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As many around the world celebrate a holiday period, the IRG Team wishes all its readers kind greetings of the season and good hopes for health and happiness in the coming year. Of course, we wish the same for your plants! After one hundred and forty years, a species of Oxalis, long thought lost, has been rediscovered, in part thanks to the IRG. Julian Shaw of the Royal Horticultural Society writes about the rediscovery of *Oxalis brevis*.

Staying in South America, we learn of a lovely new Euphrasia species in Chile, from David Santos, John Watson and Ana Rosa Flores. The Eyebrights are generally rather overlooked, which is sometimes the case for these charming flowers, which can be tricky to grow in cultivation. This extremely rare species is most unlikely ever to come into cultivation, but it is wonderful to learn about it, nonetheless.

Fresh from a fact-checking trip to Kos, Jānis Rukšāns describes a new species, *Crocus samarasii* and two more new Crocus (Iridaceae) species from Turkey and Chios. These are *Crocus erolii* from Turkey, named for Prof. Osman Erol, of Istanbul University and *Crocus homeri* from Chios. *Crocus samarasii* is named for Theodoros Samaras, who discovered this novelty.

The last article is a book review by J. Ian Young of an excellent publication, “A Field Guide to the Plants of Armenia” by Tamar Galstyan from Filbert Press.

Iris aphylla – one of the superb illustrations in Tamar Galstyan’s new book.

IRG 144 Cover image: *Euphrasia achibuenoensis* - photo by David Santos.

--- A Happy Discovery ---

An *Oxalis* lost and found after 140 years: Julian M H Shaw

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The mystery *Oxalis* - 16 Mar 2010. (John M. Watson)

A mystery *Oxalis* has been playing hide and seek in this delightful online journal for a while now. Have you spotted it?

As far as I know (and that is not very far) it first appeared in one of John and Anita Watson's articles as a possible new species along with a view of part of a colony of scattered plants in flower (Watson & Watson, 2019: 41). Then, it popped up again pretending to be *O. bulbocastanum* (Watson & Watson, 2021: 36). John Watson had photographed it during a week in the second half of March 2010, which in Chile is autumn, from a site along the coast near Huasco. There they found several colonies.

A striking feature of this *Oxalis*, as noted by John, was the long, narrow sepals. Sepals are a key character for identification in *Oxalis,* and especially in section *Carnosae*. In this section the five sepals are in two different shapes, two large broader outer ones, and two smaller narrower inner ones, with the mid-sepal often exactly half-and-half as if a large sepal and a small one had been cut in half lengthwise and glued together. This unusual sepal arrangement is typical for the section and often quite distinctive between species. So when I saw the sepals in the photograph I knew immediately it was something in section *Carnosae*, and something I had never encountered before.

By this point, I had seen specimens or images of most species of section *Carnosae*. The section extends from around Valparaíso in Chile northwards into Peru, with outlying populations in Ecuador (high up on Cotopaxi) and a few of the Galapagos Islands. There are also poorly understood relatives in the high Andes of Peru, Bolivia and northern Argentina that use names such as *Oxalis pachyrhiza*; but I suspect this could be a pseudonym for some. Why the interest in section *Carnosae*? I had been asked to identify some *Oxalis* from the lomas of Ica province in Peru and coincidentally at the same time to contribute an account of *Oxalis* for the next edition of the Illustrated Handbook of Succulent plants.

A colony of the leafless and late flowering *Oxalis* sp. at Huasco, then unidentified. (22 Mar 2010. John M. Watson)

As you may be well aware, Floras of Peru and books on *Oxalis* are both in short supply. A French botanist, Alicia Lourteig (1913 - 2003), based at the Paris Natural History Museum herbarium, had made it part of her life's work to produce a taxonomic revision of *Oxalis* outside of Southern Africa. (The South African *Oxalis* were studied and written up by Terence M. Salter (1883-1969) in 1944). She commenced work on it in earnest in 1950, and shortly before she died, managed to publish her almost complete work in a rather obscure Brazilian journal (Lourteig 1994, 2000). Thanks to the extraordinary kindness of a former postgraduate researcher from Brazil, whom I had helped many years ago, I obtained a copy. How exciting it was to consult an almost global monograph of such a fascinating, but difficult genus. However, it was not long before excitement turned to disappointment, as I realised that due to her advanced age, Lourteig had made many errors and large parts of her taxonomic treatment were unusable. Since then, other *Oxalis* workers have experienced similar difficulties with her monograph. Fortunately, someone came to the rescue. German botanist Christoph Heibl produced a very helpful well-illustrated treatment of the Chilean species of section *Carnosae*, based on his own fieldwork in Chile (Heibl 2005). He had the advantage of dealing with live plants, which not only look much better than dead squashed ones (otherwise known as herbarium specimens) but also are much easier to study, especially is this so with succulent plants. The downside was that, unsuspectingly, he adopted Lourteig's names and synonymy, as we all did to start with. Nevertheless, his work is excellent, and I owe him a large debt of gratitude for teaching me so much about *Oxalis* section *Carnosae*.

Oxalis brevis. Sarco. (Claire De Schrevel)

Oxalis brevis. Sarco. (Philippe Dandois)

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Eventually, a botanist is expected to stop reading books and getting excited over specimens and images, and when no one is looking doing little dances of delight around one's office, and instead, come up with actual valid names and stick them on the right plants. That is the scarier bit about being a botanist – what if I get this totally wrong? I lie awake at night whenever I work on a difficult group of plants, the names and images going round and round. What a nightmare if everyone copies my mistakes, because they take one look at a pile of *Oxalis* specimens and suddenly feel the need for a few beers or something stronger, or at that moment realise they forgot their favourite hand lens which conveniently they left in a herbarium in another country…

Oxalis brevis at Huasco, with Anita and John Watson. (Emma Elguita)

Of course, one way to avoid these disaster scenarios might be to cover the *Oxalis* up with a big showy *Rhododendron* or *Meconopsis* specimen, before asking someone to determine the pile. No seriously, the only way to be certain is to compare the unknown plant with the type specimen of the species one suspects it to be. (The type specimen is a specimen to which a name is permanently attached. If sufficiently complete, the type specimen defines the name). Fortunately, thousands of type specimens are available online as high-resolution digital scans. This includes many *Oxalis* types from Chile that reside in the Santiago Museum of Natural History. It was at this point that I began to remember those extraordinary sepals and had a search for them amongst some Chilean type specimens.

Sure enough, they turned up or at least a single flower turned up on a type specimen. Badly shrivelled and amongst a half teaspoonful of broken plant fragments in an envelope, but unmistakable with those sepals. If you have small children and a bagless vacuum cleaner, then you will know about those little assorted bits of everything in the bottom of the dust container that you find when you empty the vacuum cleaner. I'm afraid some type specimens come into this category. A sort of self-assembly specimen without instructions – what if there are bits missing. Back to the nightmares …

The specimen was fragmentary and had been examined by others who dismissed the pile of fragments as *Oxalis megalorrhiza*. Until recently, this name was the label used for anything in section *Carnosae* that could not readily be identified, which is about half the species in section *Carnosae*. However, the accompanying label bore the name *Oxalis brevis* Philippi, published in 1893, with a date of collection, January 1883. That is about 140 years since it was last seen.

However, there were no leaves, only flowers and broken underground stems. By coincidence, a short while later, I received a picture taken by Claire De Schrevel of a few *Oxalis* leaves lying flat of the gravel of the Atacama in Chile. Could I name it please? It turned out that these were the leaves that belong to the same *Oxalis brevis*, but unusually this *Oxalis* bore leaves in spring and flowers in autumn, never together.

Oxalis brevis. Huasco. (Emma Elguita)

Oxalis brevis. Huasco. (John M. Watson)

Oxalis brevis. Huasco. (Emma Elguita)

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Once news circulated and field workers searched through their files of images, several other pictures emerged. You can find some of them on the website for Endemic Chilean Plants run by the Royal Botanic Gardens, Edinburgh. (https://chileanendemics.rbge.org.uk/ https://chileanendemics.rbge.org.uk/taxa/oxalis-brevis-phil)

Well, even if you don't like *Oxalis*, now you know a bit about what can happen to a botanist. For some, it's being a kind of professional weed detective.

Acknowledgements.

There are so many wonderful people working on the Chilean Flora and finding a multitude of new and little known plants: Sergio Ibáñez Browne, Philipe Dandois, Emma Elguita, Martin Gardener, Christoph Heibl, Nicholas Lavandero, Raquel Pinto, Claire De Schrevel, John and Anita Watson. These are just the ones who have helped me with Chilean *Oxalis*. I cannot adequately express my admiration and gratitude for their work and generous help, without which none of this would have happened.

Oxalis brevis. Huasco. (John M. Watson)

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A new species of *Euphrasia* L. (Orobanchaceae) endemic to Maule Region in central-southern Chile

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Abstract

The new taxon is distinguished from all others in the genus *Euphrasia* by the very distinctive aggregation of a set of conspicuous characters, in particular its unique flower colour. We provide a diagnosis and description as well as background details of its genus. Discovery of the novelty, its precarious numerical and environmental situation, observed interspecific hybridization in the vicinity of the type locality, and other allied aspects are also discussed.

Key words: bipolar distribution, corolla colour, natural hybrids, pollination, rarity, site conservation, Scrophulariaceae, South America.

1) Southern South America, showing regions of Chile and Maule where *Euphrasia achibuenonensis* is located outlined in red.

Resumen

Se distingue el nuevo taxon de todas las demás del género *Euphrasia* por su muy distintiva agregación de un conjunto de caracteres llamativos, en particular el color único de la flor. Proporcionamos un diagnóstico y una descripción, así como detalles de los antecedentes de su género. Se discute también el descubrimiento de la novedad, su precaria situación numérica y ambiental, la hibridación interespecífica come fue observada en la vicinidad de la localidad tipica y otros aspectos relacionados.

Palabras claves: America del Sur, color de corola, distribución bipolar, híbridos naturales, polinización, rareza, conservación del sitio, Scrophulariaceae.

Introduction

The species described here was discovered in the southernmost province, Linares, of Maule Region in the near-south of Chile [figs.18, 19] by the first author of this account, David Santos [figs.2, 56]. It inhabits upper foothills of the local Andean chain dominated by the Longaví volcano [fig.3].

2) David Santos by the Andean lake where he discovered *Euphrasia achibuenoensis.* (Photo Anon.)

Carl Linnaeus (1753) defined *Euphrasia* for botanical science. Historically, and until recently, this genus of hemiparasitical herbs has been treated as belonging in the Scrophulariaceae (e.g. Bentham 1846, Wettstein 1891), but the traditional concept of that family has been rejected due to recent molecular studies revealing it as polyphyletic (Olmstead & Reeves 1995, Olmstead 2001). As a consequence, most genera previously lumped together under the Scrophulariaceae were found not to be interrelated at that level, but to belong in various sister families; e.g. *Calceolaria* and *Jovellana* in Calceolariaceae; *Antirrhinum*, *Digitalis* and *Ourisia* in Plantaginaceae (Olmstead 2001, Oxelman 2005); with *Erythranthe* and *Mimulus* in Phrymaceae (Barker et al. 2012). Young (1999) found that hemiparasitic genera also previously considered as belonging in Scrophulariaceae, including *Euphrasia*, were in fact

directly related to the holoparasites of the Orobanchaceae and indivisible from them. Those genera have accordingly been transferred to the latter family.

3) Volcán Longaví. (JMW)

Fourteen sections of *Euphrasia* were recognized by Barker (1982), with one further added and accepted subsequently (Gussarova 2005). The majority of taxa in South America pertain to the subshrubby-looking but herbaceous sect. *Trifidae* Benth., the group in which the present novelty belongs.

At present the hemispheric origin of the genus has not been fully ascertained (Gussarova et al. 2008, Wu et al. 2009), although evidence is beginning to point to the main Northern Hemisphere section as ancestral (Gussarova et al. 2008). In that case sect. *Trifidae* and others in the same region would presumably have evolved and diversified more recently.

Even those who study *Euphrasia* in depth admit that taxonomists find separating it out at species level and below notoriously difficult (Yeo 1978, Gussarova et al. 2008). This is due to the close similarity between many, these often growing in proximity as well as possessing a strong propensity to hybridize, a situation almost exclusive to the Northern Hemisphere annuals. Reference sources hazarding a total for the genus have differed remarkably among

themselves: e.g. Reiche (1911), more than 80; Mark & Adams (1973), about 100; Beckett (1993), roughly 450; Mabberley (1997) and Wu et al. (2009), 170; Correa (1999), some 200; The Plant List (2013), 602 described, 241 accepted. However, the most reliable estimated current figure appears to be approximately 350 (Fisher 2004) as supported by Gussarova et al. (2008).

Thanks to the recent monograph by Ortiz et al. (2021) and a global distribution map of *Euphrasia* in Gussarova et al. (2008) the situation is clearer in the Southern Hemisphere, including South America. It is limited in the latter subcontinent to Argentina, Bolivia, Chile and the Falkland Islands (known regionally in Spanish as Islas Malvinas). With the exception of the novelty described herein, eight species are accepted for those four countries, with a further three as doubtful (Moore 1968, Marticorena 2019, Ortiz et al. 2021). All eight are present in Chile, two being endemic there, as also would be one of the doubtful taxa. Argentina hosts six as natives, Bolivia and the Falklands one apiece. *E. cockayniana* Petrie a species described from New Zealand, is considered by Ortiz et al. (2021) to be adventive in South America. It was first cited as native from both Argentina and Chile (Correa 1999), then from Chile only outside of NZ (Xifreda 1999, Zuloaga et al. 2019).

Biogeographically, *Euphrasia* is cosmopolitan, but except for the presence of taxa across a chain of mountainous islands in Oceania linking the two (Wu et al. 2009) and one in Peru (Ortiz at al. 2021), it only inhabits the relatively higher latitudes in the temperate zones of both hemispheres (Gussarova et al. 2008). That is to say: it has a weakly interconnected but otherwise discrete bipolar distribution. In South America the genus reaches its northernmost limit in Peru and southernmost in Tierra del Fuego. The species which is recorded from the tropical high Andes, *E. adenota* I. M. Johnst., is annual, one of three such of the eight there.

The novelty described here will raise the number of species of *Euphrasia* recognised for South America to nine, all of them present in Chile. It will also increase the overall endemics of that country's national flora, those of its Maule Region and perennial taxa in general by one unit, thereby raising endemism of the genus in Chile to three.

Hybrids, with the new species as one parent, were also recorded as a mixed swarm [figs.42-47], and it is proposed to publish this as a nothospecies once at least one specimen has been secured. It is apparently the first natural cross known in South America, although these are common between Northern Hemisphere taxa.

4) *Euphrasia achibuenoensis.* (David Santos)

Taxonomic Results

Euphrasia achibuenoensis J.M. Watson, D. Santos & A.R. Flores *sp. nov*. [figs.4-10]

Type: CHILE. Región de Maule, Prov. Linares, valle superior del Río Achibueno, Sanctuario de la Naturaleza, Cajón del Achibueno, cerca las Lagunas Cuellar, 36º 02' 09.56"S 71º 06' 09.32"W, 2280-2285 m, 18.01.2018, leg. D. Santos, F & W 13100 (holotype: CONC!, isotype: Herb. Watson & Flores!).

Diagnosis: The new species belongs in section *Trifidae* Benth., where most closely related to *Euphrasia andicola* Bentham (1864: 554) [figs.11-13] and *Euphrasia subexserta* Benth. [figs.14-17] by some combination of its evident perennial life form, glabrous habit, divided laminas, long, scarcely expanded corolla tube with upper lobes notably larger than lower, and strongly exserted style. *E. andicola* possesses a facultative glabrous or pubescent habit and notably short and subequal, not prominent and unequal, corolla lobes: its corolla tube is usually longer [(2-)2.5-3.7 cm] than that of *E. achibuenoensis* [ca. 2 cm]. The style of *E.*

flavicans is included, not exserted, and its tube is short and apically wider. *E. achibuenoensis* also differs from both of these species by its unique red or orange corolla pigmentation.

5) *Euphrasia achibuenoensis* growing in a rock crevice. (David Santos)

Description: Glabrous, erect, perennial hemiparasitic herb to ca. 12 cm high, with stems branched at or near base only. Roots short, fine, dense, woody. Base of stems ligneous, with dense foliage and close-set nodes. Middle and upper nodes remote, up to ca. 9 per stem with internodes of 12-18 mm, clearly longer than leaves. Leaves paired at nodes, blade 8-10 x 5-6 mm, deeply trifid almost to base, lobes entire, narrowly linear-lanceolate, at times upcurved, margins strongly revolute, apex acute, central lobe straight 6-8 mm long, somewhat broader and longer than lateral lobes, these often incurving at maturity. Inflorescence, racemose, dense, 3-4.5 cm high, comprising up to 18 flowers as seen. Bracts similar to leaves. Pedicels ca. 1.5 mm. Calyx 8-10 mm long, 4-fid, teeth 3 mm long, narrowly triangular, acute, ribbed dorsally, ribs extending back to base of calyx. Corolla ca. 2 cm long x 1 cm wide, bilabiate, upper lip bilobed, lower trilobed, blood-red, scarlet or light tangerine-orange, lobes veined darker, tube increasingly paler towards base. Tube 15-18 x 4-5 mm, not expanding greatly from base to throat, with slightly raised lateral and dorsal longitudinal tumescences from midway upwards, contracting somewhat at throat.

Upper lobes broadly obovate, longer and ca. 2-3 times larger than lower lobes, claw 2.5-3 mm, expanded limb 5-6 mm long and wide, apex margin variable, subretuse, retuse, to erose-retuse. Lower lobes 4.5-5.5 mm x 2-2.5 mm, broadly linear to suboval, apex rounded-notched to rounded-emarginate or truncate-emarginate. Stamens 4, proximate, adjacent to upper corolla lobes, didynamous, Filaments curved, inserted into dorsal throat of corolla. Style prominently exserted, strongly downcurved, white. Stigma capitate. Capsule and seeds unknown.

NOTE: The low dorsal swelling on the corolla tube lends it a slightly downcurved appearance.

6) *Euphrasia achibuenoensis* showing prolonged corolla tube. (David Santos)

Phenology: *Euphrasia achibuenoensis* has been seen at peak anthesis from early December to mid-January. Nothing further is known about its annual cycle.

Distribution: As encountered, the new taxon is an extremely rare Chilean local endemic with just three adjacent but separate and numerically unequal colonies in a remote mountainous sector of southern Maule Region about 30 km from the border with Bío Bío Region [figs,1, 18-20].

7) *Euphrasia achibuenoensis,* unusual orange form. (David Santos)

Habitat: A planned exploration programme of a botanically little-known sector led to discovery of the new species. Ecological details noted included the nature of its habitat, and identification of accompanying vegetation.

8) *Euphrasia achibuenuensis,* inflorescence. (David Santos)

Euphrasia achibuenoensis was discovered by following the course of the Río Achibueno to its upper reaches, where small lakes are situated. The early stages pass through open woodland [fig.21]. This culminates in predominant stunted Andean woodland (*achaparrado*), known alternatively by its alternative definition of upper Andean copse (*mattoral*), consisting of dense, low *Nothofagus antarcticus* (G. Forst) Oerst. **Nothofagaceae**: Oerst. (*ñirre*, Antarctic southern beech) [fig.22]. It was here, during the extensive exploration of the sector that an apparently undescribed small rosulate viola was encountered. On investigation. however, it transpired to be no more than a valuable new locality for rare *V. minutiflora* Phil. [figs.23, 24] a first record for Maule Region.

The general location in the upper Achibueno river valley is open, mainly almost continuously rock-surfaced slopes and pavement with an overall shallow south exposure. Its very richly biodiverse dwarf to low Andean community there, of which the new species is an element, consists of the following taxa as observed: **Apiaceae**: *Laretia acaulis* (Cav.) Gillies & Hook.

[fig.25]; **Asteraceae**: *Belloa nivea* (Phil.) M.O. Dillon, *Nassauvia digitata* Wedd. [fig.26]; *Perezia nutans* Less.; **Berberidaceae**: *Berberis empetrifolia* Lam. [figs.27, 28]; **Bromeliaceae**: *Fascicularia bicolor* (Ruiz & Pav.) Mez subsp. *canaliculata* E.C. Nelson & Zizka; **Empetraceae**: *Empetrum rubrum* Vahl ex Willd.; **Escalloniaceae**: *Escallonia rubra* (Ruiz & Pav.) Pers.; **Euphorbiaceae**: *Euphorbia collina* Phil. [fig.29]; **Iridaceae**: *Solenomelus segethi* (Phil.) Kuntze [fig.30]; **Montiaceae**: *Montiopsis tricolor* (Phil.) J.M. Watson & A.R. Flores [fig.31]; **Myrtaceae**; *Myrteola nummularia* (Lam.) O. Berg; **Orchidaceae**: *Chloraea alpina* Poepp. [fig.32]; *C. magellanica* Hook. f. [fig.33]; *C. viridiflora* Poepp. [fig.34]; **Orobanchaceae**: *Euphrasia andicola* Benth., *E. flavicans* Phil.: **Plumbaginaceae**: *Armeria maritima* (Mill.) Willd. [fig.35]; **Protaceae**: *Orites myrtoideus* (Poepp. & Endl.) Engl.; **Solanaceae**: *Schizanthus hookeri* Gillies ex Graham [fig.36]; **Thymelaceae**: *Ovidia andina* (Poepp. & Endl.) C.F.W. Meissn.; **Tropaeolaceae**: *Tropaeolum incisum* (Speg.) Sparre [fig.37]; **Valerianaceae**: *Valeriana macrorhiza* DC. [fig.38], *V. philippiana* Briq. [fig.39]; **Violaceae**: *Viola fluehmannii* Phil. [figs.40, 41]; Unidentified *Calceolaria* (**Calceolariaceae**) and *Zephyranthes* (**Amaryllidaceae**) species were also observed.

A comprehensive illustrated field guide to this Achibueno flora will be available shortly (Santos & Santos, in prens.).

9) *Euphrasia achibuenoensis* with exserted style and stigma evident. (David Santos)

10) *Euphrasia achibuenoensis*, the type specimen. (David Santos)

Population data: *Euphrasia achibuenoensis* inhabits an upper elevation just above the southern beech thickets on the surrounds of a small lake immediately ringed by dwarf, woody vegetation [figs,42-45], where it is found both in shady and fully exposed situations, mainly in stony soil, but also in rock crevices [fig.5].

Three separate visits have been made to the locality when the species was seen in flower. During the first exploration, on 4 December 2016, a population consisting of about 30 plants was observed and photographed. All plants were uniformly red-flowered. The second visit took place on 18 January 2018. On that occasion, in addition to the original colony being reviewed, a second, larger population of over 100 plants was discovered, which contained a wider range of colour between the original blood red at one extreme and orange at the other. This was chosen as the type site, and herbarium material was collected from nowhere else. Two specimens were taken, both of the predominant blood-red. On the third visit, 6 January 2019, a further population was discovered approximately equidistant from the first two. It is estimated to be comprised of some 50 to 70 individuals. The distances between the three populations amount approximately to a minimum of 1.25 km and maximum of 1.5 km.

Other populations observed: Due to its vulnerable rarity, no herbarium specimens other than the type were gathered. The following location data records and in situ photographs represent these: CHILE: Región de Maule, Prov. Linares, valle superior del Río Achibueno, Sanctuario de la Naturaleza, Cajón del Achibueno, cerca las Lagunas Cuellar, 36º 01'18.92"S 71º 05' 09.25.69"W, 1890 m, 04.12.2016. Ibid. 36º02'02.22S 71º05'01.26"W to 36º02'12.11"S 71º05'10.63"W, 1660-1750 m, 06.01.2019.

Etymology: The epithet of the species has been chosen to draw attention to its vulnerable location, the upper Achibueno river sector, a zone of extreme natural importance for its rich biodiversity and rare taxa, including further species to be described.

Provisional conservation status: The need for immediate official protective measures for *E. achibuenoensis* and the wider environment it inhabits is a matter of vital concern. Its known global count amounts to roughly 200 individuals. Although the site appears to be relatively inaccessible, it has in fact been under imminent threat from a proposed hydroelectric scheme at two points. This is now suspended, at least for the time being (Cooperative.cl 2018). Furthermore, a persistently permanent hazard is still faced by the flora: regular grazing in the sector by cattle and goats. With IUCN (2012) gross population size, numbers and distribution criteria additionally taken into account, the new species undoubtedly qualifies as

critically endangered (CR), above all should any future resumption of the large-scale water containment project occur.

Associated species and natural hybrids: During the second visit another discrete *Euphrasia* population was encountered, situated between the *E. achibuenoensis* groups. It is separated from the type site by some 1 km, and from the other two colonies by 500 m or less. This positionally intermediate set, dispersed among scattered dwarf scrub vegetation around the perimeter of the small mountain lake located at 36º01'.47"S 71º.05'.19"W [fig.20], contains a highly polymorphic and quite remarkable range of variation. Of particular note are significant differences in both the shape and colour of corollas. These latter include all-yellow, identified as *E*. *andicola* [figs.11-13]. The others undoubtedly represented a hybrid swarm: a white with red petal lines [fig.46, 47]; white and yellow unlined bicolors [fig.48]; white, pink, and yellow with red lines [fig.49]; and pink, red and yellow [figs.50. 51]. No all-red or all-orange individuals were seen to be present. Most have more or less extended, narrow corolla tubes, but a few scarcely exceed the calyx. As seen, styles were strongly exserted to scarcely if at all. Unfortunately, it was not possible to make herbarium specimen gatherings at that point, but a range of photographs taken appear to indicate clearly the presence or genetic influence of a species other than *E*. *archibuenoensis* and *E*. *andicola*.

11) *Euphrasia andicola* flowers. (Courtesy of Jardin Alpin du Lauteret and the Internet)

12) *Euphrasia andicola*. (David Santos)

13) *Euphrasia andicola.* (David Santos)

As an intriguing, related enigma, in Hoffmann et al. (1998), together with *E. andicola*, *E. subexserta* is described and illustrated under its synonym of *E. flavicans*. Alongside the illustration of a typical, white-flowered plant as fig.1 on page 165, is a solitary inflorescence numbered fig.1a with pale pink upper petals and the three lower ones darker pink and lined black [fig.52, 53]. This is nearest to the individual in figs. 43 and 44 here, but by no means identical. We have no idea as to the exact location where this specimen might have been collected, but the range given for the species in the description on page 164 is Valdivia and Osorno, over 400 km south of the Linares sector.

Based on corolla length, upper lobe morphology and style length relative to corolla tube as is possible to observe in the photographic images, an additional parental taxon is presumed to be *E. subexserta* [fig.14, 15, 17], which was not in fact encountered during the visits. But the vast majority of plants present clearly formed a coherent and complex hybrid swarm almost certainly involving any species which are, or have been, within pollinating range of one another, including *E. achibuenoensis*.

The following critical morphological characters of *E. achibuenoensis* are present collectively in *E. andicola* and *E. subexserta*: its long corolla tube, prominent upper corolla lobes and strongly exserted, curved style. But neither of those two species possesses them all. Also, the corolla tube of the new species is longer than any other in South America. If both *E. andicola* and *E. subexserta* are indeed present in the general locality, or have been in the past, this might suggest that they could be the progenitors of *E. achibuenoensis* as well, thus including it in the overall hybrid swarm. However, various factors contest that possibility. The first is the stable homogeneity and significant spatial separation of the two colonies of the new species from one another and the swarm. Secondly, despite the swarm being situated between the two, minimal red or orange pigmentation occurs in the hybrids. Finally, the strong reds and oranges of *E. achibuenoensis* differ greatly from the corolla colours of both *E. andicola* and *E. subexserta*, and in fact from every other known species of *Euphrasia*.

Even if the new species is of fairly recent hybrid origin, it has now undoubtedly stabilized, and would therefore warrant no alternative status other than that of nothospecies. Whatever the actual situation in this respect, available evidence indicates that stable and little variable *E. achibuenoensis* is more likely to be contributing genetically to the hybrid swarm rather than being an integral element of it.

14) *Euphrasia flavicans* (Michail Belov)

15) *Euphrasia flavicans.* (Agustin Amenabar, courtesy of Project Noah and the Internet.)

16) *Euphrasia subexserta,* typical moist habitat. (JMW)

17) *Euphrasia subexserta.* (JMW)

Key to distinguish *Euphrasia achibuenoensis* from its closest cognate species

1. Style not exserted beyond stamens …… *E. subexserta*

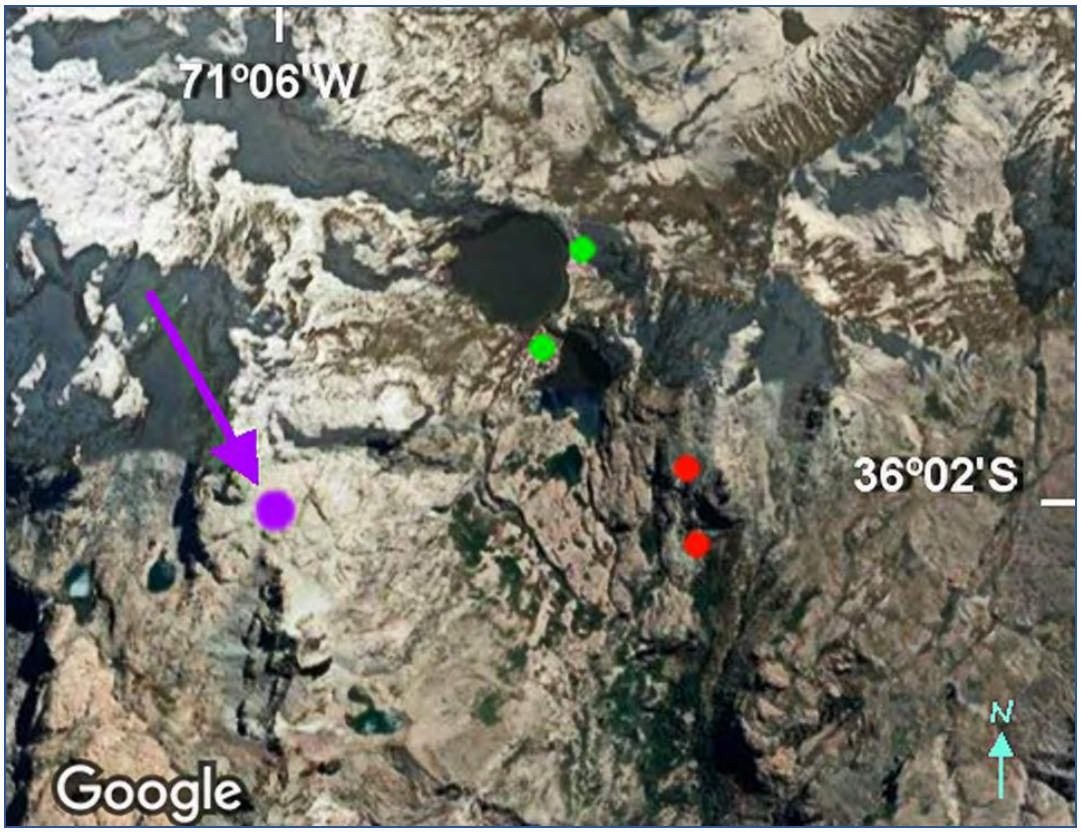
– Style strongly exserted ... 2.

2. Corolla yellow (as Achibueno populations) .... *E. andicola*

– Corolla red or orange ..... *E. achibuenoensis*

18) Talca Region, southern Chile, with the only known location of *Euphrasia achibuenoensis* circled and arrowed. (Courtesy of Turistel, Chile)

19) A physical map of Talca Region, Chile, showing the position of *Euphrasia achibuenoensis* in the upper Andean foothills. (Courtesy of the Internet)



20) *Euphrasia achibuenoensis* locations. Type site violet, arrowed. Main population green. Hybrid sector red. (Courtesy Google Earth)

21) The route through mixed woodland leading to the upper Achibueno sector. (Nicolas García)

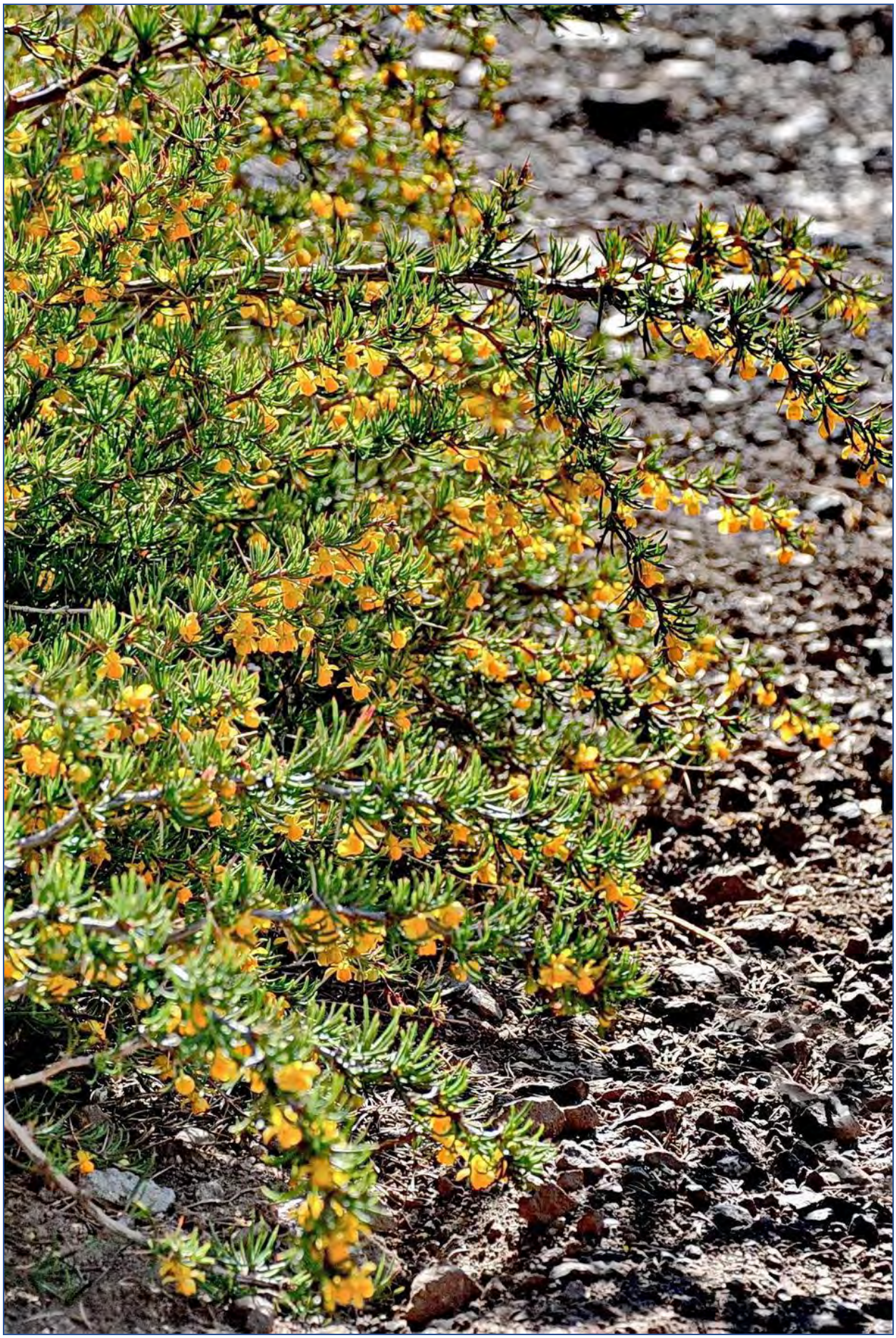
22) *Nothofagus antarcticus*, southern beech. (ARF)

23) *Viola minutiflora* at Achibueno. (Nicolas García)

24) *Viola minutiflora* flower. (Margarita Aldunate)

25) *Laretia acaulis* (Marijn van den Brink)

26) *Nassauvia digitata*. (JMW)



27) *Berberis empetrifolia* plant. (JMW)

28) *Berberis empetrifolia* inflorescences. (JMW)

29) *Euphorbia collina.* (JMW)

30) *Solenomelus segethi.* (Botanical painting Andrés Jullian)

31) *Montiopsis tricolor.* (Marijn van den Brink)

32) *Chloraea alpina.* (ARF)

33) *Chloraea magellanica*. (JMW)

34) *Chloraea viridiflora.* (ARF)

35) *Armeria maritima.* (Helga Petterson)

36) *Schizanthus hookeri.* (JMW)

37) *Tropaeolum incisum.* (JMW)

38) *Valeriana macrorhiza.* (Dick Culbert)

39) *Valeriana philippiana.* (ARF)

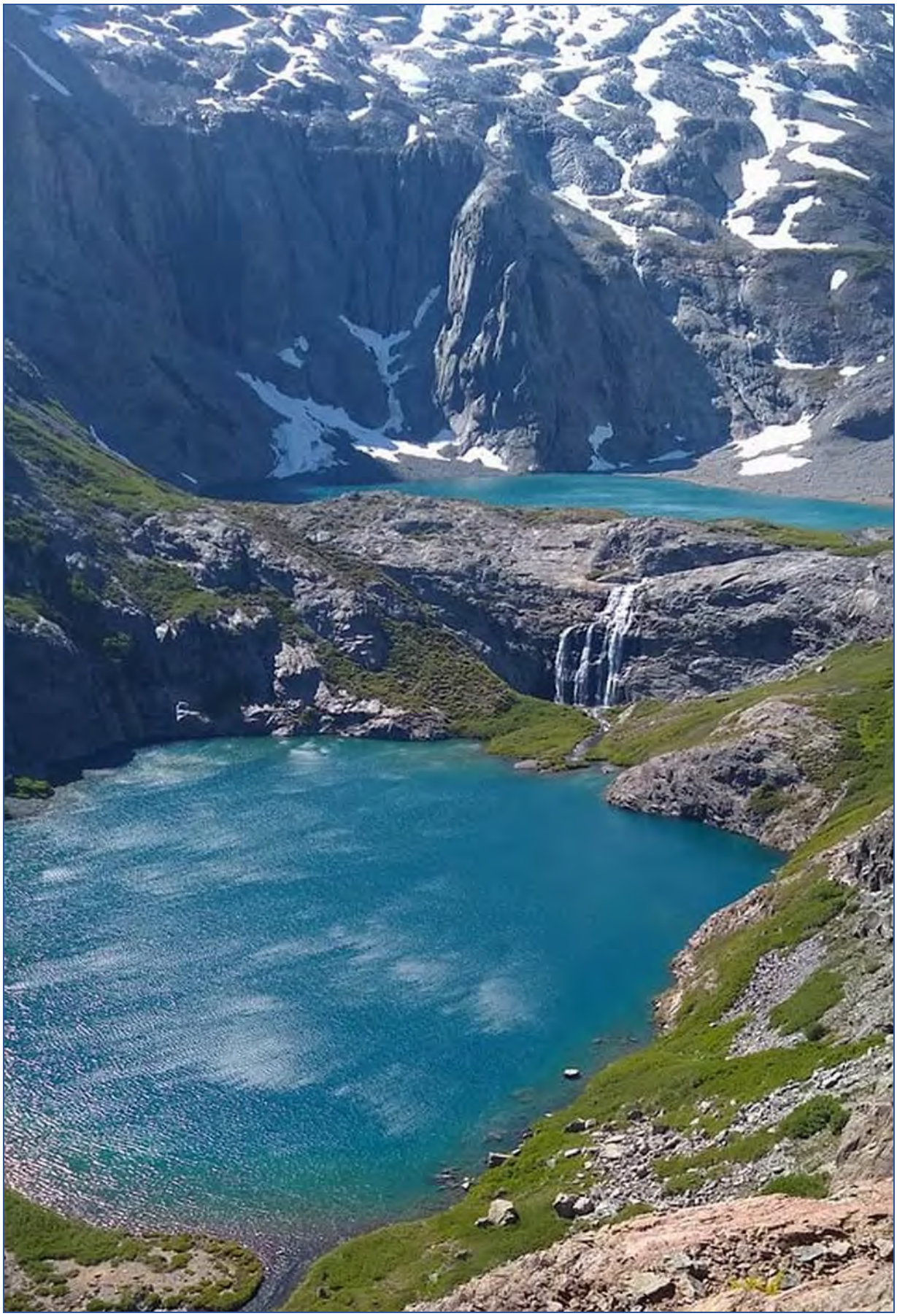
40) *Viola fluehmannii* shrublet. (JMW)

41) *Viola fluehmannii* flower. (ARF)

42) Overall habitat of *Euphrasia achibuenoensis.* (David Santos)

43) Immediate habitat of *Euphrasia achibuenoensis* with a population visible.

(David Santos. 20 January 2018)



44) The two Lagunas Cuéllar, the upper one the location of *Euphrasia achibuenoensis*, with its type site above to the left. (David Santos)

45) The Lagunas Cuéllar, habitat of the *Euphrasia* hybrid swarm. (David Santos)

46) *Euphrasia* hybrid Nº 1, detail. (David Santos)

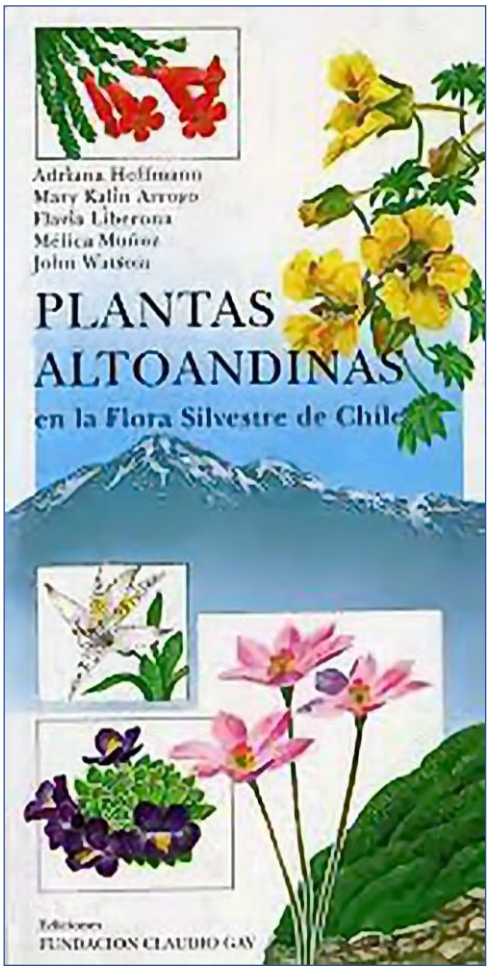
46) *Euphrasia* hybrid Nº 1, plant. (David Santos)

48) *Euphrasia* hybrid Nº 2. (David Santos)

49) *Euphrasia* hybrid Nº 3. (David Santos)

50) *Euphrasia* hybrid Nº 4. (David Santos)

51) *Euphrasia* hybrid Nº 4. (David Santos)



52) Our 1998 guide to Chile's Andean flora in which the possible hybrid of *Euphrasia subexserta* was published**.**

53) A plant of *Euphrasia subexserta* with a pink inflorescence of an almost certain hybrid involving it. (Botanical painting Andrés Jullian)

Discussion

Ecology: Although euphrasias in the main exhibit a preference for cool, moist places, those from the Northern Hemisphere and New Zealand inhabit a variety of ecological niches, as also do taxa connecting the two hemispheres. Typical environments include screes, rocky alpine slopes, natural short pasturage, tussock fields, downland, wayside borders, and even coastal sites (Sell & Yeo 1970, Mark & Adams 1973, Yeo 1973, Wu et al. 2009). A similar pattern is presented by South American species. Most tend to occur in damp, grassy habitats, often beside small streams, or snow seeps [fig.16], presumably where their host plants can flourish in more prolonged active growth. Perennial species with hardened base stems such as *E. andicola* may, however, sometimes be found in drier sites (pers. obs.).

It has been noted in the literature that certain hemiparasites are able to grow independently without a host (Heide-Jørgensen 2008), and these include some *Euphrasia* taxa (e.g. Beckett 1993). This capability is referred to as facultative hemiparasitism (Heide-Jørgensen 2008). In that context perennial species of sect. *Trifidae* in South America may occasionally be found growing on bare ground devoid of any other nearby vegetation (pers. obs.). It is not known whether *E. achibuenoensis* is capable of such autonomy, although from its vigorous growth form it seems likely.

54) A colony of *Ourisia ruelloides* in near-southern Chile. (ARF)

In South America the floral traits of *E. achibuenoensis*, a very visible red or orange corolla with a prominent tube, suggest classical coevolution of hummingbird pollination. The larger upper lobes would then be explained as 'flags' to attract the birds to the plant, while the long tube admits their tongues to feed off nectar which few potentially competitive insects are able to reach. In addition, birds have developed red colour sensitivity, while most arthropods lack significant perception of that end of the spectrum (Proctor et al. 1996). It would be simple if this were so. However, during observations over two seasons of the fairly similar and broadly sympatric red *Ourisia ruelloides* (L. f.) Kuntze [figs.54, 55], syn. *O. poeppigii* Bentham, at equivalent elevations, no hummingbirds were observed in the area, but seed-set was high, so it is assumed the species is strongly autogamous (Arroyo & Peñaloza 1990, Meudt 2006).

55) *Ourisia ruelloides,* showing the hummingbird adapted colour and shape. (ARF)

Furthermore, Chalcoff et al. (2006) found that its sucrose levels were the lowest among species from the region thought to be likely ornithophiles. There seems to be no logical reason why these plants should develop such obviously distinctive hummingbird-attracting mutualism for no purpose. It may be that the presence and interaction of the birds at their habitats was much greater in the past, and that these once effective ornithophilous characteristics have now become a redundant and diminishing aspect of that former symbiosis. Alternatively, perhaps avian visits do rarely occur and are vital for a sufficient degree of outbreeding. In support of this hypothetical possibility, *Oreotrochilus leucopleurus* Gould, the White-sided Hillstar hummingbird [fig.56], is present down to as far south as ca. 45ºS in Chile, and active between 2000 and 3500 m (Martínez & González 2004). It is also a very shy and elusive little species (pers. obs.). Resolution of the new euphrasia's particular pollination syndrome would be a worthwhile avenue of research to follow up.

However, as noted above *E. achibuenoensis* is considered with little doubt to be one parent of a complex hybrid swarm which was observed in the immediate area where it grows. Assuming this deduction to be correct, cross-pollination must occur between it and one or more of the other parents, perhaps also including the hybrids themselves. The question then arises: Are hummingbirds pollen vectors then? And if not, what are?

56) The White-sided Hillstar hummingbird. (Photo Christian Saavedra, courtesy of the Internet)

57) Part of cover painted by Andrés Jullian for a book of his on birds. (Courtesy of the Internet)

That superbly talented artist of natural history, Andrés Jullian, illustrated all the 'Plantas ... en la flora de Chile' guides [e.g. figs.30, 52, 53]. So, it seems singularly appropriate to end here with a neat combined tribute to him: a portrait of the man himself at work, and part of the cover of his book on birds which includes a hummingbird [figs.57, 58].

58) The artist Andrés Jullian with a copy of 'Plantas Altoandinas en la flora de Chile' on his desk. (R. Cadagan, courtesy of the Internet)

Conclusion

It is keenly hoped that publication of this remarkable and extremely rare species may bring it to the attention of those in the scientific world who are able to exert influence on conservation policies.

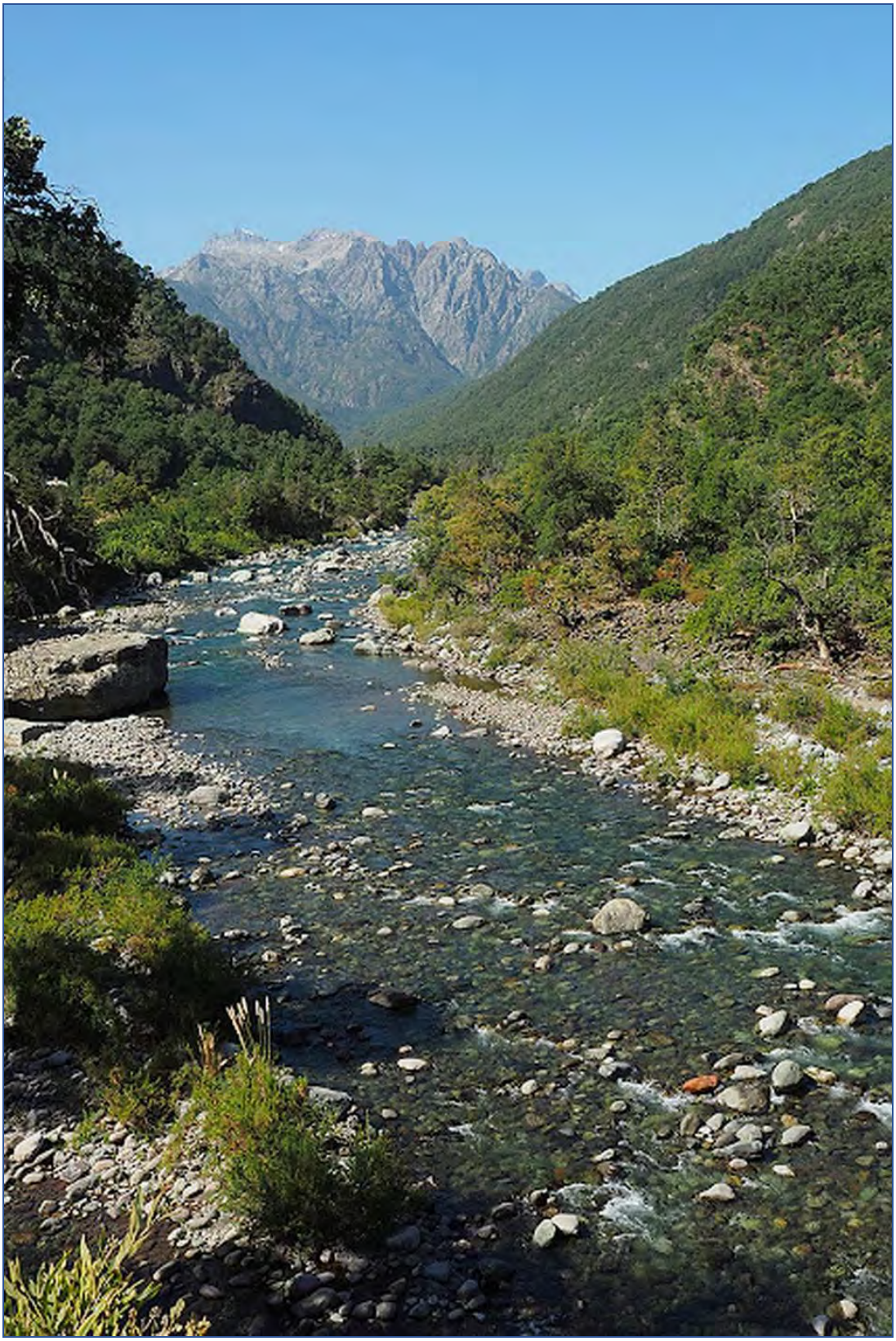
Acknowledgements

We all express our sincere thanks to Eric Santos Cisternas, brother of David, for his significant contribution. Not only has he been, and still is, one of the fundamental pillars in the movement to conserve the unique and multifarious biodiversity of this exceptional sector, but he also generously financed the field trips to survey its flora, during which time the species described here and other novelties were found. Our gratitude is sent as well to the vital Achibueno Defence Movement (Movimiento de Defensa Achibueno) for its valuable assistance.

Nicolas García has also played a part in the exploration of the sector, not least in the discovery and location of *Viola minutiflora*.

The acknowledged photographic contributions of others has enhanced the significant pictorial aspect of this exposition greatly. We are particularly satisfied for being able to include one by our very good and helpful Canadian friend, the late Dick Culbert, and thereby commemorate him to a small extent.

J. W. and A. F. are indebted to Heidi Meudt for putting us in touch with Bill Barker and Phil Garnock-Jones and are most grateful to them both for providing most helpful comparative information on Southern Hemisphere species of *Euphrasia* outside South America.



59) The Achibueno River, whose name the new species bears. (Fernando Fainberg, courtesy of the Internet)

60) David Santos, a parting portrait. (Photo Anon)

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Three new Crocus (Iridaceae) species from Turkey and the East Aegean Islands

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Abstract: Three new *crocus* species related to *Crocus pallasii* and *C. cancellatus* are described. Morphological differences between the new species and other possibly related taxa are discussed. Photographs (habitat and morphology) and distribution maps are provided.
Key words: Greece, Turkey, *crocus*.

Introduction: After the publication of my monograph “The World of Crocuses” in 2017, which comprised descriptions of 230 *crocus* species, various authors have made many new discoveries throughout the range where crocuses occur. Around 20 new species have been published from the area that starts in the Balkans and extends into Iran and many more are waiting for the completion of the research and the publishing. In this paper 3 new taxa are described together with the stories about their discovery.

Results: In 2009 our small team visited Turkey to take pictures of the autumn-blooming crocuses. On 31st of October we travelled from Denizli to Antalya (Turkey) and made a right-hand turn along the road to Golhisar. Having driven some 4-5 km farther down the road, soon after the village of Çamkoy we stopped at a place where, between the ploughed fields, there was a small spot of uncultivated stony land sparsely covered with evergreen oaks and coniferous trees. There we spotted crocuses whose colour surprised us. The first plant seen strongly resembled *Crocus mathewii* with a deep purple throat and entire, trifid stigma. The first thought was that the range of *C. mathewii* was much larger than was believed previously – the nearest point where *C. mathewii* had been observed was located some 100 km to the south of Çamkoy village. But when the plant was dug out to check the corm tunics, instead of the supposed finely parallelly fibrous tunics, it had coarsely reticulated corm coverings, typical of *C. cancellatus*. The practically entire stigma in combination with the coarsely reticulated corm tunics immediately made us think about a new species.

Inspection of the other plants in this population revealed that stigmatic branches sometimes were entire, but mostly they were very shortly subdivided into 2-3 mm long secondary branches and only very rarely the branches were somewhat longer. The style in the new crocus mostly split at the tips of the anthers, whilst in a typical *Crocus cancellatus* the dividing point is

positioned much lower and the stigma is located at the tips of the anthers or slightly higher. By the dividing point of the style the new species was rather similar to *C. damascenus*, but in the latter the style is distinctly subdivided into many long secondary branches. All these features allowed to regard this plant as a new, unknown species. Further correspondence with other travellers who had visited this region, showed that the distribution area of this crocus was much larger and extended to the east and southeast from the locus classicus, but for exact data more research is needed.

Typical flower of *Crocus cancellatus* (sample ARGI-103)

Typical flower of *Crocus damascenus* (sample JJVV-039)

Crocus erolii – locus classicus.

Crocus erolii Rukšāns species nova

Type: Along the road from Denizli to Golhisar, Burdur Prov., Turkey, 37°15'N; 29°32'E, alt. 955 m, JJJ-015, leg. J. Ruksans, 31-10-2009; ex culturae in horto Jānis Rukšāns, leg. & det. J. Rukšāns, 13-10-2018. Holo: GB

Habitat and distribution – Known from the type locality in Burdur Province where it was observed growing in open spots among sparse shrubs and small coniferous trees at altitudes of 950-960 m, but reported as being distributed in a much wider area.

Flowering time – September-October.

Corm – slightly elongated, round, up to 20 mm in diameter.

Tunics – coarsely reticulated.

Tunic neck – up to 2-2.5 cm long, formed by prolongated fibres of the main tunic.

Basal plate – small, with long, thread-like fibres, in the base area singular or bound in groups of 2-3(5) fibres, higher fibres become +/- parallel.

Prophyll – absent.

Cataphylls – 3, creamy, at the very top slightly greenish.

Leaves – (3)4-5, emerge just after flowering, 2 mm wide, dark green, the median stripe around ½ or slightly more of the leaf width, lateral channels with (1)2 ribs in each, the ridge papillose, sometimes only sparsely along the edge.

Perianth tube – variable: from whitish becoming creamy below the flower to greyish, light purplish with darker ribs, occasionally confluent right below the flower.

Bract and bracteole – transparent, whitish, slightly exceeding the cataphylls.

Throat – sparsely hairy, whitish, mostly with short lilac stripes at the edge, sometimes the stripes are confluent or very pale, occasionally the throat entirely deep lilac.

Filaments – creamy, 4- 5(7) mm long, glabrous.

Anthers – yellow to orange-yellow, 11-12(14) mm long, basal lobes up to 1 mm long, sharp.

Connective – whitish to yellow (when anthers are darker).

Style – in the throat the yellow gradually becomes orange higher, divided just over the tips of the anthers, sometimes significantly higher (in 6 out of 33 observed flowers the dividing point was slightly lower than the tips of the anthers), into 3 deep orange 7-**10**-12(17) mm long stigmatic branches, at the very top mostly very shortly subdivided into 2-3 secondary branches, on average 2-3 mm long, sometimes almost entire, rarely the length of the secondary branches 5-7 mm long, the edge of the stigmas toothed.

Flower segments – lanceolate, inner segments shorter and only slightly narrower than the outer segments, the colour of the outer and inner segments the same and practically identical

on both sides of the segments – from very pale lilac, almost whitish to light lilac. In cases when the outer segments have a dark purple basal blotch, the inner segments are without one.

Outer segments – 32-**41**-47 mm long and 8-**10**-11 mm wide.

Inner segments – 30-**38**-44 mm long and 7-**9**-10 mm wide.

Capsule – positioned around 3 cm above the ground, up to 15 mm long and 8 mm wide, marbled buff, pointed at the tip.

Seeds – dark purplish to blackish brown, up to 3 mm long and 2 mm wide, with a distinct caruncle and less prominent raphe.

2n = unknown.

Etymology – Named after Prof. Osman Erol from Istanbul University who has discovered and published several new crocus species.

Crocus erolii flowers in the wild.

 Charity registered in Scotland SC000942 ISSN 2053-7557

Crocus erolii – corm tunic

 Charity registered in Scotland SC000942 ISSN 2053-7557

Crocus erolii corms - basal plate

 Charity registered in Scotland SC000942 ISSN 2053-7557

Crocus erolii corm tunics on cultivated plants

Crocus erolii flower details

 Charity registered in Scotland SC000942 ISSN 2053-7557

Cultivated flowers of *Crocus erolii*

Cultivated flowers of *Crocus erolii* and flower details.

Crocus erolii flower details.

Crocus erolii seedpods.

Crocus erolii seeds.

Crocus erolii holotype specimen

 Charity registered in Scotland SC000942 ISSN 2053-7557

In 1996 J. & K. Persson from the Gothenburg Botanical Garden collected a *crocus* on Chios Island (Greece) that superficially resembled *Crocus pallasii*, but it was so special that after the first blooming it got the varietal name 'Homeri'. Some corms of this sample were sent to me. It looked so distinct that I even started to doubt – was the epithet of "*C. pallasii*" applicable to it at all? – and only a careful examination of minor details allowed to retain its taxonomical position although there still remained serious doubts about the correctness of this decision. This clone had entirely black anthers, not observed earlier in *C. pallasii* sensu lato. That and the examination of a possible existence of spring-blooming species with annulate corm tunics (related to the *biflorus/chrysanthus* group) on this island (according to the data supplied by A. Strid) spurred me to undertake a trip to Chios. When my friend from Israel, Oron Peri, informed me that he had collected a few corms of Chios' "*pallasii*" with similar features, it only strengthened my intention to visit the island and this was made in spring 2011 together with the Dutch nature photographer Kees Jan van Zwienen. Another spring-blooming *crocus* that I was looking for was *C. fleischeri* – in the Gothenburg BG I saw an incredibly beautiful form from Chios with almost blackish brown stigmatic branches.

Crocus fleischeri KJGR-034 from Chios Island

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The problem was to choose the best time for the trip, as one of the crocuses blooms in spring, and the other – in autumn. My Australian friend Marcus Harvey wrote to me that in May all the mountain slopes there had been heavily grazed, so I went there from 9th to 16th of April – a compromise: even though they would be out of flower, the corms might be rather mature and the leaves hopefully not grazed. As it turned out it had been the best choice – the crocus leaves were everywhere, and among them we found several fritillaries, too. Marcus Harvey especially asked me for *Fritillaria pelinaea*, described in 1996 from the slopes of Mt. Pelineo (1297 m) after which this fritillary was named. After a long search we found it (spotted by Kees Jan) at an altitude of 880 m growing in a very unusual for frits habitat – on an unstable stone slide where I would never look for frits, but the plants undoubtedly were true *F. pelinaea* – quite easily separable from *F. carica* (found in full bloom on this island as well) by its very wide, ovate and strongly opposite bottom leaf pair. In *F. carica* bottom leaves are subopposite and more lanceolate. Later, on the southern slopes of Skoni Mountain, we discovered another population of *F. pelinaea*. Here we found it at an altitude of 530 m and it was growing on stable hard clay ground hidden among very spiny shrubs. The colour and leaves clearly indicated that it was *F. pelinaea*.

Ed.: The plantsman Marcus Harvey died in 2016. A book of his writings is planned in 2022.

Fritillaria pelinaea, found!

Crocus homeri clone 'Homeri'

We visited the spot from where in 1996 J. & K. Persson originally collected *crocus* 'Homeri', and well as criss-crossed the island searching for crocus populations, collecting at each site up to 5 corms (only at Persson's locality we collected 10) to get a better idea about the variability. It was late in spring, so no crocus flowers were seen and the flowers from all the gatherings were observed later in cultivation. In total we found there two autumn-blooming species – the aforementioned *C.* cf. *pallasii* and *C. pulchellus* (practically identical to the ones growing on the mainland Greece and Turkey and seen almost at every stop throughout the island), spring-blooming *C. olivieri* and its relative *C. balansae*, and *C. fleischeri* that usually accompanied *C.* cf. *pallasii.* A high proportion of collected samples (9 populations) of *C. fleischeri* had dark reddish brown stigmatic branches. During this and the later two trips to Chios we did not find any spring-blooming crocuses with annulate corm tunics. The singular mention of such reported by P. Saliaris (23.11. 1994) at Chalandra and Nea Potamia turned out to be misidentified *C. pulchellus*, and the gathering from Mount Pelineo done by A. Strid as "*C. biflorus*" in the Gothenburg BG also bloomed as *C. pulchellus*.

Populations of *Crocus* cf. *pallasii* on Chios were quite uniform in overall appearance and in fact looked like some variants observed in Crimea. The filaments in the Chios plants were somewhat

longer, but like in Crimea there were plants with a greyish upper part of the filaments, and one individual had almost entirely dark grey filaments. The leaves of the Chios plants were somewhat different from those of *C. pallasii* observed at the locus classicus of this species in Crimea (Ukraine, at present occupied by Russia). Of course, all the plants collected during this trip were without flowers and only from the type locality, where *crocus* 'Homeri' was found, were gathered 10 corms. At other places where we saw crocuses allied to *C. pallasii*, only 3-5 corms were taken. In total were collected 35 corms. When they bloomed in cultivation, 11 plants had black colour in the anthers; in the population from where 'Homeri' came such were four. Only one individual had an entirely black connective and one had yellow anthers with white connectives shaded blackish on either side in the upper half. Even a pure albino was accidentally collected at one of the localities. [Later I crossed 'Homeri' with a quite interesting *C. pallasii* aff. (leaves with a very wide keel and narrowly opened lateral channels without ribs) from near Labranda in Turkey and harvested a good seed crop. Seedlings have already bloomed and a few had black anthers similar to those in 'Homeri'. Most interesting is that the hybrids are fertile; in 2015 and 2016 they gave me plenty of seed from open pollinated flowers.] This urged me to repeat the visit to Chios Island in 2019 while this species was in bloom, in order to check the variability of all populations. In total were observed 10 localities (see the attached map). Between the two visits on the island had raged serious forest fires, some of them in places where previously *Crocus* cf. *pallasii* was observed, but only in one locality (on the map marked with black and situated very close to the type locality) we didn't see any crocus.

Crocus homeri localities on Chios Island

In most of the others it was just the culmination of blooming or very close to it, thus we could evaluate many more individuals. At the locus classicus of the new species in total were observed and measured the flower features of 48 plants. 31 of them had black colour in the

anthers, but it is possible that the actual percentage was higher, as there were cases where due to the fully dehisced anthers it was impossible to determine their original colour; in such instances it was assumed that they had yellow anthers. So, at the locus classicus 64.6% of plants had black colour in the anthers. One pure white specimen with pure yellow anthers was found among generally quite uniform purplish blue-coloured plants. This and other morphological differences from the typical *C. pallasii* from Crimea allowed to regard the plants from Chios as another, different *crocus* species.

Albino *Crocus homeri* at locus classicus.

Crocus homeri habitat at locus classicus in spring, 2011.

Crocus homeri habitat at locus classicus in autumn 2019, after forest fires.

Crocus homeri at locus classicus.

Crocus homeri leaves at locus classicus in spring, 2011.

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Crocus homeri leaves at locus classicus in spring, 2011.

Crocus homeri at locus classicus.

Crocus homeri at locus classicus.

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Crocus homeri Rukšāns species nova

Type: Chios Island, Greece – road to Anavatos, 38°22'N; 26°03'E, alt. 715 m. 19GRA-010, leg. Jānis Rukšāns, 9th November, 2019. Holo: GB.

Habitat and distribution – Known only from Chios Island (Greece) where it grows on limestone outcrops and clearings between sparse pine forests at altitudes of 400-750 m.

Flowering time – October-November.

Corm – depressed-globose, flattened at the base, 20-28 mm in diameter.

Tunics – parallelly finely fibrous, slightly reticulated at the very top.

Tunic neck – 25-30 mm long, formed by fine, prolongated fibres of the main tunic.

Prophyll – absent.

Cataphylls – 4-5, white above ground, slightly brownish below ground.

Leaves – 8-**11**-17, development starts during flowering or just after the end of blooming, greyish green, distinctly hairy on the edges, sometimes also very sparsely on the lamina, rarely completely glabrous, 2-3 mm wide, the white stripe narrow, only 1/5-1/4 of the lamina width, lateral channels widely open with downwards and slightly inwardly turned edges, without or with 1 rib, the keel wide – around ½ of the leaf width, distinctly hairy on the edges.

Perianth tube – colour is determined by the colour of the flower segments and is very variable – from almost white or striped lilac on white ground to deep purple, especially darker below the flower base.

Bract and bracteole – transparent, silvery, the bracteole longer, ends around halfway along the tube, sometimes somewhat longer.

Throat – distinctly hairy, white, small to almost indistinct, at the edge with dark purplish stripes, sometimes confluent, giving an impression of a deep purple throat; higher up the stripes diffuse or in the form of pale lining reach the tips of the flower segments.

Filaments – glabrous, 5-**7**-10 mm long, mostly white but sometimes lilac or speckled greyish, especially in the upper part, mostly in plants with black in the anthers, rarely were seen plants with filaments that were greyish or lilac throughout.

Anthers – colour variable – from yellow all through to greyish shaded, but in general black. The proportion of black-anthered plants somewhat varies among populations, at the type locality 64.6 % of observed plants had black colour in the anthers. Pollen – deep yellow.

Connective – white.

Style – glabrous, in the throat deep yellow to orange, higher up turning bright red, divided mostly below the base of the anthers, less often at the same level and only rarely higher (respectively in 24-15-9 cases from the observed 48 flowers), into 3 comparatively long (9-**14**-20 mm) branches. The position of the stigma is determined by the dividing point – if it is lower or

level with the base of the anthers, the stigma mostly ends below the tips of the anthers, if the dividing point is above the base of the anthers – stigmatic branches overtop the anthers. In cultivated plants this proportion changes and the style branches mostly overtop the anthers.

Flower segments – oblanceolate to obovate with acute, more or less distinctly acuminate or cuspidate tips, less often rounded, lighter or darker lilac, mostly with more or less prominent darker stripes, more distinct on the segment inside, on the outside the basal stripes become confluent producing a dark purple basal blotch.

Outer segments – 31-**38**-49 mm long and 12-**16**-23 mm wide.

Inner segments – 27-**33**-47 mm long and 8-**13**-17 mm wide.

Capsule – 20 mm long and 8 mm wide, silvery at the base, becoming buff to brownish at the top; usually positioned 2-2.5 cm above the ground.

Seeds – very dark brown, ovate to almost round, with a prominent, large caruncle and a large, ridge-like raphe, often with a large, sharp, triangular lighter brown appendage.

2n = unknown.

Etymology – named after the ancient Greek poet Homer, author of “Iliad” and “Odyssey” – who, according to a legend, was born and lived on Chios Island.

Crocus homeri - hairs in throat of the flower.

Crocus homeri corms, above, flower details, below.

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Crocus homeri – flower details

Crocus homeri seedpods

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Crocus homeri flower details.

Crocus homeri seeds.

Crocus homeri KJGR-001 from the locus classicus.

Crocus homeri KJGR-001 from the locus classicus.

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Crocus homeri KJGR-035

Crocus homeri KJGR-038

Crocus homeri KJGR-040

Crocus homeri KJGR-047

 Charity registered in Scotland SC000942 ISSN 2053-7557

Crocus homeri KJGR-060

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In late autumn 2021 I got an e-mail from the Greek nature lover Theodoros Samaras with pictures of a quite distinctly looking *crocus*, photographed by him on the island of Kos (Greece). He asked me to identify this *crocus*. From Kos up until recently was known only one *crocus* gathering and namely – *Crocus mazziaricus* (Ristow & al. no. 1350/08 2008-11-01 – as *C. cancellatus* subsp. *mazziaricus*). It was observed at two spots on Mt. Dikeios in an open Cypressus forest south of vil. Zia and below the top on stony openings of phrygana at altitudes of 600-800 meters. But the plants in the pictures did not look like *C. mazziaricus*. They all had stigmatic branches with more or less entire tips. Although I am sure that under the name *C. mazziaricus* are hidden several different species and the degree of sub-splits of the stigma varies between them, their stigmatic branches are not almost entire as it was clearly noticeable in the sent pictures. By the stigma this crocus on pictures somewhat resembled one of my gatherings in Turkey, near Denizli, described here as a new species – *Crocus erolii*, therefore this plant aroused my intense curiosity. Pictures of corms were too unclear to judge on the shape of the corm tunics.

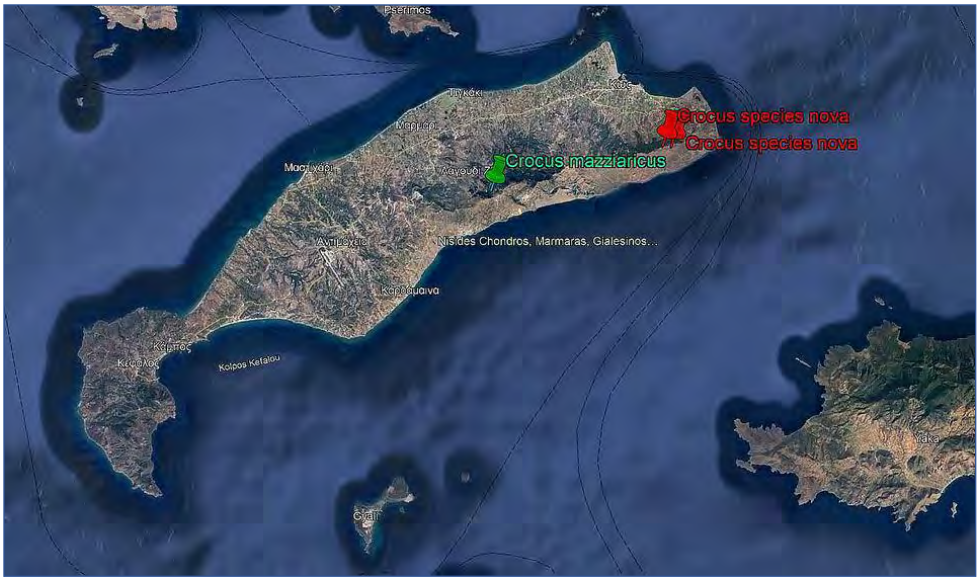
I offered to cover Theodoros Samaras' expenses and arrange a repeated visit to the locality where this crocus was pictured. He kindly agreed and the next weekend I flew to Kos. There are only 2 direct weekly flights from Riga to Athens, but they perfectly matched our needs, allowing to spend two full days on Kos. This trip turned out to be a real stroke of luck because alone I could have never found the right road in the labyrinth of small streets and winding mountain roads to the locality, where this *crocus* was discovered. Even more – its type locality lies within a military area with strictly controlled entry and is guarded by dogs. Long before the mountaintop there were road signs forbidding entry, taking photos, and warning about the dogs. I by myself would have never continued to ascend, but my Greek colleague tried to calm me by telling me that it was Sunday and he knew someone there, so we drove almost to the top of Mt. Sympetron.

Previously T. Samaras had spotted this crocus at 3 points, and we started our search from the highest one. There we saw the last flowers of this *crocus* and, despite a very strong wind, I took some pictures and collected a few flowers for the later fixing on a sticky tape. When I checked the corm tunics, I found that they closely resembled those of *Crocus* cf. *pallasii* not recorded from this island before. Twice we came too close to the military zone and the alarm started to sound, so we quickly departed from there to a lower altitude, where Theodoros had seen a few flowers during his first visit to this mountain. There we witnessed the peak of blooming and it was possible to collect good samples for herbarium and amass more detailed observations. Contrary to the spring-blooming species whose flowering starts at lower altitudes

and gradually moves upwards, with the autumn bloomers the opposite is the case for their blooming starts at higher altitudes and gradually moves downwards.

All open flowers had shrivelled and very curly anthers that already had shed their pollen, so it was impossible to check their position and take accurate measurements that are important in identification of *crocus* species. Fortunately, after a very long search we came across three individuals with flowers that only now had started peeking through the cataphylls, but still in tight buds. They were collected and put in a glass with water in a warm hotel room to spur on their opening. This was successful and it was possible to fix the position of the stigma regarding the anthers as well as the colour of the anthers and connectives. We discovered that within 1-2 hours after opening the anthers dehisced and shrivelled well below the tips of the stigma, whereas in fresh flowers the stigmatic branches invariably did not reach higher than the middle of the anthers. The dominating colour in the seen plants was very light lilac; we spotted only one pure albino and a few with darker lilac flowers. Comparing the gathered data with the description of *Crocus pallasii* from the locus classicus and taking into account the huge distance from Crimea where typical *C. pallasii* grows, I concluded that the *crocus* species from Kos Island was an example of islandic endemism and could be regarded as a new species, sufficiently different from its allies by position of stigmatic branches according anther tips and by reticulation of corm tunics.

The next day we explored the slopes of Mt. Dikeios, from where *C. mazziaricus* was reported, but found no plants. Most likely because of the very long and hot summer, the blooming of *Crocus mazziaricus* (as well as *Colchicum atticum,* known from there) was delayed, so it was impossible to check its identity. Actually, the first autumn rains had fallen only a few days before our arrival and the soil was still dry and hard as stone. Crocuses in more open places on Mt. Sympetron, although already in bloom, had only started forming the new roots.



Crocus localities on Kos Island - red marks - *Crocus samarasii*, green - *Crocus mazziaricus.*

Crocus samarasii Rukšāns, species nova

Type: Greece, Kos Island, Mt. Sympetron, alt. 420 m, 36°52'N; 27°19'E, leg. Jānis Rukšāns, 28.11.2021, 21KOS-002. Holo: GB.

Habitat and distribution – Known only from the type locality where it grows in phrygana, mostly in clearings among (occasionally within) shrubs of *Sarcopoterium spinosum* around the top of Mt. Sympetron on Kos Island (Greece) at altitudes from 400 to 450 m.

Flowering time – November-December.

Corm – elongated–globose with a flat base, 10-15 mm in diameter.

Tunics – finely reticulated, at the basal part parallelly fibrous.

Tunic neck – 18-45 mm, formed by thick, parallel fibres of the main tunic.

Prophyll – present.

Cataphylls – 3(4), the lower cataphyll brownish yellow, the upper cataphyll dirty white with a slight greenish tint.

Leaves – develop during blooming or just after, 7-**8**-12, glabrous on the surface and edges, very narrow, dark greyish green, the white stripe 1/3 of the leaf width, lateral channels open, without ridges, the keel is wide with evenly spaced papillae along the edges.

Perianth tube – mostly whitish, occasionally with darker stripes just below the flower segments, very rarely (in the darkest coloured specimens) – purplish lilac.

Bract and bracteole – greyish white, subequal, ending well below the flower base.

Throat – small, pure white, with or without lilac stripes at the edge, distinctly but sparsely hairy.

Filaments – (5)6 mm long, light yellowish, glabrous.

Anthers – 12-**13**-16 mm long, deep yellow, after dehiscing shrivel and curl significantly below the tips of the stigma.

Connective – white to creamy.

Style – glabrous, in the throat yellow, higher up gradually becomes orange to brownish orange at the tips of the stigmatic branches, generally divided just below the anthers, rarely at their base level or slightly higher (detected in 6 individuals out of the 50 observed), into three dark red, in the upper part – brownish red, 6-**7**-9 mm long branches which end at the middle of the anthers. The stigma has an uneven edge that is not subdivided.

Flower segments – elliptic, oblanceolate or obovate, sometimes with rounded, mostly subacute to acute tips; the inside colour the same in both whorls.

Outer segments – 26-**33**-41 mm long and 12-**13**-16 mm wide, on the outside very light lilac with a short dark basal blotch at the top with a starry edge, not surpassing 1/5 of the segment length, but mostly shorter. During the whole day we observed only one individual with white flowers and

a few with darker lilac segments. The inside is of the same colour, turning darker in the throat, with lighter or darker purple stripes at edge of white throat.

Inner segments – 23-**30**-36 mm long and 10-**12**-13 mm wide, colouring the same as on the outer segments.

Capsule and seeds – unknown.

2n = unknown.

Etymology – Named after Theodoros Samaras, who was the first to observe this plant and sent its pictures to the author, advocating more research.

Crocus samarasii - typical Phrygana habitat.

Crocus samarasii - typical Phrygana habitat. Photo T. Samaras.

Variations of *Crocus samarasii.*

Crocus samarasii.

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Crocus samarasii.

Crocus samarasii flower details.

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Variations in *Crocus samarasii* flower details.

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Crocus samarasii has sparse hairs in the throat of the flowers. Photo T. Samaras.

Crocus samarasii - corm's basal plate

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Crocus samarasii - corm tunics

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Theodoro Samaras after whom new crocus species was named.

Author picturing *Crocus samarasii.*

Acknowledgments

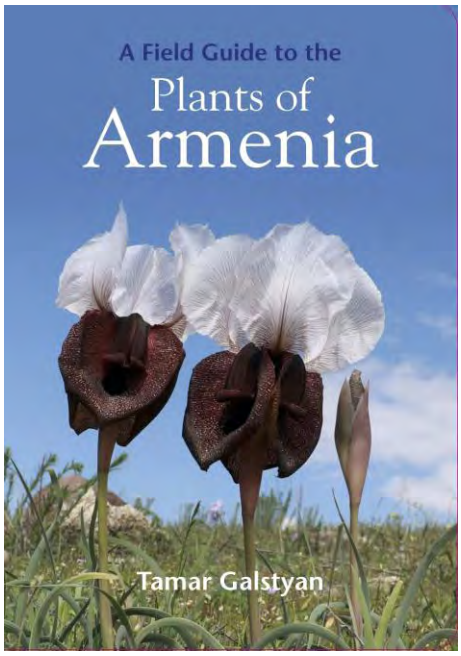
First of all, I express my thanks to Prof. Arne Strid for sharing data about *crocus* localities in Greece, to Henrik Zetterlund from Gothenburg BG, for his help with *crocus* samples from the large collection of the Botanical Garden's and information about *crocus* localities as well. Of course, without help of my permanent travel companions Vaclav Jošt and Jiri Bydzowskyi who always assisted me during my researches in mountains, those travels would not be possible. Of course, I can't forget here Theodoros Samaras for sharing information as well as assisting me in travel to Kos Island. And as always, thanks to Mārtiņš Erminas for his patience in correcting my ugly English. I'm especially thankful to my family and my wife Guna for their help and patience during my trips and preparation of my publications.

Crocus samarasii.

--- Book Review ---

A Field Guide to the Plants of Armenia by Tamar Galstyan

Publisher: Filbert Press
ISBN: 9781999734589



The Author, Tamar Galstyan, graduated from the University of Art and Theatre in Yerevan. She studied ecology and worked with children as an ecology teacher. Tamar began to travel regularly in Armenia, taking numerous pictures of plants and identifying them. She created a website to help students learn about the Armenian flora and this led to her popular Facebook page Plants of Armenia. In 2012, she was invited to guide a botany trip. Gradually, the geographical range of her trips expanded, and some are managed through her own travel company, SkyGreen. Travels in Georgia, Iran and Central Asia have deepened Tamar's love of Nature as well as her plant knowledge.

This book has the feel of a weighty tome coming in at 782g and flicking through the 592 pages I realise that it could have been much heavier. The paper is thin enough to keep that weight (and price) down but not at the sacrifice of print quality which I find to be good throughout. I also like the design of this book - physically the soft cover and rounded corners will make it a comfortable fit to be carried in a backpack or even a large pocket.

Syunik Province: *Iris grossheimii*

The plants are listed in two sections; one for monocotyledons and the other much larger section for the Dicotyledons. I very much like the addition of six pages each containing 12 images to help the user identify the main plant families which in turn will help to navigate the rest of the book where the plants are listed alphabetically under their plant families. I also find the consistent layout using two columns per page where the upper two thirds contain the pictures with the descriptions in the bottom third very logical and easy to search through plus there is a small map at the bottom of the page indicating the distribution of each plant in Armenia. Sometimes there is a single image of the plant in the upper part sometimes where appropriate to aid identification there are two.

Orchis simia

Some of the plants, especially those with smaller flowers, can be challenging to photograph overall the photographs are of a good quality and again serve to help identify the subject.

Reading the author's introduction I was struck by how the love and enthusiasm she has for the plants of her homeland have driven Tamar Galstyan to seek and then share this knowledge, first through her Plants of Armenia Facebook page which then, with the help of her collaborators including Christopher Gardner and the publisher resulted in this book.

With pictures and descriptions of 1000 plants including bulbs, herbaceous plants, woody plants, grasses and ferns this is an impressive list but in the words of the author 'I only regret the limited number of species included here, but to have included more would have made the book too large and unwieldy. A good reason to plan a second book!'.

There are many plants in this book that I have simply not seen before and I concur with the publicly expressed opinion of Panayoti Kelaidis (Senior Curator at Denver Botanic Gardens): 'Wow! This is a remarkable and significant contribution to the literature of the region. The Photography is exceptional and despite my vast botanical library I've not seen at least 50% of the plants in any other book of this nature.'

This is a wonderful introduction to the plants of Armenia as well as a field guide and I have thoroughly enjoyed looking at the wide range of plants illustrated.

I for one would look forward to a second book. J.I.Young