1.5-2.5 cm, many-flowered. *Stipules* short, membranous. *Leaf* rhomboid-spathulate, long (pseudo)petiolate, margins white ciliate, hairs long towards base and short towards tip: (pseudo)petiole 5-6 mm, membranous above, long-ciliate: lamina 3-4 mm long and broad, subacute or subobtuse, face deeply foveolate-papillose (i.e. alveolate-reticulate), ciliate at the base, undersurface smooth, with short linear glands. *Flowers* 3-4 mm, scarcely exceeding the foliage. *Peduncles* thick-fleshy: bracteoles membranous, deeply inserted, sparsely ciliate towards tips. *Sepals* ovate-lanceolate, acutish, long-villose, particularly at base, with short hair on back. *Petals* possibly yellow (from dried specimen) and partly violet, exceeding sepals: lateral petals oblong, glabrous, but with large verrucas (basal tumors): inferior petal elongate-obcordate, deeply emarginate: spur short, thick, emarginate. *Style* clavate: stigma suberect-beaked: style crest reflexed, expanded, weakly tripartite-emarginate.

Note 1: Although Becker does not explicitly state the plant is perennial, he always noted when section *Andinium* species were annual (pers. obs.).

Note 2: We have provided our equivalents in parentheses for some of his Latin terminology.

On the 7th of February 2003 the present authors discovered a very small colony of a rosulate viola in Minas Department at the extreme north of the Argentinian province of Neuquén in Patagonia, close to the international border with Chile. The locality is on approximately the same latitude as the type site of *V. rugosa*, and separated east-west from it by ca. 30 km.

On investigation, it became obvious that this hitherto undiscovered population was in fact very close to *V. rugosa*. However, although an evident slight morphological difference suggested at first it might be new to science, closer, more thorough examination and comparison with Becker's protologue of *V. rugosa* indicates that the two are conspecific in our latest judgement, which requires that the original description be slightly amended, as follows.

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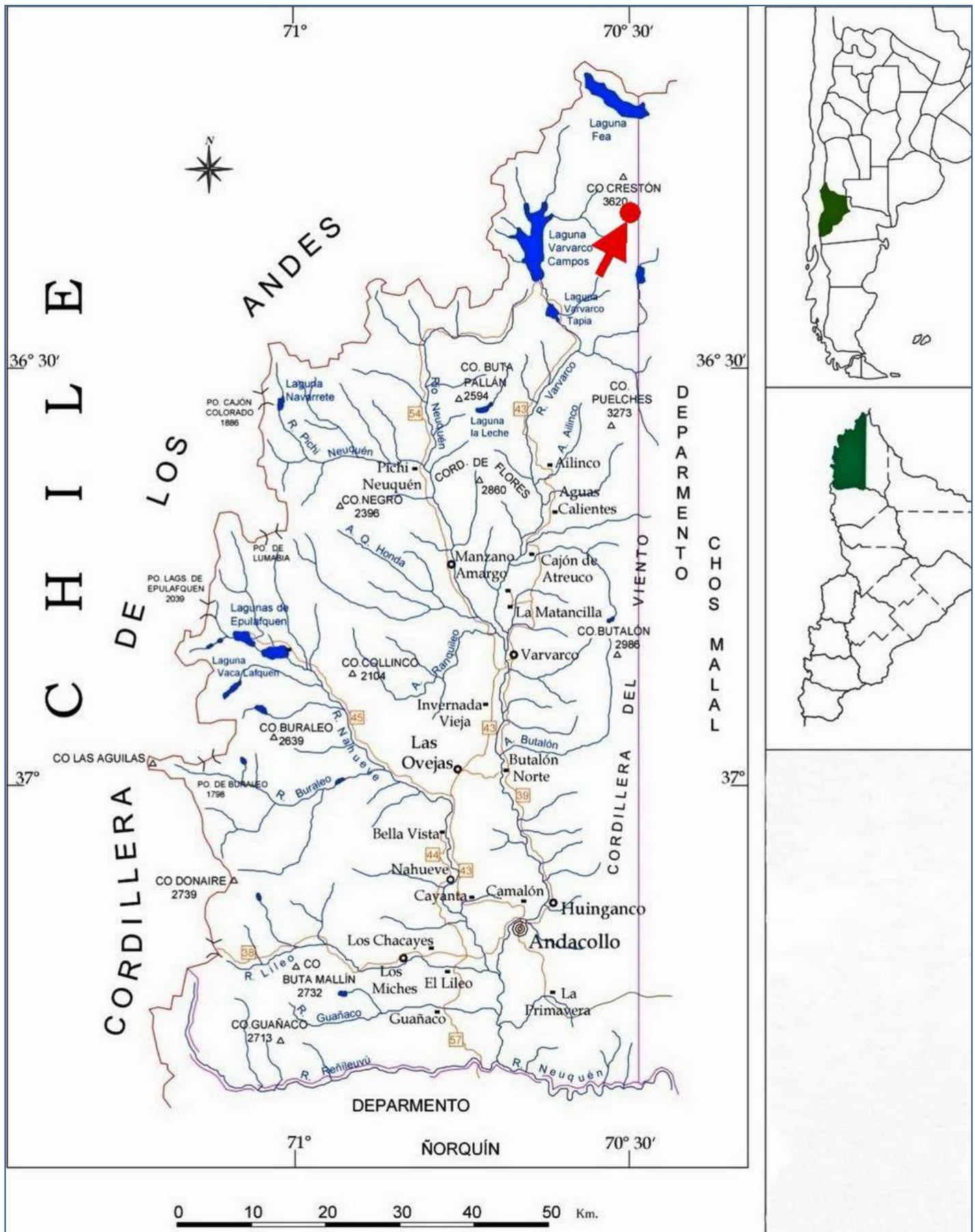


fig.4: Minas Department, northern Neuquén Province, Argentinian Patagonia, showing the exact location of the new location of *Viola rugosa* (F.& W.10700).

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fig.5: A closer cartographical view of the new site of *Viola rugosa* (F.& W.10700) at south base of Cerro Crestón, the dominant peak in the Cajon de los Nevados.

Taxonomic treatments

***Viola rugosa* Phil. ex W. Becker, emend. J.M. Watson**
[figs. 1-12]

Type:- CHILE. Maule Region, Linares Province, Quebrada del Potrero, 1860, leg. R. A. Philippi, R. A. Philippi 43 (holotype B [destroyed]).

Neotype, here designated:- ARGENTINA. Neuquén Province, Minas Department, S base of Cerro Crestón, 36°18'33"S 70°28'08" W, 2365 m, 07.02.2003, leg. A. R. Flores & J. M. Watson, F.& W. 10700 (neotype SGO; isoneotypes CONC, herb. Flores & Watson [omnia!]).

Description:- *Life form* perennial, depressed-rosulate hemicyptophyte. *Rootstock* to 8-10 cm long x 1.5-2 mm diameter at junction with caudex, vertical-axial; caudex ca. 1-2 cm long. *Rosette* ca. 1.5-2.5 cm dia. x 5 mm or less high, solitary or forming small branched contingent cluster; foliage tightly imbricate. *Leaf* ca. 8-12.5 mm when mature. *Stipules* 0.5 mm, linear-triangular, acute. *Pseudopetiole* 4-8 mm, subglabrous to long-ciliate. *Lamina* ca. 3.5 x 2.5-4 mm, rhomboid-spathulate to orbicular-obovate to broadly obovate, dull cryptic greenish brown above with paler brown venation; margin entire or shallowly 3-crenate towards base on each side, white ciliate, hairs long towards base and short towards tip; apex subacute to obtuse; face with raised alveolate-reticulate venation; undersurface glabrous or with sparse, long-villose indumentum towards base, often along veins, with overall cover of short linear glands, or otherwise frequently eglandular, or with 1-few short, dark glands, both latter states on same plant. *Anthesis* successional. *Flowers* ca. 3-5 mm high x 4-6 mm wide, axial, solitary, forming ring around circumference of rosette. *Peduncle* ca. 8-10 mm, somewhat shorter than leaves, glabrous. *Bracteoles* 0.3-0.5 mm, inserted subbasally, narrowly lanceolate, acute, membranous, sparsely ciliate towards apex. *Calyx* ca. 2 mm long; sepals, ovate-lanceolate, acute, long-villose, particularly at base, shorter and sparser becoming subglabrous or glabrous towards apex; superior sepal shorter than rest; margins entire, glabrous, hyaline. *Corolla* glabrous, faces of superior and lateral petals very pale pink, white towards and along lateral margins; reverse similar, darker; face of superior petals with narrow, broken longitudinal central thin dark violet line, extending from base as far as apical third; lateral petals same. but with multiple lines and heavier violet markings at base; throat yellow on inferior and lateral petals, extending forwards on inferior petal, where sparsely dotted with dark violet, this becoming a closely-broken dense central marking of radiating lines and dots with margins unmarked and white; superior petals 5 mm x 1.5-1.6 mm, oblong-obovate, apex obtuse-depressed; lateral petals 4.5-6 x 1.5-1.9 mm, oblong to oblong-obovate, apex rounded-obtuse, base with solitary large tumor; inferior petal 6.5-6.7 x 2.1-3 mm, elongate-obcordate, deeply rounded-emarginate; spur 0.8-1 mm, short, thick, apex retuse. *Anthers* ca. 1 mm, lower pair with 1.3 mm long, narrowly tubular nectar spurs; connectives 1 mm, orange-brown. *Style* geniculate, clavate; stigma shortly beaked, porrect or suberect. *Style crest* apical, reflexed, flabellate, trilobed, lobes somewhat downcurved. *Fruit* ca. 4-5 x 3-4 mm, trilocular explosive capsule. *Seeds* solitary or few per capsule, 2 x 1.2 mm, tear-shaped (*lacrimiformis*), apex blunt, pale brown.

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Note: The taxonomic resolution of the species is problematical, due to consistent small discontinuous morphological differences between the type and neotype populations, as presented in the table below. We concluded the differences were not sufficient to justify considering the two as distinct species. There does exist the possibility though that future judgement may separate them at infraspecific level, especially if molecular analysis can be performed on both populations and supports such a change.

Other data

F. & W.10700 field note: The very small, rather scattered colony of effectively cryptic coloured plants inhabits the south base of an abrupt upland peak, occupying the stable termination of an almost unvegetated, long scree run with several large, persistent snowdrifts above and along its length. Well dispersed plants of a prostrate Andean steppe subshrub were the only other immediate taxon observed, and the viola was seen to grow on bare scree apart from these. [figs. 6,7 & IRG 105, fig. 21]

Distribution: *V. rugosa* is recorded from two locations only, one in Chile where the type collection was made, the other in adjacent Argentina They are aligned approximately along the 36°S parallel, and separated from one another by an estimated 30 km. The species classifies accordingly as a local geographical endemic.

Overall environment and habitat of F. & W.10700: Northern Patagonian Andean uplands east of the main watershed, comprising a rugged plateau at over 2000 m to ca. 2800 m which is interspersed with mountains up to 3500 m. Heavy winter snowfalls produce many late, slow-melting snowdrifts. A variety of available ecological niches ranging from bare scree and rock crevices to flat steppe and grassy snowmelt seeps contains a richly biodiverse flora of dwarf herbs, geophytes, subshrubs and shublets, including numerous Asteraceae, calandrinias, junellias, olsyniums, ourisias, and other violas.

Phenology: Flowering in January and early February as observed. One precocious capsule with ripe seed was already open in early February. Main fruiting and seed dispersal are presumed to follow approximately one month after anthesis.

Considered conservation status: The type population has not been seen since its only gathering in 1860, and therefore its numerical content is unknown. However, the neotype consists of no more than one small local colony of a few individuals. Both sites are remote and considered to be under no obvious threat, provided grazing by stock remains at its present very low level. Nevertheless, the overall distribution of this extremely rare species at only two known localities in close geographical proximity, together with the negligible number of plants observed, classify it as at least vulnerable (VU) (IUCN 2012).

Table indicating differences in character states between the holotype and neotype population of *Viola rugosa*.

<u>CHARACTER</u>	<u>V. RUGOSA: TYPE CHILE</u>	<u>V. RUGOSA: NEOTYPE ARGENTINA</u>
Stipules	Membranous	Solid
Pseudopetiole	Long-ciliate	Subglabrous
Lamina margin	Entire	Shallowly 3-crenate
Leaf undersurface	Apparently glabrous	With sparse long-villose hair
Leaf undersurface	With short, linear glands	Eglandular or with one to few sparse, scattered glands on same plant
Flower size	3-4 mm	4-6 mm
Stigma	Suberect	Porrect

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Below- fig.6: The rather barren looking habitat of F.& W.10700 *Viola rugosa*, a new location for the species. Cerro Crestón, Neuquén, N Argentinian Patagonia. (JMW. 7 Feb 2003)



Right - fig.7: Cryptic F.& W.10700 *Viola rugosa* arrowed. Ringed by stones so we won't tread on it! Cerro Crestón, Neuquén, Argentina. (JMW. 7 Feb 2003)

Below - fig.8: F.& W.10700 *Viola rugosa* blending perfectly into its surroundings. Cerro Crestón, Minas Department, Neuquén Province, Argentina. (JMW. 7 Feb 2003)



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fig.9: F.& W.10700 *Viola rugosa*. The same plant taken by Anita on her camera. Cerro Crestón, Minas Department, Neuquén Province, Argentina. (ARF. 7 Feb 2003)



fig.10: F.& W.10700 *Viola rugosa*. Full-face view of a solitary rosette. Cerro Crestón, Minas Department, Neuquén Province, Argentina.(ARF. 7 Feb 2003)

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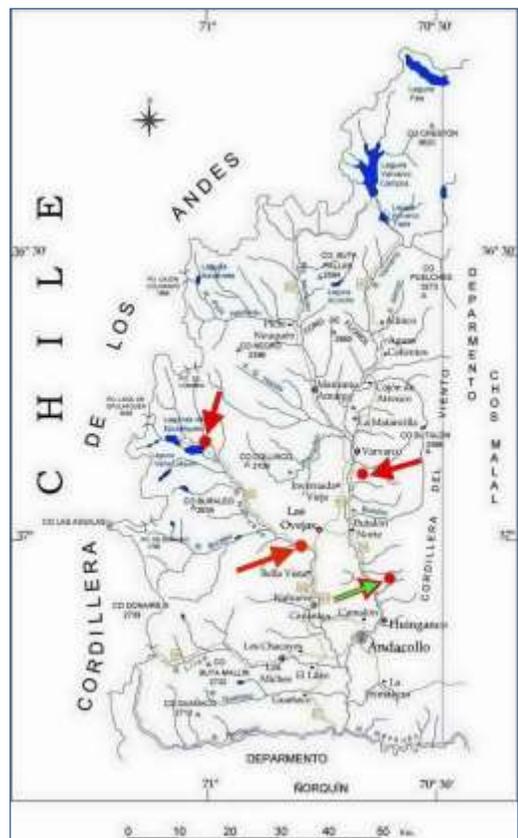
fig.11: F.& W.10700 *Viola rugosa*. A multi-rosette formation seen from above. Cerro Crestón, Minas Department, Neuquén Province, Argentina. (JMW 7 Feb 2003)



Below - fig.12: Flower of F.& W.10700 *Viola rugosa* showing protruding style crest. Cerro Crestón, Minas Department, Neuquén Province, Argentina. (ARF. 7 Feb 2003)



fig.13: Map of Minas Department, Neuquén Province, S Argentina showing the 4 *Viola rubromarginata* sites recorded by ourselves. (type location arrowed green).



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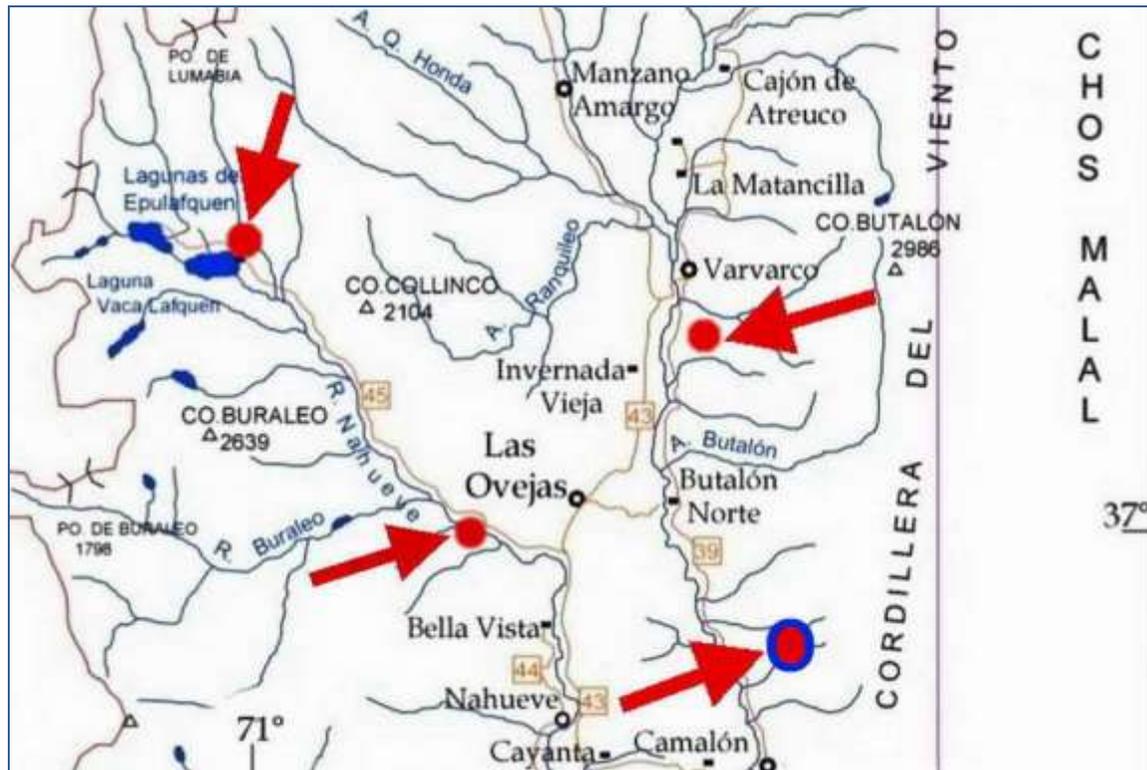


fig.14: Close-up of our four recorded locations of *Viola rubromarginata* (type site ringed blue). Minas Department, Neuquén Province, S. Argentina



fig.15: F.& W.8010 *Viola rubromarginata* at time and place of first discovery. W base Cordillera del Viento, Minas Dept, Neuquén Prov., Argentina. (JMW. Dec 1994)

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Left - fig.16: F.& W.10639 *Viola rubromarginata*, a type population record. W base of Cordillera del Viento, Minas Department, Neuquén Province, Argentina. (ARF. 25 Dec 2002)

Below - fig.17:
F.& W.11608 *Viola rubromarginata*. View of rosette face from above. Eastern shore of Lagunas de Epulafquén, Minas Department, Neuquén Province, Argentina. (ARF. 21 Jan 2008)

Below - fig.18:
F.& W.10639 *Viola rubromarginata* flower from type population. W base of Cordillera del Viento, Minas Department, Neuquén Province, Argentina. (ARF. 25 Dec 2002)



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Viola rubromarginata J.M. Watson & A.R. Flores, sp. nov. [figs. 1-3, 13-18]

Type:- ARGENTINA. Neuquén Province, Minas Department, W foot of Cordillera del Viento, 10 km N of Andacollo, 37°06'00"S 70°37'00" W, 1250 m, 25.12.2002, leg. A. R. Flores & J. M. Watson, F.& W. 10639 (holotype CONC; isotypes, SGO, herb. Flores & Watson [omnia!]).

Diagnosis:- *The new species pertains to Viola section Andinium W. Becker and is closely related to Viola rugosa Phil. ex W. Becker, and Viola trochlearis J.M. Watson & A.R. Flores, as described below. The red margins and apiculate apex of the lamina, consistent and different corolla colour and markings, and style crest morphology distinguish it from both of those taxa.*

Description:—*Life form* perennial, depressed-rosulate hemicryptophyte. *Rootstock* long vertical-axial; caudex ca. 1-2.5 cm long. *Rosette* ca. (2-)2.5-5(-7) cm dia. × 2-5 cm high, solitary or forming small branched contingent cluster; foliage imbricate, more tightly so on face of rosette. *Leaf* ca. (1-)1.25-2.5(-3.5) cm when mature. *Stipules* ca. 1 mm, broadly ovate, membranous, with light purple, tapering longitudinal central vein, margins fimbriate. *Pseudopetiole* 0.6-2(-3) cm × 2-2.2 mm, glabrous, or with few short cilia basally and at junction with lamina. *Lamina* ca. 4-10 × 4.5-11.5 mm, entire, rhomboid, depressed-rhomboid to flabellate, shortly cuneate to pseudopetiole, dull green with pale venation; margin raised, narrow and clear brownish red (this critical colour feature lost in pressing and drying) bordered by continuous short ciliate hair, longer and sparser at cuneate junction with pseudopetiole; apex rounded-depressed-obtuse with small, obtuse apical point; face with with raised alveolate-reticulate venation; undersurface glabrous, densely set overall with radiating, linear, dark brown glands. *Anthesis* successional. *Flowers* ca. 1-1.5 cm high × 1-1.2 cm wide, axial, solitary, forming ring around circumference of rosette. *Peduncle* ca. (0.8-)1-2.2(-3) cm, somewhat shorter than leaves, glabrous. *Bracteoles* 5-6 mm, inserted basally, broadly oblong-triangular, subacute, membranous, with light purple, tapering longitudinal central vein; margins entire, undulate. *Calyx* ca. 3-4.5 mm long, glabrous; sepals, ovate to elliptical, acute, with plane basal spur, superior sepal shorter than rest; margins hyaline. *Corolla* glabrous, face with base of all petals clear dark violet, rarely excepting superior petals, this often extending outwards to midway and becoming pale towards apex; all petals densely veined slightly darker violet; throat of inferior petal yellow, blotched darker violet; reverse of all petals pale yellowish, veined dark violet; superior petals 7-8 × 2.3-2.5 mm, oblong-cuneate, apex obtuse-depressed; lateral petals 7.5-8 × 2-2.5 mm, oblong-cuneate, apex obtuse-depressed, base with solitary large tumor; inferior petal 8-9 × 6 mm, broadly obcordate, often more or less conduplicate, deeply rounded-emarginate; spur 1.6-1.8 × 1.5 mm, short-tubular, apex rounded. *Anthers* 2 mm, lower pair with 2 mm narrowly tubular nectar spurs; connectives 3 mm, orange-brown. *Style* straight, clavate; stigma beaked, porrect. *Style crest* apical, reflexed, flabellate, weakly trilobed, lobes strongly upcurved. *Fruit* oval, trilocular explosive capsule, longer than calyx when mature. *Seeds* not seen.

Other data

F.& W.10639 field note: The sheltered western foot-slope of a continuous high, fairly abrupt mountain ridge running due north-south. The location is situated one side of and above a small mountain tributary stream bordered by intermittent shrubs. The immediate habitat is open ground around low, small outcrops with minimal accompanying dwarf steppe vegetation.

Paratype: ARGENTINA. Neuquén Province, Minas Department, E shore of eastern Laguna de Epulauquén, 36°50'39"S 71°00'40" W, 1480 m, 21.01.2008, leg. A. R. Flores & J. M. Watson, F.& W. 11608 (herb. Flores & Watson!).

Distribution: *V. trochlearis* is a local endemic of northern Neuquén Province in Argentinian Patagonia. It has been recorded from four localities there with a distance of 44.5 km between the farthest apart.

Overall environment and habitat in the type sector: The Tromén regional nature park the new species inhabits contains an exceptionally biodiverse Andean steppe flora adapted to its many and varied ecological niches. These taxa range from dwarf high Andean herbs and geophytes to upland

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deciduous trees, and from xerophytes to helophytes. The families Asteraceae, Iridaceae, Montiaceae Verbenaceae and Violaceae are particularly well represented.

Phenology: Flowering early December to late January, with fruiting and seed expulsion assumed to follow approximately a month later than anthesis.

Etymology: Named for the distinctive red margin to the laminas, unique in this group.

Considered conservation status: Despite being situated entirely within a protected area, and also having a somewhat greater quantity - both of populations (four) and overall individual numbers - than many others in its section *Andinium*, *V. rubromarginata* is still rare and local. According to IUCN (2012) criteria, it should therefore unquestionably be categorized as vulnerable (VU).



fig.21: A triple-rosetted F.& W.11543 *Viola trochlearis* at the type site. Primeros Pinos, Picunches Department, Neuquén Province, Argentina. (ARF. 22 Dec 2007)

fig.22:
F.& W.11543
Viola trochlearis
of the type
population.
Primeros Pinos,
Picunches
Department,
central
Neuquén
Province,
Argentina.
(ARF. 22 Dec
2007)



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Left - fig.23: F.& W.11534 *Viola trochlearis*. View of a type population rosette. Primeros Pinos, Picunches Dept, Neuquén Prov., Argentina. (JMW. 22 Dec 2007)

Below - fig.24: F.& W.11534 *Viola trochlearis* flower from type population. Picunches Department, Neuquén Province, Argentina. (JMW. 22 Dec 2007)



***Viola trochlearis* J.M. Watson & A.R. Flores, sp. nov.** [figs. 1-3. 19-24]

Type:- ARGENTINA. Neuquén Province, Picunches Department, Primeros Pinos, 38°52'29"S 70°35'06" W, 1625 m, 22.12.2007, leg. A. R. Flores & J. M. Watson, F.& W.11543 (holotype CONC; isotype herb. Flores & Watson [omnia!]).

Diagnosis:- *Viola trochlearis*, a new species of section *Andinium* W. Becker, is proximately allied to *Viola rugosa* Phil. ex W. Becker, and *Viola rubromarginata* J.M. Watson & A.R. Flores as described above. It may be told from the last named by its integrated, concolorous pale brown lamina margins and the obtuse, not subapiculate, termination of the lamina apex; also by the different corolla colour and markings. It differs from *V. rugosa* by larger sized rosettes, by the lamina being wider than long, and for the calyx being glabrous, not pilose.

Description:—Life form perennial, depressed-rosulate hemicryptophyte. Rootstock ca. 7-15 cm long, 1.5-3 mm dia at junction with caudex, vertical-axial; caudex ca. 0.4-3 cm long. Rosette ca. 2.5-6 cm dia. x 0.5-1 cm high, solitary or forming small branched contingent clusters of up to 3(-5); foliage tightly imbricate. Leaf ca. 1.25-3 cm when mature. Stipulesca. 0.8-1.2 mm, broadly ovate to lanceolate, membranous, margins subentire, apex terminating in a long point. Pseudopetiole 1-2.5 cm x 0.3-0.8 mm. Lamina ca. 3-12 x 4-14 mm, entire, rhomboid, depressed-rhomboid to flabellate, shortly cuneate to pseudopetiole, light cryptic brown with paler venation; margin bordered by continuous short ciliate hair, this longer and sparser at cuneate junction with pseudopetiole;

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apex obtuse to rounded-depressed-obtuse; face with with raised alveolate-reticulate venation; undersurface glabrous, more or less densely set at the base with radiating, linear, dark brown glands, these becoming sparse towards apex; apex and lamina, but not plant, at times lacking glands.

Anthesis successional. *Flowers* ca. 1 cm high × 1 cm wide, axial, solitary, forming ring around circumference of rosette. *Peduncle* ca. 1.3-1.5 cm, somewhat shorter than subtending leaves, glabrous. *Bracteoles* 1.5 mm, inserted basally, broadly oblong-triangular, subacute, membranous, with light purple, tapering longitudinal central vein, margins entire, undulate. *Calyx* ca. 3-5 mm long, glabrous; sepals, ovate to elliptical, acute, with plane basal spur, superior sepal shorter than rest; margins hyaline. *Corolla* glabrous, faces of superior and lateral petals very pale pink longitudinally, white towards lateral margins, reverse similar, darker; face of superior petals with one or few broken longitudinal thin dark violet lines, extending from base as far as apical third; lateral petals same. but with multiple lines and much heavier violet markings at base; throat of inferior petal yellow and extending forwards, where sparsely dotted with dark violet, this becoming a closely-broken dense central marking of radiating lines and dots; all petals margins unmarked and pale or white; superior petals 5-5.5 × 1.5-1.7 mm, oblong-cuneate, apex rounded; lateral petals 5.8-6.3 × 1.8-2 mm, oblong-cuneate, apex obtuse-depressed, base with solitary large tumor; inferior petal 7 × 4-5 mm, broadly obcordate, deeply rounded-emarginate, lateral margins often upcurved or somewhat conduplicate; spur 1 × 1.2 mm, short-tubular, apex rounded. *Anthers* 1.3 mm, nectar spurs not seen; connectives 0.8 mm, orange-brown. *Style* geniculate, clavate; stigma suberect-beaked, distinctly spiculate. *Style crest* apical, reflexed, flabellate, deeply trilobed, papillose. *Fruit* and *seeds* not seen.

Other data

F. & W.11543 field note: Situated on sparsely vegetated ground and shallow, rocky west exposure slopes in an isolated small, very open woodland of *Araucaria araucana*, these solitary or in groups of a few. The viola colony was dispersed, consisting of an extremely limited number of individual plants, including some in the unfenced grounds of a rural family dwelling. Accompanying ground-level vegetation included *Festuca palleescens*, *Oxalis adenophylla*, *Acaena splendens* and introduced *Rumex acetosella*.

Distribution: The two known locations of *Viola trochlearis* are situated 1.4 km apart along parallel 38°52'30"S in central Neuquén Province, Argentina. Based on this knowledge, it classifies as a very narrow local endemic.

Overall environment and habitat in the type sector: North Patagonian subandean steppe dominated by *Festuca palleescens* bunchgrass, often as a near monoculture. *Viola trochlearis* inhabits the eastern limit of *Araucaria araucana* distribution, where that tree forms small, very dispersed, open groves on flatter terrain at the foot of the the main Andean chain. Other occasional individual dwarf herbs were noted in open clearings or among the bunchgrass in the immediate sector containing *V. trochlearis*: *Acaena splendens*, *Jaborosa volckmannii*, *Oxalis adenophylla*, *Rumex acetosella* and *Taraxacum officinale*.

Phenology: Flowering late December to early February with fruiting and seed production considered likely to follow about a month after anthesis.

Etymology: The Latin *trochlearis* signifies a pulley wheel, circular and depressed in the centre, which exactly describes the rosettes of this species.

Considered conservation status: Given the minimal distance between its two known populations and their insubstantial combined total, on those factors alone *V. trochlearis* qualifies as a vulnerable rarity. To that should be added a lack of any form of national or regional protection, and the situation of the type locality in the immediate proximity of human habitations. Taken as a whole, these circumstances indicate the species would best be regarded as endangered (EN) according to IUCN (2012) criteria.



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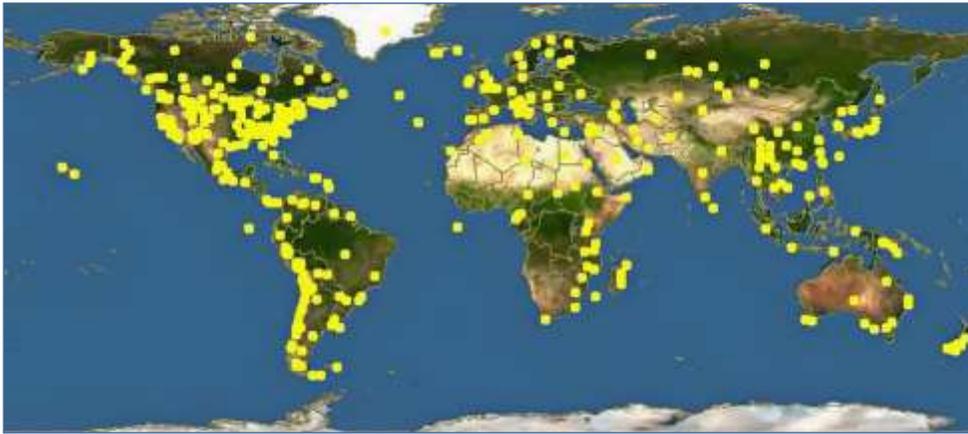


fig.25: Present total world distribution of the genus Viola.



fig.26: Full distributional range and approximate density of Viola section Andinium (the rosulate violas) in South America.

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The *Viola rugosa* Phil. ex W. Becker alliance of section *Andinium* W. Becker

Given the thirty million or so years it has had to evolve since splitting off from the rest of the world's *Viola* taxa [fig. 25], it is hardly surprising section *Andinium* has diversified into a wide and often disparate range of species, several of which are visually unlike any other. As well as that timescale, we should take into account the section's continuous geographical longitudinal span of over 5000 km, which contains its nearly 150 known species, and its flexible adaptation to continual environmental changes as well as to a notable variety of ecological niches. These latter occur from the foggy Pacific coast to the high Andean volcanoes of Ecuador, and down as far as the Patagonian steppe [fig. 26].



fig.27: F.& W.8300 *Viola fluehmannii* Phil., a 'non-rosulate rosulate' ericoid species. Volcán Llaima, Araucania Region, S Chile. (JMW. Dec.1994)

One challenge for those studying them is to try to work out their relationships and sort them either into individual species with no close living allies, such as ericoid *Viola fluehmannii* Phil. [fig. 27], rhizomatous *Viola escondidaensis* W. Becker [fig. 28], *Viola pygmaea* Poir. [fig. 29] as representing the tropical Andes, and *Viola sacculus* Skotts. [fig. 30] with its spectacular upwards facing ring of large white corollas. At some point in time the section gradually began to split up into groups specialised to take advantage of a variety of newly occurring local conditions during a geologically and climatically unstable period which has lasted to the present. The lower elevations and coast required an exclusively annual life form, and this has produced a remarkable assortment of contrasting forms and sizes. *Viola subandina* J.M. Watson [fig. 31] and its kind fill the niche presented by mid-elevations between the coast and the high Andes. These annuals include widespread and greatly variable *Viola*

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polypoda Turcz. [fig. 32] and its immediate allies from the Pacific littoral and immediately interior fog belt sector of Chile's desert north and mediterranean zone; also tiny *Viola minutiflora* Phil. [fig. 33] from cool southern beech woodlands. The many compact, tough, rosulate perennials we label as sempervivoid are ideally suited to pioneering habitats such as still active volcanoes, ash fields and the bare uppermost limits for Andean plantlife, where few other plants can exist. Some, like the common and successful *Viola cotyledon* Ging. [fig. 34] from the south, have relatively open rosettes and the ability to colonise a good number of distinct niches as elements of an open steppe community. Others possess a tightly imbricate form, sometimes columnar, and cannot tolerate more than a minimum of competition, so not infrequently may be found growing in individual or collective isolation. Examples of these are *Viola atropurpurea* Leyb. [fig. 35] and *Viola petraea* W. Becker [fig. 36].

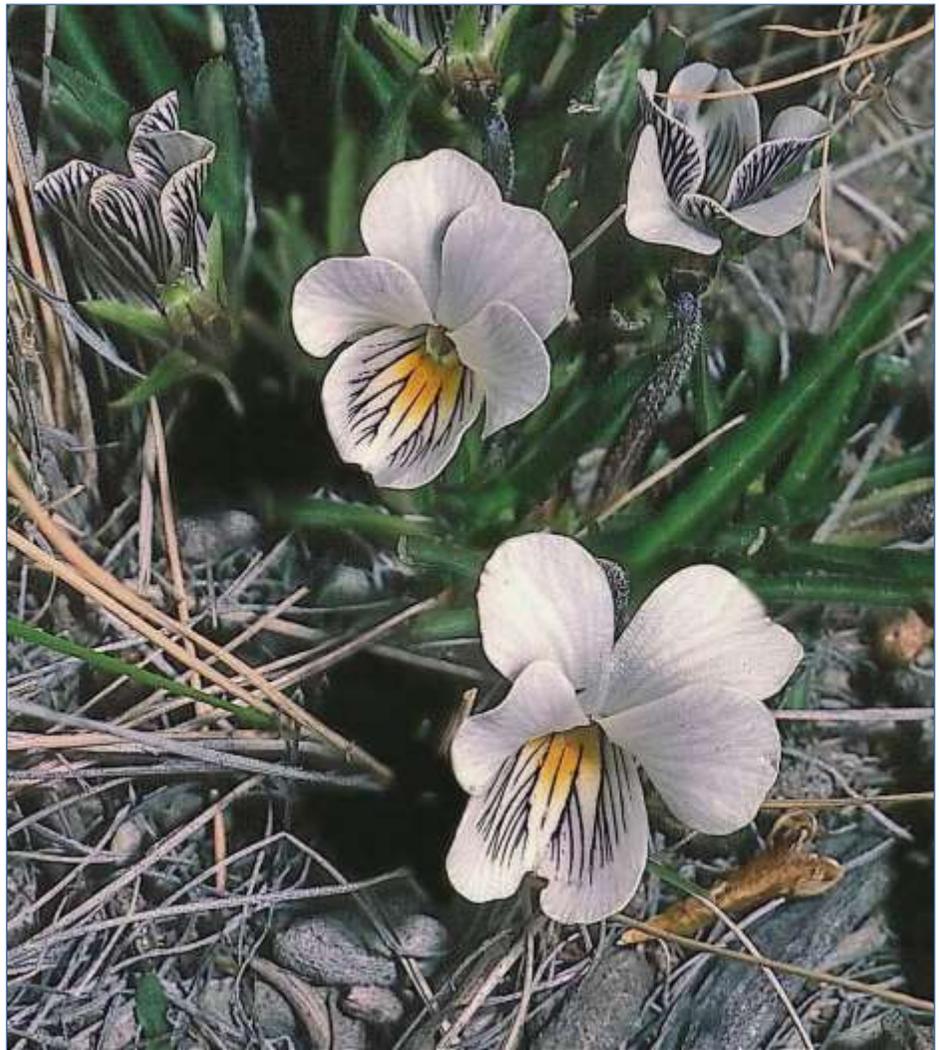


fig. 28: F.& W.10632 *Viola escondidaensis* W. Becker, a rhizomatous 'non-rosulate rosulate'. Parque Tromén, Neuquén Province, Argentina. (ARF. 24 Dec 2002)

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Right - fig.29:

Viola pygmaea Poir.
One of a small, quite unique
alliance in the tropical Andes.
Jujuy Province, NW
Argentina. (Ken Preston-
Mafham)



Below – fig. 30: F.& W.10658
Viola sacculus Skotts., a
distinctive species with no
close allies. Cerro Catedral,
Río Negro Province,
Argentina. (ARF. 30 Dec
2002)





fig. 31: F.& W.11277 *Viola subandina* J.M. Watson. A widespread annual of lower interior elevations. Mid-Aconcagua valley, Aconcagua Province, Valparaiso Region, Chile. (ARF. 22 Sep 2006)



fig.32: This is F.& W.12068 *Viola polypoda* Turcz. an annual of a yellow-flowered Pacific and lowland group. Yerbas Buenas, Atacama Region, Chile. (JMW. 12 Oct 2010)



fig.33: B.C.& W.4459 *Viola minutiflora* Phil., a southern woodland annual. Cordillera de Chillán, Bío Bío Region, south-central Chile. (JMW. Oct 1971) (B.C.&W = Beckett, Cheese & Watson collection)

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fig.34: F.& W.10613 *Viola cotyledon* Ging., sempervivoid, but with looser rosettes. Paso Pino Hachado, Araucania Region, Chile. (ARF. 20 Dec 2002)



fig.35: Sempervivoid F.& W. 12594 *Viola atropurpurea* Leyb., an unusual yellow form. Portillo Pass, Aconcagua Province, central Chile. (ARF. 1 Dec 2013)

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fig.36: F.& W.10660 *Viola petraea* W. Becker, a more depressed sempervivoid form. Cerro Catedral, Río Negro Province, S Argentina. (ARF. 30 Dec 2002)



fig.37: F.& W.10672 *Viola rosulata* Poepp. & Endl., an evolutionary intermediate. Shangri La, Cordillera de Chillán, Bío Bío Region, Chile. (ARF. 2 Jan 2003)

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All the foregoing and those closely related to them are glabrous (other than a very few of the annuals which may possess marginal hair on the lamina), have a smooth surface to the top of their leaves, and lack glands on their foliage - unlike the final large, loose, widespread agglomeration, which contains the three species described above. We refer to it provisionally as the *Viola volcanica* group after one of the very first of its species to be published. It is considered by ourselves to have evolved from the glabrous imbricate form relatively late on in the section's history, differing from that by the presence of indumentum, especially as ciliate margins to the more flexible leaves, and a network of more or less raised veins on the upper surface of the leaves. Further distinctive features found in many or most of its species are crenate rather than entire margins, and dark, short foliar glands, usually on the undersurface only, but occasionally also in the sinuses of the crenate leaf margins. One species, *Viola rosulata* Poepp. & Endl. [fig. 37], is intermediate between the glabrous kinds and those with indumentum, and so is considered to be a likely ancestor of the *V. volcanica* conglomerate. This heterogeneous group can readily be divided into recognisable subsets, usually connected both morphologically and geographically. An example is the two or three represented by *Viola montagnei* Gay [fig. 38] with its unusual, diminutive, blackish blue, white-centred corollas. A large and very diverse group with narrow, strongly crenate leaves belongs here and contains both perennials and annuals such as *Viola chamaedrys* Leyb. [fig. 39]. Another is the immediate close alliance of *V. volcanica* Gillies ex Hook. & Arn. itself [fig. 40]. Essentially, our three, *V. rugosa*, *V. rubromarginata* and *V. trochlearis* differ from these by their entire or facultative very weakly crenulate leaves as opposed to strongly crenate. In fact only two other species resemble them in that respect, *Viola decipiens* Reiche and *Viola philippii* Leyb. [fig. 41] from central Chile and Argentina. With more careful investigation it may become apparent that those two should be included in the present subset as keyed out immediately below.



fig.38: *Viola montagnei* Gay. One of the raised-vein group. Cordillera de Aconcagua, Mendoza Province, Argentina (Carlos Celedón. 19 Nov 2013)



fig.39: F.& W.12585 *Viola chamaedrys* Leyb. An annual within the raised-vein group. Paso Chacabuco, Valparaiso Region, Chile. (JMW. 8 Sep 2013)



fig.40: F.& W.10657 *Viola volcanica* Gillies ex Hook & Arn, the classic raised-vein model. Paso Cordoba, Neuquén Province, S Argentina. (ARF. 29 Dec 2002)

Key to differentiate the three species of the *Viola rugosa* alliance:

1. Rosette to 2.5 cm diameter. Mature lamina narrower than long to equally as wide. Calyx villose. Apical lobes of style crest downcurved ... *Viola rugosa*
- Rosette to 6-7 cm diameter. Mature lamina wider than long. Calyx glabrous. Apical lobes of style crest patent or upcurved ... 2.
2. Lamina with distinct red margin, apex apiculate to subapiculate. Corolla dark violet. Stigma glabrous. Style crest glabrous, apical lobes upcurved ... *Viola rubromarginata*
3. Lamina margin concolorous with interior of face, apex rounded. Corolla pink. Stigma spiculate. Style crest papillose, apical lobes patent ... *Viola trochlearis*



fig.41: F.& W.12309 *Viola philippii* Leyb. perhaps belongs in the *Viola rugosa* alliance. Lagunillas, Cordillera de Santiago, Chile. (ARF. 10 Dec 2010)

Discussion

Although none were seen on *V. rugosa*, a particular species of ant with a red head and thorax and black abdomen, probably a *Dorymyrmex* species, has been encountered on various occasions

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attending both *V. rubromarginata* and *V. trochlearis* [figs. 42, and 43, 44 respectively]. The distance between the two points of observation concerned is 200-225 km. Considerable numbers of individuals of other, smaller ant species have also been observed occasionally on *Viola dasyphylla* W. Becker and *Viola fluehmannii* [fig.27] further south in Chile and Argentina (pers. obs.). They swarmed up aggressively from below the plants when disturbed.

We presume some sort of symbiosis exists between the social insects and violas in these cases. A solitary aphid was noticed on one rosette, but did not appear to be the reason for the ants' presence. One possibility is there being some rewarding incentive for ants to carry off and bury seeds at a distance, perhaps an edible coating. Another is that they might provide protection from herbivorous arthropods. The attractant in that case could be the presence of extra-foliar nectaries or other food bodies on the foliage, perhaps secretions from the underleaf glands (Rico-Garay & Oliviera 1995). This interesting phenomenon would be worth investigating.

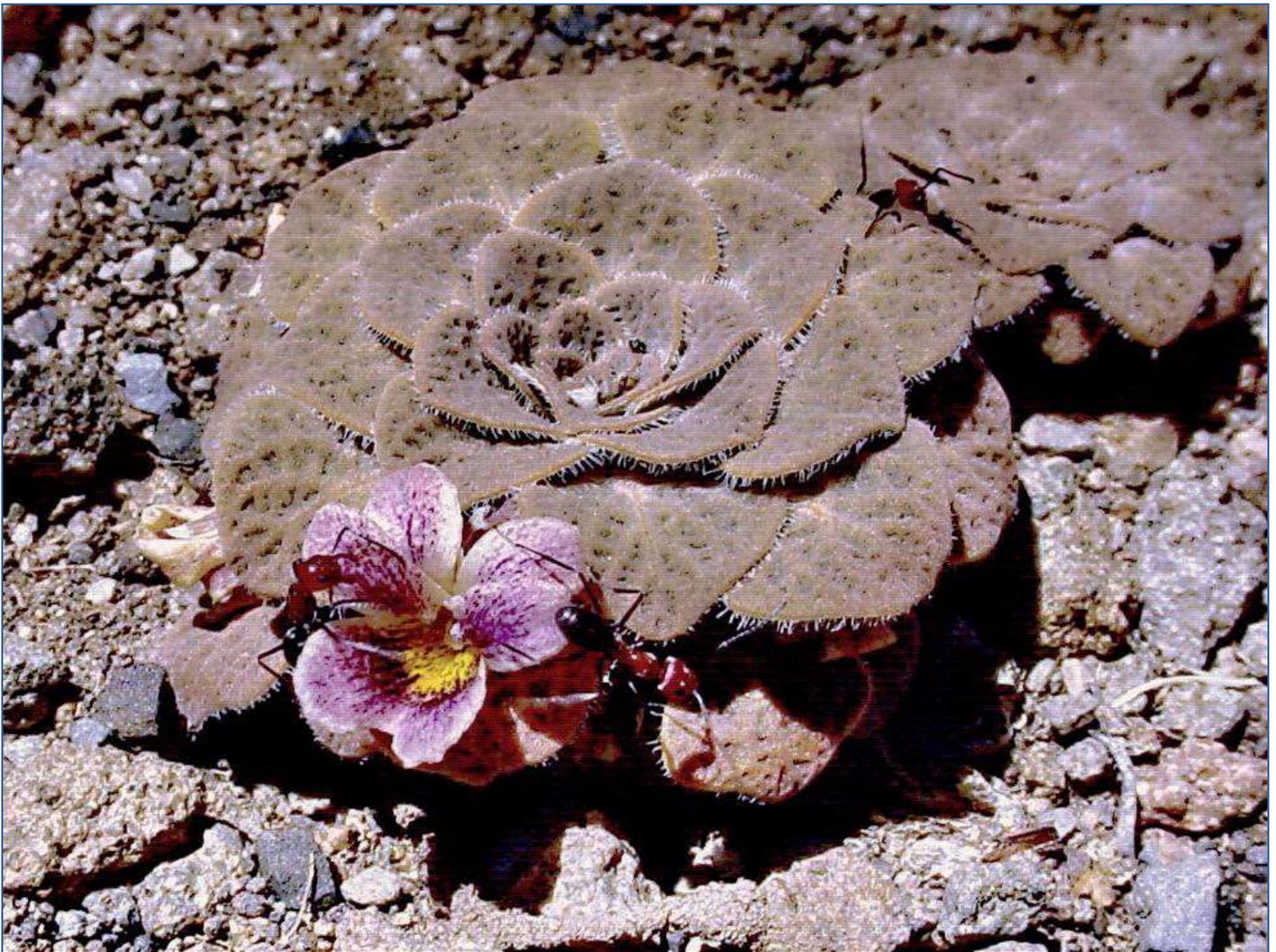


fig.42: Ants attending F.& W.11543 *Viola trochlearis* at its Primeros Pinos type site, N Argentinian Patagonia. (ARF. 22 Dec 2007).

Acknowledgements

We cannot end without expressing our unconstrained gratitude to the Alpine Garden Society for provision of generous funding towards the 2007/08 project when *Viola trochlearis* was found and collected. Our thanks are also due to the friendly family at Primeros Pinos whose information proved of such value for us, and also to our pastoral host in the mountainous region of Cerro Crestón, the site of *Viola rugosa*, who fed us a barbecued meal fit for kings.



fig.43: The same ant species 225 km to the north on F.& W.11608 *Viola rubromarginata* at the Epuaquén lakes site, N Argentinian Patagonia. (JMW. 21 Jan 2008)

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fig.44: A close up detail of an ant on that F.& W.11608 *Viola rubromarginata* plant by the Epulauquén lakes, N Argentinian Patagonia. (JMW. 21 Jan 2008)

ADDENDUM

***Viola rosulata* Poepp. & Endl, another new record for the flora of Argentina**

It has come to our notice via Margaret Young at the very time this article is about to be published that *V. rosulata* [figs. A, B] has recently been located near - but not in - the Área Natural Protegida de Copahue (Protected Natural Area of Copahue), Ñorquín Department, Neuquén Province, Patagonia [figs. C, D]. This represents a first observation of the species in Argentina. It was discovered and photographed by Estela Garrido, a professional naturalist. We are most grateful to her for permission to publish her information and photographs.

Although a reference specimen will be needed to establish *V. rosulata* formally as extant in Argentina, there is absolutely no doubt whatever it is in fact present in that country, for which reason we confidently announce the fact here.

fig.A: *Viola rosulata* near Copahue in Ñorquín Department, Neuquén Province, Argentinian Patagonia. (Estela Garrido. Dec 2016)



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fig.B: *Viola rosulata* near Copahue in Norquín Department, Neuquén Province, Argentinian Patagonia. (Estela Garrido. Dec 2016)



fig.C: The provinces of Argentina, with Neuquén depicted, also showing Copahue, where *Viola rosulata* is recorded.



Estela Garrido

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fig.D: Detail of the protected natural zone around Copahue in the Ñorquín Department of Neuquén Province, near the actual immediate area where *Viola rosulata* was found.

In addition, Estela also photographed *Viola farkasiana* (IRG, May 2018) [fig E], in the sector which represents both a new location and doubling of the north-south distribution of that species to 120 km.



fig.E: *Viola farkasiana* near Copahue in Ñorquín Department, Neuquén Province, Argentinian Patagonia. (Estela Garrido)

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---Around Europe---

INTERESTING PLANTS OF EASTERN CRETE : text VLASTIMIL BRAUN

Arum creticum

Eastern Crete is a country where I am happy to return, anytime. At the end of the year, in the winter and spring, this flourishing region is rich in flowering bulbs; in the advancing spring at higher altitudes and in April and May, flowering moves into two high mountain ranges, Dikti and Thripti. From the end of spring, the landscape is dry and deserted, but with a special local mystique that is still attractive.

People are friendly and happy to see every tourist. There are places with well-known names such as Lasithi Plain, the Cave and Village of Psychro, Cha Wild Gorge, Zakros Town and Canyon, Vai Beach or Xerokambos. There is also the southernmost city of Europe, the seaside resort of Ierapetra with nearby coastal towns, from which I visited the picturesque Myrthos.

Although there is no surface water in Eastern Crete, local residents have enough drinking water from the underground sources in the mountains, although the last few years have been almost without rain, and usually it does not rain from January to October.

At the end of September, when even casual tourists disappear, the beaches still have beautiful, golden sand. Warm water and peaceful seas invite you to swim and laze. Not surprisingly, with an excellent diet and a healthy environment and a peaceful lifestyle, the Cretans live 10 years longer than the average age in the EU.



Dikti Mountains



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The landscape of Eastern Crete



A drunken bumblebee on *Glaucium flavum*

Dikti

The massive range of the Dikti is the counterbalance of the White Mountains on an imaginary Cretan ship with a main mast in the form of the Psiloritis Mountains. If we land at the airport of the capital of Crete, Iraklion (Heraklion), it is only a short drive to the Dikti, the main mountain range of eastern Crete. The road, marked on the map as a tourist route, runs through a beautiful valley landscape with a reservoir, Cretan villages and lonely windmills.

Along the way, I have seen interesting plants such as *Campanula* aff. *pelviformis*, rich pink swords of *Gladiolus italicus* and a perennial yellow-flowered herb with silver-green leaves, ***Glaucium flavum***, with huge yellow poppy flowers with such a strong nectar that a visiting bumblebee appeared drunk.

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There are abundant Arums, such as *Dracunculus vulgaris*, which grows best in olive groves, *Convolvulus elegantissimus* and *Cyclamen creticum*. In some rubble I found an interesting 3cm scorpion, whose name I do not know. [Ed.: Scorpion is possibly *Euscorpium carpathicus candiota*.]



Dracunculus, above and *Convolvulus* aff. *elegantissimus*, below.



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Cyclamen creticum and a scorpion found on the way to Lasithi

The best starting point for the mountains is the Plain of Lasithi, where nature almost copies the virtually horizontal Omalos Plateau from the White Mountains. Lasithi is more picturesque and more spacious, with a lake in the eastern corner. Its altitude of 800m causes the snow cover to be tens of centimetres deep for weeks in winter, which is beneficial for the local plants. Lasithi is, like Omalos, divided into many plots of land worked by farmers cultivating vegetables and olives thanks to the favourable climate. Some of the cultivars are processed to make olive oil: the most delicious is, of course, virgin; I bought from a farmer who also operated a ceramic workshop and shop.

At the edges of the plain, the valleys flowing into the mountains rise and there are interesting plants, orchids, blooming ***Anemone hortensis* subsp. *heldreichii*** in the spring, and a white and pink form of *Cyclamen creticum*. Here, too, there is a beautiful clematis, ***Clematis cirrhosa***, which is spread throughout the whole of eastern Crete.



Above: The picturesque church and *Clematis cirrhosa* and left: *Anemone hortensis* subsp. *heldreichii* at Lasithi.

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A local goat with artistic tendencies (as regards pruning!) at the Psychro (Diktaean) Cave.

On the edge of the plateau above the town of Psychro, we can climb with the nimble goats to a nearby cave, which has a beautiful stalactite decoration and a very pleasant, cool climate. From the entrance to the cave, 150 metres high above the plain, we can see the entire Lasithi plain.



Lasithi Plateau from Dikti peak.



Cyclamen creticum by the Psycho Cave.

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Above: *Iris unguicularis* subsp. *cretensis* and below: *Arum idaeum*



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If we want to get out of Lasithi onto the central ridge Dikti with the 2147m peak, it is a challenge for physical fitness. At the highest peak of the mountain range, a long drive leads first to the forest level and to 1200m of pastures and gullies of dry streams. In addition, there are stony paths around which we can find beautiful plants in the spring, small *Iris unguicularis subsp. cretensis*, miniature white *Arum idaeum* and the most stunning plant is the tiny tulip, *Tulipa cretica*. Among a large number of pink shaded flowers I discovered an albino.



Tulipa cretica and *T. cretica* var. *alba*



Crocus sieberi subsp. *sieberi*

In the highest mountain ranges around 1900-2000m, the beautiful **Crocus sieberi subsp. sieberi** is crowned here in April and the breathtaking views of the surrounding area with the Lasithi Plateau open from the crest.

Descending from the highest ridge Dikti through the rocky paths back to Lasithi is extremely physically demanding for any untrained tourists.

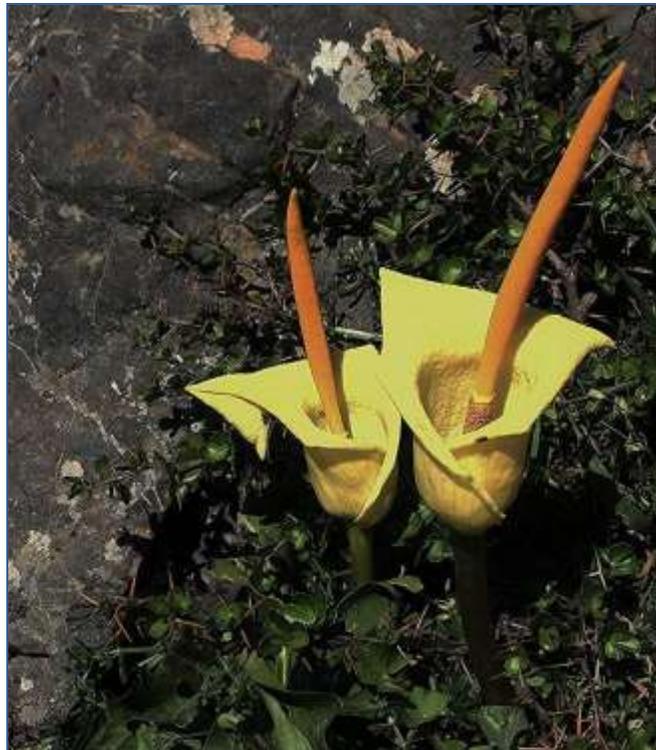
The second largest mountain range in eastern Crete is Thripti. On the way from the west we drive around one of the most imposing natural attractions and impressive streams in the limestone mountain range, the **Cha Gorge**. It is very narrow and steep and with a length of 1.8km has 24 waterfalls. It can only be traversed using ropes at a suitable time. There is an interesting flora and fauna here, for example birds, the lammergeier, *Gypaetus barbatus* and *Pyrrhocorax pyrrhocorax*, the red-billed chough. Besides transmitters, the peaks of the

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mountains also host many interesting plants. In the spring, Thriпти is full of beautiful sulphur-yellow *Arum creticum*, the small tulips, *T. saxatilis* and *T. cretica* and the local endemic, the small creeping bellflower, *Campanula hierapetrae*.



Cha Gorge



Arum creticum, the most impressive plant at Thriпти.

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Campanula hierapetrae with detail of flower.



Ranunculus cupreus - photo by Š.Haškovcová.

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Butterfly: *Zerynthia cerisy* subsp. *cretica*

The eastern coast of Crete is full of natural beauty. In Zakros Gorge, which is straight out of the American West, I have seen, in addition to interesting plants in the spring, a local natural jewel, the 'Cretan Festoon' *Zerynthia cerisy* subsp. *cretica*. It is related to one of the rarest butterflies in the Czech Republic.

Eastern Crete and its mountains are a desert in the hot months, but in spring many plants are in bloom, ranging from *Ranunculus asiaticus* to *Anemone coronaria* and *A. hortensis*. After the arrival of the fall in temperature in October and November, comes the first rain that awakens the autumn saffron, the ever-open *Crocus tournefortii*, the white *C. boryii* with the bark beetle orange blush, *Narcissus serotinus* and *Sternbergia*. In the middle of November I found in the olive trees above the Canyon of Zakros an *Anemone coronaria* with a fairly rich blue-violet blossom.



Ranunculus asiaticus, *Anemone coronaria* and *A. hortensis* - photo by C. Haškovec.

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Crocus tournefortii



Crocus boryii



Left: *Sternbergia aff. sicula*

From the east coast of Crete, I headed south and south of Thripti to the southernmost city of Europe, Ierapetra, which is the centre of vegetable growing. The gleaming reflection from hundreds of foil greenhouses create the impression that the landscape is a water surface when viewed from the height of the mountains. Thanks to this entrepreneurial activity, Crete has become a major vegetable producer for the EU.

I left the South Coast and set off on a mountain road to Dikti, south of the mountain range. Its monumental slope hosts beautiful plants, including the dominant ***Astragalus creticus***, below, and below left: ***Ebenus cretica*** from the rocks of southern Thripti.

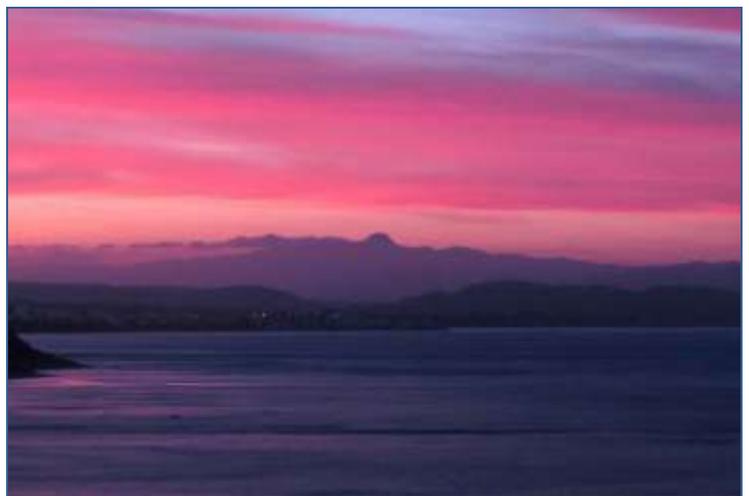


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Southern slope of Afendis Dikti and *Astragalus cretica*.

Downhill through the tarmac paths we passed across the Dikti foothills through mythical places, and the former hippie center, Mátala; through the picturesque town of the southern coast of Agia Galini with a very rapid sunset, almost as if the Greek god Helios rode with his horses straight into the sea.



Sunset over the sea at Mátala and the sunset over the Dikti Mountains photographed from Agia Galina.

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We are already in the central part of Crete. North of Agia Galini lies Mt. Khedros, where exploration of the peak to the top has revealed many interesting plants such as *Arum creticum*, *Cyclamen creticum*, ***Trifolium uniflorum***, *Tulipa hageri* or the higher form of ***Daphne sericea***, which at an altitude of about 1000m was still in bloom at the end April. There are magnificent views of the two highest mountain groups of Crete, Psiloritis with Mt. Ida and the mighty wall of Levka Ori opening from the massif.

To end we return to the north coast of the island to the picturesque Chanie, whose evening attractions and ancient centre with the gardens of excellent restaurants attracts crowds of tourists or to the airport of Crete's capital, Heraklion. V. B. with Z.Z.



Above: *Trifolium uniflorum* and below: *Daphne sericea* from Mt. Khedros.



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