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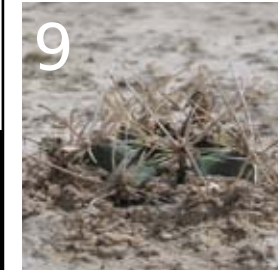
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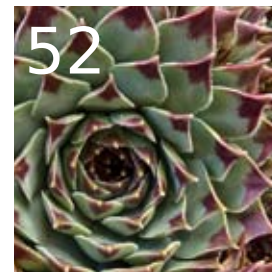
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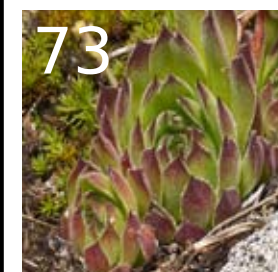
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# EDITORIAL



*The advent of the digital era has changed every moment of our lives, even the shortest ones.*

*Until a few years ago, if one wanted to read about succulent plants, the choice was between buying expensive publications or becoming a member of a specialized association; whilst now the appearance of several online magazines, often free of charge, allows everybody, including those who can't afford to pay for it, to have access to Knowledge.*

*This is a major step forward, since Knowledge is everybody's natural right.*

*With this in mind, we present to you Acta succulenta, a new international magazine, free of charge and the first magazine published simultaneously in three languages; Italian, French and English.*

*Whilst our goal will be that of maintaining a highly varied content, we'll try to emphasize European succulents, often neglected by succulent enthusiasts.*

*In this first issue, in addition to a new species of Nolina, we introduce the area around La Quiaca, Argentina and feature an article on a Mexican Ancistrocactus. We'll also start to present the little known succulent halophytes, those that live by the sea. We then continue with an article devoted to two Caucasian houseleeks, re-publishing the first issue of «Urcaela», a series devoted to the genus Sempervivum. In this first installment, the star is Sempervivum calcareum.*

*We close with an article discussing fertilization, with the opinions of an expert who will enlighten us with the pros, the cons, and everything in between that we should know about feeding succulent plants.*

*We'll do our best to make a complete magazine, hoping to satisfy all tastes.*

*Davide Donati*

# *Nolina pollyjeanniae*

a new species from Oklahoma

*by Fritz Hochstätter*





**Abstract:** A new species of *Nolina* from central-western United States, Section *Erumpentes* (Trel.) Hochstätter, *Nolina pollyjeanneae* sp. nov. is described and illustrated.

**Key words:** *Asparagaceae*, *Nolina*, *Nolinaceae*, United States.

## Introduction

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The genus *Nolina* Michaux is a morphologically heterogeneous group of North-American plants, belonging to the family *Asparagaceae* (*Nolinaceae*). If members of the Section *Arborescentes* Trel. can be considered as true trees, with a robust and tall trunk (sometimes branching after flowering), which develop numerous, long and fibrous leaves at the top, some species of *Nolina* show a morphology with very short, succulent stems (a sort of caudex for some species) and with grassy leaves. These plants belong to the Section *Erumpentes* (Trel.) Hochstätter.

## The plant

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In the central-western USA, in the Cimmaron River Valley in northwestern Oklahoma State, at an elevation of 1300 m asl, an interesting endemic grass-like *Nolina* grows isolated on gentle limestone slopes, on dry rocky hills in open woodland.

This plant forms compact clumps 1-2 m wide. *Nolina greenei* S.Watson ex Wooton & Standl. and *Nolina texana* S.Watson are the grass-like species of *Nolina* geographically and ecologically closest to this taxon. The following table compares their characteristics:

	<i>Nolina sp.</i>	<i>Nolina greenei</i>	<i>Nolina texana</i>
Stem	Clumps of acauline rosettes, up to 2 m in diam.	Clumps of acauline rosettes, up to 1.5 m in diam.	Clumps of acauline rosettes, up to 1.5 m in diam.
Leaves	80 cm long, 2-4 mm (up to 4-8 mm) wide, grass-like, green, convex at the base then concave, flexible and barely fibrous, leaf margin finely denticulate.	120 cm long, 2-4 mm wide, grass like, pale green in colour, applanate, rather rigid, finely fibrous, leaf margin smooth.	150 cm long, width variable (2-8 mm), grass like, stiff, pale green to yellow in colour, completely convex, roughly fibrous, leaf margin rarely slightly denticulate at the base.
Inflorescence	Variable, 40-80 cm tall, generally exceeding the leaves.	Variable, 30-70 cm tall, often not exceeding the leaves.	Variable, 30-60 cm tall, not exceeding the leaves.
Distribution range	Oklahoma, at 1300-1350 m asl.	New Mexico-Colorado border, at 1500-2000 m asl.	Texas-New Mexico, at 200-1700 m asl.
Habitat	Rocky limestone hills in open woodland; woodland.	Rocky limestone/volcanic hills in open woodland.	Rocky limestone/granite hills, in grassy shrubland.

As evident in the table, the nearest species is *Nolina greenei* which in contrast has smooth, applanate and larger leaves, with smooth leaf margins. Furthermore, *N. greenei* grows quite far from the habitat of this new *Nolina*, at higher elevations on the state border between New Mexico and Colorado, on flat volcanic/limestone hillsides, in open woodland.

For this reason, in my opinion this *Nolina* from Oklahoma can be described as a new species.





*Nolina pollyjeanneae* F.Hochstaetter, sp. nov.

*Nolina* caespitosa, 1-2 m in diametro ; *rosulis* acaulibus, multis ; *foliis* tenuibus, herbaceis, vix fibrosis, marginibus minute denticulatis, lamina inferne convexa, superne concava ; *inflorescentia* saepe superans folia.

Affinis *N. greenii*, quae foliis latioribus, marginibus levibus nec denticulatis, differt.

Habitat in America septentrionali, in regione Oklahoma, in valle fluminis dictis Cimmaron, ad 1300 m alt. s. m., in calcareis saxosis collibus.

**Typus a mihi designatus:** leg. Fritz Hochstätter, n° FH-0523.50, 2010-06-25 ; "USA, Oklahoma, Cimmaron River Valley, 1350 m" ; Holotypus SRP, Isotypus: HEID.

**Specimina visa:** *N. pollyjeanneae* : [Oklahoma] FH-0523.50, FH-0523.51, FH-0523.51 (foliae), in Herb. F. Hochstätter — *N. greenii* : [New Mexico] FH-0523.52, FH-0523.54, FH-0523.55 ; [Colorado] FH-0523.56, FH-0523.57.



**Description :** *Nolina* acauline forming robust clumps 1 to 2 m in diameter; leaves thin, grass-like, 40-80 cm long, 2-4 mm wide at the base, deep green, quite flexible, convex at the base then concave, tip fibrous and tapered; leaf surface smooth on the upper side, rough on the lower side, leaf margins finely denticulate; inflorescence central or lateral in the rosette of leaves, generally exceeding the leaves in height, branched, paniculate, 40-80 cm tall; flower white - greenish, 2 to 3 mm wide; fruit a unilocular capsule, light brown to almost transparent, 3-4 mm wide; seeds spherical, brown, 2-3 mm in diameter. The flowering period is May/June.

**Distribution:** *Nolina pollyjeanneae* is endemic in the state of Oklahoma, Cimmaron River Valley, at an elevation of 1300 m asl, on rocky limestone hills, in open woodland, and pinyon/juniper woodland; often associated with *Yucca harrimaniae* subsp. *neomexicana* (Wooton & Standl.) Hochstätter, *Cylindropuntia imbricata* (Haw.) F.M.Knuth and *Opuntia* sp.

Dedicated to my big kid Polly Jeanne. ■

**Aknowledgements:** a gratefull thank to Cathy Daniel, Jeff Thompson, Roy Mottram, Davide Donati, and to Gérard Dumont for the Latin diagnosis.

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# *Ancistrocactus* Britton. & Rose, considerations on a quasi-geophytic plant.

*by Davide Donati*





Cuatrociénegas

**M**EXICO is considered to be one of the best known countries for biodiversity, thanks to the incredible variety of habitats which can be found on its territory. Furthermore, some Mexican regions are noted for their high levels of evolutionary pressure (any cause that reduces reproductive success in a proportion of a population potentially exerts evolutionary pressure), that it is possible to find distinct forms of the same species separated only by a few kilometres.

Situated in the central part of the Mexican state of Coahuila, the Bolson of Cuatrociénegas is an area famous for its high biodiversity. In the middle of one of the driest parts of the Sonoran desert, clean water flows and forms rivers and lakes, which provide hospitality to endemic fish, turtles, and even living fossils such as stromatolites (concretions created by colonies of cyanobacteria).

## The discovery

Some years ago whilst I visited the Cuatrociénegas area on a day after a heavy rainstorm, the ground was already dry and dusty on the surface, but a few centimetres below, the soil was still moist.

Walking on alluvial areas, rich in salty deposits, among the few dry grasses I saw a pile of fresh soil, which looked like the tunnelling of a rodent. Curious, I went closer and I saw some hooked spines emerging from the soil, which highlighted the presence of a small cactus covered by a thin layer of earth. Upon cleaning up the plant I realized that it was a small member of the genus *Ancistrocactus* Britton. & Rose<sup>(1)</sup>.

The rains that hit the area the next evening helped me to find other specimens in the following days. The plants took advantage of the heavy rains, their stems swelling with the liquids absorbed by the roots, so that they were able to emerge above the surface of the soil again.

1 In this paper I reject the proposal to include the genus *Ancistrocactus* in the genus *Sclerocactus* Britton & Rose for the following reasons:

- *Ancistrocactus* develops indehiscent fruits, very fleshy and juicy ; *Sclerocactus* produces dehiscent fruits, dry once ripe.
- *Ancistrocactus* has peculiar seeds, with tegument furrowed by fine and linear intrusions, forming a sort of structure divided in geometrical cells, finely papillate; *Sclerocactus* seeds presents a tegument normally papillate (Doweld, 2001).
- Chloroplast DNA evidence (Barcenas et al. 2011, Butterworth et al., 2002) shows the genus *Ancistrocactus* closer to *Thelocactus* (K.Schum.) Britton & Rose, *Ferocactus* Britton & Rose ed *Echinocactus* Link & Otto, more than to *Sclerocactus*.
- Hunt et al. (2006) mentions molecular evidence which supports the inclusion of *Ancistrocactus* in *Sclerocactus*, but these studies are not reported; furthermore,, the studies which support this thesis, analyze very few species which questions the inclusion of *Ancistrocactus* in *Sclerocactus*.
- The inclusion of *Ancistrocactus* in *Sclerocactus* is based on few characteristics, like the naked pericarpel, usually scaled (as in many other North and South American genera of *Cactaceae*), the presence of glands on the elongated areoles (like in many other genera of *Cactaceae*), and the hooked spines (like hundreds of other species of *Cactaceae*). I think that these characters have a secondary relevance, in respect of the data reported here at points 1, 2 and 3.

A plant just emerged from the soil, still partially covered by the gypsum sand.





Habitat of *Ancistrocactus* sp.



## The plant

For many years the existence of a strange *Ancistrocactus* has been reported in the vast area of Cuatrociénegas. Some people have even compared it with a member of the genus *Sclerocactus* sensu stricto, consequently surrounding this plant with an aura of mystery, given the difficulty in detecting it and also of the fact that this plant seems to disappear so rapidly from sight. Few people can actually confirm that they found this plant in habitat.

This is due to the most interesting characteristic of this *Ancistrocactus*; the ability to remain out of sight below the soil surface, dormant even for months, covered by a layer of dust and dirt which protects it from sun and drought and also hiding it from the eyes of potential predators. Once the rains arrive and the water supply is sufficient to allow a good absorption, it can swell up and appear on the surface.

This is largely possible because the stem of this plant, in particular its epigeous portion, can retract for several millimetres, especially in its lower portion, near the neck. This plants is able to survive dormant for several months, hidden below the surface, thanks to its enormous tuberous root, often bi or trifurcate, which often looks disproportionate to the stem. When the weather is rainy, the root is able to absorb the water quickly, so the plant appears rapidly on the surface.

Specimens that show adult spination, with 4 central spines pink and rigid, not flattened, the lower hooked are rare, while more numerous (but still not common) are the specimens that bloom when they are still showing a juvenile spination, with no central spines. The juveniles, with the body completely flattened on the ground and 6-10 radial spines per areole, are quite similar to other cacti, so they can be confused with other *Cactaceae*, such as juvenile forms of *Mammillaria heyderi* Muel., or *Coryphanthas*.

One of the most distinctive characters of this plant, however, is the flower. Its size is unusual for the genus *Ancistrocactus*, since it can exceed 4 cm in diameter and is able to emerge and open above the spines, thanks to a long pericarpel, adorned with few, big scales. The petals are large, silky, over 3 cm long and white with a purplish midstripe. A young plant, 2 cm in diameter, can develop a flower wider than 3 cm.

The fruit is large, sometimes 3 cm in length, and contains large seeds, 1.5-2 mm long, contained in a mucilaginous pulp.



## In conclusion

The characteristics of this plant are peculiar, even if we compare it with the form 'megarhizus' of *Ancistrocactus scheeri* Britton & Rose, a plant typical of areas at low altitude, which also develops a big, tuberous root. The ecology of the *Ancistrocactus* from Cuatrociénegas is an important distinctive character from the rest of the species.

Some authors considered the plant from Cuatrociénegas as *A. brevihamatus* var. *pallidus* A.D.Zimmerman ex A.M.Powell. I have observed the latter plant in south-western Texas, not far from the Big Bend area and note that its morphology and ecology are similar to *Ancistrocactus scheeri* and *A. brevihamatus* (Eng.) Britton & Rose, with yellowish spines rather appanate and quite flexible, and a small flower (2 cm wide) with narrow petals, unusually white, or yellowish/pinkish. This plant grows primarily in flat and gravelly areas, not on clayish alluvial plains, with strong accumulation of salts and having a quite distinct ecology from the plant from Cuatrociénegas.

A plantlet of *Ancistrocactus* sp, almost invisible in the gypsum soil, despite heavy rainfall.

There are many noticeable differences between the plant from Cuatrociénegas and all other species of *Ancistrocactus*, and in-depth studies are needed to better understand its relation with *A. brevihamatus*.

However, I think the first step is a clarification about the relationship between *A. brevihamatus* and *A. scheeri*, presently considered as a distinct species. They are very similar in morphology and ecology except for a few characteristics, and some intermediate forms grow in the Mexican states of Coahuila and Nuevo León, with progressive intergradations, and consequently some *in situ* data could lead us to consider them as a single species. ■

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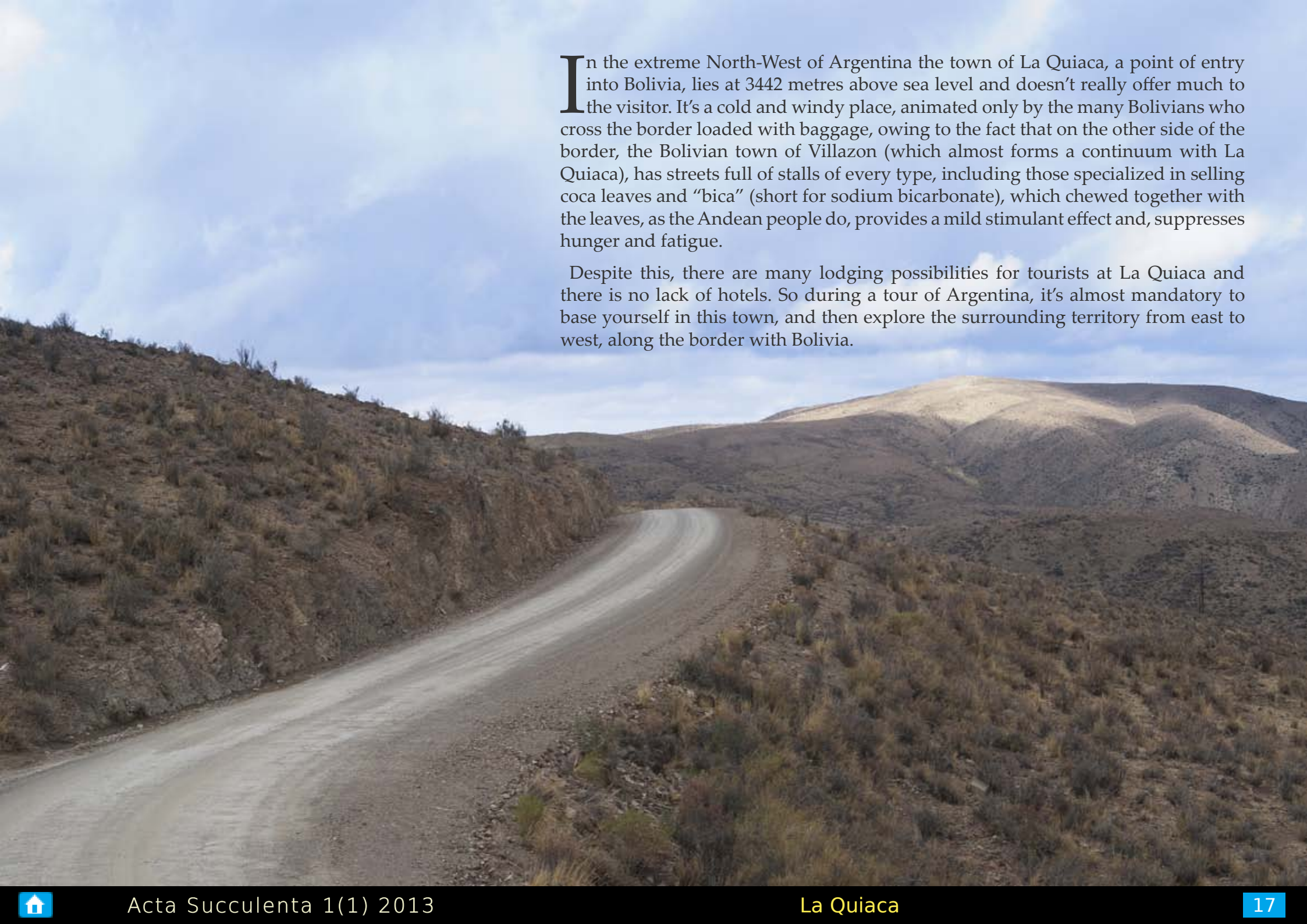
# La Quiaca

## Cactuslands on the border

*by Elvia Speranza and Moreno Centa*





A wide-angle photograph of a dirt road curving through a dry, hilly landscape. The road is light-colored and appears to be made of packed earth or gravel. The hills are covered in sparse, dry vegetation, including small shrubs and grasses. The sky is filled with soft, white clouds, and the overall lighting suggests a bright but slightly overcast day. The road leads the eye from the foreground into the distance, where the hills continue to rise and fall.

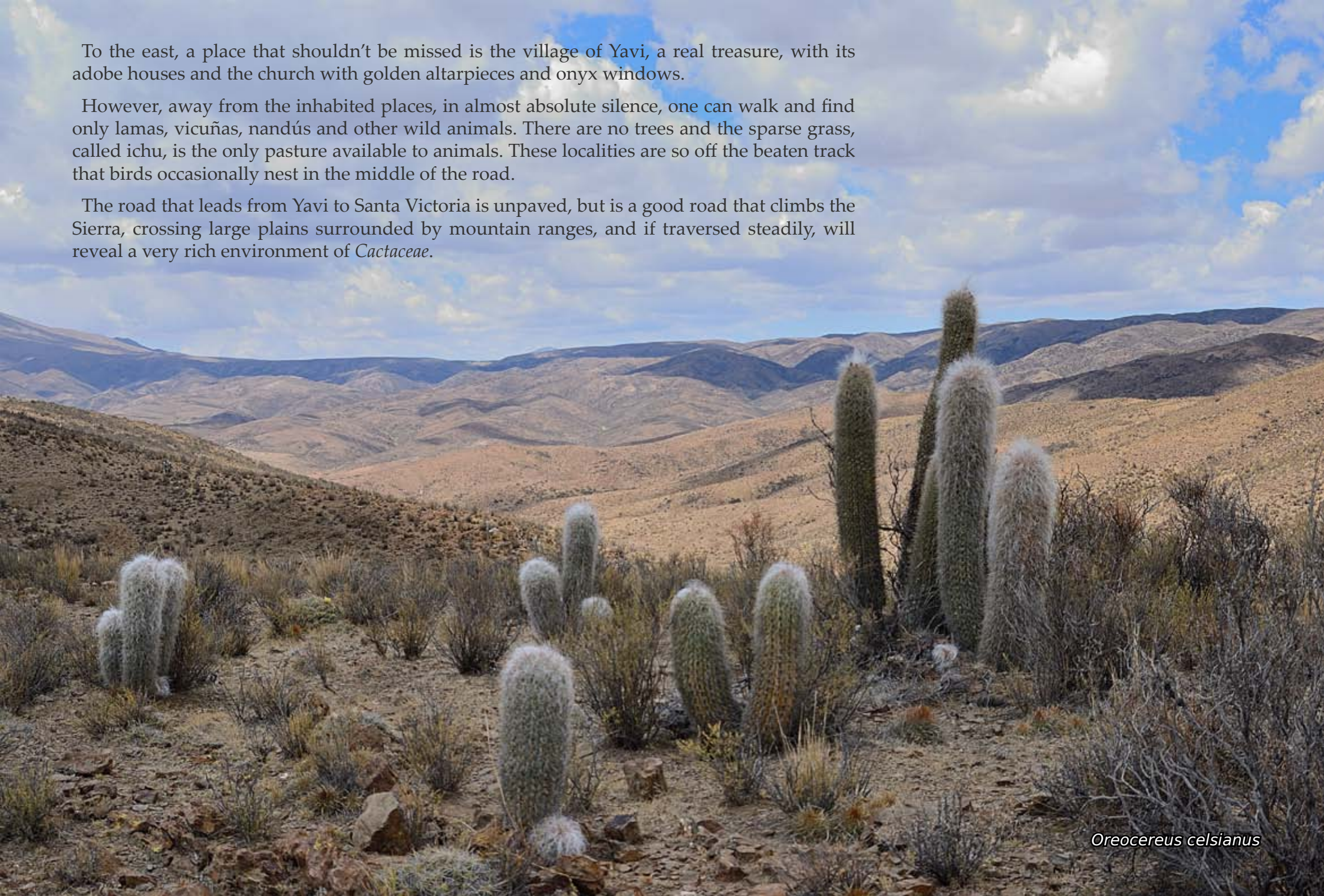
In the extreme North-West of Argentina the town of La Quiaca, a point of entry into Bolivia, lies at 3442 metres above sea level and doesn't really offer much to the visitor. It's a cold and windy place, animated only by the many Bolivians who cross the border loaded with baggage, owing to the fact that on the other side of the border, the Bolivian town of Villazon (which almost forms a continuum with La Quiaca), has streets full of stalls of every type, including those specialized in selling coca leaves and "bica" (short for sodium bicarbonate), which chewed together with the leaves, as the Andean people do, provides a mild stimulant effect and, suppresses hunger and fatigue.

Despite this, there are many lodging possibilities for tourists at La Quiaca and there is no lack of hotels. So during a tour of Argentina, it's almost mandatory to base yourself in this town, and then explore the surrounding territory from east to west, along the border with Bolivia.

To the east, a place that shouldn't be missed is the village of Yavi, a real treasure, with its adobe houses and the church with golden altarpieces and onyx windows.

However, away from the inhabited places, in almost absolute silence, one can walk and find only lamas, vicuñas, nandús and other wild animals. There are no trees and the sparse grass, called ichu, is the only pasture available to animals. These localities are so off the beaten track that birds occasionally nest in the middle of the road.

The road that leads from Yavi to Santa Victoria is unpaved, but is a good road that climbs the Sierra, crossing large plains surrounded by mountain ranges, and if traversed steadily, will reveal a very rich environment of *Cactaceae*.



*Oreocereus celsianus*



*Austrocylindropuntia shaferi*



*Yavia cryptocarpa*



*Austrocylindropuntia shaferi*

Even those who aren't interested in opuntiods, will be intrigued by the colours, shapes and the extraordinary spines of plants such as *Maihueniopsis hypogaea*, *Tephrocactus nigrispinus*, *Cumulopuntia boliviana*, *Cumulopuntia boliviana* ssp. *dactylifera*, *Tunilla tilcarensis* and *Austrocylindropuntia shaferi*, which grow on the slopes and plains in this area. Both lovers of globular and columnar cacti won't be disappointed, since *Oreocereus celsianus*, *O. trollii*, *Lobivia ferox*, *Parodia maassii*, etc. can be spotted almost everywhere.

*Azorella compacta*, an *Apiaceae* called yareta or llareta merits particular mention. This lives between 3000 and 4500m a.s.l., forming mats of microscopic rosettes of a bright green colour that really stand out between the rocks. In the past it was intensively harvested and used as domestic and industrial fuel, but luckily it's protected nowadays.



*Parodia massii*



*Lobivia ferox* × *pugionacantha*



*Austrocyllindropuntia verschaffeltii*

Moving westwards, the Ruta Nacional 40 follows the border with Chile for thousands of kilometres, terminating at Ushuaia, in the Tierra del Fuego. This road is mainly unpaved and difficult, if not impossible to transit during the rainy season, and is challenging to drivers even during the dry season. Don't think however that this is an inhabited land, since even here, where the Andes are higher than 5000 meters, you can find small villages that seem fixed in time. The area is rich with lagoons, and sometimes just a short detour is enough to see incredible spectacles such as the pink flamingoes of Laguna Pozuelos.



*Cumulopuntia* sp.



*Lobivia ferox*



*Tunilla tilcarensis*

Let's not forget our beloved *Cactaceae* though, since there's a high variety of species in this area. First of all, the rare and elusive *Yavia cryptocarpa*, whose distribution range is limited to just a few hills, and has a low population density. It's even possible to find true forests of *Oreocereus celsianus*, whose woolly hairs shine under sunlight, especially when back-lit, creating incredible atmospheres. Here and there, *Parodia maassii*, *Rebutia pygmaea*, *Lobivia pugionacantha* subsp. *pugionacantha*, *Lobivia ferox* var. *longispina*, etc. stand out and it's even possible to find hybrids between *Lobivia ferox* and *L. pugionacantha*.

We must also not forget the above mentioned plants such as *Tunilla tilcarensis*, *Austrocylindropuntia shaferi*, *A. verschaffeltii*, *Cumulopuntia boliviana*, etc...



*Yavia cryptocarpa* (crested plant)

We consider that a stop in La Quiaca is recommended to any visitors interested in nature in its various forms, in addition to finding interesting cacti, and not forgetting that from here it's quite easy to descend towards Jujuy, to the Quebrada Humahuaca, another unforgettable place.

We'll talk about this later, before we have to speak about the plants we mentioned... ■

# *Crithmum maritimum*

the succulent of storms

*by Gérard Dumont and Antoine Mazzacurati*



ONCE upon a time there was a fairy, whose flighty husband had a mistress. The jealous fairy in revenge changed him into a fish, and his mistress into a plant living on a sea-facing cliff, condemned to see each other forever, but unable to touch. This is how a Breton legend<sup>(1)</sup> explains the origin of skaouarc'h, *Crithmum maritimum* L.

Don't worry, *ACTA SUCCULENTA* doesn't have any intention to become a journal specializing in fairy tales and myths, but simply wishes to put some emphasis on indigenous succulents that inhabit our regions and on their environments, and thus, among these, the sea-coastal environments. Indeed, the maritime succulents are often overlooked and poorly known by enthusiasts, although they are really extremely interesting, due to their very peculiar ecology, and the complex survival strategies that they developed in order to survive in an environment very hostile to superior plants.

The first article of this series is devoted to *Crithmum maritimum*, a plant strictly confined to coastal areas but also a true succulent plant. This plant gracing rocks and cliffs in most of Europe is also one of the very few succulents which it's possible to appreciate the scent of the leaves before...eating them.

Very few lovers of succulents plants would never have been to the coast, on the Mediterranean, as well as the Atlantic, and all the readers of this journal have probably seen this plant, so common on our coasts. But would they have examined it? No? Well...we are going to fix this oversight.

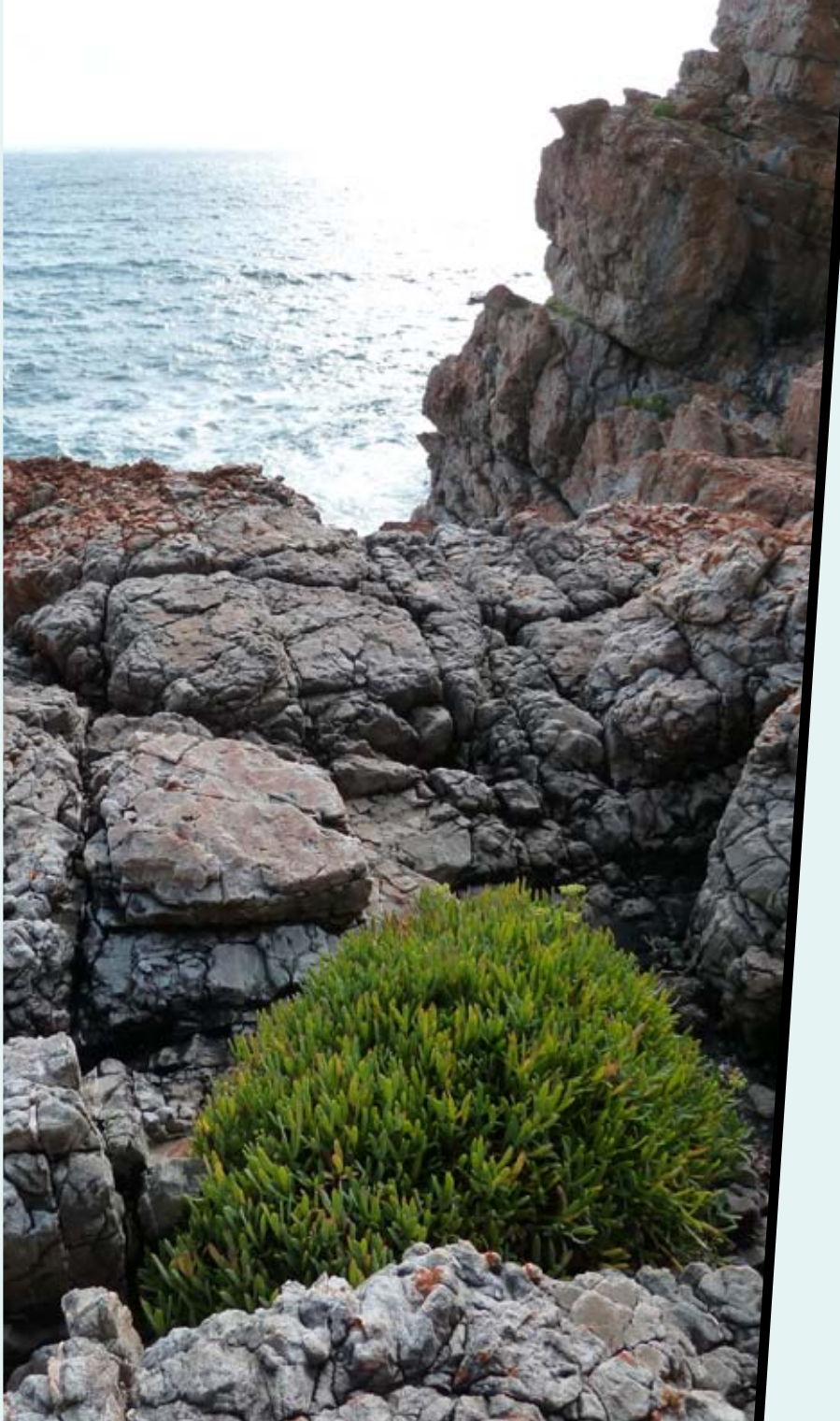
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1 Reported in Allaire D. (2012), *Étonnante flore de Bretagne*









## Ecology

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*Crithmum maritimum* is a maritime, heliophylous plant, mainly saxicolous (i.e. living on rocks) and generally rupicolous (i.e. living on more or less vertical cliffs). Most often it appears as a chasmophyte (i.e. a plant that lives in crevices).

### A maritime plant?

*Crithmum maritimum* is a maritime succulent. Well, but what's a maritime succulent? And, more generally, what's a maritime plant?

A maritime plant is a plant that lives in places where it's *directly* influenced by the sea. In practice, maritime plants are those plants that spontaneously grow on the narrow coastal strip between the sea and the natural limit <sup>(2)</sup> of the scrubland that precedes the trees.

The vegetation of this maritime strip is itself divided into several rather well individualized strips, running parallel to the coastline, with variable width, some being very narrow (a few meters or sometimes a few decimeters). This horizontal ecological partition is similar to that, vertical, of high mountains. The difference between "coastal plant" and "maritime plant" is very similar to that between "mountain plant" and "alpine plant".

Be careful, a *maritime* plant isn't a *marine* plant, since this term describes the few superior plants that live *in* the sea. They are actually very few among the superior plants.

---

<sup>2</sup> This *natural* limit is very often a *virtual* limit, far from what the *real* limit on the field, due to agriculture, urbanization, tourist flow, and attempts to stabilize the dunes through reforestation...

## Its domain, the spray zone

On the coast, *Crithmum maritimum* occupies a rather narrow strip starting from the upper part of the tidal zone, at the spring tide high water mark, up to the upper limit of the part of the sea cliffs that is exposed to sea spray. One might even consider that this plant 'draws' on the coastline with great accuracy, the so-called "spray zone". From a phytosociological point of view, *Crithmum maritimum* represents a characteristic and one of the best indicative elements of the floral community of the spray zones of the European rocky coasts.

In addition to the rocks, *Crithmum maritimum* can be found on certain pebble bars, where it can be abundant but only if they are sufficiently stable, therefore a few back from the sea, while it is generally absent on the moving bars. It's also possible to find it on sandy substrates, at the margins of lawns bordering beaches, mainly in the Mediterranean area, where tides are limited; on the Atlantic coast it more rarely grows there, as well in semifixed dunes, and is less abundant than on rocks, which are its ideal habitat. It should be noted that, when *Crithmum maritimum* is found on sandy substrate, this last is often only a layer of sand covering rocks or a pebble bar in which its deep roots dive. *Crithmum maritimum* is completely indifferent to the soil's pH, and acidic or alkaline, it makes no difference.





*Crithmum maritimum* withstands water spray perfectly and even tolerates strong splashing waves, but doesn't like to be submerged, except for very short and temporary periods. It is particularly abundant in very exposed areas like rocky points facing the open sea, where it can withstand persistent winds and heaviest storms, unscathed. In such places, it is often the dominant plant and can even form flourishing, mono-specific populations, literally covering the rocks. Along the Atlantic coast, in exposed rocky places, *Crithmum maritimum* is the superior plant that comes closest to the high tide limit<sup>3</sup>.

It's also possible to find it abundant in anthropized environments, like the damaged joints of harbour walls, the crevices and cracks in the docks, the stonewalls facing the sea, etc.

In short, it's an opportunistic plant, ever present and commonplace along the Atlantic and Mediterranean coast, with a strong potential for colonizing and dominating inside the "spray zone".

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<sup>3</sup> In sandy areas, some other succulents do better, growing even below the high tide limit, we'll talk about this here in the future. That's the same for some plants from the high slikke of the mudflats.



## Living on rocks doesn't mean having a "poor appetite"

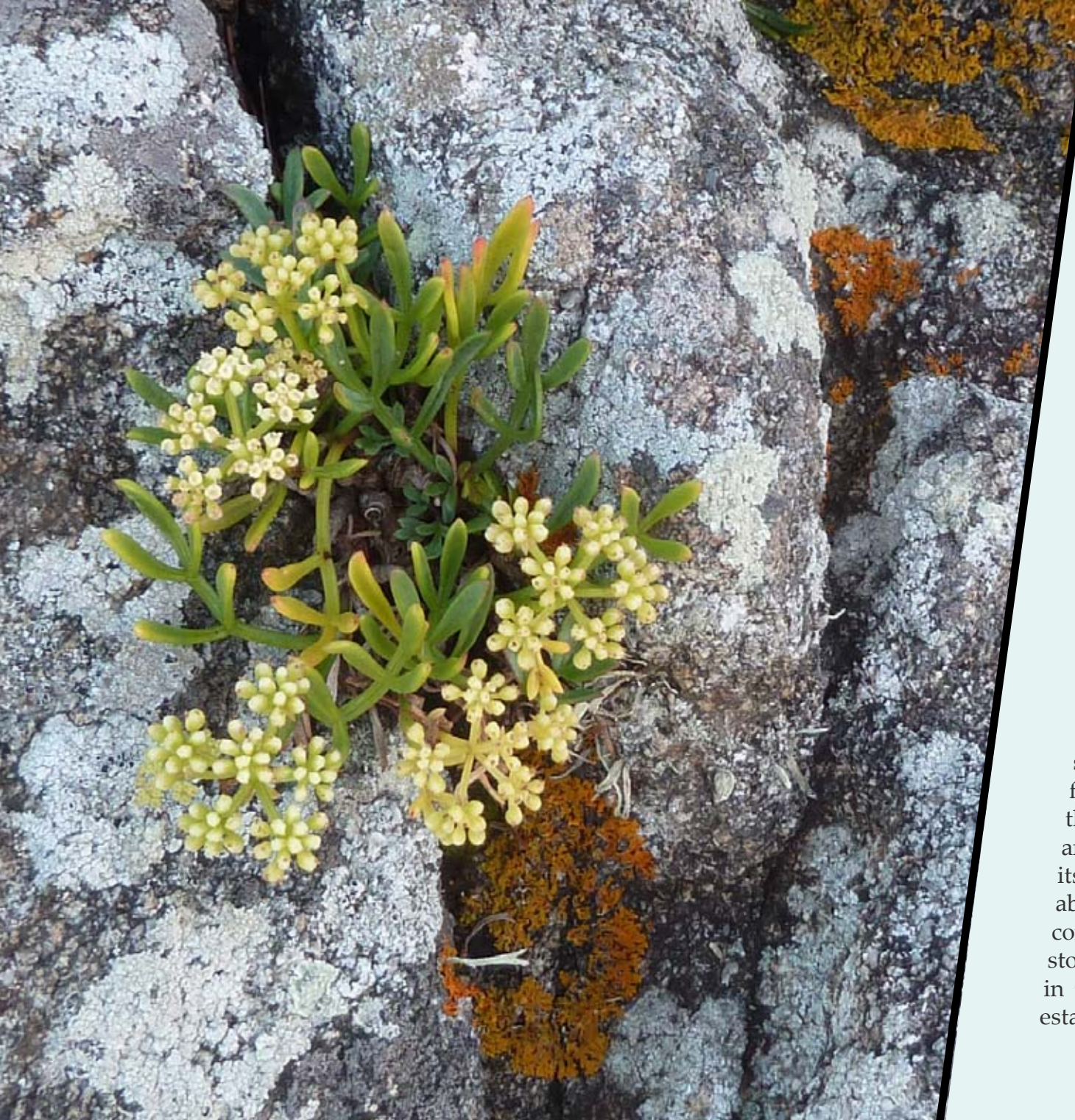
Like many maritime plants, *Crithmum maritimum* ecologically behaves like a nitrophilous halophyte<sup>(4)</sup> (the two words are often condensed in halonitrophilous), that is, a plant that accepts (or sometimes needs) a relatively high salinity in the substrate (*halophyte*), as well as liking or needing high quantities of nitrogen.

Isn't it a paradox that a nitrophilous plant, lives on mainly mineral, bare rocks? Absolutely not!

In reality, despite their strong « mineral » look, the sea-facing cliffs, or, more exactly, the fissures and crevices within them, are very rich in nutrients: the wind as well as the sea, by the sprays and the tempest waves, regularly deposit organic matter and salts, which are caught in the cracks by runoff. Then the rain, washing the remaining deposits, increases this phenomenon of concentration of nutrients in the cracks.

<sup>4</sup> The term *halophyte* has the opposite meaning of *glycophyte*, which describes a plant unable to withstand even slight and temporary increases of salinity in the substrate caused by the chlorides, that is, the majority of plants





## An indissoluble couple, the plant and the rock

The main factors that limit the establishment of plants in the crevices of the maritime rocks are mechanical (the strong winds and the waves of the high tides can break the aerial part of a plant or even uproot it completely) and osmotic: the high concentration of sodium chloride (NaCl) of these substrates, makes them physiologically dry even when they are permeated with water. Various xerophilous adaptations, like a cutinized epidermis, epidermal wax, a strong osmotic pressure powered by the roots, and, of course, a certain degree of succulence, should come as no surprise even in these apparently very wet environments during a large part of the year.

*Crithmum maritimum* is a good example of such an adaptation, since it can withstand both mechanical and osmotic adversities: for the mechanical resistance, its stems are at the same time flexible and rich enough in structural fibres, and don't easily break (except at the end of the growing season, when the fruits are formed, and then they can easily break at their base); its hemispherical clumps of dense, thin leaves, absorb and mitigate the wind pressure without contrasting it, and, in case of major damage, its stock and its long, tuberous roots, deeply anchored in the crevices, quickly sprout new stems. Once established, nothing can remove it.



This perfect adaptation to very exposed coastal environments is a remarkable selective advantage in the maritime rocky areas that are the favourite biotope of *Crithmum maritimum*. As a consequence, the plant is very abundant in these places<sup>(5)</sup> whilst it's completely absent even a few meters or a few decimeters in the hinterland, where a less specialized flora is more competitive and replaces it.

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5 In the Atlantic area, naturalists commonly use the term "Crithmum rocks" to define the rocks in the spray zone: the plant is so linked to its environment, that it's used to define the environment itself.



## When the sea acts as a stork

To be clear, the factor that limits the distribution of *Crithmum maritimum* to the spray zone isn't just natural competition, but also the way it's disseminated: thalassochory. This term describes any way of an organisms dispersal by the sea (from Greek *Thalassa*).

Indeed, *Crithmum maritimum*'s seeds (achenes really, cf. infra) are perfectly adapted to this type of dispersal: corky and very light, they are easily captured by the strong autumn winds, but, if they don't quickly land inside a crevice, sooner or later they fall in the sea, or are captured by sea waves during storms. Their low density allows them to float<sup>6</sup> for a long time, and sea currents can transport them far away, without any problems, since germination is inhibited while they are floating on sea water.

The waves crashing on the cliffs will deposit them, but even this violence can be well withstood, since the seeds' fibrous shell will protect them perfectly from the repeated clashes on the rocks, and help to anchor them in the crevices thanks to their half-moon shape and a slightly grooved surface. The seeds will then remain dormant until the first good soaking by fresh water.

<sup>6</sup> The seeds of most plants sink in water, as a matter of fact, gardeners put the seeds in water to discard the dead ones, which stay afloat. With *Crithmum maritimum* this test is without valour: in sea water its seeds float nearly indefinitely and, in soft water, they sink only after a few days.







## Distribution

*Crithmum maritimum* has a vast distribution range, an obvious consequence of the above-mentioned thalassochory, which allows it to easily colonize all suitable places.

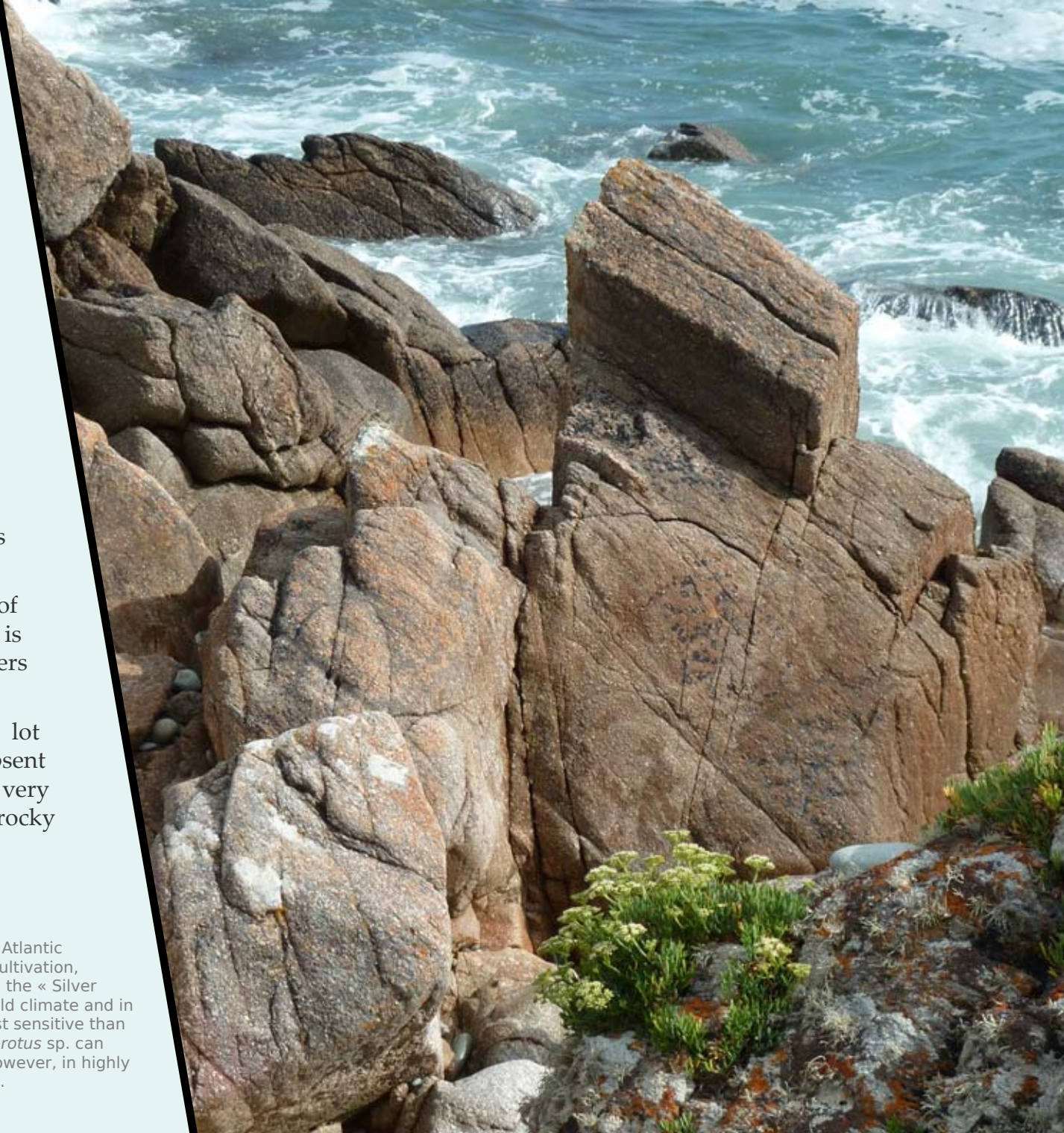
*Crithmum maritimum* is present and spontaneous in all the European Atlantic coastal zones (including the British Isles), on the coasts of the British Channel, Northern Africa, the Canary Islands and Madeira. It penetrates, even if just a little, in the North Sea (Belgium and Netherlands), where it's rare and localized though, mainly being present in the anthropized areas (dikes, etc.).

*Crithmum maritimum* is equally present, but with some gaps, on the entire Mediterranean coast (islands included) and the Black Sea.

We shouldn't forget that despite the thousands of kilometres covered by its distribution range; this is really a very narrow strip, just a few dozen meters wide, at most!

Throughout its range its abundance varies a lot depending on the type of coast: it is rare or absent along the sandy coasts with dunes, on the contrary very abundant and common, often dominant<sup>(7)</sup>, on the rocky European Atlantic coasts.

<sup>7</sup> One of its most successful competitors seems to be, on the Atlantic coast, an introduced maritime plant, escaped in ancient times from cultivation, but spontaneous on the Mediterranean coasts: *Senecio cineraria* DC., the « Silver Ragwort », but this competition is limited to those localities with a mild climate and in not very exposed situation, since *Senecio cineraria* is much more frost sensitive than *Crithmum maritimum*. The invasive South-African *Aizoaceae*, *Carpobrotus* sp. can also strongly compete in protected situation in mild climate areas. However, in highly exposed to the sea localities, *Crithmum maritimum* reigns unrivalled.







From the coast of Ulster (left) to the Adriatic coast (right) via that of Brittany (middle) and many others, *Crithmum maritimum* is present everywhere.



## Description

**Clump:** lively plant that forms a clump with a flattened and irregular dome. Stems and leaves are a vivid and bright green colour, sometimes more or less glaucous or very glaucous, depending on the geographical origin, with the Mediterranean populations generally more glaucous than the Atlantic ones, but this is not a rule. The clump's height varies from 20 to 30 cm, but much less in very exposed areas (just some cm in these cases), where the plant looks much more compact, dense and more succulent.

**Stems:** fibrous, slightly woody at their base, especially on the joint with the neck, often slightly zigzagging, little or no branching, except on the upper portion (the branches bear umbels). Stems desiccate more or less completely after fruiting and are regularly renewed (every year in exposed environment). New stems appear at their base or directly from the neck.

**Leaves:** persistent; alternate with amplexant base without stipules; petiole branching in 2-3 levels; succulent leaflets, narrow linear-elliptical, borne vertically or almost vertically.

**Roots:** main roots are tap roots, thick, few, very long compared to the plant's size; they penetrate very deeply into the crevices searching for humidity and strongly anchor the plant. Secondary roots scarcely developed.

**Flowering:** starting from end of June/beginning of July, and lasting all summer, up to the middle and sometimes even up to the end of autumn. The plant can bear flowers and fruits at the same time. The inflorescence is typical of the *Apiaceae*: an umbel of umbels. The latter are made by tiny hermaphrodite flowers, whitish or greenish-yellow, sometimes turning to pink before wilting. The five petals, short and wide, are strongly curved inwards. The inflorescence very much brings to mind that of fennel (*Foeniculum vulgare* Mill.). The highly nectariferous flowers attract not only insects, but, in the Mediterranean area, lizards as well.

**Fruit:** pyriform diachene, that means it's an achene (an indehiscent dry fruit, whose wall doesn't open and is more or less fused with the seed; which is disseminated as it is, despite being a fruit, it functionally behaves like a seed) and it's diachene because it contains two seeds, each inside its own carpel cell; the two portions of this diachene (mericarps) split when the "seeds" are disseminated, but don't open since each portion is an independant achene. The fruit's surface is grooved, with a more or less pinkish-purple colour when fresh, whilst it dries up at maturity before disseminating; its consistency becomes corky and it becomes light and can float, helping its dispersion by wind and waves (cf. supra). Maturity and seeds' dispersion are spread over time, from the beginning of autumn up to the end of winter.

**Other:** like many *Apiaceae*, the plant is rich in essential oils in each of its parts and is thus strongly scented, including the seeds. Its odour is pleasant and spicy, and it can be described as something in-between a fennel, a carrot and a lemon. The leaves are edible when fresh, and have a strong, salty and spicy taste, very pleasant during spring; then fading and becoming much less pleasant by the end of the season.

## Possible confusion

*Crithmum maritimum* is easily recognizable *in situ* and difficult to confuse.

In most of its distribution area, it can't be mistaken with any other plant, with the exception of *Inula crithmoides* L.<sup>(8)</sup> (*Asteraceae* fam.) during the vegetative stage, especially considering that these two plants can intermingle, but, considering that both plants flower throughout summer, it's rather difficult to confuse *Crithmum*'s umbels with *Inula*'s radiating flower heads.

However, in Corsica and Sardinia, the confusion can sometimes occur with another *Apiaceae*, which is endemic from these islands: *Seseli praecox* (Gamisans) Gamisans, which has more numerous, more flattened and wider leaflets. Despite its presence on maritime rocks, it is less maritime than *Crithmum maritimum* and much rarer.

*Crithmum maritimum* is not only an unmistakable plant; it can be recognized even with closed eyes as its characteristic scent eliminates any possible confusion.

<sup>8</sup> We'll discuss this plant in a future article.



*Crithmum maritimum* growing with *Inula crithmoides*.



Pollinating insects are very often small beetles (*Cteniopus sulphureus*).



## Uses

*Crithmum maritimum*, the maritime fennel, was once commonly cultivated in vegetable gardens (with varying degree of success), away from the sea, since those who lived near coastal cliffs were obviously keen to collect the abundant wild plants.

Its strongly tasting aromatic leaves were used as a vegetable (cooked like green beans) or as a side dish (as pickles, like gherkins), and its “seeds” (we should say its fruits) used as spice. In Italy, the inhabitants of the coastal areas used to serve it with fish, pasta or on top of pizza. One of the quickest and easiest way to taste it is to dice its fresh leaves and mix them in a salad with other vegetables<sup>(9)</sup>.

Consumption of *Crithmum maritimum* dates back at least to ancient Greece and ancient Rome. Indeed, this plant is mentioned<sup>(10)</sup>, and its medicinal and alimentary consumption discussed, starting with Dioscorides<sup>(11)</sup> and Pliny<sup>(12)</sup>: in fact, most of the ancient authors of pharmacopeias or alimentary plant treatises mention it<sup>(13)</sup>, right up to modern times. Even Shakespeare, in the 17th century, mentions it<sup>(14)</sup> and emphasizes the dangers of collecting it.

Today, its consumption and cultivation have fallen almost into disuse.

*Crithmum maritimum* is still marginally used in cosmetics due to its richness in essential oils, and the leaves used for this purpose can only be collected in habitat, since only wild plants can produce leaves with a sufficient concentration of essential oils. This collection doesn't affect the natural populations, since the plant is quite common in many places and collections represent just a small fraction of the total number of plants. In many places, like France for example, collections are strictly regulated: leaves are collected only in authorized localities, where the plants are extremely abundant. However, the future lies in the *in vitro* replication of cells, currently in development, but almost a reality for the cosmetic usage of this plant.

For all types of usage, culinary or cosmetic, the best period to collect it is right before flowering, that is, at the end of spring, when its olfactory and gustatory properties are at their best.

Obviously it can be cultivated just for its beauty...

9 **ATTENTION !** The *Apiaceae* family includes many very toxic plants (ask Socrates...), so if you want to taste *Crithmum maritimum*, please make sure it really is this species, since we'd be very sorry to lose readers right after the first issue.

10 The exact identification of plants mentioned in ancient texts is always subject to interpretation doubts, but in the case of Cretmos/Krêthmon it seems to be reliable.

11 Dioscorides, *De Materia Medica*: 2.129.

12 Pliny the Elder, *Historia Naturalis*: XXVI:L (26.50).

13 For an exhaustive list, see F. Borde (1910), *Etude pharmacognosique du Crithmum maritimum* : 100 pp.

14 *King Lear*, Act 4, Scene 6.





## Protection

In the **United Kingdom**, *Crithmum maritimum* is not protected, nationally at least.

In **Italy**, *Crithmum maritimum* is not protected.

In **France**, *Crithmum maritimum* is integrally protected in the region of Aquitaine (Arrêté du 8 mars 2002), since the coast in this region is sandy and the biotopes capable of sustaining it are scarce. In the rest of the territory, *Crithmum maritimum* is included in the list of plants potentially subject to permanent or temporary regulation by the Prefect (Arrêté du 13 octobre 1989) that allows to locally regulate, if necessary, its collection for cosmetic and alimentary uses.

In **Spain**, *Crithmum maritimum* is partially protected in the autonomous region of the Illes Balears (Decreto 75/2005, de 8 de julio); collection for commercial purposes is prohibited without a permit.

In **Algeria**, *Crithmum maritimum* is integrally protected by the Décret exécutif n° 12-03 du 10 Safar 1433 (4 January 2012). The plant is actually rare in this country and is considered to be threatened.



*Crithmum maritimum* growing with another succulent from the maritime rocks, *Cochlearia officinalis* L. (we'll speak about it in a future issue).





## Cultivation notes

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*Crithmum maritimum* can be cultivated in the open ground all year round, in those regions with oceanic or Mediterranean climates at least. The soil should be light and well draining, but rich.

As far as we are aware of, *Crithmum maritimum*, has probably never been cultivated in pots by succulent plant growers, so it's rather difficult to gather any suggestions about the cultivation of an adult plant in a pot. Unfortunately, we are unable to give very reliable advice about that because observation of the wild plant is enough for our happiness.

Like any other maritime plant, *Crithmum maritimum* lives in salty substrates with a strong osmotic pressure, and it's thus useful to be heavy handed with fertilization, not only to feed the plant, but to keep a strong osmotic concentration/salinity in the substrate. Even a pinch of table salt dispersed over the soil from time to time will be well accepted. A very deep pot, filled for the lower 2/3 with a compost rich in organic matter and the top third with thin gravel or coarse disintegrated granite, will help it not to feel nostalgic of its native biotopes.

In order to keep the plant compact, it's better to cut the stems at the base just after flowering. After observing the dwarfed specimen *in situ*, whose aspect reminds that of some *Tylecodon* or *Pachypodium* (with a much less pronounced "caudex" obviously), it's impossible to resist replicating those shapes, with small pots and regular pruning.

*Crithmum maritimum* tolerates temporary aridity, but it isn't rot prone, so it must be cultivated outside all year round even in very humid areas, both due to rainfall and environmental humidity. It needs full sun exposure, but in its natural habitat the proximity with the sea mitigates summer heat, as well as day and night temperature fluctuations. For this reason, in case it's cultivated far away from the coast, in areas with hot weather, it is suggested that a south-east or east facing position would be best.

## Hardiness

*Crithmum maritimum* can withstand only moderate frost (from about  $-5^{\circ}\text{C}$  to  $-7^{\circ}\text{C}$  *in situ*<sup>(15)</sup>, likely less in cultivation). In case of even lower temperatures, the foliage (the little that remains in winter) will be damaged or destroyed, but the plant will resume vegetation from the stock and, in case even this is destroyed, the deep roots will eventually develop new shoots.

It's quite likely, actually certain, that the hardiness of these plants varies with the latitude of provenance, since the winter cold of the Scottish coast is, for instance, slightly more rigid than that of the Tunisian coast!

<sup>15</sup> It's a simple order of magnitude, since it's very difficult to be precise on the seacoast, where the temperature can vary by many degrees simply by moving a few meters.



Aspect during winter

## A question of salt

Traditionally, a spoon of table salt (NaCl) from time to time, at the base of *Crithmum maritimum*, when cultivated in vegetable garden, was suggested as being beneficial: then this practice has been experimentally demonstrated to be useful, a sufficient quantity of NaCl actually stimulates the plant's growth<sup>(16)</sup>, with the optimum concentration found at about 50 mmol/l, a rather modest concentration compared to that of some other mandatory halophytes (mainly plants from sea mudflats), which need much more salt and are, contrary to *Crithmum maritimum*, virtually impossible to cultivate in a normal non-salty soil.

However, it's rather difficult to demonstrate that this addition of salt could have any real effect on the open ground, due to the quick and continuous rain-wash... On the contrary, a pinch of table salt spread over the soil in a pot (from time to time and with moderation!) should make the plant happy. It would also be possible to water the plant with sea water from time to time, if available<sup>(17)</sup>, thus adding, on top of NaCl, many other trace elements.

It should be pointed out that the experimental results on this matter are contradictory, since another study<sup>(18)</sup> has shown no noticeable effects on the plant's growth by adding salt. This seems to demonstrate that the halophytism of *Crithmum maritimum* is more a good tolerance to salt, than a physiological need, which makes it possible to cultivate it in conditions that are much less salty than its natural environment.

In any case, even if they slightly slow down growth, the addition of salt remains useful for cultivation as vegetable (to improve the taste) and as an ornamental plant (to increase the succulence).

<sup>16</sup> Ben Amor N. & al. (2005), Physiological and antioxidant responses of the perennial halophyte *Crithmum maritimum* to salinity, in *Plant Science* 168(4): 889-899.

<sup>17</sup> The salt used for sea aquariums could be used, it's rather expensive, but it'll be used just occasionally, so it'll last a long time.

<sup>18</sup> Ben Hamed K. & al. (2004), Salt response of *Crithmum maritimum*, an oleagineous halophyte, in *Tropical Ecology* 45(1): 151-159.





## Propagation

Sowing is the simplest way, if fresh seed is available. Be careful, the plant grows on salty substrates, but germination needs a temporary desalination of the soil, as happens with most halophytes. In nature, this happens with the heavy spring rains. This strong germination inhibition by salt isn't casual but *adaptive*, since it avoids the seeds germinating whilst still being transported by the sea, rather than when they find a suitable substrate.

In cultivation, sowing should be done on non or slightly salty substrates, and watered with sweet water. The ideal salinity for germination is much lower than the ideal salinity for plant growing<sup>(19)</sup>.

In practice, the achenes should be sown as they are, or, if you are patient, "peeled" to obtain the naked seed: in this way the natural mechanical and microbiological degradation of the achene's wall is mimicked, improving germination rate and speed. Several old books<sup>(20)</sup>, dating back to the period when this plant was commonly cultivated in vegetable gardens, recommend autumn sowing, as soon as the seeds are ripe, in order to accelerate germination and growth the following spring, but seed peeling should achieve the same result.

Taking stem cuttings during spring (before flowering) or splitting clumps are also viable methods of propagation and it's even possible to do root cuttings.

19 Atia A. & al. (2006), Alleviation of salt-induced seed dormancy in the perennial halophyte *Crithmum maritimum*, in *Pak. J. Bot.*, 38(5): 1367-1372.

20 J.W.H. Trail (1884), *The Illustrated Dictionary of Gardening* 1: 398. ; F. Burr (1865), *The field and garden vegetables of America*: 381. ; W.P. Thomson (1920), *The Vegetable Garden* : 643.



## Where to get this plant?

*Crithmum maritimum* is very seldom available at the market, as well as spice plants or plants from the “vegetable gardens of yesterday”. Unfortunately, its seeds are not easier to find than the plant itself...

Nevertheless, by looking hard on the Internet it's possible to find a few producers of aromatic plants offering seeds of *Crithmum maritimum* and even plants with various locality data, but, in practice, the scarce demand implies that stocks are always limited and the availability isn't always assured...

To start to cultivate it, the best way would be to get it directly from some other grower (not an easy thing), or, probably easier, to collect some seed or cutting *in situ*, wherever this plant is abundant and not protected. In case of collecting *in situ*, the plant shouldn't be uprooted, both because this is often prohibited, but also because this would damage the rocky coastal environment, where the plants have difficulties establishing themselves<sup>(21)</sup>. Moreover you won't succeed because, to be honest, to extract a *Crithmum maritimum* from its rock, you would need a sledge-hammer...

<sup>21</sup> The difficulty isn't due to the slowness of the plant to re-establish itself, but to the fact that the substrate, once naked and disturbed, gets washed away by the storms before this happens.



The goal of any grower of *Crithmum maritimum*: getting a plant looking like this one.



## A bit of nomenclature

*Crithmum maritimum* L., *Sp. Pl.* 1: 246 (1753)

**Family:** *Apiaceae* (nom. alt. *Umbelliferae*)

**Type:** (Lectotypus) Herb. Clifford: 94, *Crithmum* 1 (BM-000558263) / design. Reduron in Jarvis, *Order out of Chaos*: 458 (2007) // *Crithmum maritimum* L. is the nomenclatural type of the genus *Crithmum* L.

**Synonyms:**

- ≡ *Cachrys maritima* (L.) Spreng., *Mag. Neu. Ent. Ges. Nat. Fr. Berlin* 6: 259 (1812)
- = *Crithmum canariense* Cav., *Anal. Cienc.* 3: 35 (1801)

**Chromosome number:**  $2n = 10$  <sup>(22)</sup>.

## Common names

- (GB) Rock samphire, Sea samphire, Sea fennel.
- (FR) Criste marine, Perce-pierre, Passe-Pierre, Casse-Pierre, Fenouil marin, Herbe de saint-Pierre.
- (IT) Finocchio marino, bacicci, cretamo, spaccasassi, paccasassi, frangisassi, critamo, critmo, crite, crista marina, erba di san Pietro.

The ancient Romans, already knew this plants as *Crithmum*, the name that would eventually be used by Linneaus. The Romans had in turn borrowed the name from the ancient Greeks who were calling it *Krêthmon* (Κρήθμον), for the resemblance of its achenes with barley grains (Κρήθή, *Krêthê*). For this reason, its common name “cretamo marino / criste marine” could be interpreted maybe as “sea barley”.



## Related species

Although some other species have been added to the genus *Crithmum*, it is currently considered as a monotypic genus, since some of these species have been recombined into other genera, or reduced to synonymy with *Crithmum maritimum* (simple phenotypical variations, or at most, minor morphological variations, due to its large distribution range).

## Infraspecific taxa

Despite its vast distribution range, that covers very different areas from a climatic point of view, *Crithmum maritimum* is morphologically and ecologically rather homogeneous, and it would seem that there are no intraspecific taxa worth of consideration.

## Conclusion

*Crithmum maritimum* is an uncommon succulent plant in cultivation, but beautiful, strong and with a nicely aromatic foliage. It's also very interesting for its very specialized ecology, yet it's possible to cultivate it in quite different conditions than the natural ones, something that it's not so common with halophytes. Finally, it's very peculiar, since it belongs to a family, the *Apiaceae*, which nobody will think about when mentioning succulents.

Why not give it a try? And if you don't believe the old Breton myths and get tired of it: EAT IT ! ■

# Urcaeta


Tempus Sempervivi



**H**ouseleeks (*Sempervivum* L. genus, *Crassulaceae* family) are often ignored or even forgotten by succulent plant enthusiasts. True, these plants don't grow on inaccessible Mexican barrancas or quartz fields of the Great Karoo, but on the mountains and hills in the heart of Europe, sometimes a stone's throw from our house.

Beautiful, sometimes splendid, interesting from a botanical point of view as in cultivation, we hope to make them look like "stars" to those who have ignored them until now, reputed them as second class plants.

We kick-off this series of articles dedicated to houseleeks with one of the finest members of this genus, that could be described as one of the most beautiful rosette-forming plants: *Sempervivum calcareum* Jord., the "Limestone Houseleek". Since it's also very easy to cultivate (not all the houseleeks are easy, contrary to common belief), this choice was a must.



# *Sempervivum calcareum* Jord., portrait of a misunderstood star

*by Davide Donati et Gérard Dumont*



**D**UE to their beauty, the Maritime Alps are a very popular destination with tourists, and many will have noticed the houseleeks, our small “fat artichokes”: some will have recognized the Common Houseleek, *Sempervivum tectorum* L., others the Cobwebbed Houseleek, *Sempervivum arachnoideum* L., and these species grow almost everywhere on the Alps (and on several other European mountain ranges). However, the most curious amongst them will have noticed in this area another grey-reddish houseleek, which resembles *S. tectorum* but with different characteristics, and those even more observant will have realized that it doesn’t grow anywhere else on the Alps.

The identity of this houseleek obviously lies in the title of this article: *Sempervivum calcareum*, a plant that we could define as the “star” amongst houseleeks, unfortunately little known.

In this article you’ll find many references to *S. tectorum*, since this is both the most common houseleek in cultivation and the plant which most often gets confused with *S. calcareum*.

## Description

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Although all succulent plants enthusiasts can usually recognize a houseleek, distinguishing the various species it’s another matter, especially in cultivation, particularly when there’s only one specimen available. However, recognizing *S. calcareum* it’s generally easy, even in cultivation.

**Clumps:** dense, regular and very compact, which expand laterally by producing abundant and short stolons, each of them terminating with a rosette; these stolons are almost invisible, since they are hidden by the rosettes. When they reach maturity, the rosettes don’t produce stolons in the year they flower.

**Adult rosette:** flattened, sometimes depressed, apex not prominent; leaves numerous (more than *S. tectorum*), densely imbricate with little room between leaves. Dry leaves form a thick and hard layer at the base (much harder and prickly than *S. tectorum*).



**Leaves:** thick and rigid, generally narrower than *S. tectorum*; with mucronate-acuminate tip, hard and rather prickly (much more than *S. tectorum*); rather pale grey-green colour, tending to glaucous, with a reddish-brown apical patch, strongly in contrast, with well defined and clear margins, on both sides of the leaf (in *S. tectorum*, the apical patch, if present, has blurred and not well defined margins, and tends to bend along the leaf's margins). The margins are fringed by a series of non glandular cilia. External leaves can turn yellow or even whitish if exposed to strong sunlight during summer, but this is neither a symptom of scorching nor of physiological distress. Each leaf is entirely pubescent even on adult plants (with individual variability and depending on the environment), but hairs are very tiny, so the leaf looks glabrous at first glance. Hairs aren't glandular, so the leaf seems smooth when touched rather than sticky, and it's slightly scented.

Once dry and dead, the leaf attains a light grey, almost silvery colour, partially keeping its original rigidity, but the external side tends to wrinkle markedly, looking like raisins, and then decompose very slowly. Quite different is *S. tectorum*, whose dry leaves are darker, thin, delicate, papery, and decompose faster.



© F.B.

The typical appearance of flowering *S. calcareum* in exposed situation. Note the very narrow look of the inflorescences and their brick colour, which contrasts with the pale petals and the discoloured appearance of the rosettes. The habitat on limestone rock among sub-shrubs of the Mediterranean scrubland is also typical of the biotopes of this plant. [slopes of Mt Ventoux, France, ca. 1000 m]





**Inflorescence:** terminal, in July (-August); the floral stalk is decidedly erect, with very short lateral branches, quite adpressed to the main stalk, much less opened like a fan as in *S. tectorum* and in the majority of the other members of the genus. This minaret-like appearance of *S. calcareum*, is very characteristic and allows to notice the plant from a distance. The strong insulation gives to the floral stalk a reddish-purple colour, much in contrast with the ivory colour of the rosettes under this condition. *In situ*, *S. calcareum* flowers with a frequency comparable with that of the other houseleeks, whilst when cultivated at sea-level, particularly in areas with oceanic or cold continental climates, flowering is very rare. Each rosette is strictly monocarpic and dies after flowering, as is the case with all the houseleeks, but it's soon replaced in the clump by the offsets produced the year before.

**Flower:** actinomorphic, rather small, markedly polymerous (a dozen of floral divisions, but the number is variable between plants and even on the same plant, so it's scarcely significant). Corolla wide open, with rather narrow linear petals, (the lower half narrower than those of *S. tectorum*), not tangent to the base since they are separated by thick and rigid sepals, inserted between them (sepals are more flexible and recurved in *S. tectorum*). The petals colour is dirty-white, more or less pinkish depending on the individual; the fact that this pink tinge is distributed on the entire limb and not just on the petal's base or the staminal filaments, makes this houseleek being attributed to the "red"<sup>(1)</sup> flowered houseleeks. Petals base visibly purplish-red. Staminal filaments purplish-red, glabrous (the filaments base is slightly hairy in *S. tectorum*).

**Variability:** as with all the houseleeks, *S. calcareum* presents a certain degree of morphological variability between different populations and even between individuals of the same population (size and leaf density of the rosette, leaf shape and colour, flower colour, etc.). However, it should be pointed out that in *S. calcareum* this variability is low, even very low, when compared with that of the other species of *Sempervivum*.

*S. calcareum* can therefore be considered as a morphologically little variable houseleek (little variable only while considering in the frame of this Chameleon-genus).

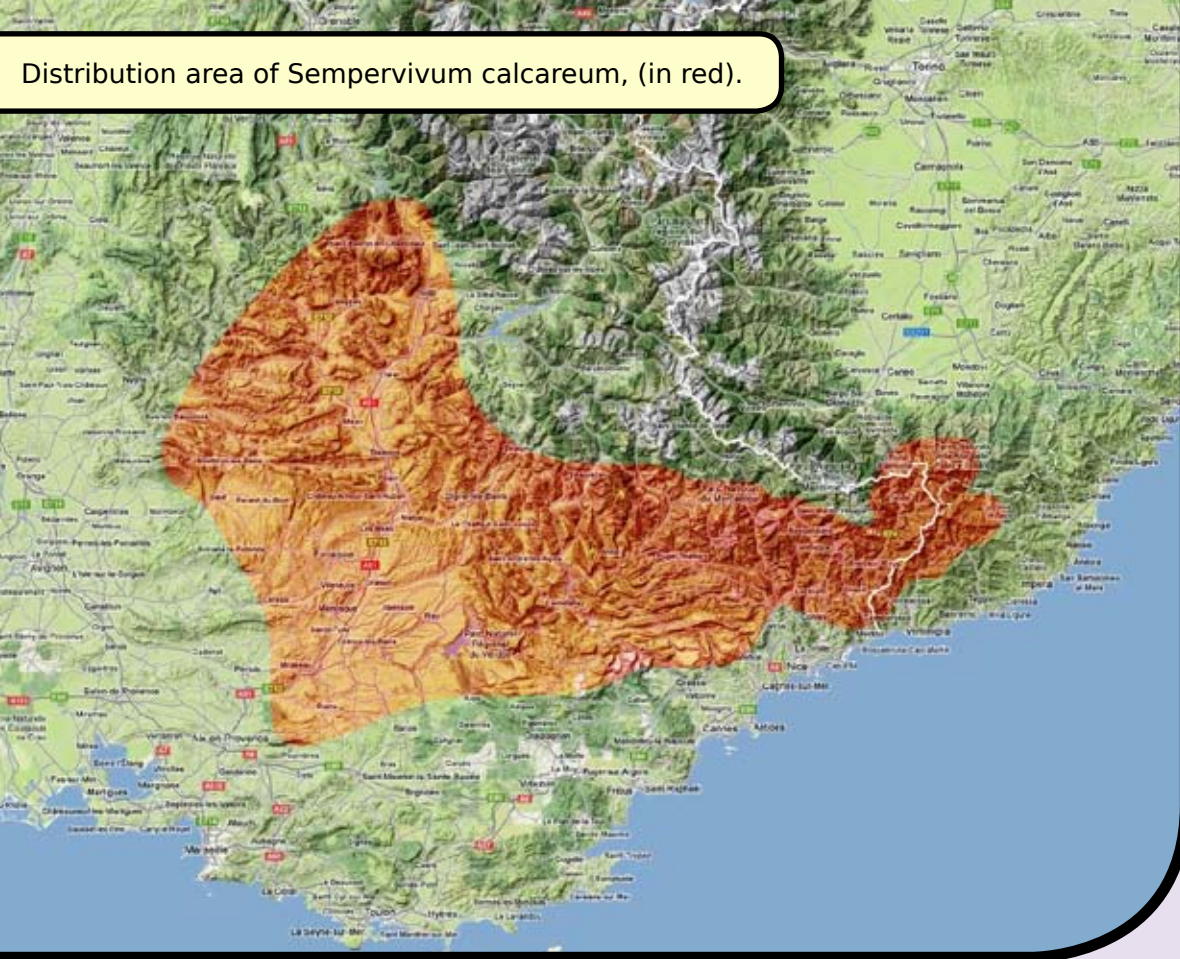
<sup>1</sup> The limb colour of the petals is a characteristic which allows to split the houseleeks *stricto sensu* (subgenus *Sempervivum*, that is, excluding the subgenus *Jovibarba*) into two well defined groups, the "red" flowered houseleeks and the "yellow" flowered ones. This colour difference seems to be important, since there appears to be a real phylogenetic distinction between these two groups. The yellow flowered houseleeks are mainly eastern in distribution, so that the only yellow flowered western true houseleeks are *S. grandiflorum* and *S. wulfenii* in the Alps, but more about that later...



Example of *S. calcareum* (left side) and *S. tectorum* growing intermingled. This shows us how the confusion between these two species by former botanists is a consequence of poor research in situ ... [slopes of Monte Torragio, ca 1500 m — Photo F. Bertaux]



Distribution area of *Sempervivum calcareum*, (in red).



Its good morphological characterization and low variability make *S. calcareum* a rather easy plant to identify both *in situ* (in the wild) and *ex situ* (in cultivation). Once “adjusted the eye”, it becomes very easy to recognize it, something that can’t quite be said for its “cousins”... *In situ* the only possible confusion is with *S. tectorum*, mainly during Spring, when the snow has just melted and the vegetation is just beginning to grow, and the rosettes of *S. calcareum* are rather retracted and purplish. During the rest of the year it’s very difficult to confuse it, except for some scarcely characterized individuals.

## Distribution

*Sempervivum calcareum* is endemic of the calcareous south-western Alps. Its distribution range spans from Triora in Italy up to the Devoluy massif, north of Gap in France, forming a sort of crescent around the crystalline massifs of the southern Alps, where this species is absent. It should be noted that the northern limit of its distribution, north of Gap, coincides with the biogeographical (floristic and faunistic) limit of Southwestern Alps. The western limit touches the Rhône valley (mount Ventoux and others), but doesn’t go beyond it.

The distribution range of *Sempervivum calcareum* can be considered homogeneous and continuous, without any important subdivisions or gaps in its distribution. With a larger scale though, this range looks as it consists of many small, isolated populations, but the distances that separate them aren’t sufficient to completely block the genetic flow from one to the other.



Also, the north-western boundaries aren't very precise, since *Sempervivum calcareum* has been reported in the Diois and on the southern slopes of the Vercors (French massifs), some of these are probably identification errors between *S. calcareum* and *S. tectorum*. Since all these areas weren't personally checked, on the map published here, an "Intermediate" north-western limit is shown, that can vary in both directions. In the literature it's possible to find reports of occurrences well outside the distribution range<sup>(2)</sup>, but, unless the contrary is proved, they are invariably identification errors, mis-identifications of *S. tectorum*, a species with a very large distribution range that incorporates roughly that of *S. calcareum*.

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<sup>2</sup> We still mention here an old reporting of *S. calcareum* at Païolive, on the eastern margin of the Ardèche Plateau, made by an trustworthy botanist: this ectopic location is well suited to host *S. calcareum* (except for its low altitude, 200-250 m), in addition, it's at the same latitude than the most westwards locations of *S. calcareum* in the Alps. That could lead to think that *S. calcareum* would cross or have crossed the river Rhône. During a short visit to this locality, we haven't been able to confirm it's presence, whilst the nearby presence *S. tectorum* leads to believe to another case of mis-identification, albeit conditionally, since there's no proof of this mis-identification and this locality is rather intricate and difficult to explore exhaustively.





## Ecology

*Sempervivum calcareum* is a saxicolous plant, that colonizes rocks and stony areas often south-east facing. As the name implies, it's a calcicolous plant, however, it doesn't seem to be physiologically bound to a calcareous substrate, since, albeit rarely, it can be found on siliceous substrates (on sandstone at Annot and in the gorges of Daluis, on pelite in the Gorges Sumérieures du Cians, in the gorges of Daluis and at La Croix-sur-Roudoule, on schist at Triora). Therefore calcicolous, but not strictly calciphilous: in reality its apparent attitude is probably due to the fact that the areas where it grows are almost entirely calcareous, whilst its absence from the crystalline massifs of the Maritime Alps, rather than to the nature of the soil, is probably due to the climate of these areas, which are much less warm and dry, to the markedly higher altitudes and the lack of the Mediterranean scrub communities, that's replaced by true forests. The ecological needs of *S. calcareum* seem to be more macro and micro climatological, rather than linked to the substrate.

*S. calcareum* occupies an altitude range starting from about 500 m up to about 1600 m a.s.l., although it can be found frequently below 1000 meters: it is thus a medium-low altitude mountain plant. Comparing it with the common *S. tectorum*, the distribution range of the latter overlaps with that of *S. calcareum*, but at higher altitudes, so that reports of *S. calcareum* above 1600-1700m are probably due to confusing it with *S. tectorum*; in fact, an altitudinal overlap occurs only in some areas. Shifting the reasoning to the vegetation belts, *S. calcareum* is a typical plant of the hill level (or so-called Mediterranean level in this area), rare on the mountain level, very rare on the subalpine level and totally absent on the alpine level, whilst *S. tectorum* is a typical plant of the mountain and subalpine levels, but it can be found in all four levels.»

*S. calcareum* is a markedly xerophilous, heliophilous and thermophilous plant (much more thermophilous than *S. tectorum*), which likes full sun exposure even at low-altitude areas with a torrid climate, where it assumes a very poor, pale appearance, so that one of the nicest houseleeks in cultivation is often one of the least interesting in the wild. Some of its localities are real "solar furnaces", where the heat is so high that very few other houseleeks would survive: amongst the western houseleeks, *S. calcareum* is the species that better withstands the summer heat, while other species, like *S. tectorum*, tend to move to higher elevations whenever there's an increase of the average temps. Although *S. calcareum* seems to share its distribution range with *S. arachnoideum* and *S. tectorum* on the horizontal plane, this happens only partially in the vertical plane. If these species grow sometimes intermingled in the northern part of the distribution of *S. calcareum*, the latter very often grows solitary in the southern part of its distribution range.



One factor that all the houseleeks share, is their dislike for excessive nitrogen: *in situ* they disappear very quickly wherever the soil is too rich with this element, and are rapidly replaced by more vigorous plants capable of taking advantage of this nutrient, although a real physiological intolerance to nitrogen by houseleeks (with an increase of fungal, bacterial, etc. attacks), cannot be ruled out. There's only one exception: *S. calcareum*. Its relative tolerance to nitrogen-rich soils is proved and almost unique in the genus, it's possible to find rosettes emerging from dense layers of manure, inside sheep restplaces... clearly not ideal places to observe this plant in Nature, but it's presence is a fact.

One last adaptation that *S. calcareum* shares with the rest of the genus, but it's even more evident in its case, due to the environment where it lives, is a good resistance to fires. The southern Prealps are generally covered by Mediterranean scrub, where fires are

an integral part of the ecology, even outside a criminal context (marked combustibility of the spontaneous vegetation, summer drought, high temps, frequent thunderstorms). *S. calcareum* has a very low habit, strong epidermis and very succulent and thick leaves, capable of withstanding the passage of fire, even partially burned rosettes quickly resume growth from their centre. This good resistance to lightning-initiated fires is probably the cause of the popular superstition that these plants protect the house from lightning.

*S. calcareum* is therefore a species perfectly adapted to a specific habitat, the dry and sun-backed rocky biotopes of the calcareous Mediterranean Prealps, and this perfect adaptation makes it neither rare nor threatened (currently at least...), but its ecological needs are much stricter than the ever-present and polymorphic *S. tectorum*, so its much more limited distribution range is no surprise.

## Legal protection

Neither Italy nor France, the only countries where *Sempervivum calcareum* grows wild, are currently legally protecting it.



*Sempervivum calcareum* after a fire. Note the rosettes are still alive. In a few weeks, they will recover their previous state [Mont Pensier, France, ca 1200 m — photo F. Bertaux]



Original illustrations [from *Icones ad Floram Europæ*] of the three taxa described by Jordan (with the collaboration of J. Fourreau for two of them), only morphotypes of the same plant, here figured at the end of flowering time. For the nomenclatural rule of priority, the correct name is *Sempervivum calcareum* Jord. and its illustration is the holotype of the species.



## A bit of nomenclature

*Sempervivum calcareum* Jord., in Observations sur plusieurs Plantes nouvelles rares ou critiques de la France (in *Annales de la Société Linnéenne de Lyon*), 7: 26-27 (1849)

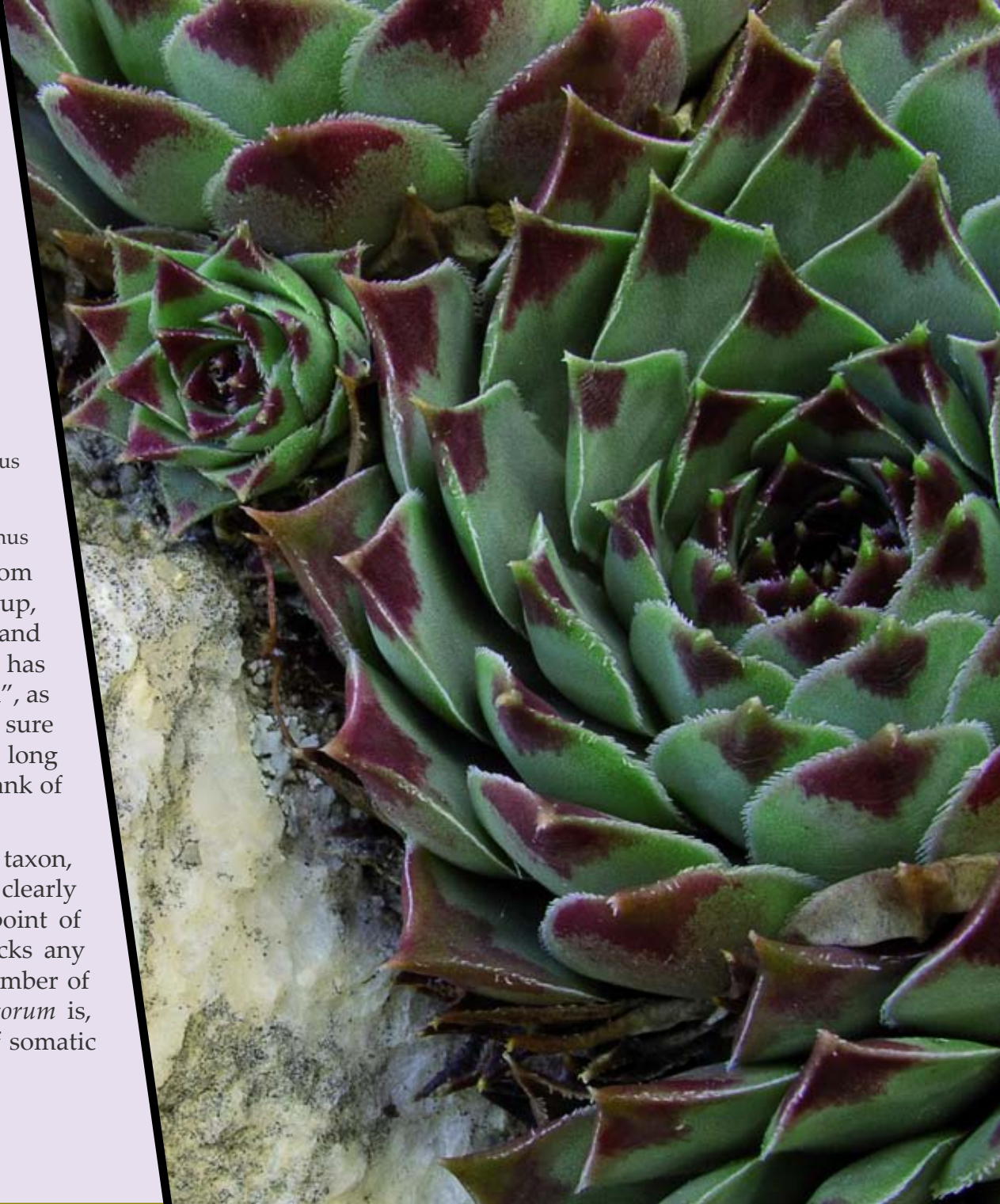
**Famille :** *Crassulaceae*

**Synonymie :**

- ≡ *Sempervivum calcareum* [var.] *genuinum* Rouy & E.G.Camus
- ≡ *Sempervivum arvernense* var. *calcareum* (Jord.) Coste
- ≡ *Sempervivum tectorum* subsp. *calcareum* (Jord.) Rouy & E.G.Camus
- ≡ *Sempervivum tectorum* var. *calcareum* (Jord.) Cariot & St.-Lag.
- = *Sempervivum columnare* Jord. & Fourr.
  - ≡ *Sempervivum calcareum* [var.] *columnare* (Jord. & Fourr.) Rouy & E.G.Camus
- = *Sempervivum greenii* Baker
- = *Sempervivum racemosum* Jord. & Fourr.
  - ≡ *Sempervivum calcareum* [var.] *racemosum* (Jord. & Fourr.) Rouy & E.G.Camus

This species was described by the botanist Alexis Jordan, from Lyon, France, author of many micro-taxa in the *S. tectorum* group, with scarce nomenclatural values, due to his very singular and narrow notion of a botanical species. For this reason, *S. calcareum* has been considered for a long time a “Jordanian” species (“Jordanian”, as opposed to “Linnaean”, the species described by Linnaeus), for sure not a value-adding adjective, and for this reason neglected for a long time, wrongly reduced to synonymy with *S. tectorum*, or to the rank of subspecies or simple variety at best.

Currently however, *S. calcareum* is not only considered a valid taxon, but a perfectly distinct species from *S. tectorum*: which is not only clearly separated from a morphological, chorological and ecological point of view, but also has a different number of chromosomes and lacks any hypothetical links: *S. calcareum* has a diploid genome with a number of somatic chromosomes of  $2n = 38$ , whilst the genome of *S. tectorum* is, like many other houseleeks, (allo-) polyploid, and its number of somatic chromosomes is “ $2n$ ” = 72.



To be convinced about the distinction between *S. calcareum* and *S. tectorum* it's sufficient to visit one of the localities where these plants live sympatrically, particularly on the north-east of the distribution range of *S. calcareum*: not only are the two species perfectly distinguishable, but it's impossible to find any hybrids, or likely to be, despite their partially overlapping flowering periods. This is an exceptional aspect for the *Sempervivum* genus, since the presence of hybrids is almost constant where two or more species cohabit.

In our opinion, the relationship between *S. calcareum* and *S. tectorum* has been well clarified: they are two distinct species and no serious argument can be used to subordinate one taxon to the other.

Whilst houseleeks generally have a long list of subordinate taxa (subspecies, varieties, forms...), *S. calcareum* has just a few and we chose not to retain any of them in this paper. With some pushing, it would be possible to distinguish many local micro-forms, however, their characteristics aren't sufficient to give them any nomenclatural status, since they can all be integrated in the global variability of the species.



## Hybrids

As just stated, natural hybrids of *Sempervivum calcareum* are virtually unknown, including those *S. arachnoideum* hybrids that could look like the result of a crossing with *S. calcareum*, but almost invariably end up being mere *S. ×piliferum* Jord. (= *S. arachnoideum* × *tectorum*). In literature only a single case of a *S. calcareum* × *tectorum* hybrid has been reported by Favarger & Scherbatoff in 1973, and positively verified by a chromosome count. For sure the morphology of this hybrid doesn't help identifying it *in situ* and its frequency is certainly underestimated, but even then it remains very low.

It's quite possible however to artificially hybridize *S. calcareum* with other species (*S. arachnoideum*, *S. tectorum*, *S. wulfenii*...).

## Cultivation notes

As reported above, *Sempervivum calcareum* represents a pearl in a collection of succulent plants, and some of its ecological characteristics (xerophilous and thermophilous plant of low altitude) make it easy to cultivate at sea-level, in conditions where the other houseleeks suffer due to the summer heat and the lack of UV rays. Despite this easiness of cultivation, knowing some additional concept isn't useless, since houseleeks can't be cultivated like cacti!



F.B.

## But how?

Like all the houseleeks, *Sempervivum calcareum* is exclusively cultivated outdoors, in a rocky garden or in a pot, but for sure not in a greenhouse, where this beautiful plant would soon etiolate and lose its nice colour. A greenhouse could be used only as a shelter during the winter months, nothing more.

A pot suited for *S. calcareum* will always be deep, so that its root will expand deeply into the soil, but also square, in order to maximise the available space (but not only for that, see below). Black pots should be avoided, in order to reduce radical heating during summer, since houseleeks badly tolerate it, and *S. calcareum* makes no exception to a simple but fundamental rule: warm head and cool feet.

As far as the substrate is concerned, there's no problem: a cactus potting mix will be perfect, perhaps a bit enriched with leaf mould. However, any potting mix will do, the results will be the same [if all the other parameters remain the same], since despite its origins (the calcareous Prealps), *S. calcareum* will grow well both on acidic and on alkaline soils. The only recommendation is to avoid a too asphyctic soil, whether it's rich in humus or mineral doesn't matter, provided it's not clayish.

Watering can be abundant during summer, particularly for potted plants, although they can be happy by getting just rain. If the substrate will be allowed to dry up between watering, even better. *S. calcareum* can withstand a prolonged drought during summer (it will enter aestivation contracting its rosettes), proving a higher resistance to aridity than many succulents, including some cacti.



Feeding through occasional fertilizations will be greatly appreciated by the plants, that will react by becoming larger, producing more stolons and attain a more intense colour, but even without them, the plants will grow well, without showing any deficiencies.

What's absolutely essential is full sun exposure: six daily hours are the minimum for this plant. Less than that and it will begin to etiolate, and once etiolated, this sun-loving plant will paradoxically suffer from severe scorching.

There's only one thing that *S. calcareum* hates, like the vast majority of houseleeks: excessive humidity during autumn and winter. Although it can take even prolonged frost, in those areas with generally high winter-autumn rainfall levels, like those with a continental or oceanic climate, some form of protection against excessive humidity will be needed, since the humidity could damage or rot the plant. A well ventilated greenhouse, a plastic tunnel, or even a simple glass or plastic pane inclined will offer enough protection during the bad weather, however, the plant shouldn't be positioned under shade, since growth, although slowing down a lot, won't completely stop. If no protection is available, resting the pot on one side with the bottom facing the dominant winds will be enough, the main reason for using square pots!

A note about frost-tolerance: this will be total for a houseleek in good conditions, but scarce even for a slightly etiolated plant. Considering that houseleeks etiolate very easily and quickly, this explains the discouragement of some enthusiasts that because of this, consider houseleeks "less hardy than what they say..."



## Propagation

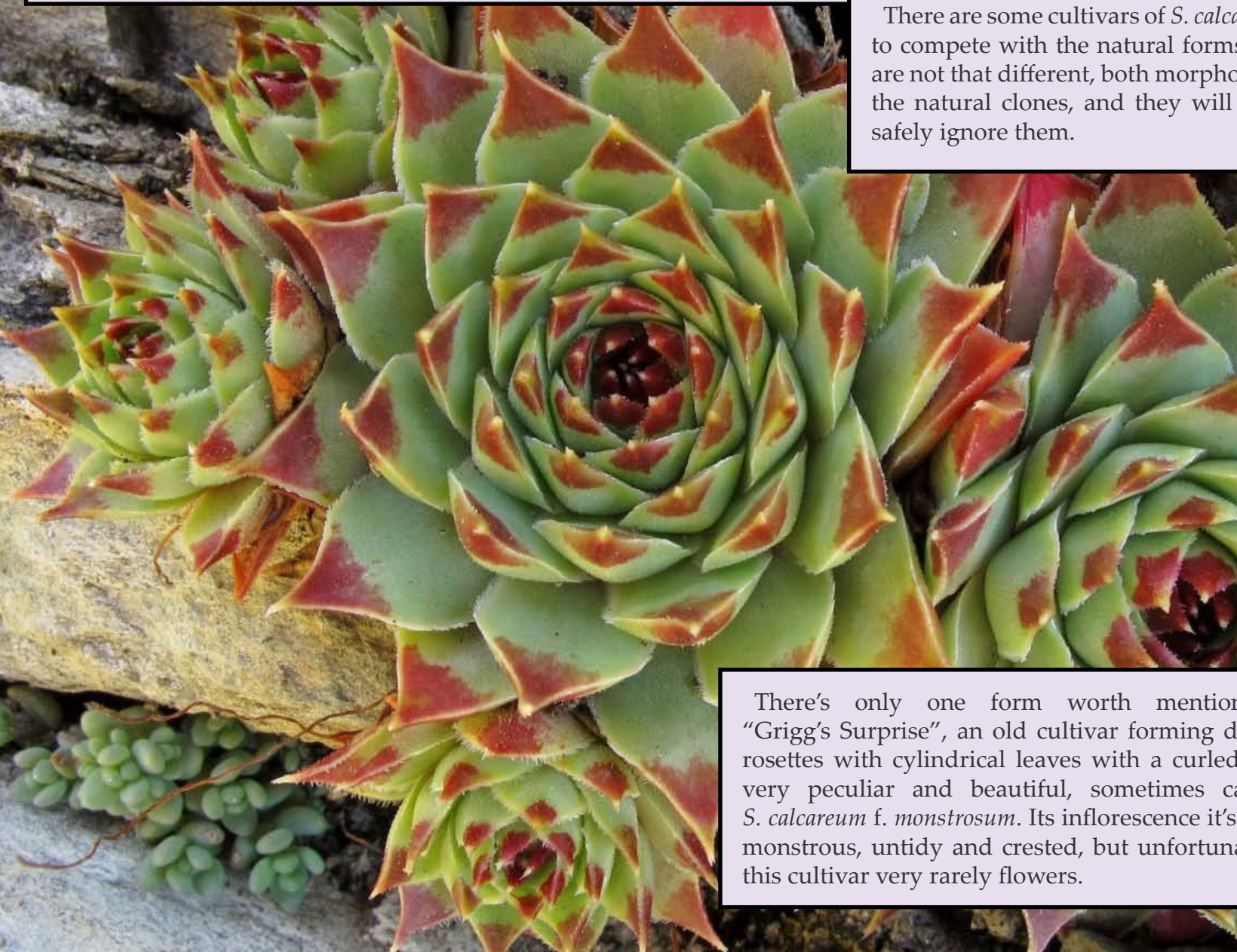
*Sempervivum calcareum* can be easily sown, and, considering the difficulty hybridizing it, that will allow to hope to get what has been sown, unlike what happens with the other houseleeks, where it's easy to end up with undetermined and unintentional hybrid seedlings.

In practice *S. calcareum* is mainly propagated by cuttings, since it's relatively scarcely floriferous in plain cultivation, but capable of producing abundant stolons from which many new plants can be obtained, much to the joy of friends and acquaintances.

## What to grow?

Frequently found it in catalogues of hardy succulents and rock garden plants, and commonly cultivated by enthusiasts of the genus *Sempervivum*, *S. calcareum* – whether natural clones or cultivars – is easy to find for anyone willing to try cultivating it.

There are some cultivars of *S. calcareum* on the market, which pretend to compete with the natural forms of this beautiful houseleek. They are not that different, both morphologically and physiologically, from the natural clones, and they will never have their appeal: you can safely ignore them.



There's only one form worth mentioning, "Grigg's Surprise", an old cultivar forming dense rosettes with cylindrical leaves with a curled tip, very peculiar and beautiful, sometimes called *S. calcareum* f. *monstrosum*. Its inflorescence it's also monstrous, untidy and crested, but unfortunately this cultivar very rarely flowers.



'Grigg's Surprise'

## In conclusion...

You don't know this plant? Never grown it?

Are you sure you love succulent plants? ■

### Bibliography :

- FAVARGER C. & SCHERBATOFF M. (1973) ; Sur une espèce intéressante des Alpes austro-occidentales : *Sempervivum calcareum* Jordan, in *Candollea* 28: 219-235.
- DONATI D. & DUMONT G. (2012), *Sempervivum calcareum*, in *Piante Grasse* 36(1): 34-45.



F.B.



*Urcaeta*  
*Tempus Sempervivivi*

*Sempervivum annae*  
and *Sempervivum dzhavachischvilii*,  
two poorly known Caucasian Houseleeks.

*par Davide Donati et Gérard Dumont*



**T**HE Caucasus is a long Eurasian mountain system between the Black Sea and the Caspian Sea. Many species of *Sempervivum* can be found there. Among them, two central-eastern species, *Sempervivum annae* Gurgen. and *Sempervivum dzhavachischvilii* Gurgen. merit special interest.

## The Caucasus

The Caucasus Mountains formed largely as the result of a tectonic plate collision between the Arabian plate moving northwards against the Eurasian plate. As a consequence of this activity, the entire region is regularly subject to strong earthquakes.

The Caucasus can be divided into two main ranges: the Greater Caucasus in the north and the Lesser Caucasus in the south.

The Greater Caucasus extends from the northeastern coast of the Black Sea nearly to Baku on the Caspian Sea, generally trending east-southeast. It is composed principally of metamorphic silicate rocks: granites, schists, etc.

The highest Caucasian summit stands in the Greater Caucasus: Mount Elbrus, which rises to 5,642 metres a.s.l.

The Lesser Caucasus is lower but geologically rather complex and is mainly composed of effusive rocks.

The Caucasus Mountains have a continental climate and are known for their high amount of snowfall. The southwestern slopes of the Greater Caucasus range are especially marked by heavy snowfall, so thick that in several regions (Svaneti and northern Abkhazia) it can reach 5 metres/year.

This structure and climate, and many other features, make the Greater Caucasus ecologically very similar to the Alps. As a consequence of this similarity, many genera of alpine plants also grow in the Caucasus together with endemic species.



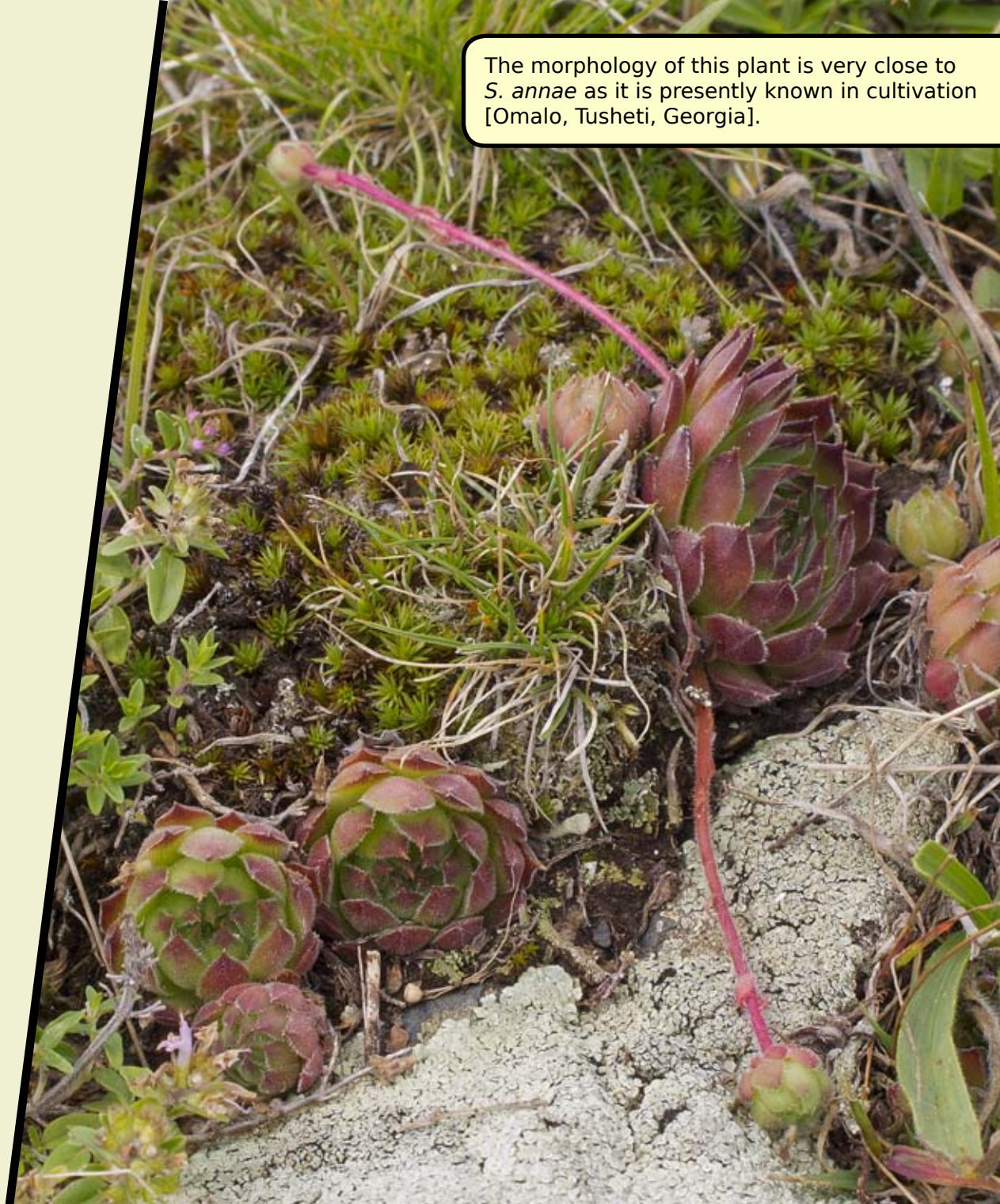
Driving in the Caucasus in hunting the locations of *Sempervivum* is always a bit of an adventure, given the condition and maintenance of the road network...



## The genus *Sempervivum* in the Caucasus

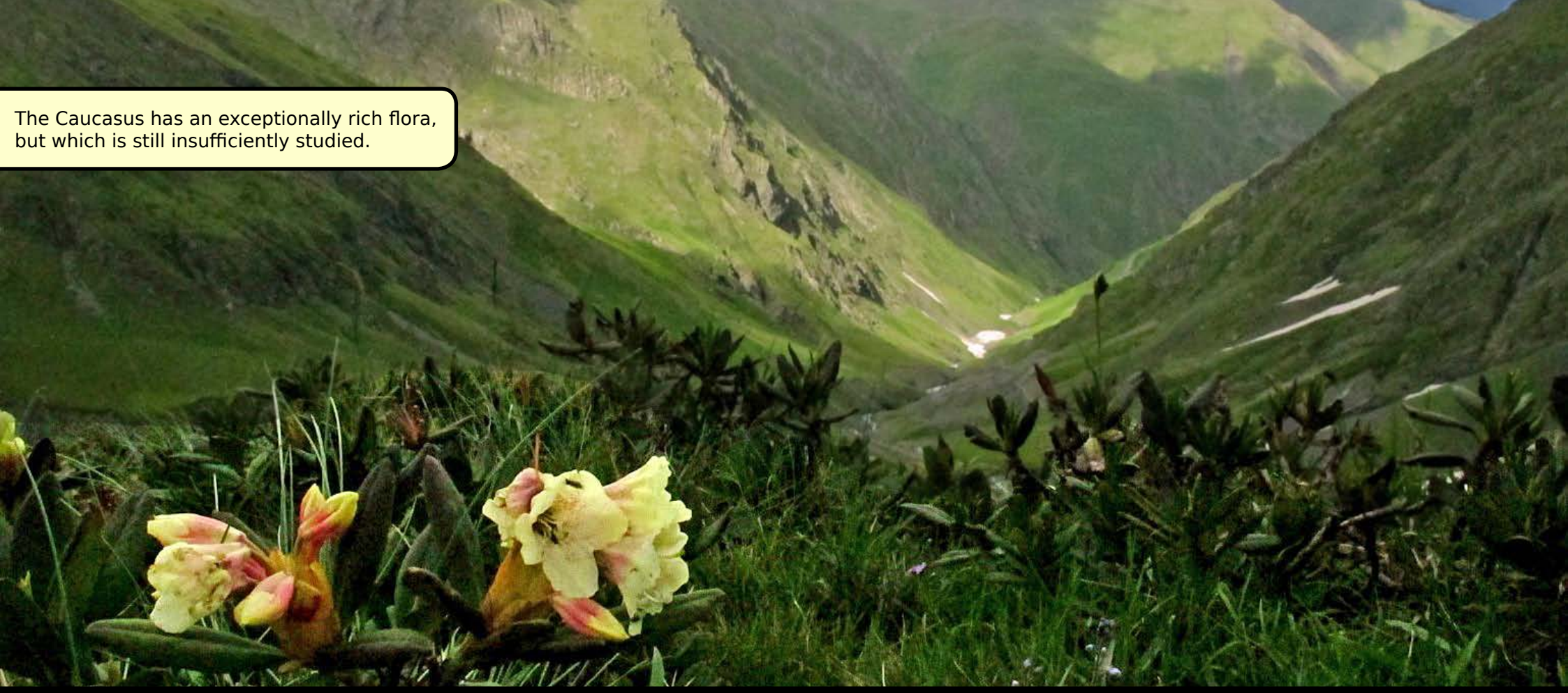
In the middle of the last century, the genus *Sempervivum* L. was quite popular among botanists who explored this area, and a lot of new houseleeks were described by some authors. Many of these were unfortunately based on one single collection without a global consideration of the genus in this area.

Since then, very few botanists have studied the genus *Sempervivum* in this area, due to political constraints. The political and ethnic map of the Caucasus is complex because of the volatility and the intermingling of states, religions and nations, which lead to permanent conflicts. After the fall of the Berlin Wall and the splitting of the Soviet Union, some of the former Soviet Caucasian states (Georgia, Armenia, Azerbaijan) became free republics, while some others kept the federal status of Caucasian Republics in the new Russia (Dagestan, Chechnya, N-Ossetia, etc.). They are all characterized by strong political instability (the recent war Russia/Georgia is an example) and ethnic conflicts. Even today, many Caucasian regions are hence difficult and dangerous to visit for tourists and botanists as well.



The morphology of this plant is very close to *S. annae* as it is presently known in cultivation [Omalo, Tusheti, Georgia].

The Caucasus has an exceptionally rich flora, but which is still insufficiently studied.



So, unfortunately, most *Sempervivum* from the Caucasus are today only known by their herbarium exsicata and by a few living clones (mostly doubtful) available in cultivation without precise field data (or no field data at all...). As a consequence, many taxa which are very poorly known are presently accepted by hobbyists as well as botanists, without any reliable data to support them.

Given that the species of the genus *Sempervivum* are highly variable, the current nomenclature of Caucasian *Sempervivum* must be considered as outdated and not very reliable and it is still a work in progress.

That is the background to the two interesting houseleeks, from central-eastern Caucasus, that we are studying in this paper.



## *Sempervivum annae* Gurgen.

*Sempervivum annae* is a very poorly known Caucasian species, described by Gurgenidze in 1969 together with several other species. It is dedicated to Anna S. Schchian (1905-1990), a scholar of Caucasian flora.

*Sempervivum annae* is a red-flowered houseleek, as all the known *Sempervivum* from the Greater Caucasus. It is small in size and hairy leaved.

The distribution of this species, as well as its morphological variability and ecology, are almost unknown. Until now, only one single clone is known in cultivation under this name, which is presently grown by some enthusiasts, but it's lacking in field data and nothing guarantees its authenticity.

*Sempervivum annae* Gurgen., Generis *Sempervivum* species novae e Caucaso / New species of the genus *Sempervivum* from the Caucasus, in *Notul. Syst. Geogr. Inst. Bot. Tbiliss.*, (Tbilisi, Georgia) fasc. 27: 36 (1969)

**Typus:** legit Gurgenidze, 1962; Caucasus : Tuschetia mountain, Omalo region, plane subalpine ; (= Tusetskij hrebet, Omalo) ; Holotypus TB<sup>(1)</sup>.

Here is the original description<sup>(2)</sup>:

*Planta perennis, 15-30(40) cm alta; caulis pilis longis simplicibus, glandulosis immixtis tectus; folia rosulantia rosulas 3-4(5) cm in diam. formantia, lanceolata, 2-2.5 cm longa, 0.4-0.5 cm lata, apice in acumen purpureum sensim angustata, pallide virida, utrinque longe glanduloso-pilosa, caulina lanceolata, semiamplexicaulia, 1.3 cm longa, 0.5 cm lata, pallide viridia, apice purpurea, utrinque glanduloso-pilosa. Inflorescentia 15-30(40) - flora, pedicellis inaequilongis, floribus 1.8-2.0cm in diam., sepalis 11-12(13), 4 mm longis, 1-1.2 mm latis, lanceolatis, apice acuminatis extus dense glanduloso-pilosis, intus vix pilosis, petalis 11-12(13) pallide roseis medio striis purpureis ornatis albo-marginatus, extus glanduloso-pilosis, intus glabris, apicem versus sparsim glanduloso-pilosis. Stamina 22-24(26), 4.5-5.5 mm longis, filamentis basi apiceque albidis, medio purpureis, ad basin vix glanduloso-pilosis, antheris apice angustatis cuspidatis, aurantiaco-purpureis, carpellis 11-12(13), 4-5 mm longis, squamis hypogynis 11-12(13), linearibus 0.5 mm longis. Floret Julio-Augusto.*

1 We tried to study the holotypes of *S. annae* and *S. dzhavachischvilii* and contacted for the Tbilisi Herbarium (Georgia). Unfortunately we got no answer... and no isotype is known elsewhere.

2 Reproduced in *Houseleeks* n° 41: 3 (1994)

## *Sempervivum dzhavachischvilii* Gurgen.

*Sempervivum dzhavachischvilii* is another plant described by Gurgenidze in 1969, in the same work as *S. annae*. It is dedicated to A. Dzhavachischvili, its collector. Unfortunately for any non-Georgian users of this plant name, this person had a very complicated name...

This plant is known only by its first collection in Daghestan, a Russian Republic. Its ecology, natural variability and distribution are unknown.

Only one single clone of this plant is known in cultivation under this name. It's a small and hairy houseleek, which is presently grown by some enthusiasts, but it's lacking any field data. Does it really represent the original collection?

*Sempervivum dzhavachischvilii* Gurgen. in Generis *Sempervivum* species novae e Caucaso / New species of the genus *Sempervivum* from the Caucasus, in Notul. Syst. Geogr. Inst. Bot. Tbiliss., (Tbilisi, Georgia) fasc. 27: 39 (1969).

**Typus:** leg. A. Dzhavachischvili, 1953-07-15 ; Gunib, Daghestan ; Holotypus: TB ?

Here is the original description<sup>(3)</sup>:

*Planta perennis; 7-10(12) cm alta; caulis pilis glandulosis inaequilongis tectus. Folia rosulantia rosulas 3-5 cm in diam. formantia, lanceolata, apice acuminata, atroviridia, extus vix purpurea ad apicem atro-purpurea, 1,5-3,8 cm longa, saepe apice inflexo, utrinque pilis glandulosis brevibus vestita, caulina lanceolata, medio saepe vix angustata, basi lata, ad apicem sensim angustata, utrinque glanduloso-pilosa. Inflorescentia corymboso-umbellata, 20-25-flora, ramis pilis glandulosis inaequilongis tectis, pedicellis inaequilongis (0,5-1 cm longis), glanduloso-pilosus, floribus 2-2,3 cm in diam. 11-meris, calyce poculiformi, sepalis lineari-lanceolatis, sursum acuminatis, apice purpureis, extus pilis glandulosis inaequilongis tectis, intus a medio tantum breviter pubescentibus, petalis 1,3 cm longis, 2,5 mm latis, lineari-lanceolatis, sursum sensim acuminatis, incurvatis, intense purpureis, vix roseis, albo-marginatis, extus et margine pilis glandulosis intense purpureis vestitis, intus glabris, nitidis. Stamina 6,5-7,5 mm longa, filamentis atropurpureis, basi incrassatis, ad partem quartam glanduloso-pilosis, antheris oblongis, apice interdum cuspidatis, pallide purpureis, vix aurantiacis, carpellis 6,5 mm longis, viridibus, glanduloso-pilosis. Stylus pallide purpureus, glaber, squamis hypogynis quadrangularibus, medio saepe emarginatis.*

## New field data

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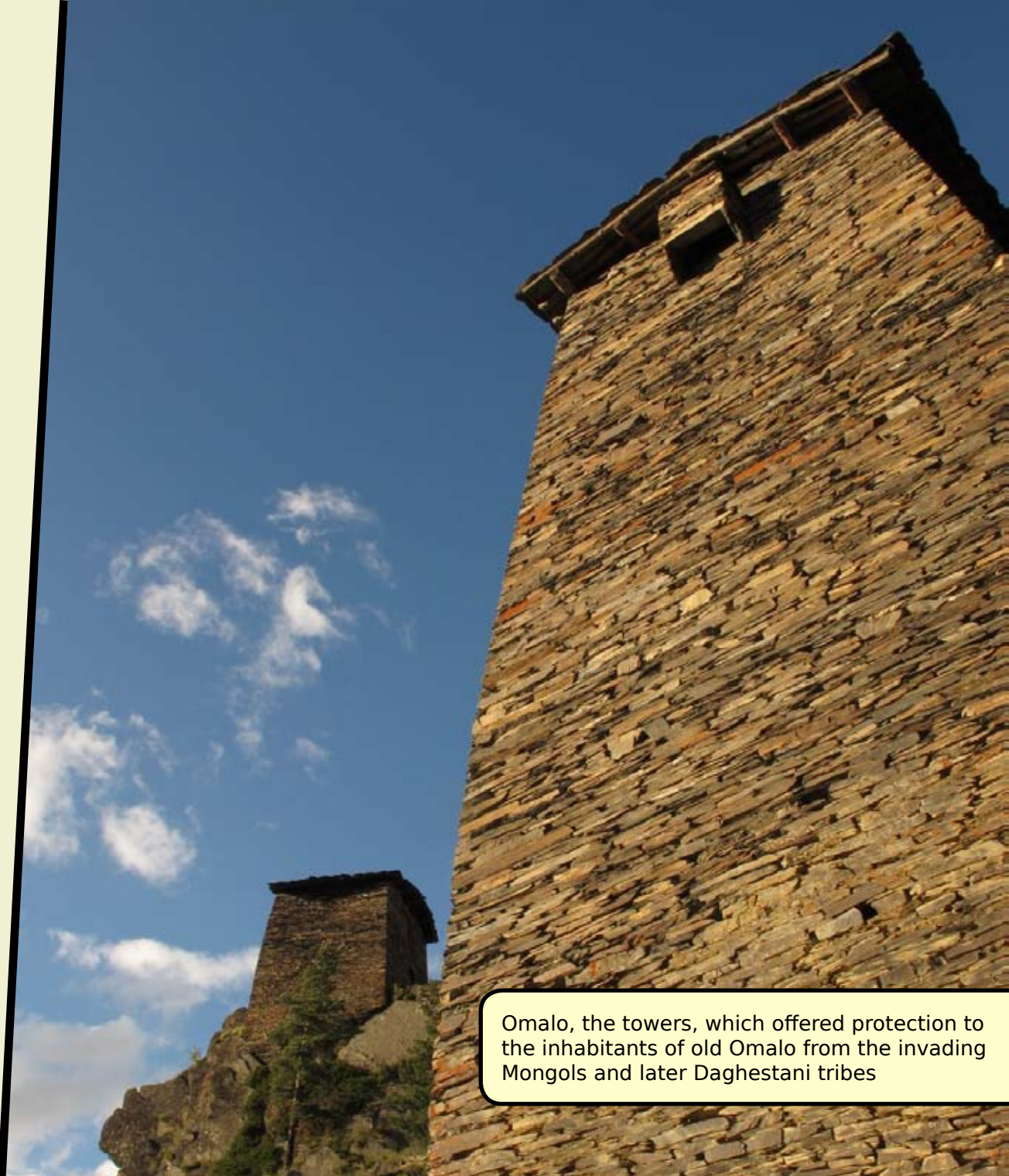
As mentioned above, *Sempervivum annae* and *S. dzhavachischvilii* are very poorly known plants.

However, we recently gathered some new field data about them, which allows us now to discuss and try to go further about the status of these two species.

In the central part of the Greater Caucasus range, we can distinguish 3 sides of the watershed line: the central-western side, which collects the waters of the Terek River; the eastern side, which collects the waters of the Sulak River; and the southern side, which collects the waters of some tributaries of the Kura River.

Houseleeks are quite uncommon on the southern side of the Greater Caucasus, but very common on the drier northern side.

On the Georgian territory, in the Tusheti area, from the eastern side of the watershed line the Sulak basin begins, and collects waters from all the northern side of eastern Caucasus. Inside this remote and hard-to-visit area, *Sempervivum* is very common on silicate rocks.



Omalo, the towers, which offered protection to the inhabitants of old Omalo from the invading Mongols and later Daghestani tribes



Growing close to the remote town of Omalo, the type locality of *Sempervivum annae*, are some plants, which match the original description well. They are not numerous but are present in many distinct colonies. The plants show a high morphological variability: the rosettes are glandular-hairy, 3-5 cm wide, composed of succulent leaves with an evident reddish-purple patch at the tip; the stolons are long and thin (as are many other Caucasian species), 5-20 cm; the inflorescence is 7-40 cm tall, very hairy with pinkish flowers. Within a few square metres, one can observe plants identical to the cultivated clone of *Sempervivum annae*, but many individuals also show the morphology of the cultivated clone of *S. dzhavachischvilii*, with perfectly even intergradations between the *annae* morphotype and the *dzhavachischvilii* morphotype. There is no evidence *in situ* of hybridity between two possible sympatric plants but rather one single variable plant.

The most important point to highlight is that the morphological variability range of these plants *in situ* matches BOTH the original descriptions by Gurgenedze, in ALL the populations observed (Omalo, Diklo, Dartlo).





## Discussion

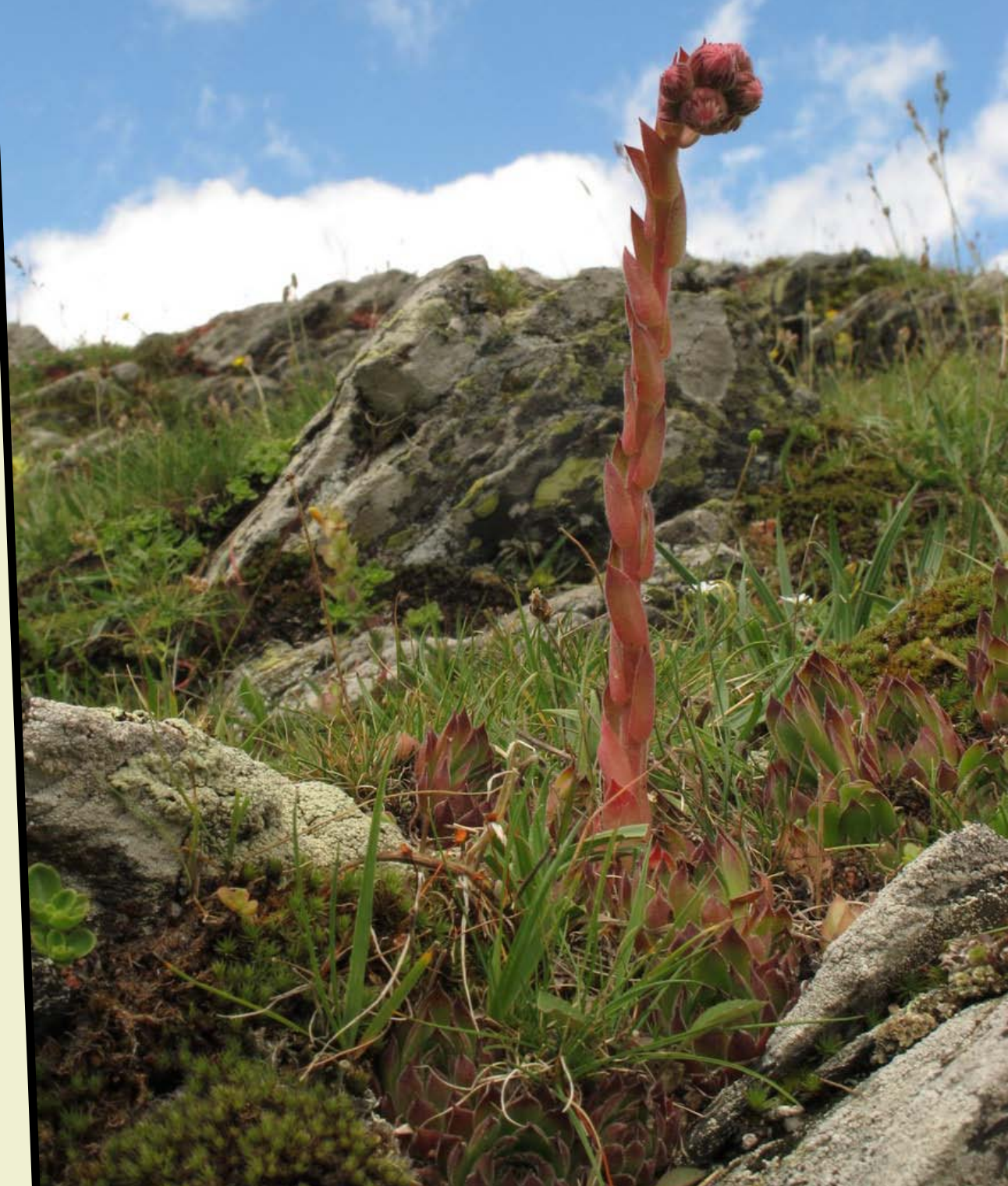
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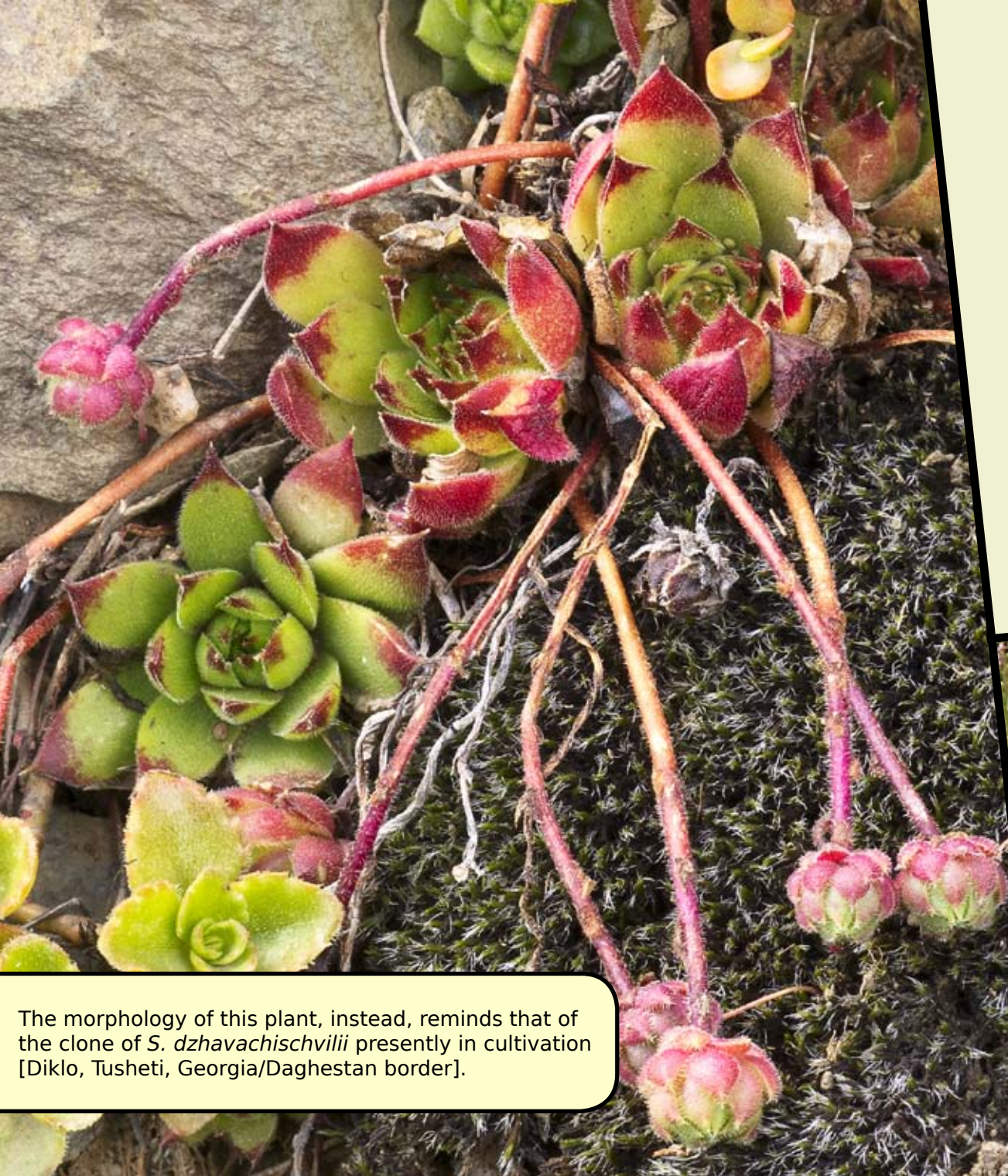
These field data lead us to ask: are *Sempervivum annae* and *S. dzhavachischvilii* one single species or not?

For a completely reliable answer, it would be necessary to also visit the type locality of *Sempervivum dzhavachischvilii* at Gunib. Unfortunately, this was not possible, because Daghestan is not currently a safe place.

However, many facts allow us to establish a relationship between *Sempervivum annae* and *S. dzhavachischvilii*:

1. The Omalo area (*S. annae*) and the Gunib area (*S. dzhavachischvilii*) are only separated by around 100 km as the crow flies, a distance which is covered by the distribution of most of the *Sempervivum* species;
2. The Tusheti region, where *S. annae* grows is on the north-eastern side of the watershed line and the waters of the region are collected in the Sulak river basin. Gunib, the type locality of *S. dzhavachischvilii*, is on the same side of the watershed line, and the rivers of the area are tributaries of the Sulak River. No evident topographical obstacles at the distribution of one same *Sempervivum* species are present;
3. South-western Daghestan and the Tusheti region share many endemic species, for example *Rosa tuschetica* Boiss., and therefore make one floristic region.
4. Each of the three sides of the watershed line of the Central Greater Caucasus is characterized by different species of *Sempervivum*. On the southern side, houseleeks are rare, with a prevalence of *S. caucasicum* Rupr. ex Boiss. (aggr.). On the north-western side, *S. pumilum* M.Bieb. is the dominant species and present everywhere. On the north eastern side, where *S. annae* is found, *S. pumilum* is practically absent and *S. caucasicum* is rare.






These geographical and chorological data combined with our field data and the evidence that the variability of *Sempervivum annae* integrates with the morphology of *S. dzhavachischvilii*, leads us to think that *S. dzhavachischvilii* Gurgen. can be considered as a synonym of *S. annae* Gurgen.; the last having nomenclatural priority since it was described first in their common protologue.



The morphology of this plant, instead, reminds that of the clone of *S. dzhavachischvilii* presently in cultivation [Diklo, Tusheti, Georgia/Daghestan border].



To fully solve this question, and know if *Sempervivum dzhavachischvilii* is simply a synonym of *S. annae* or if it deserves some infraspecific status, visiting Gunib will be necessary. However, to do that, we must wait for a quieter geopolitical time in this area. ■

# My modest opinion about fertilizing cacti and succulents

by Fabrizio Barbieri

Fertilization of plants is an ancient agronomic practice, performed in different ways and techniques since agriculture began, but all with the same goal of improving soil fertility, and obtaining the maximum harvest.

Initially, only edible plants were cultivated, but with the evolution of civilization, cultivation expanded to ornamental plants as well.<sup>(1)</sup>

I'd like to tackle the subject of fertilization by concentrating on a single chemical element at a time, in order to better understand its complexity.

Since the earliest analytical researches, studies and experiments; it emerged that only a limited number of mineral elements are really needed by plants. It's been proved that there are only sixteen of them, divided into macro-, meso- and micro-elements, depending on the quantity that shows up in their ashes. Obviously there should be some flexibility, depending on the species, the cultivar, and the agronomical use. The picture is still largely incomplete, since a lack of many mineral elements, often considered insignificant, due to the fact that they appear in traces only (or not at all) in the vegetal tissues, can cause remarkable adverse effects on some plants.

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<sup>1</sup> Today, according to modern and increasingly sophisticated knowledge, we can say that there isn't a clear distinction between edible and ornamental species: each species is cultivated for its economical value, or, to put it better, for its economical/utilitarian value, since even ornamental plants, that aren't cultivated for harvesting fruit, grain, etc., in addition to their aesthetic function, are often used as a visual or acoustic barrier, increasingly important in this era of unstoppable urbanization.



Magnesium deficiency on *Echinocereus pentalophus*.

Many researches now agree that an element's importance depends on the plant's need for it during its phenological phases<sup>(2)</sup> and its deficiency can block the completion of the life cycle, and thus the perpetuation of the species. Unfortunately this is rather difficult to research, due to the many obscure aspects of the carbon fixation process<sup>(3)</sup>, so that even the atomic theory isn't always exhaustive when applied to plants, particularly in explaining the nutritional metabolism in the biomass production.

This short preamble is meant as an introduction to fertilization, a little complicated perhaps, but necessary to help you understand that feeding isn't just a matter of diluting a solution into water and giving it to the plants, but that it's a true science, devoted to satisfy all the plant's needs.

Precisely for this reason, I want to finish with a personal note, dedicated to all growers of ornamental plants, and especially to succulent growers.

Succulent plants have the privilege and the burden of living in very peculiar environments, apparently hostile to vegetal life. Despite this, they are cultivated everywhere, including very humid climates, the opposite of their original environment, thus proving to be true "globalized" species. In order to satisfy this demand without boundaries for succulent plants, growers and agronomists have developed refined techniques adapted to the various climates, in striking contrast with the common stereotype that succulents, being robust, can be easily cultivated, provided the temperature is warm, and little water is given.

Many growers are aware of the metabolic process known as Crassulacean Acid Metabolism (CAM). This peculiar metabolism is the product of the adaptation to extreme environmental conditions.

The purpose of the CAM cycle is basically to fix the carbon dioxide into organic acids, the malic acid in particular, opening the stomata mainly at night in order to reduce perspiration, and thus reducing water loss, particularly in environments where this resource is extremely precious.

<sup>2</sup> Season-induced life cycles

<sup>3</sup> Carbon dioxide (CO<sub>2</sub>) fixation by photosynthesis, through solar energy, yields 1 molecule of glucose and 6 molecules of oxygen, from 6 molecules of carbon dioxide and 6 molecules of water :  $6 \text{ CO}_2 + 6 \text{ H}_2\text{O} + \text{light} = \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2$

An organism that has developed these characteristics is unable to perform its fundamental metabolism without the correct environmental conditions. This means that by setting an environment where, in our opinion, an organism should "live better", in reality this isn't necessarily really the case.

I'm thinking about aspects such as shading, frequent waterings, nebulisations and heavy fertilization applied to very large collections of plants.

Each environment has forged a certain number of species, that are at their best only with the conditions that exist in that environment.

When buying a plant, whether it's a succulent or not, one should always acquire some botanical and agronomical knowledge about that species, collecting in advance all the relevant information. For this reason it would be advisable to buy a single plant at a time, since too many plants can create confusion and superficial knowledge, amongst beginners at least. I understand that this concept could seem absurd to some, but it's the best way to achieve the best result.

Once one becomes "intimate" with the plant, it's time to buy it. The plant doesn't necessarily need to be rare, since the prior study, in addition to providing information, also allows evaluation of all the cultivation parameters outside its original environment, and thus determines whether it can be successfully grown, and therefore wisely evaluate the costs/benefits of its purchase.

In fact, just to keep it alive isn't sufficient, we want it to show off all its beauty and add enhance our homes. That is, it should grow well, and even experience some hardiness, like it would do "at home" in its natural environment.



## Magnesium

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Let's analyse Magnesium, the chemical element defined with the Mg symbol.

Magnesium is absorbed by plants as the ion  $Mg^{++}$  and is of fundamental importance, even though it's considered a meso-element, since it's one of chlorophyll's components (we could say it is its core) which, as you know, are those molecules that, through small electrical discharges, allow the transformation of inorganic molecules ( $CO_2$ ) into organic molecules (sugars), thus allowing life.

This element also promotes hundreds of enzymatic reactions that involve ATP (the plants' energetic tank), participates to the formation of various pigments (xanthophyll and others), is included in the composition of the protein phytin which is part of the seeds' reserve and is fundamental in the initial metabolism of young seedlings, etc.

Magnesium is thus an active part of photosynthesis, promoting the enzymatic processes by ATP, and helping the colonization of young plants.

Without this element, there would be no photosynthesis, and the energetic flywheel responsible for so many metabolic reactions

wouldn't be formed and couldn't be used, so no jump-start to young seedlings, no vegetative growth, no food for animals (Man included), which are unable to feed just on mineral salts<sup>(4)</sup>.

Magnesium is a very mobile element inside the plants, which are able to move it from old photosynthetic parts to young ones in case of deficiency, which appears as chlorotic up to more or less marked necrotic areas, moving from the more external parts up to the vegetative apex, in order to ensure the plant's survival and reproduction, despite stunted growth.

Magnesium deficiency in a plant isn't necessarily due to the scarcity of this element in the substrate, but also to the so-called antagonisms. Magnesium is competing at ionic level with calcium and potassium for root absorption, and this often has a negative impact on the magnesium intake of plants, especially in substrates rich in active calcium, even when magnesium is present. However, even with calcium-poor substrates, heavy potassium fertilization could negatively affect magnesium absorption.

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<sup>4</sup> These simple agronomic informations should make clear that any one single factor of utmost importance doesn't exist in biology, agronomy, etc., but that there's only an articulated synergy of all the elements essential to life and not strictly linked to just the macro-, meso- and micro-elements.



## Magnesium and succulents

The relationship between magnesium and succulents is largely underestimated. In fact, it's often possible to read that the succulents need for magnesium is very low (almost negligible), since they are very adaptive and often live on calcareous terrains or rocks, where magnesium is scarce or almost unusable to the extent that specialized fertilizers almost invariably lack this element, due to the belief that the magnesium found in the substrate is enough. Apparently, the fact that many succulents live on calcium-poor substrates is ignored; some are calcifugous and many live on rocks containing magnesium such as dolomitic limestone or even serpentine. More importantly, although

they need magnesium in minimum quantities, succulents, like all other plants, can't live without it.

Maybe it's due to laziness, maybe it's because is commonplace, or it's just due to space problems, but many growers tend to delay re-potting for years. Water is often rich with calcium and carbonates, which will build up in the potting mix with time, becoming excessively high and with very high alkalinity. As already mentioned above, regarding the calcium/magnesium antagonism, a substrate too rich in calcium will make more difficult for the plant to absorb magnesium.



Magnesium deficiency on *Turbinicarpus lophophoroides*.

On top of that, if we consider that fertilizers specifically designed for succulents contain a very high quantity of potassium; this will make magnesium absorption even more difficult, if not impossible, at every fertilization, due to the potassium/magnesium antagonism.

Magnesium deficiency shows up rather slowly in succulent plants:

- Plants with more or less succulent leaves will show a stunted growth, appearing “thin” at first glance, with scarcely succulent caudices and/or leaves, and typically chlorotic vegetation looking yellowish or pale at least, being green near the apex only, and a more or less marked leaf loss. With time, the plants will shrink to long and thin stems with a few leaves near the apices.
- With mainly or totally aphyllous plants<sup>(5)</sup>, like many *Euphorbiaceae*, but especially the *Cactaceae*, in case of deficiency (direct and/or induced by antagonists) the affected plant moves magnesium from the old photosynthetic tissues to the apex. Since photosynthesis occurs in stem tissues, a magnesium deficiency will manifest itself with yellowish or reddish chlorotic pigmentations, more evident when moving away from the apex, which usually remains green towards the base. Growth will become very stunted, reduced to a minimum, and the plant will clearly look as if it's suffering, without energy and thin. If the deficiency worsens or lasts for too long, the superficial tissues at the stem's base will start to necrotize, showing small round spots at first, becoming larger and larger, until you have complete suberization of the oldest part of the stem.

Although the situation can be fixed with a good re-potting, completely replacing the old soil, the damage and deformation caused by this deficiency will remain like a permanent scar on our plant.

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Leafless.

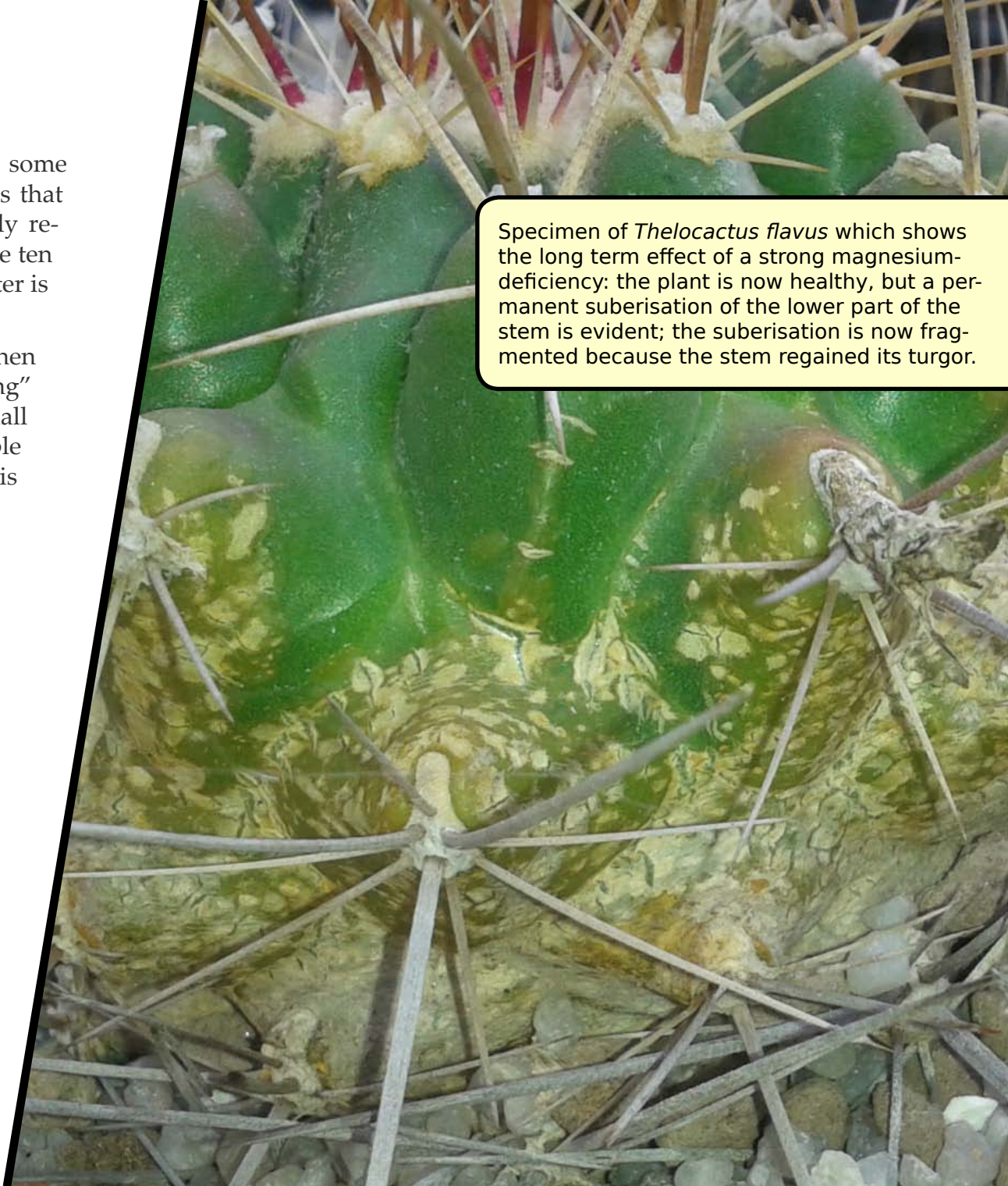


The same *T. lophophoroides* (see previous photo) some months later, after repotting and a good fertilization program with magnesium.

The right thing to do is to prevent all this is by giving some magnesium when fertilizing (there are complex fertilizers that contain it, 2% of MgO would be enough), and frequently re-potting, since it's better to lose a plant out of ten, than have ten badly growing plants. Watering with rainwater or soft water is another recommendation.

In conclusion, magnesium clearly shows that even when one thinks everything has been done for the “well being” of an organism, this isn't necessarily the case, when a small but fundamental piece in the mosaic of the indispensable knowledge on how to grow healthy and beautiful plants is lacking. ■

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Specimen of *Thelocactus flavus* which shows the long term effect of a strong magnesium-deficiency: the plant is now healthy, but a permanent suberisation of the lower part of the stem is evident; the suberisation is now fragmented because the stem regained its turgor.

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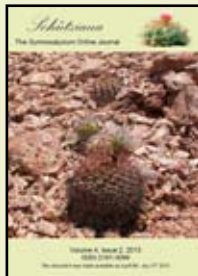
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