Schütziana

The Gymnocalycium Online Journal

Volume 15, Issue 1, 2024
ISSN 2191-3099

This journal was published on April 1st, 2024

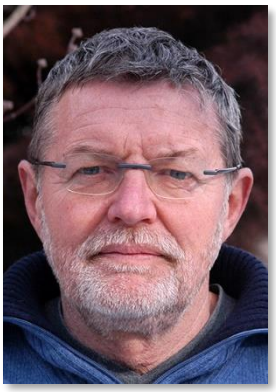
Contents

Published: 1st April 2024

ISSN 2191–3099

Cover picture: *Gymnocalycium monvillei* MaW 13-362/579 south of Santa Cruz (photo: M. Wick).

Editorial



Dear Gymnocalycium friends,

Wolfgang Papsch

A surprisingly high number of visitors considered the new venue in Dresden-Coschütz and the program of the Gymnocalycium-conference worth the effort of travelling. Not only the excellent service at the conference hotel, but of course also the scheduled program of presentations and discussions with the focus on *Gymnocalycium monvillei* were incentives for our guests to participate in this event. The meeting yielded interesting insights, which will be reported on in this issue of SCHÜTZIANA. Holger Lunau is going to outline in detail the proceedings of the meeting in his contribution.

Thomas Strub has made it his task to present the localities of *Gymnocalycium monvillei* in the eastern part of its distribution area, combined with exact, relevant additional information, such as flower structure, seed, soil conditions, details of the accompanying vegetation and altitude. Here, a complete, meticulously researched inventory of habitats in Province Córdoba is showcased. Thomas Strub will similarly delineate the habitats in the western region, the province San Luis, in the next issue. Such a contribution also points out what an effort it takes in terms of time and money to create such an extensive opus. As the editor of the magazine, I would be glad to receive more interesting papers about the subject *Gymnocalycium*.

We would like to express our warmest thanks to Mrs Iris Blanz (Austria) who supports us with the translation into English, to Mrs Larisa Zaitseva (Russia) for the translation into Russian, to Mr Victor Gapon (Russia) for the content corrections of the Russian edition, to Mr Takashi Shimada (Japan) for the translation into Japanese, to Mr Jiahui Lin (China) for the translation into Chinese, to Mr Václav Johanna (Czech Republic) for the translation into Czech and to Mr Daniel Schweich (France), who has mirrored our publications under http://www.cactuspro.com/biblio/.

37th International Gymno-Conference from 1st to 3rd September 2023 in Dresden-Coschütz

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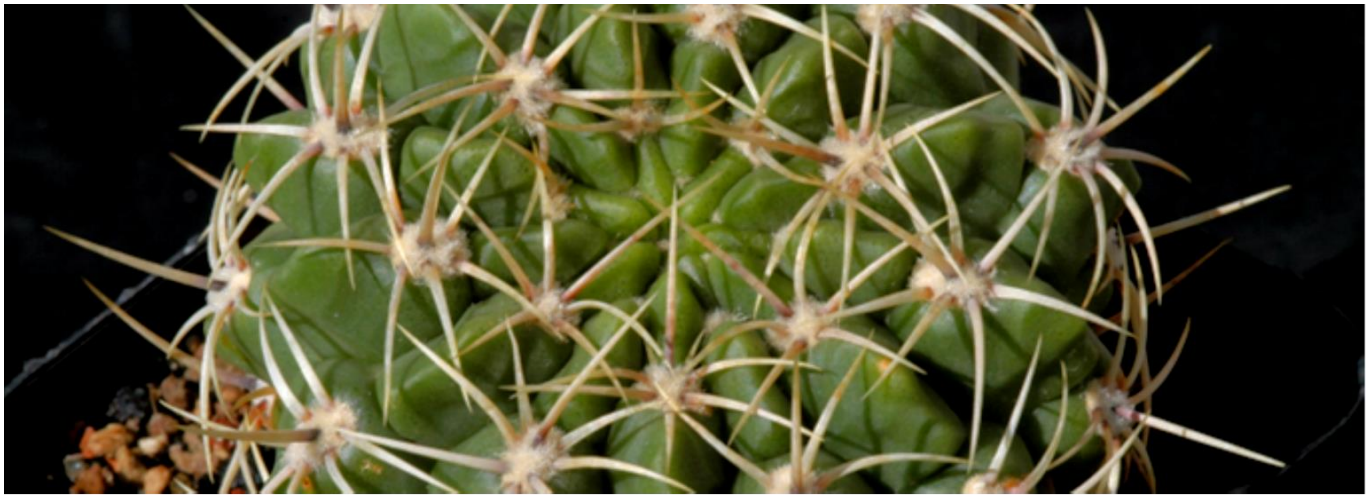
The conference topic: *Gymnocalycium monvillei*



It still goes on: After an enforced one year's break due to the economic aftermath of the Covid-19 pandemic the International Gymnocalycium Conference took place for the currently 37th time between 1st and 3rd September 2023. This time shoptalk did not take place as usually in the "Goldener Anker" Hotel in Radebeul, but in the Coschütz Inn in Dresden. Since the hotel in Radebeul was still not able to offer any adequate conference service due to lack of staff, moving was necessary. However, this did not impair the participants' interest, just the opposite was true. Never before had as many as around 50 participants listened to the presentations. Obviously there was a lot to tell and many experiences and travel adventures to share. The big international response was once more a reason to rejoice. Thus, guests from, among other countries, Italy, Austria, Poland, Switzerland and the Czech Republic arrived.

According to tradition, the welcoming address to the participants took place on Friday night, given by conference organiser Volker Schädlich (Spremberg, Germany) as well as by presenter Reiner Sperling (Salzkotten, Germany). Before *Gymnocalycium monvillei* and its relatives became the centre of attention on the following day there was a travelogue. The audience was whisked away to Argentina by Frank Wagner (Dresden, Germany). He had travelled the country for the first time in 2022 and so he put his heart and soul into the report about his experiences, also those aside the cacti habitats.

On Saturday we initially had to digest “tough stuff”, all the presentations revolved around *G. monvillei* with its multitude of localities in the Argentinian provinces Córdoba and San Luis. Meticulously as usual, Wolfgang Papsch (Kalsdorf, Austria) gave an introduction to the topic based on extensive literature research. He disentangled the nomenclatory jumble referring to the plants and retraced the path to the discovery of *G. monvillei*. Judging from his findings, the type locality can doubtlessly be attributed to an area situated between Villa Tulumba and San Pedro Norte in Province Córdoba.

Then it was Thomas Strub’s (Binningen, Switzerland) turn to present the various “faces” of *G. monvillei*. Owing to his numerous journeys he could show pictures of umpteen localities in Province Córdoba. It became apparent that it is not always easy to identify *G. monvillei* unambiguously in the field. The plants occasionally have a tendency to hybridize, which results in hybrids with other *Gymnocalycium* species, such as *G. capillense,* in some places. These observations in habitat by Thomas Strub were corroborated by data from greenhouses, e.g. concerning flowering periods.

Wolfgang Papsch finally drew an imaginary arc into Province San Luis, where *G. monvillei* can also be found and *G. monvillei* subsp. *gertrudae* grows as well. Thomas Strub showed lots of pictures referring to this fact. To conclude, there are also uncertainties about the exact identification of the plants west of the Sierra Comechingones. This feature continued throughout Reiner Sperling’s presentation, which focused on *G. monvillei* from the Sierra Comechingones. However, *G. achirasense* and *G. orientale* with their multitude of variations often make an exact identification in the field extremely difficult. Finally the subject was rounded off by Tomáš Kulhánek (Moravsky Krumlov, Czech Republic) with a lecture about plants in the Sierra de las Peñas. There, too, *G. monvillei* obviously forms hybrids and can sometimes hardly be distinguished from

G. achiresense aff. “Typical“ *G. monvillei* are easy to recognise, but a lot of work in the field and in greenhouses remains to be done in order to detect all the transitions to other species.

Mario Wick (Gernrode, Germany) showcased a completely different issue. He outlined the results of multi-year investigations into ploidy of *Gymnocalycium* species. In the past the study group Gymnocalycium financed the determination of ploidy levels with out-of-pocket payments and thus have already brought to light interesting results. These refer to, among others, the degree of relationship between *Gymnocalycium* species in the evolutionary hotspot of the provinces Córdoba and Catamarca. Mario Wick already elaborated on the first details in the last SCHÜTZIANA issue.

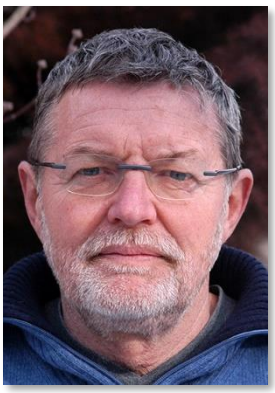
Before dinner Holger Lunau (Berlin, Germany) transferred the participants to eastern Paraguay by means of his presentation. He had travelled the country together with Volker Schädlich and Michael Melojer in March 2023. Habitats of *G. fleischerianum* and *G. paraguayense* were shown, as well as *Echinopsis*, *Frailea* and *Notocactus* species. The report was completed with pictures of the country and its people, which revealed the enormous degree of pressure by urban growth existing in this country, too.

Eventually it was up to Wolfgang Papsch to round off the day with his travelogue “Spring in Chile 2022”. He displayed not only fantastic photographs of, for example, *Copiapoa* species and other succulent plants, but also of people’s life in this country. Sadly, he also had to tell about incredible human intrusion into nature due to huge ore mines.

On Sunday morning Horst Kallenowsky (Hamburg, Germany) concluded the meeting with his travelogue “Cacti, Catastrophes and Drone Flights – Argentina 2022”. Beautiful images of nature

were contrasted with pictures of huge forest fires, strikingly documented with the help of drones. After Reiner Sperling's summary of the conference results all the participants agreed on the fact that it had once more been a successful get-together with a lot of news. Thus most of the guest will reappear for the next edition of the Gymno-meeting in Dresden-Coschütz from 30th August to 1st September 2024.

Research on the Type Locality of *Gymnocalycium monvillei* (Lemaire) Britton & Rose



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ABSTRACT: By means of John Tweedie's travel records, his connections with Luis van Houtte and the latter's business connections with Boissel de Monville and Charles Lemaire, the so far unknown type locality of *Gymnocalycium monvillei* (Lemaire) Britton & Rose can be located and its way to Europe retraced. A neotype is suggested.

KEYWORDS: *Gymnocalycium*, *monvillei*, neotype, John Tweedie.

In his first description of *Echinocactus monvillii* Charles Lemaire drafted a detailed description in 1838 and supplemented it with an excellent drawing of the plant. Lemaire specifies Paraguay, Cordillaria[2)] as its locality.

Apart from the obviously wrong specification of the locality as it appears from today's perspective, unfortunately Lemaire did not mention anything referring to the collector of the plant. Neither does he mention how the new species came to Europe and into the collection of Hippolyte Boissel de Monville.

During the first half of the nineteenth century the knowledge of cacti in Latin America, particularly Argentina, was increasing extremely. This was only brought about by travel reports of few botanists who travelled to areas difficult to access. The Scotsman John Tweedie, who had emigrated to Buenos Aires in 1825, was among the first botanists who could explore Argentina more intensively[1)]. Controlled by the Spanish, travelling in Argentina was hardly possible. Not until after 1816 was the country more easily accessible, even though still obstructed by political turmoil.

After having become established in Buenos Aires Tweedie, then 50 years old, started his botanical excursions. Considering the unfavourable travelling conditions, the excursions were an impressive achievement, yielding substantial insights into so far unknown botanical material. Tweedie intensively fostered contacts with influential botanists, such as William J. Hooker and Aimé Bonplant, as well as with eminent botanical gardens like Kew or Glasgow. His deliveries of seeds and plants were a relevant contribution to making known the up to then almost unknown flora of the travelled regions.

In 1835 he joined a supply trek in Buenos Aires, which was on its way to Tucuman. He reports vividly on this seven months' journey in his messages to Hooker[3)]. The route more or less corresponded with the course of Camino Real, which formed the economically essential connection between Buenos Aires and Alto Perú (Bolivia)[3)].

The focus of this contribution is on the section between Córdoba and its border with the province Santiago del Estero. In this section of the route along Camino Real there were twelve Postas, mostly simple supply points for the passing groups of travellers, positioned at intervals of an estimated 4-6 leguas (1 legua del post = about 4.5 km). According to Tweedie, his trek also covered the section between Posta de Intihuasi (San Juan, near Intihuasi), Posta da Santa Cruz and Posta San Pedro Viejo. In his report to Hooker he also mentions finding cacti in this section[3)].

Today we know from many travellers of Argentina that *Gymnocalycium monvillei* grows along the road between Intihuasi and La Esperanza in grassy terrain interspersed with rocks. They are partly very conspicuous and large specimens. *G. monvillei* was neither found along the sections of Camino Real south of Intihuasi, nor north of La Esperanza. These impressive plants must have attracted the attention of a botanist and professional collector of plants like Tweedie. As they were unknown, deposit specimens were certainly collected. Tweedie was also a businessman with his own garden centre in Buenos Aires and thus he did business with the collected plants, especially the unknown ones.

Fig. 1 left: Camino Real: Postas north of Córdoba up to the border with Province Santiago del Estero; red box = area where *Gymnocalycium monvillei* grows (map: M. Wick, map background: OpenStreetMap).

Fig. 2 right: Map section: J. Arrowsmith: The Provinces of La Plata, the Banda Oriental Del Uruguay and Chile1839.

Fig. 3: *Gymnocalycium monvillei* SPE 96-38 at neotype locality La Esperanza (photo: R. Sperling).

Fig. 4: *Gymnocalycium monvillei* VoS 757, Córdoba, north of Santa Cruz.

Tweedie also stayed in close contact with Luis van Houtte, a Belgium botanist and owner of a garden centre[5)]. He had become acquainted with him in Banda Oriental and subsequently went on some minor collection journeys with him. Van Houtte imported many seeds and plants from various collectors in Latin America, thus presumably from Tweedie as well. Particularly large specimens could be found in the special offers, which was of course a source for Monville. He owned the probably best-stocked cacti collection at that time. As of 1856 van Houtte was the editor of the magazine “Flore des Serres et des Jardins de l`Europe”, in the editing committee of which Lemaire was also a staff member until 1859.

Thus *E. monvillei* seems to be highly likely to have taken the path along the cornerstones Tweedie as collector, van Houtte as importer, Monville as customer to Lemaire as the person to describe it.

In order to establish a basis for further studies on *G. monvillei* as to distribution area, ecology and variability, it is appropriate to define a type locality. According to considerations presented above it is highly likely to define the Camino Real section between Intihuasi and San Pedro Norte in the province Córdoba as the type locality.

Gymnocalycium monvillei (Lemaire) Britton & Rose emend. H. Till 1990

Britton N. L. & Rose J. N. 1922: The Cactaceae 3: 161. illus., emended by H. Till, 1990: A beautiful though often underestimated species: *Gymnocalycium monvillei*.: Gymnocalycium 3 (3): 37 (1990). illus.

Basionym: *Echinocactus monvillei* Lemaire (monvillii sic.)
Cactearum Aliquot Novarum: 14-15 + pl. illus.

Type: protologue and illustration.

Neotypus hic design.: Reiner Sperling, SPE 96-38, 21st January 2013, Argentina, Province Córdoba, Province Ruta 18, between Santa Cruz and San Pedro Norte, GPS 30.18629 N; 64.14978 S; Universalmuseum Joanneum Graz (UMJ, neo).

Fig. 5-6: *Gymnocalycium monvillei* WP 387 Córdoba, RP18, north of La Esperanza.

Fig. 7: *Gymnocalycium monvillei* WP 387, Córdoba, RP18, north of La Esperanza.

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2) LEMAIRE CH. (1838): Cactearum Aliquot Novarum: 14-15.

3) TWEEDIE J. (1840): Account of a Journey across the Pampa of Buenos Aires to Tucuman. – Annales of Natural History vol. 4, part 21, 28, 29.

4) VAN HOUTTE L. Hrg. (1856): Flore des serres et les jardins de l´Europe, Bd 2.-Gent.

5) LE TESNIER F. (1911): Notices sur les Jardiniers celebres et les Amateurs de jardins, - Paris (translated by Judith M. Taylor). https://www.plantexplorers.com/articles/louis-vanhoutte.htm (retrieved 2.2.2024).

Gymnocalycium monvillei – Part 1

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ABSTRACT

This article gives an overview of the species *Gymnocalycium monvillei* from the Argentinian provinces Córdoba and San Luis. Pictures of the locality, plants in their habitat and in cultivation as well as of flower sections and also seeds are presented. Apart from that, flowering periods in cultivation and not only the altitude of the localities, but also the accompanying cacti of *G. monvillei* are introduced.

KEYWORDS

Cactaceae, *Gymnocalycium*, *monvillei, monvillei* subsp. *gertrudae*, *monvillei* var. *coloratum*, *monvillei* var. *grandiflorum*, *monvillei* var. *safronovii*, *monvillei* var. *steineri*

INTRODUCTION

Due to Ludwig Bercht's initiative, the study group decided in 2019 to present the subject *G. monvillei* the following year. In the years 2020 and 2021 the group could not meet because of the Corona pandemic and in 2022 the conference did not take place owing to Covid-19 long-term consequences. Therefore, *G. monvillei* was the main subject of the 2023 conference in Coschütz.

G. monvillei belongs to the subgenus *Scabrosemineum*. The subgenera occurring in *G. monvillei's* habitat are:

- *Scabrosemineum* (e.g.: *G. monvillei, G. mostii, G. achirasense*).
- *Gymnocalycium* (*Ovatisemineum* Schütz), (e.g.: *G. bruchii, G. andreae*).
- *Trichomosemineum* (e.g.: *G. quehlianum, G. ochoterenae*).

G. monvillei can be found in the Argentinian provinces Córdoba and San Luis. *G. monvillei* covers a large distribution area in Córdoba, spanning 500 km in north-south direction. Within the distribution area different altitudes are populated. The lowest locality known to the author is situated below 700 m a.s.l. in the Sierra de las Peñas. The highest locality visited by the author is at 2,200 m a.s.l. in the Sierra Grande. *G. monvillei* subsp. *gertrudae* appears in the Sierra de San Luis, on Cerro El Morro as well as in the Sierra de Comechingones. The distribution area extends over around 250 km in northeast-southwest direction.

Surprisingly, the plants display only slight variability despite the large distribution area and the different altitudes. For this reason merely one subspecies and few varieties have been described:

- *G. monvillei* subsp. *gertrudae,*
- *G. monvillei* subsp. *gertrudae* var. *confusa,*
- *G. monvillei* var. *coloratum,*
- *G. monvillei* var. *grandiflorum,*
- *G. monvillei* var. *safronovii,*
- *G. monvillei* var. *steineri.*

In the subgenus *Gymnocalycium* substantially more species respectively subspecies have been described. On the one hand, evolution is still in full swing within the subgenus *Gymnocalycium*, on the other hand the subgenus *Scabrosemineum* does not induce the same interest among collectors.

Definition of “variety” in the botanical sense (*source: Wikipedia).*

As already mentioned, merely varieties of *G. monvillei* and no subspecies from province Córdoba were described. The subgenus resp. subspecies *gertrudae* originates from province San Luis, as well as from the border region of the provinces San Luis and Córdoba, the Sierra de Comechingones.

A variety is a taxonomic rank between subspecies and form in biological terms.

As perceived today, a variety includes several populations, which differ in single or only very few features from the type‘s form (species). As opposed to a subspecies, they do not have a separate distribution area. Thus the biological meaning of the features and consequently of the variety is often unclear.

Tab. 1: The taxonomic ranks.

Even about the chromosome number of *G. monvillei* only little to nothing had been known up to then. The study group had many seeds of *G. monvillei* investigated as to their ploidy level (number of chromosome sets in a cell nucleus).

Merely the author’s localities are indicated on the distribution area map (fig. 1). It can be assumed that plants can also be found in the central Sierra Grande and Sierra de Comechingones regions. As there are neither roads nor earth roads, the localities can hardly be reached.

On looking for his favourites from the subgenus *Gymnocalycium* (among others *G. bruchii, G. andreae, G. campestre, G. capillense*) the author frequently discovered *G. monvillei* as a “by-catch“.

This article aims at explaining the connections based on first descriptions, the author’s knowledge of localities as well as on offspring.

Mainly localities from which offspring, seeds and flower sections are available and chromosome sets (ploidy) are known have been included.

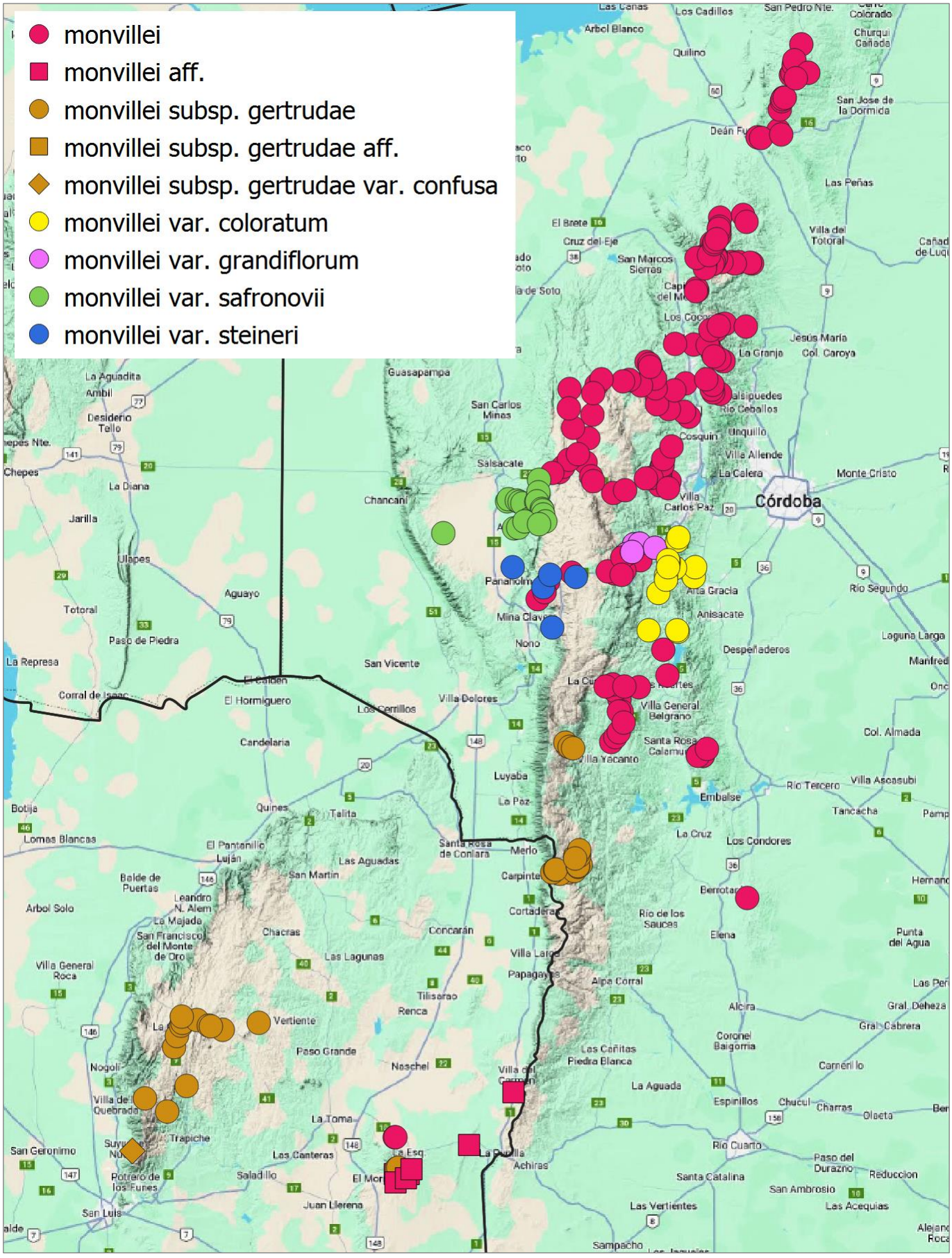


Fig 1: Distribution area of *G. monvillei* (all maps: M. Wick, all map backgrounds: Google Maps)

How can *G. monvillei* be distinguished from other members of the subgenus *Scabrosemineum*?

Extensive ploidy research has revealed that *G. monvillei* always has a chromosome set of 4n=tetraploid. The other species in the subgenus *Scabrosemineum* (e.g. *G. achirasense, G. orientale, G. mostii)* always have a chromosome set of 2n=diploid. Since chromosome set as well as form of seeds and flowers are often unknown, the plants can mostly be distinguished only with the help of their spine arrangement. The spines of *G. monvillei* are yellowish, mostly shining, with a red base (fig. 2-3). The spines of the other species in the subgenus *Scabrosemineum* are matt (fig. 4-5).

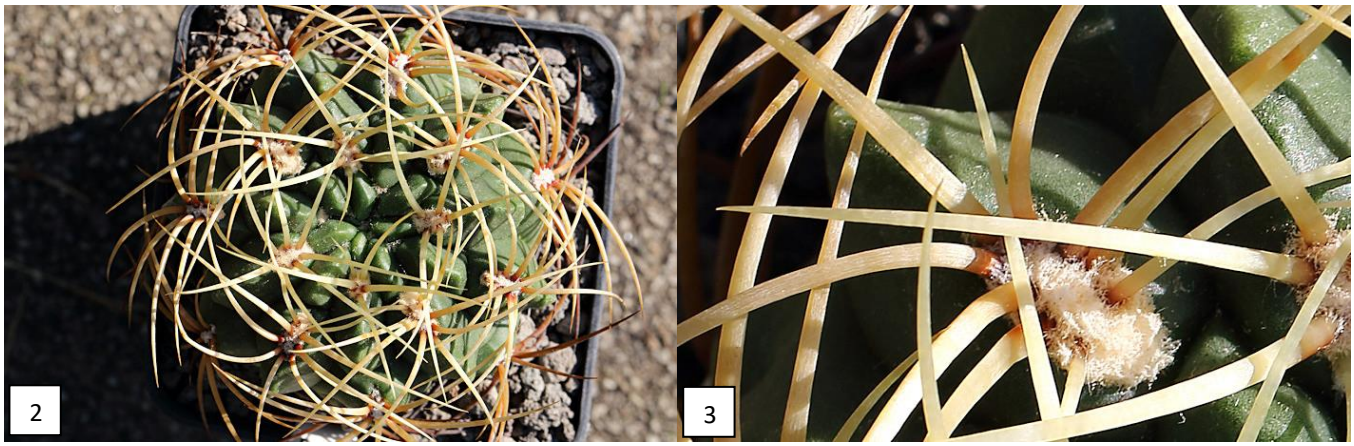


Fig. 2-3: *G. monvillei* TS 845, San Gerónimo, plant with shining yellow spines, the chromosome set is 4n=tetraploid.

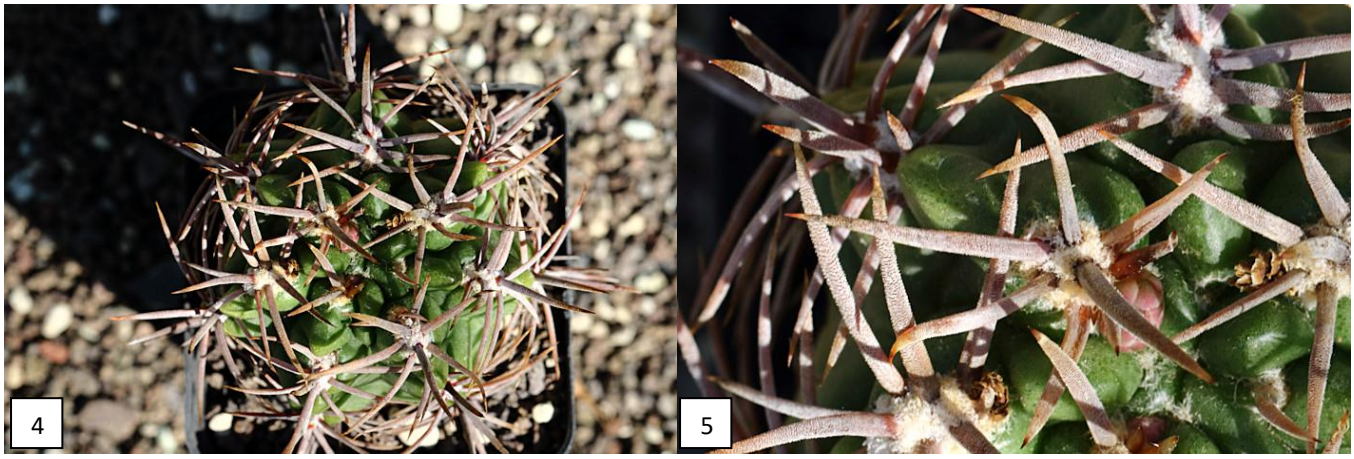


Fig. 4-5: *G. achirasense* TS 766, Los Molles, plant with matt spines, the chromosome set is 2n=diploid.

The distribution areas of *G. monvillei* and *G. monvillei* subsp. *gertrudae* will be presented in geographical order from northeast to southwest in the following.

1. Gymnocalycium monvillei.

Localities in north-eastern Córdoba.

The north-easternmost members of the *G. monvillei* group occur in the Sierra de Ambargasta, Sierra de Ischillin and Sierra Chica (fig. 6-7). The large salt lakes Salinas Grandes and Salinas de Ambargasta are situated further to the north, forming a species barrier. A flat alluvial region, which is unsuitable for cacti to grow, stretches in northern direction.

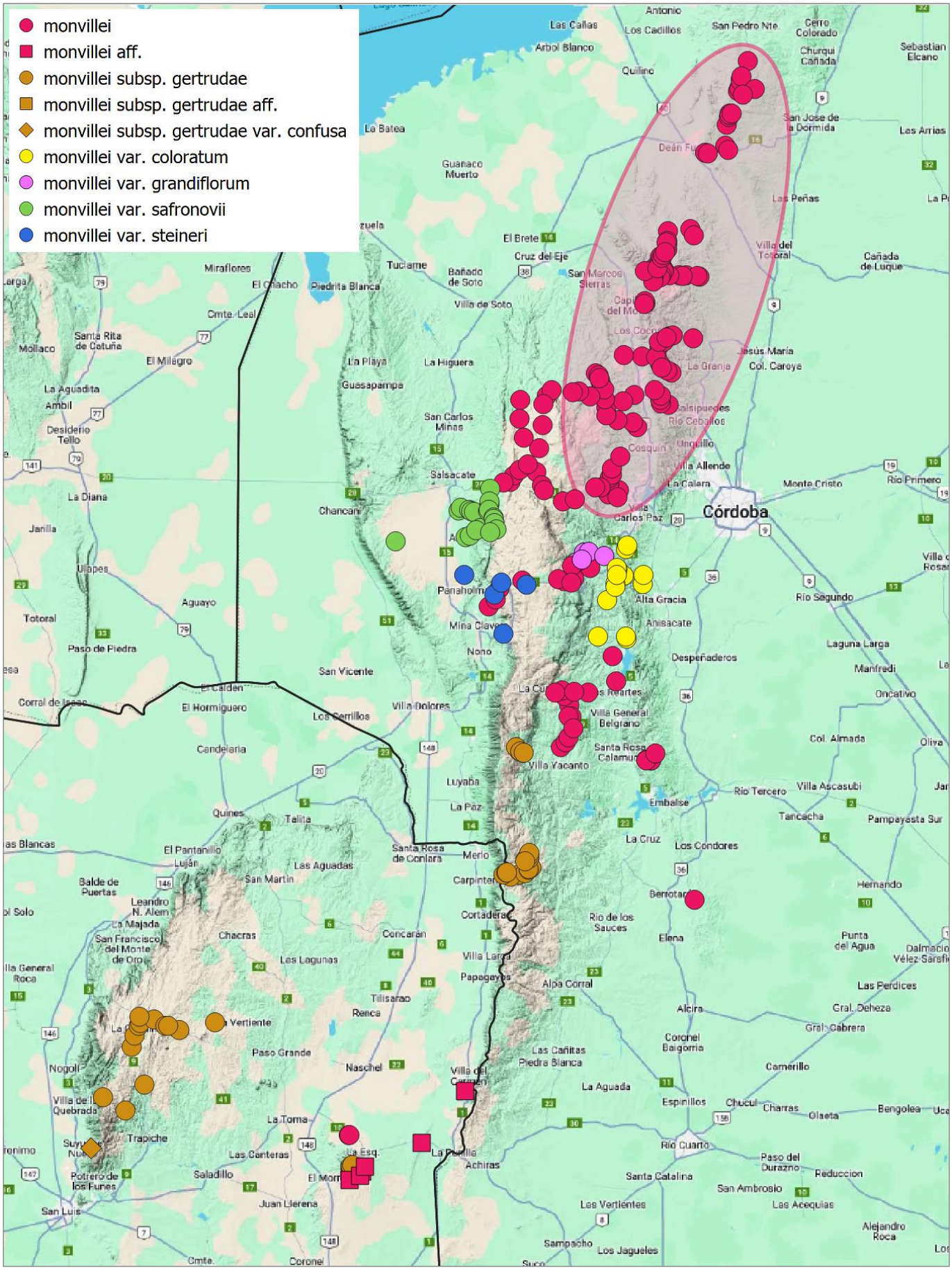


Fig. 6: Distribution area of *G. monvillei*, Córdoba northeast.

It becomes apparent from the detailed map sector of the north-easternmost distribution area of the *G. monvillei* group (fig. 7) that *G. monvillei* do not grow in areas of low altitude. The soil is sandy and therefore unsuitable for *G. monvillei*, which prefer rocky habitats.

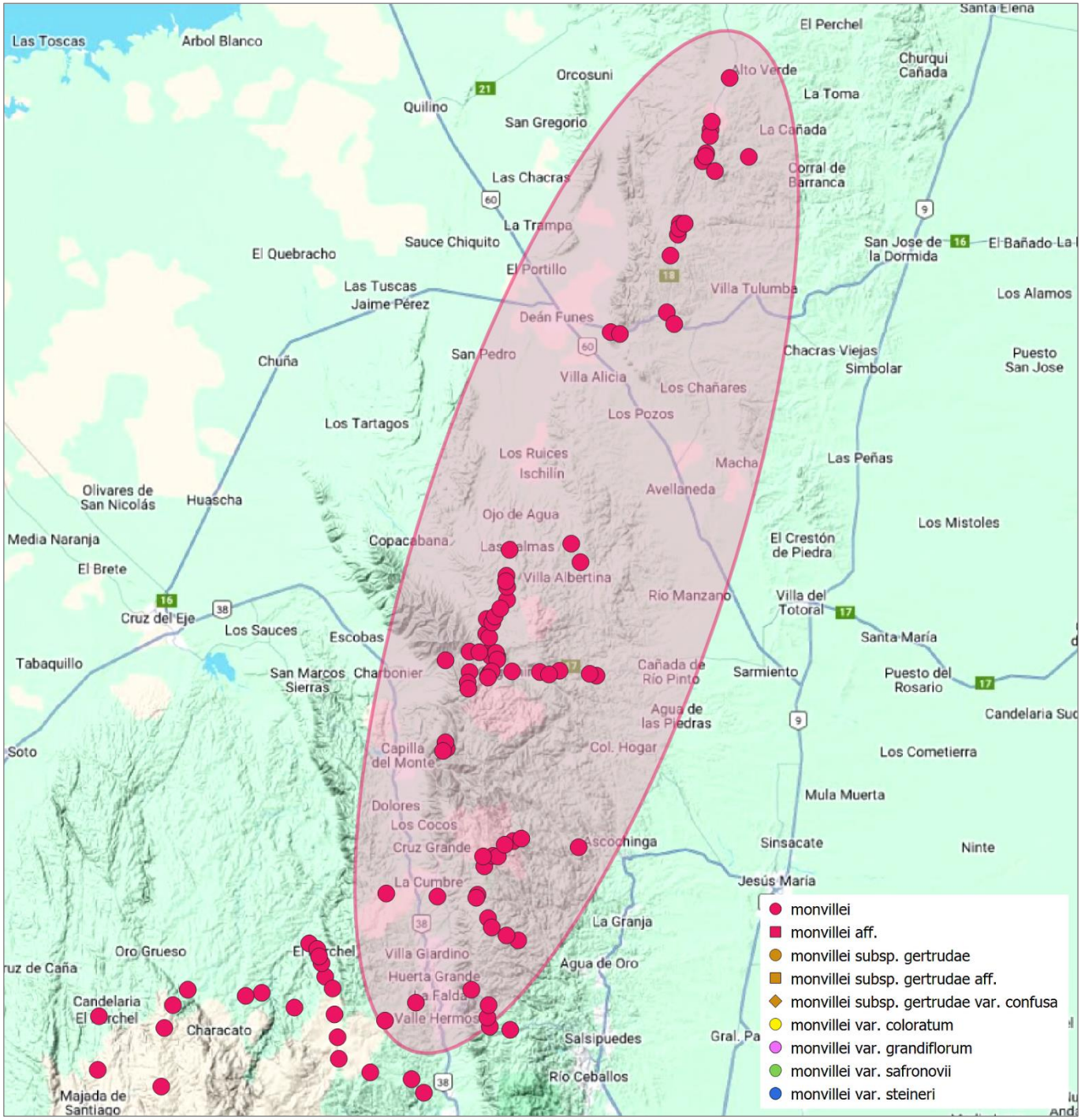


Fig. 7: Detailed map of *G. monvillei's* north-easternmost distribution area.

In low-lying regions the habitat consists of small rocky hills which are more or less grown over with acacias. Vegetation and climate are alpine in higher mountains and the substrate is rocky.

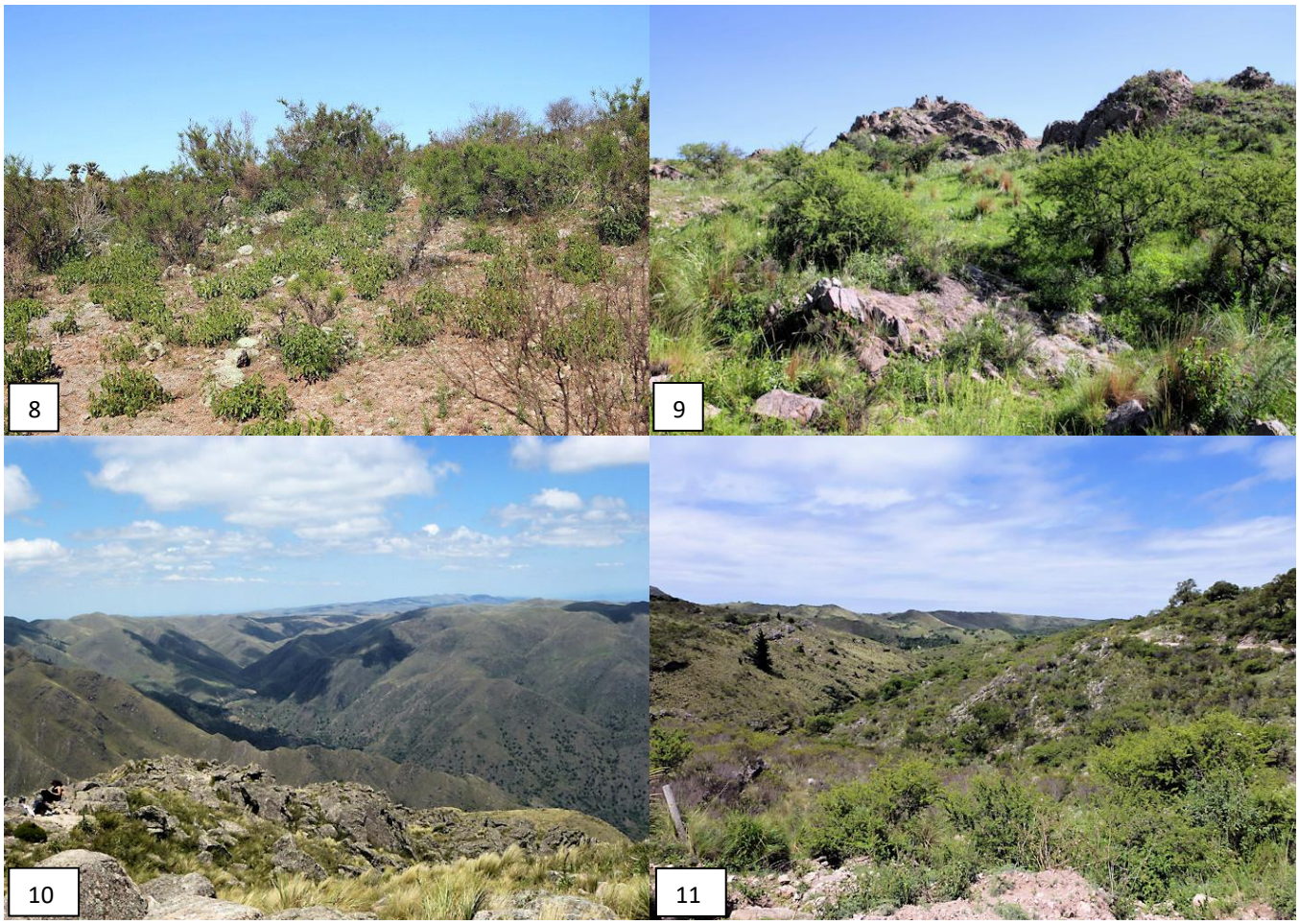


Fig. 8-11: Localities: (8) TS 131, Santa Cruz, 961 m (photo: V. Schädlich); (9) TS 111, Todos los Santos 1,022 m; (10) TS 546a, Cerro Uritorco, 1,931 m; (11) TS 881, Capilla Candonga, 1,345 m (photo: M. Strub).

The plant bodies reach a considerable height. The epidermis is light to medium green. In cool temperatures the plants develop rose-coloured flowers in their habitat. Older specimens begin to sprout.

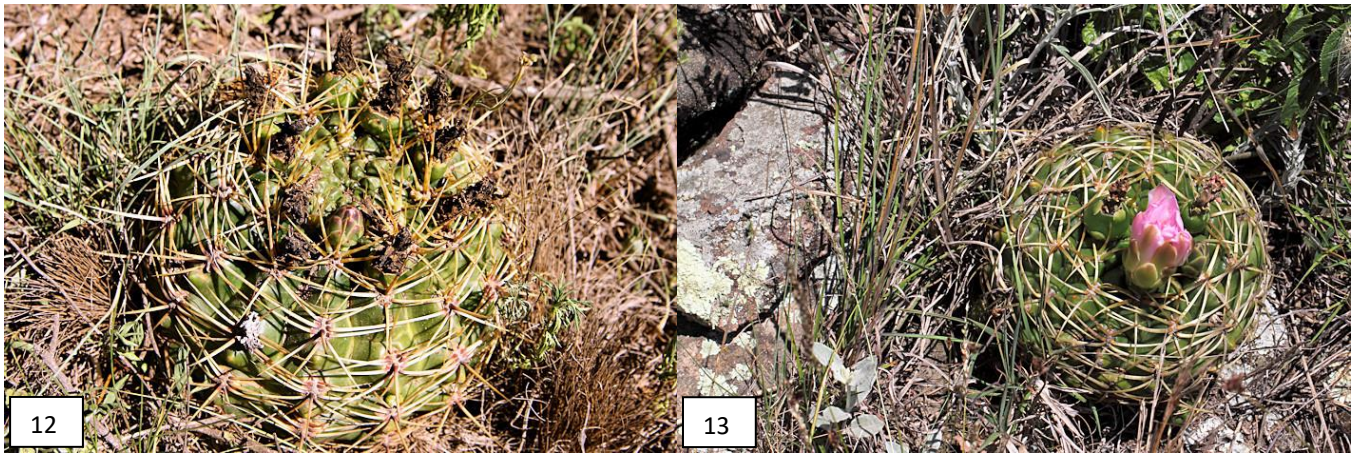


Fig. 12-13: Plants in their habitat: (12) TS 131 *G. monvillei*, Santa Cruz, 961 m (photo: V. Schädlich); (13) TS 111 *G. monvillei*, Todos los Santos, 1,022 m.

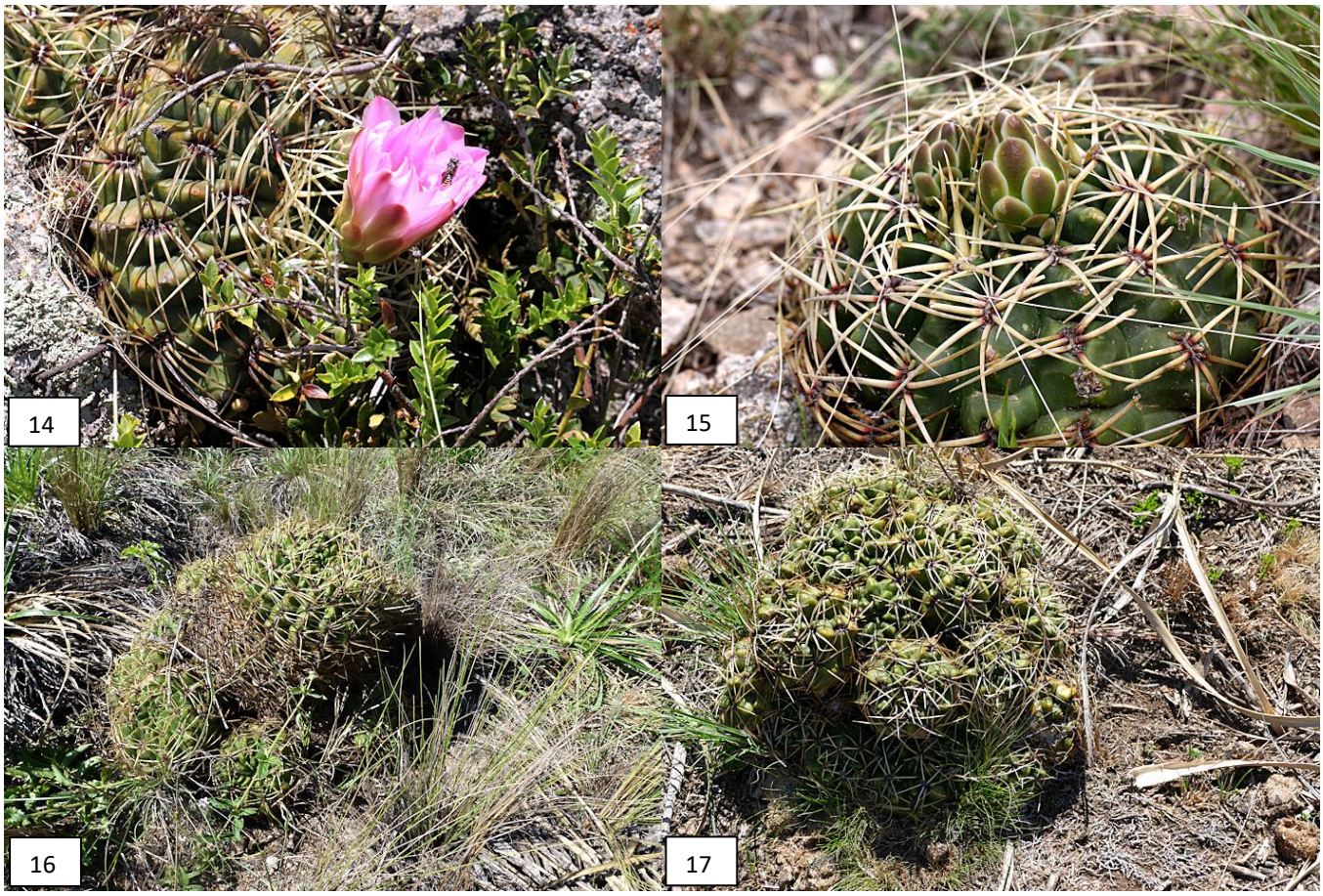


Fig. 14-17: Plants in their habitat: (14) TS 546a *G. monvillei*, Cerro Uritorco, 1,931 m; (15) TS 881 *G. monvillei*, Capilla Candonga, 1,345 m; (16) TS 450 *G. monvillei*, Inti Huasi, 915 m (photo: M. Strub); (17) TS 2041 *G. monvillei*, La Higuera, 840 m (photo: M. Strub).

The plants depicted in the following are roughly the same age and thus comparable. There is only little variability. The epidermis of *G. monvillei* is uniformly dark green in cultivation. Spines are close to the body to slightly protruding, yellow and shining, mostly with a dark base. At the age of around ten years most plants start sprouting from old areoles located close to the base. Ploidy of all seeds investigated is 4n=tetraploid.

Fig. 18-19: Spination: (18) TS 131 *G. monvillei,* Santa Cruz, 961 m; (19) TS 111 *G. monvillei*, Todos los Santos, 1,022 m.

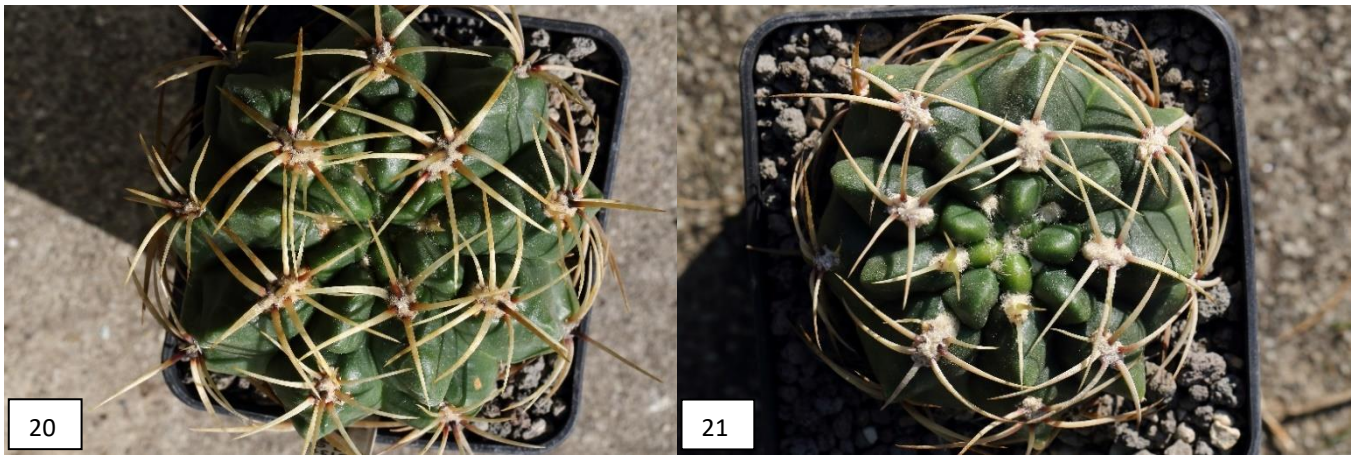


Fig. 20-21: Spination: (20) TS 546a *G. monvillei*, Cerro Uritorco, 1,931 m; (21) TS 881 *G. monvillei*, Capilla Candonga, 1,345 m.

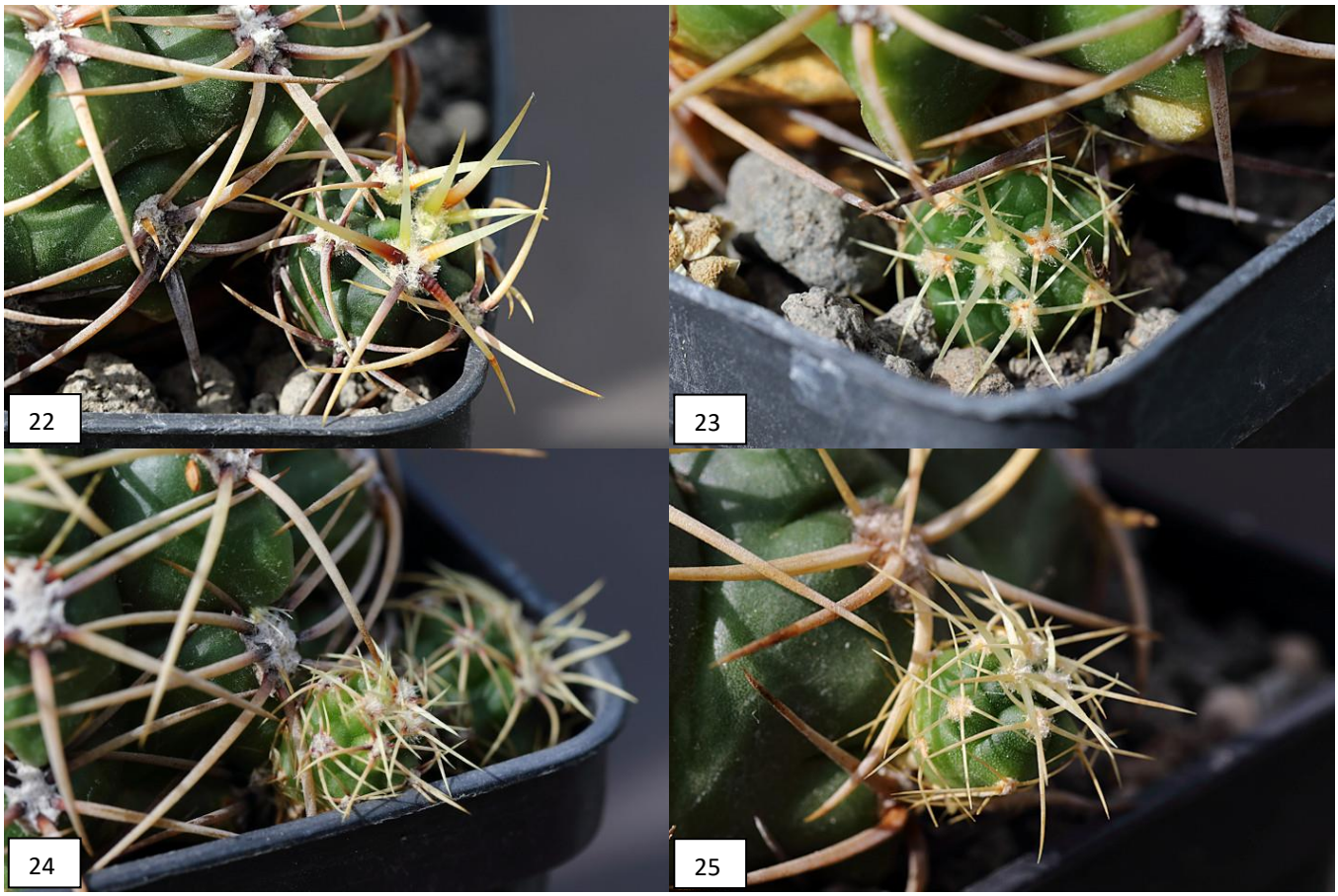


Fig. 22-25: Sprout from the base: (22) TS 359 *G. monvillei*, Tío Mayo, 1,433 m; (23) TS 111 *G. monvillei*, Todos los Santos, 1,022 m; (24) TS 546 *G. monvillei*, Cerro Uritorco, 1,749 m; (25) TS 881 *G. monvillei*, Capilla Candonga, 1,345 m.

The flower form is funnel- to cup-shaped. The ovary is short compared with the pericarp. Flowers are mostly hermaphroditic and possess functioning female and male sexual organs, respectively normally developed style and anthers with pollen (fig. 26-29). In some plants the flower is exclusively predetermined to be female, pollen is totally missing here (fig. 30).

The colour of petals is mostly white in culture.

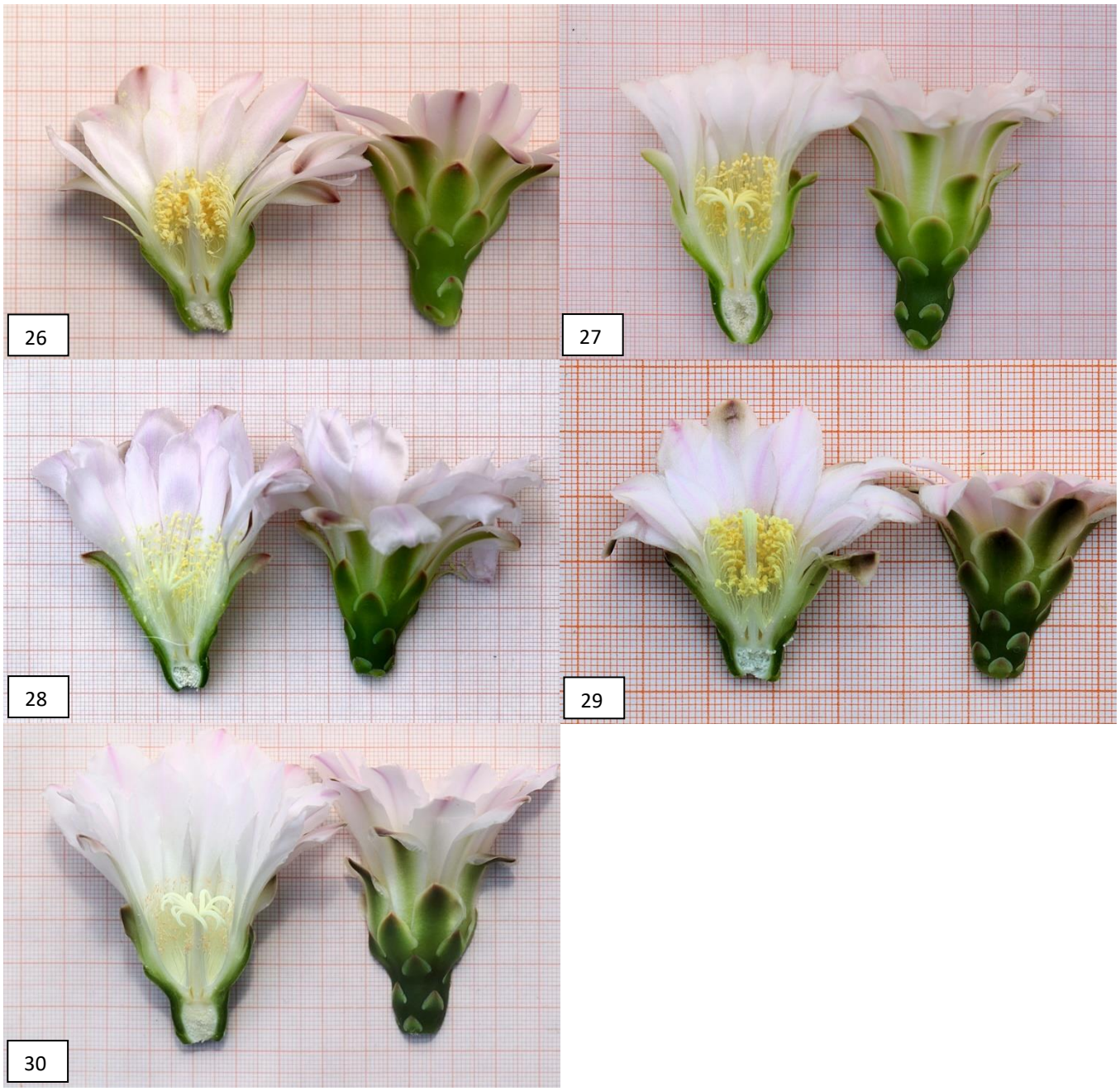


Fig. 26-30: Flower sections: (26) TS 131 *G. monvillei*, Santa Cruz, 961m; (27) TS 111 *G. monvillei*, Todos los Santos, 1,022 m; (28) TS 546a *G. monvillei*, Cerro Uritorco, 1,931 m; (29) TS 881 *G. monvillei*, Capilla Candonga, 1,345 m; (30) TS 128 *G. monvillei*, Santa Cruz, 922 m (the flower is predetermined to be female, pollen is missing).

It is a seed typical of the subgenus *Scabrosemineum*.

Seeds of plants from the north-eastern part of the distribution area possess a relatively wide hilum. The form has the tendency towards being somewhat elongated. There is little difference when compared with seeds of *G. achirasense* (fig. 31-35).

Fig. 31-35: Pictures of seeds: (31) TS 131 *G. monvillei*, Santa Cruz, 961 m; (32) TS 111 *G. monvillei*, Todos los Santos, 1,022 m; (33) TS 546a *G. monvillei*, Cerro Uritorco, 1,931 m; (34) TS 881 *G. monvillei*, Capilla Candonga, 1,345 m; (35) TS 505 *G. achirasense*, Papagayos, 1,038 m (seed pictures: V. Schädlich).

Various species of the genus *Gymnocalycium* from different subgenera coexist in the northern distribution area, namely the southern foothills of the Sierra de Ambargasta (fig. 36). Again, the habitats consist of flat, rocky hills grown over with acacias (fig. 37-38).

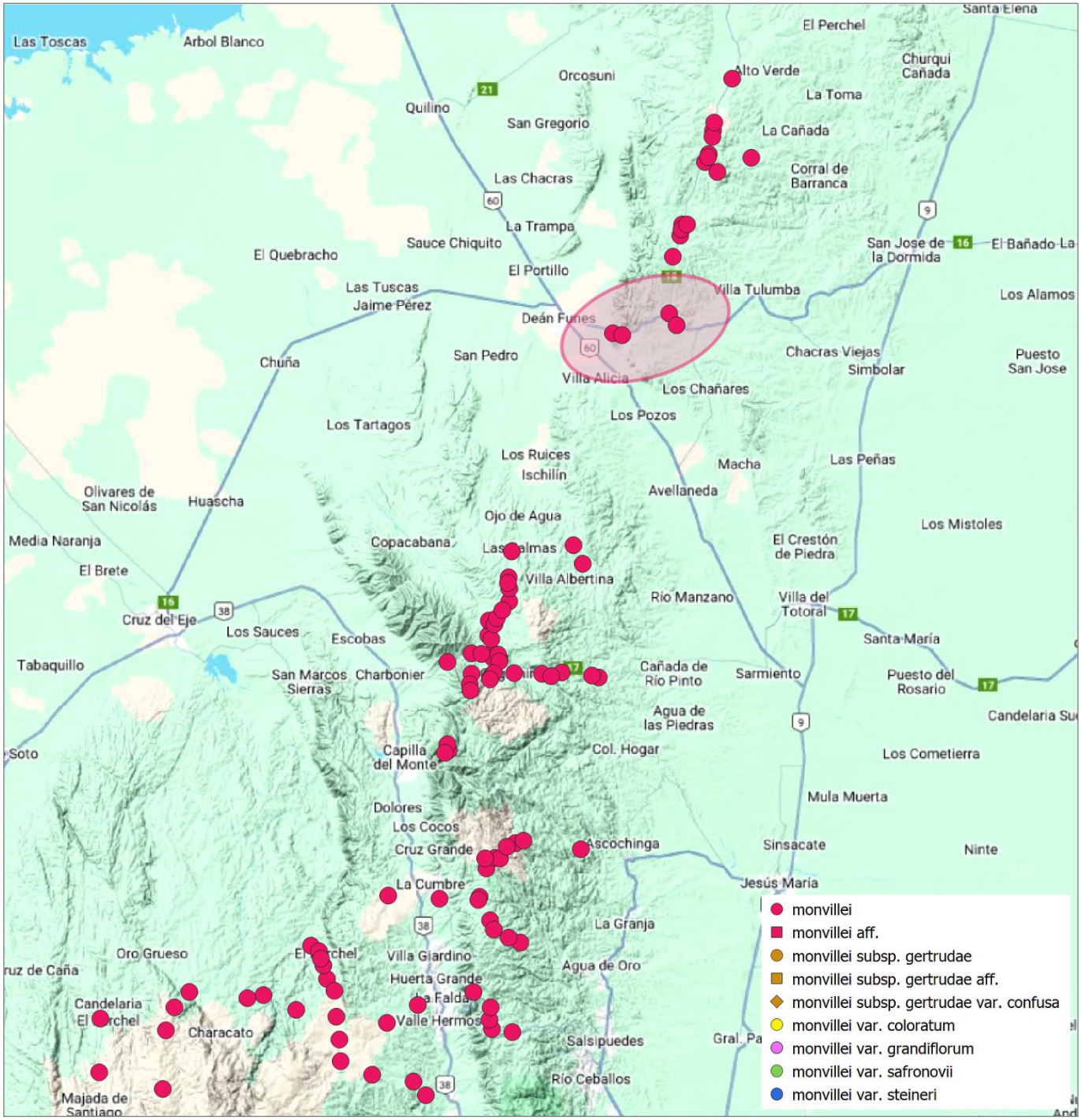


Fig 36: Detailed map of *G. monvillei's* north-easternmost distribution area.

Specimens typical of the species *G. monvillei* can rarely be found at the locality near Inti Huasi (fig. 40), but many *G. monvillei* x *campestre* hybrids (fig. 41-42) as well as *G. campestre* from the subgenus *Gymnocalycium* (fig. 43). The hybrid offspring brought about by *G. monvillei* x *G. campestre* develop seeds which have the capacity to germinate. Spine colour is inherited from the *G. monvillei* parent, spine form and position are shaped as found with *G. campestre* (also 4n=tetraploid). A new species seems to be developing at this locality.

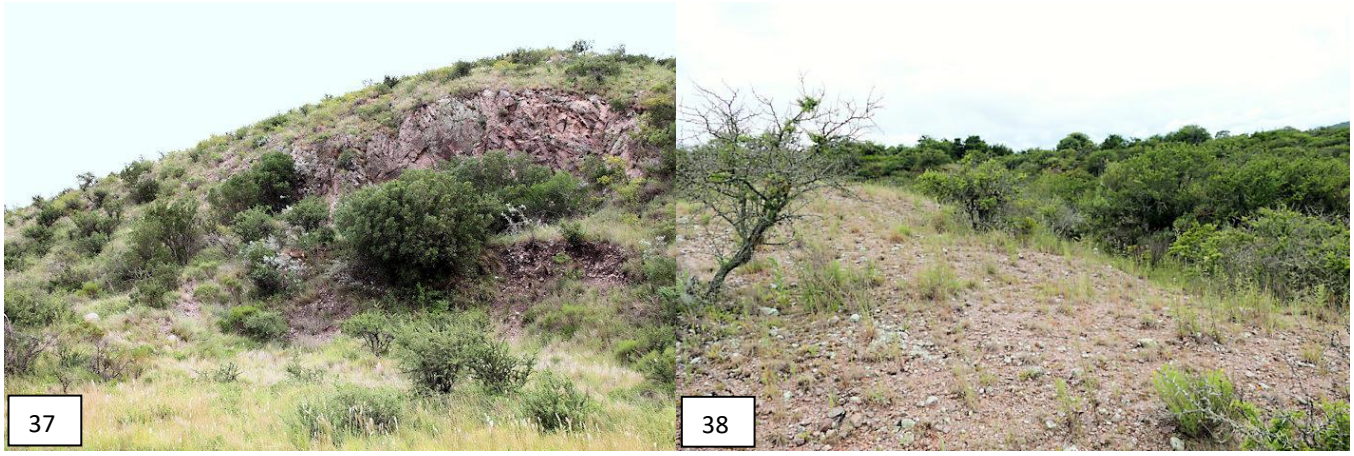


Fig. 37-38: Localities: (37) TS 140, Sauce Punco, 842 m; (38) TS 1093, Inti Huasi, 824 m.

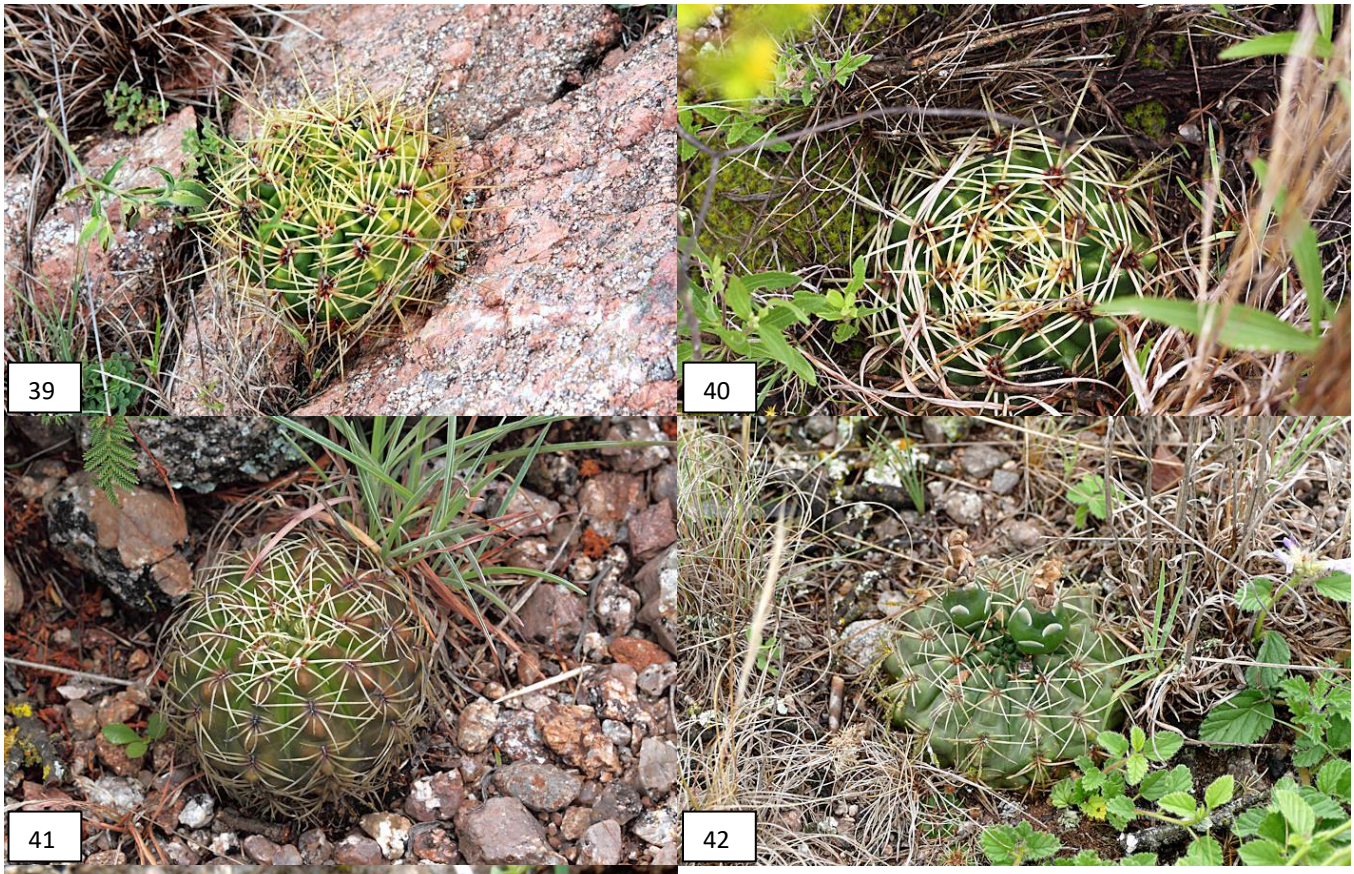


Fig. 39-43: Plants in their habitat: (39) TS 140 *G. monvillei,* Sauce Punco, 842 m (photo: M. Wick); (40) TS 1093 *G. monvillei,* Inti Huasi, 824 m; (41-42) TS 1093 *G. monvillei* x *G. campestre,* Inti Huasi, 824 m (hybrids); (43) TS 1094 *G. campestre,* Inti Huasi, 824 m (species from the subgenus *Gymnocalycium*).

The differences with *G. monvillei* typical of the species are clearly evident in cultivation, too. The outward appearance of the hybrids does not correspond with the actual *G. monvillei* as the spines are needle-like (fig. 44-45) and not as prominent as with *G. monvillei* (fig. 46-47). Not only the hybrids, but also the typical *G. monvillei's* seeds have a chromosome set of 4n=tetraploid. Not surprisingly, *G. campestre* from the same locality also possess a 4n=tetraploid chromosome set.

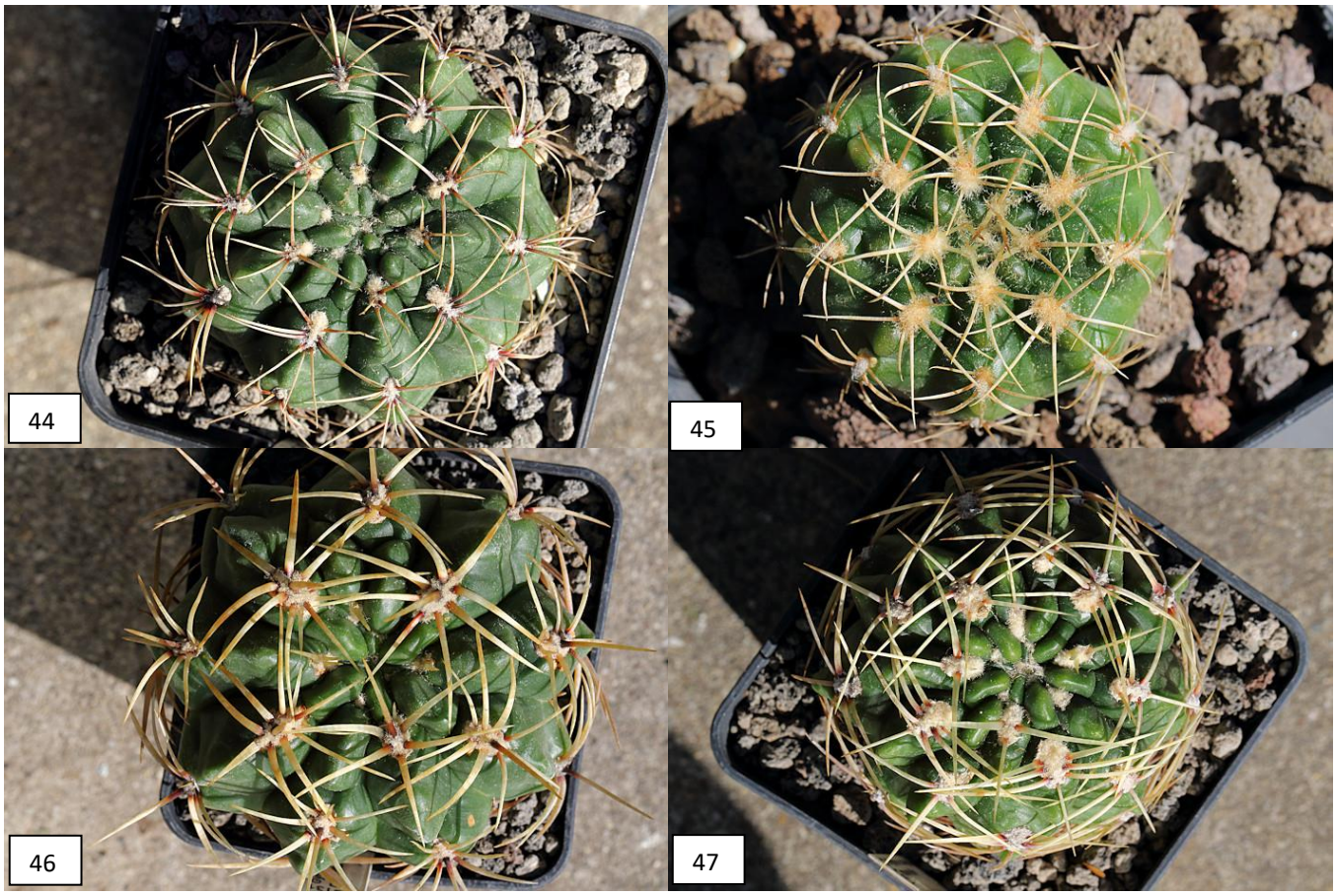


Fig. 44-47: Spination: (44) TS 140 *G. monvillei* x *G. campestre*, Sauce Punco. 842 m (hybrid); (45) TS 1093 *G. monvillei* x *G. campestre*, Inti Huasi, 824 m (hybrid); (46) TS 131 *G. monvillei*, Santa Cruz, 961 m; (47) TS 111 *G. monvillei*, Todos los Santos, 1,022 m.

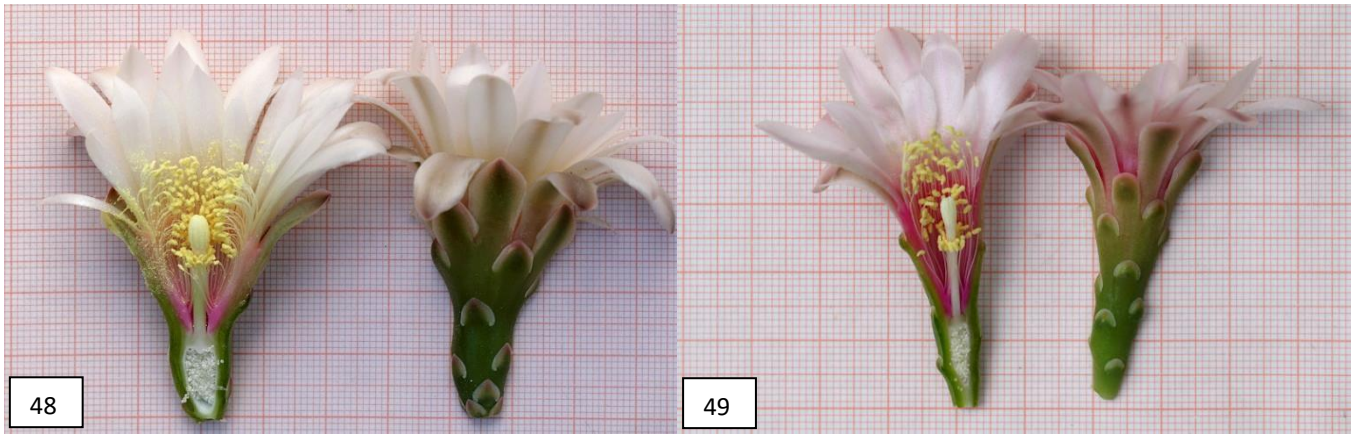


Fig. 48-49: Flower sections: (48) TS 140 *G. monvillei* x *G. campestre*, Sauce Punco, 842 m (hybrid's flower); (49) TS 1093 *G. monvillei* x *G. campestre*, Inti Huasi, 824 m (hybrid's flower).

Neither the colour features of the pericarp nor the proportion of pericarp and ovary of the hybrids correspond with the *G. monvillei* flower (fig. 48-49). Typical *G. monvillei* flowers differ completely in structure (fig. 50-51). The flower of TS 128 is female by predetermination, anthers are missing (fig. 50).

Fig. 50-51: Flower sections: (50) TS 128 *G. monvillei,* Santa Cruz, 932 m (*G. monvillei* flower, female by predetermination); (51) TS 131 *G. monvillei*, Santa Cruz, 961 m (*G. monvillei* flower).

There are no obvious differences from the *G. monvillei* type recognisable with the seeds. They are elongated to compact and the hilum is narrow to slightly widened (fig. 52-54). The hybrid's seeds show all the features of the female plant since the embryo is generated by the female parent. No features of the male plant are present (fig. 54a).

Fig. 52-53: Seed pictures: (52) TS 140 *G. monvillei* x *G. campestre,* Sauce Punco, 842 m; (53) TS 1093 *G. monvillei* x *G. campestre* (seeds from which hybrids originated, photos: V. Schädlich).

Fig. 54-54a: Seed pictures: (54) TS 131 *G. monvillei*, Santa Cruz, 961 m (species-typical seed for comparison) (photo: V. Schädlich); (54a) TS 1094 *G. campestre,* Inti Huasi, 824 m (seed of the subgenus *Gymnocalycium*).

The flowering period, that of hybrid TS 140 as well, corresponds with *G. monvillei's* flowering time. The hybrid TS 1093 flowers later, possibly influenced by *G. campestre,* whose flowering period is later than that of *G. monvillei* (fig. 55). This statistics is based on data from 2022. In 2023 the author's *G. monvillei* did not flower frequently. It was a warm spring followed by a cold stretch, which was not beneficial for the formation of *G. monvillei's* flowers.

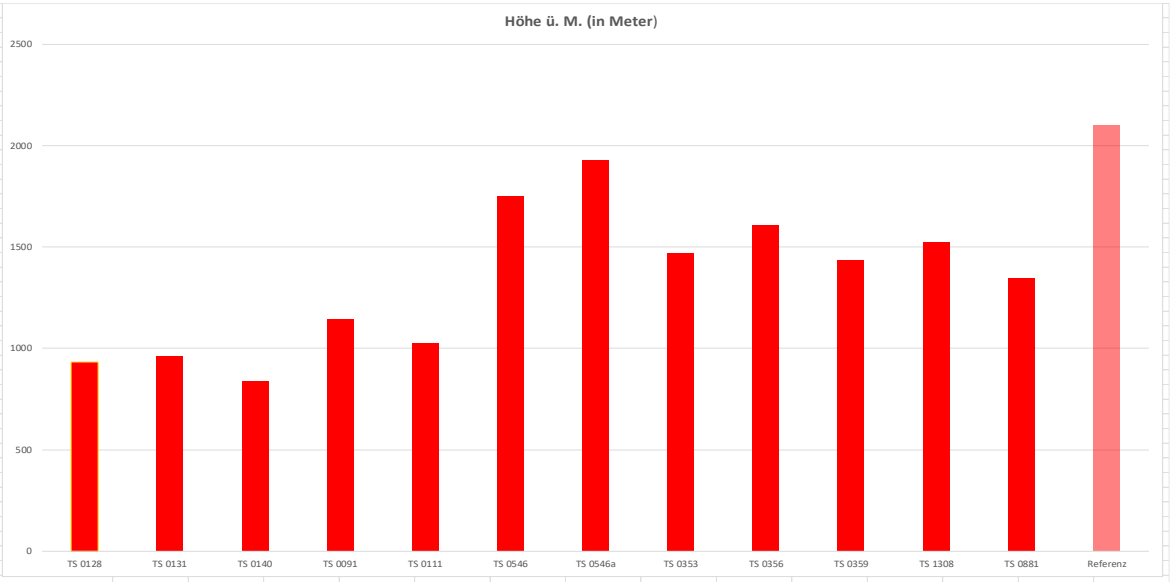
Feldnummer	Art	Ort	H.ü.M	März				April				Mai				Juni			
Córdoba Nordost																			
TS 0128	monvillei	Santa Cruz	932																
TS 0131	monvillei	Santa Cruz	961																
TS 0140	monvillei x campestre	Sauce Punco	840																
TS 1093	monvillei x campestre	Inti Huasi	824																
TS 0091	monvillei	Las Palmas	1 141																
TS 0100	monvillei	Las Palmas	1 175																
TS 0111	monvillei	Todos Los Santos	1 022																
TS 0546	monvillei	Cerro Uritorco	1 749																
TS 0546a	monvillei	Cerro Uritorco	1 931																
TS 0353	monvillei	Tío Mayo	1 468																
TS 0356	monvillei	Tío Mayo	1 608																
TS 0359	monvillei	Tío Mayo	1 433																
TS 1308	monvillei	Estancia El Rosario-Candonga	1 521																
TS 0881	monvillei	Estancia El Rosario-Candonga	1 345																

Tab. 2: Flowering period of *G. monvillei* from north-east Córdoba (Basel, 2022).

The localities are situated at an altitude of between 800 and 2,000 m a.s.l.. The locality of the highest altitude from which offspring exist is taken as reference. It was introduced so that altitudes remain graphically comparable.

Apart from at the highest rising locality there are often *Echinopsis aurea* and *Parodia submammulosa* as accompanying plants (fig. 55-56). Both species have a huge distribution area within Argentina. *Acanthocalycium spiniflorum* grows along with *G. monvillei* only as an exception (fig. 57). Together with the genus *Gymnocalycium* these genera belong to the few spherical cacti occurring in the provinces Córdoba and San Luis.

Feldnummer	Höhe/M	Art
TS 0128	932	monvillei
TS 0131	961	monvillei
TS 0140	840	monvillei
TS 0091	1 141	monvillei
TS 0111	1 022	monvillei
TS 0546	1 749	monvillei
TS 0546a	1 931	monvillei
TS 0353	1 468	monvillei
TS 0356	1 608	monvillei
TS 0359	1 433	monvillei
TS 1308	1 521	monvillei
TS 0881	1 345	monvillei
Referenz	2 100	Ref.



Tab. 3: Altitudes, distribution area north-east Córdoba.

Many species from the genus *Gymnocalycium* have been described in the north-east Córdoba area. According to first descriptions, there are six subspecies and one variety just from *G. bruchii*, namely *G. bruchii* subsp. *pawlovskyi* (fig. 58), *G. bruchii* subsp*. deminii, G. bruchii* subsp. *atroviride, G. bruchii* subsp. *elegans, G. bruchii* subsp. *lafaldense, G. bruchii* subsp. *implexum, G. bruchii* subsp*. multicostatum, as well as G. bruchii* var. *niveum.*

Gymnocalycium erinaceum grows together with *G. monvillei* (fig. 50) in the Sierra de Ambargasta and the Sierra de Ischilin. *G. erinaceum* at its locality is difficult to distinguish from *G. campestre* of the subgenus *Gymnocalycium* (fig. 60).

G. monvillei forms a phytocenosis with *G. amerhauseri* and *G. andreae* subsp. *pabloi* (fig. 61-62) in the Sierra Chica, but also with *G. mostii* (fig. 63) from the subgenus *Scabrosemineum* with ploidy of 2n=diploid.

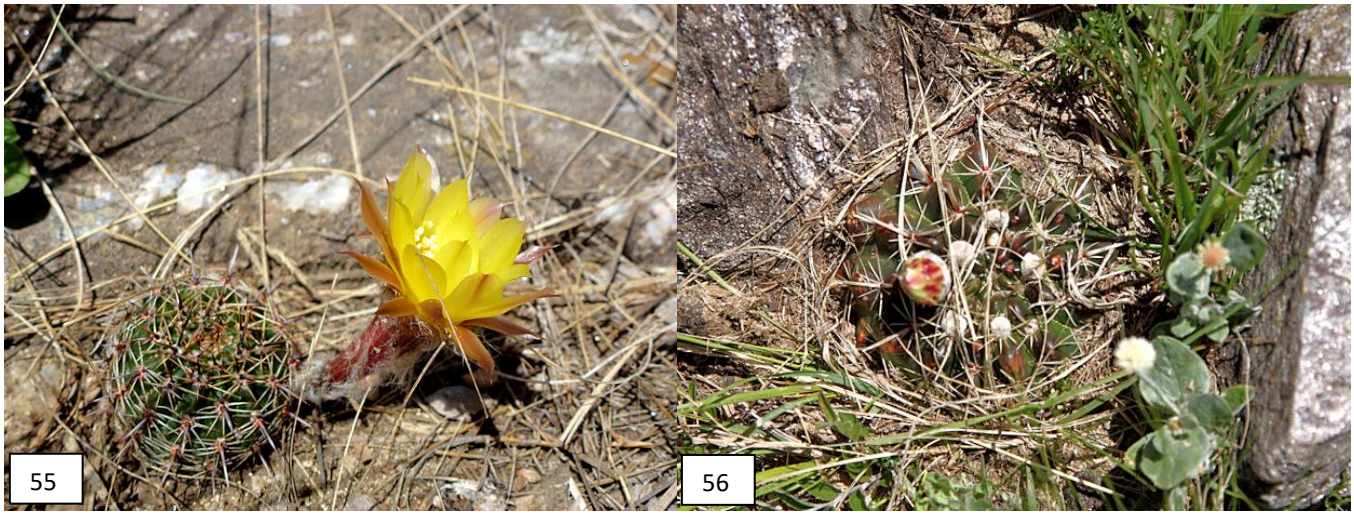


Fig. 55-56: Accompanying flora: (55) TS 358a *Echinopsis aurea*, Tío Mayo, 1,498 m: (56) TS 358b *Parodia submammulosa*, Tío Mayo, 1,498 m (photo: M. Strub).

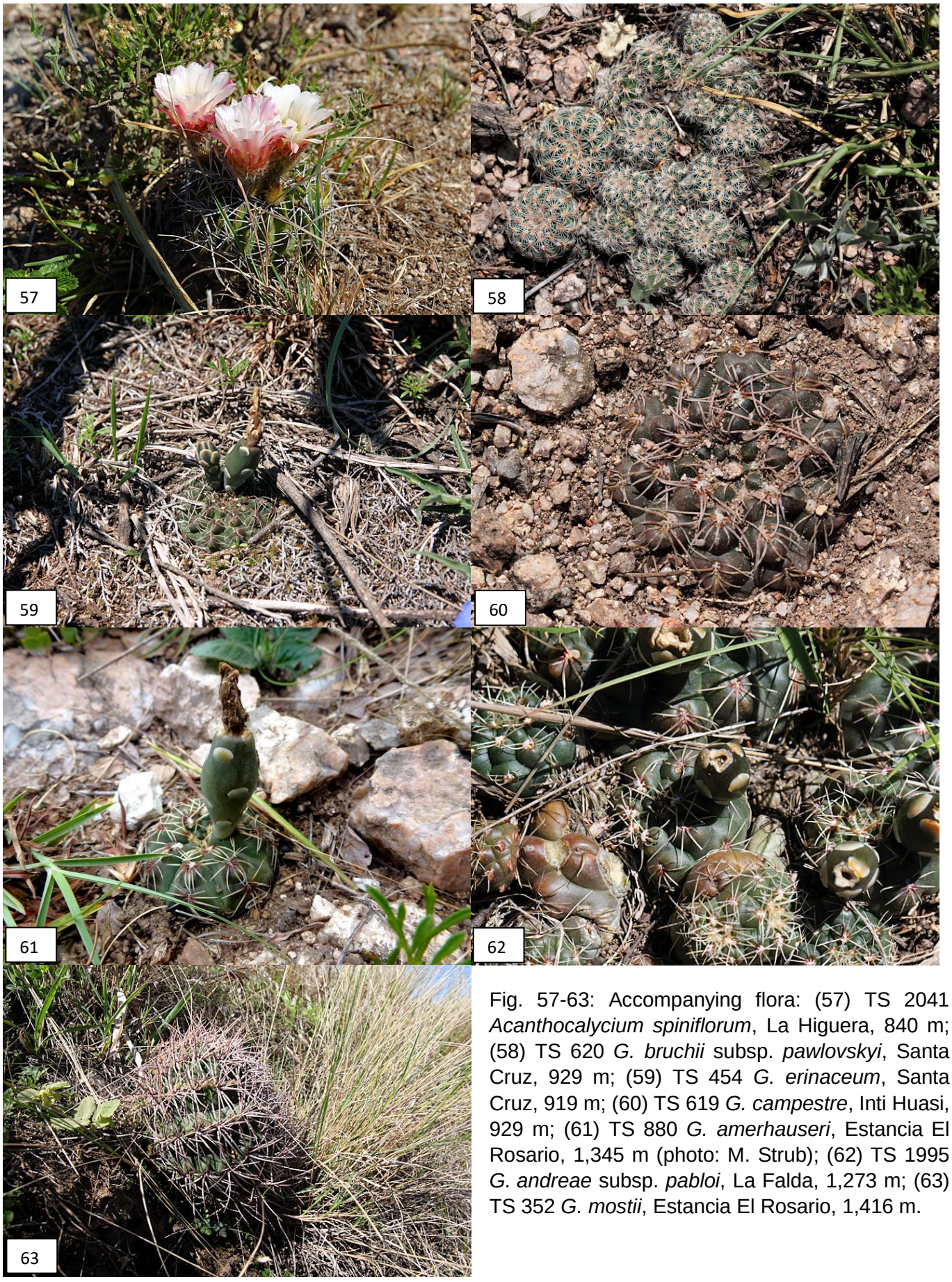


Fig. 57-63: Accompanying flora: (57) TS 2041 *Acanthocalycium spiniflorum*, La Higuera, 840 m; (58) TS 620 *G. bruchii* subsp. *pawlovskyi*, Santa Cruz, 929 m; (59) TS 454 *G. erinaceum*, Santa Cruz, 919 m; (60) TS 619 *G. campestre*, Inti Huasi, 929 m; (61) TS 880 *G. amerhauseri*, Estancia El Rosario, 1,345 m (photo: M. Strub); (62) TS 1995 *G. andreae* subsp. *pabloi*, La Falda, 1,273 m; (63) TS 352 *G. mostii*, Estancia El Rosario, 1,416 m.

2. Distribution Area in the Sierra Grande

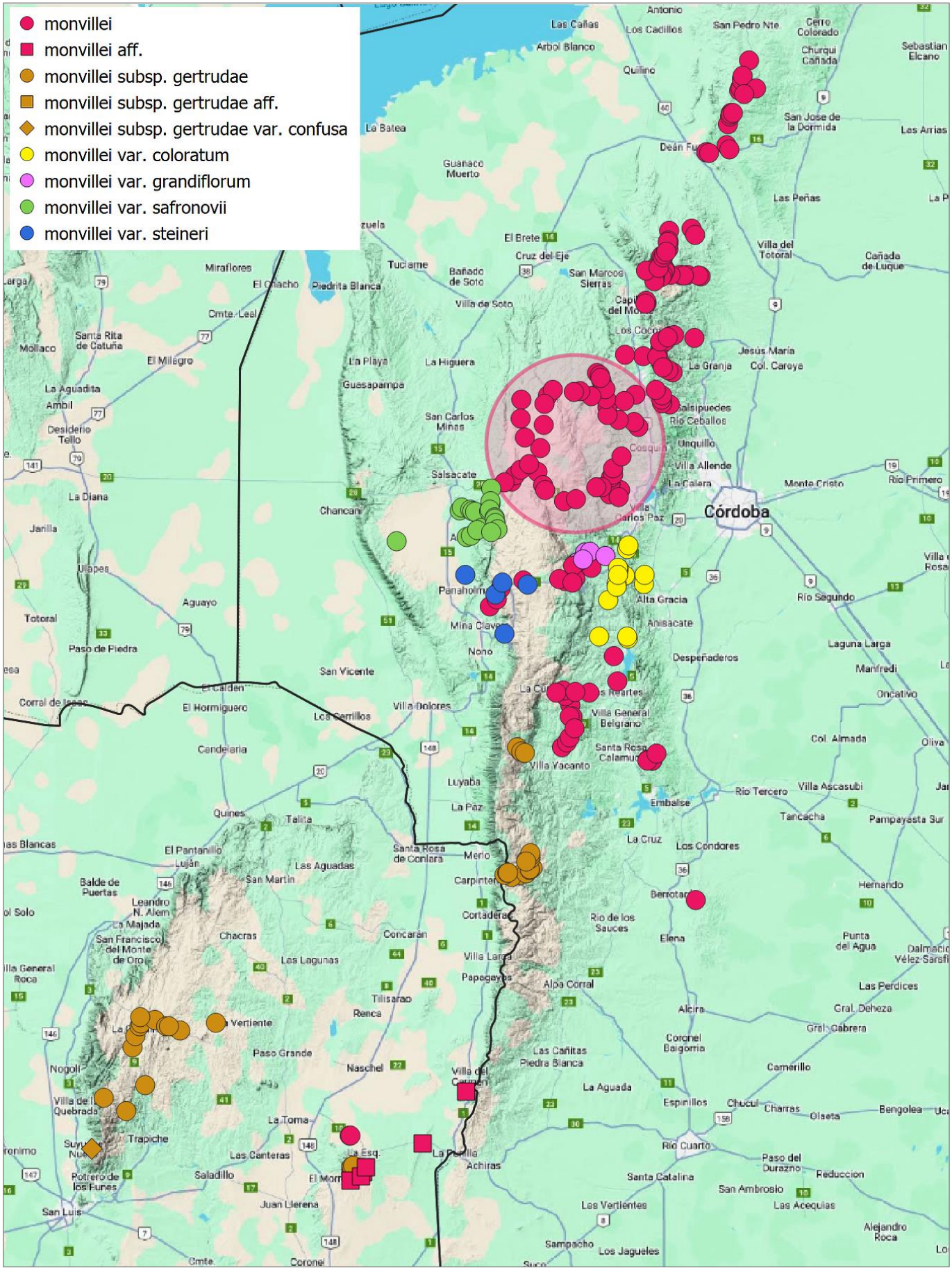


Fig. 64: Distribution area of *G. monvillei* in the Sierra Grande.

Another large distribution area can be found in the Sierra Grande (fig. 64-65).

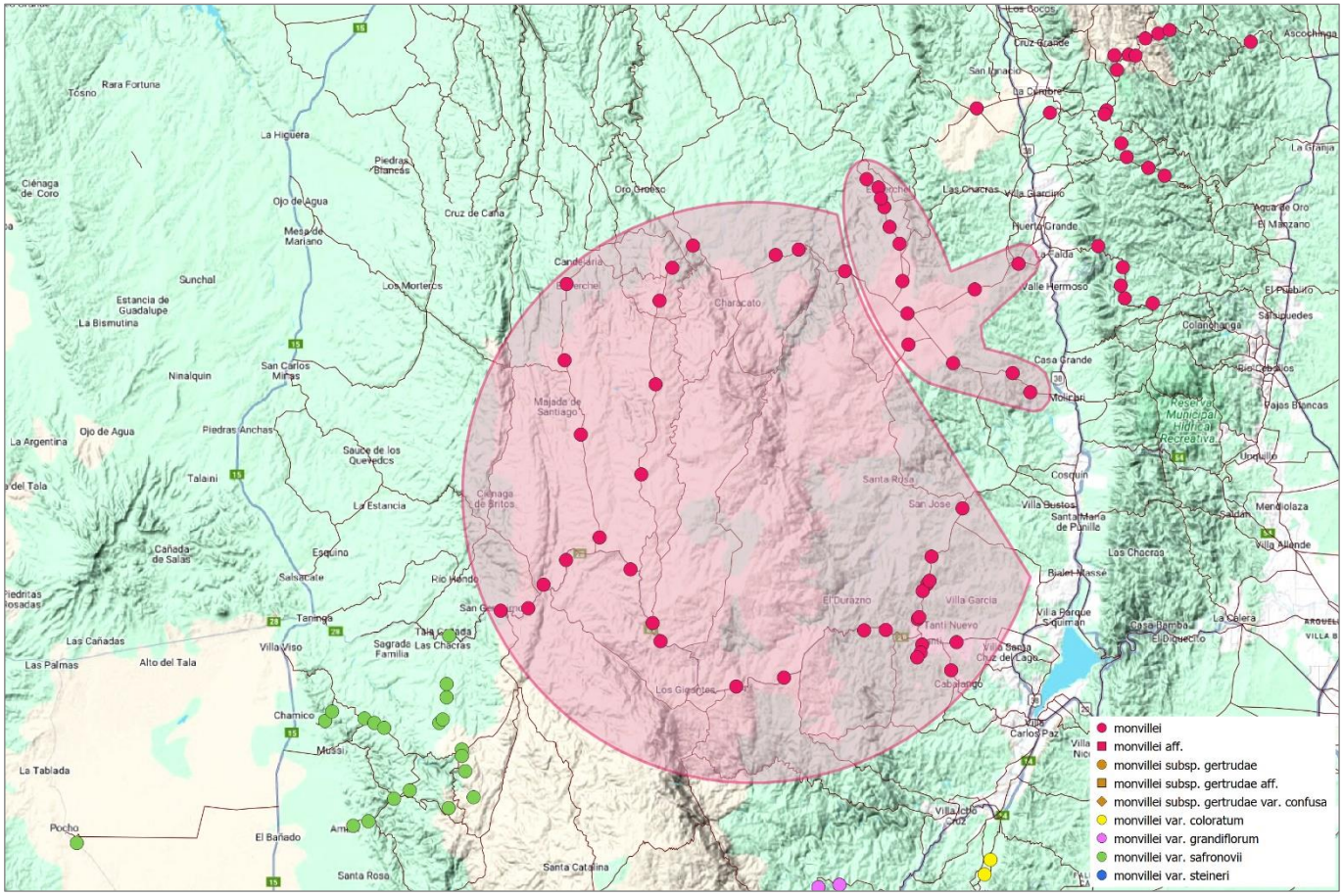


Fig. 65: Detailed map of the north-eastern and central Sierra Grande.

The northern, more low-lying region consists of rocky grassland grown over with thornbushes, similar to the Sierra Chica locality (fig. 66-67).

In the central region, which is situated at a much higher altitude, climate and vegetation are alpine and the soil is interspersed with rocks (fig. 68-69). During the summer season there are frequent thundery rainfalls.

Fig. 66-67: Localities: (67) TS 70a, Arroyo del Perchel, 934 m; (67) TS 57, Pampa de Olaén, 1,154 m.

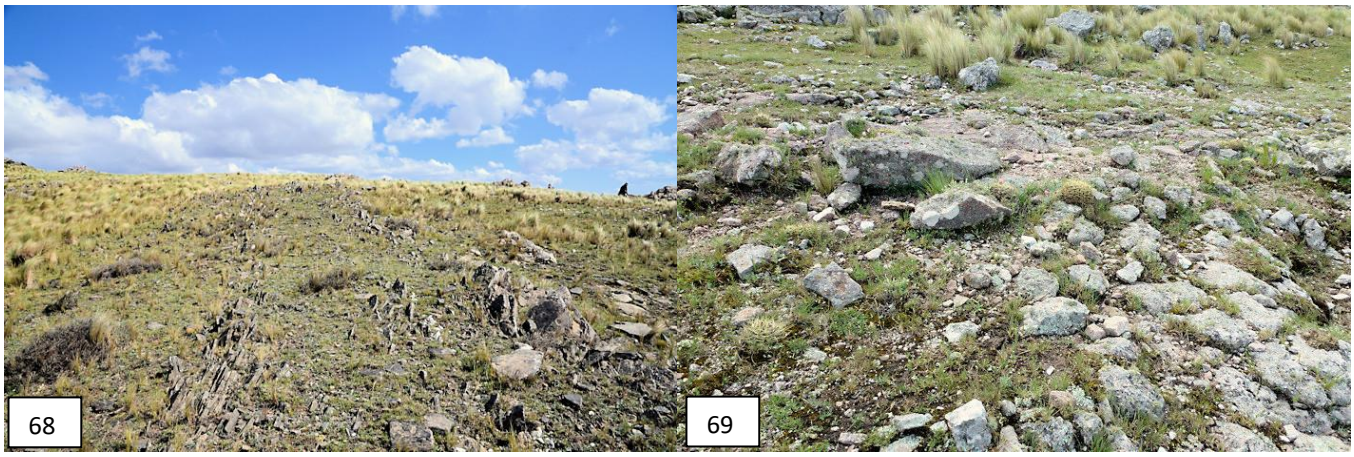


Fig. 68-69: Localities: (68) TS 845, San Gerónimo, 1,768 m (photo: M. Strub); (69) TS 849, Cuchilla Nevada, 1,941 m (photo: M. Strub).

Spine colour and arrangement of spines of *G. monvillei* are uniform in the northern area. The spines are yellowish, slightly shining and resting on the body. Older plants have central spines. The plants largely match *G. monvillei* from the eastern region (fig. 70-71).

G. monvillei from the highest altitudes are often armoured with fine spines in nature. The plants grow to a considerable size and sprout heavily. They were probably damaged at the apex by trampling of livestock. Flowers in nature mostly exhibit a slightly rose-coloured shade.

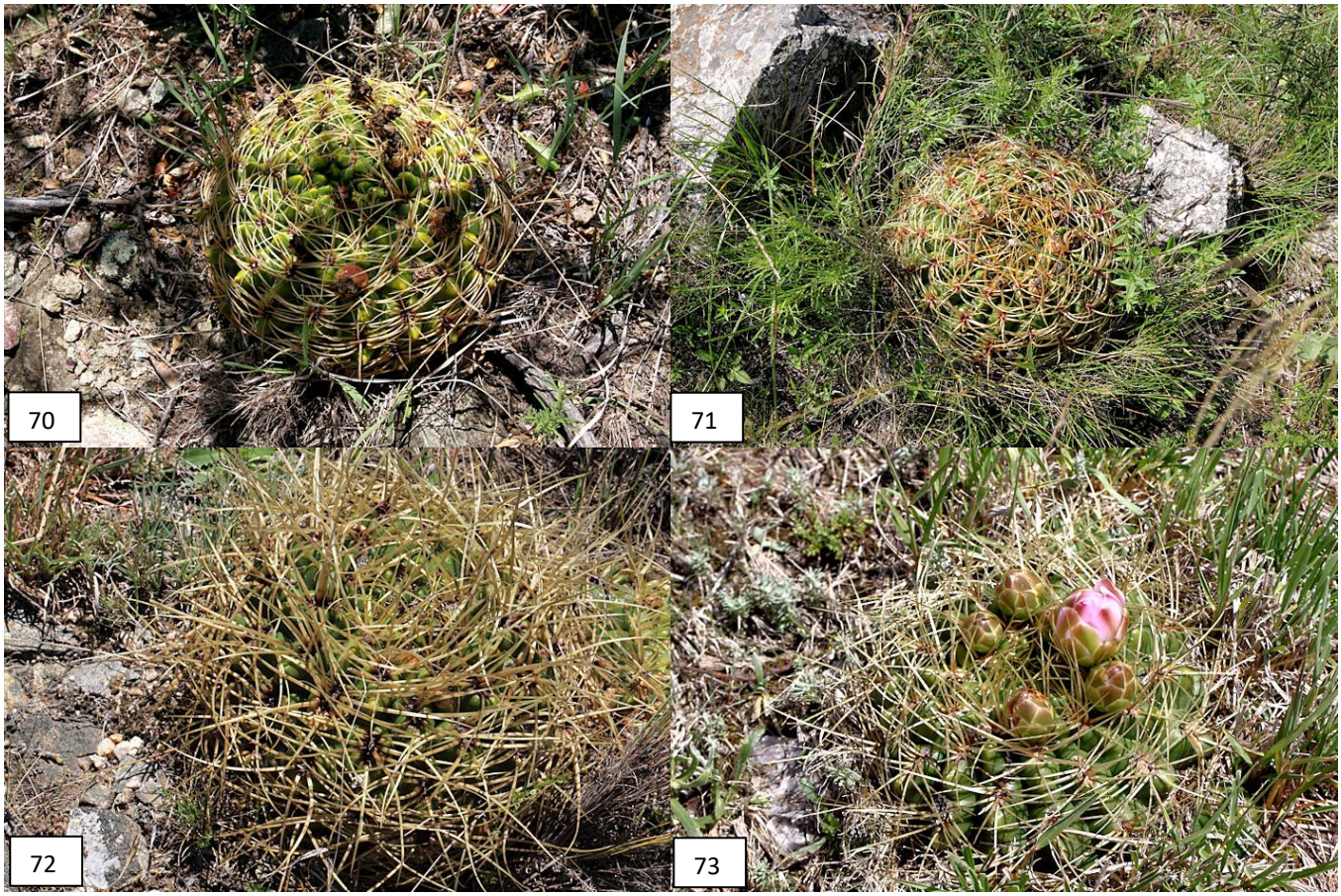


Fig. 70-73: Plants in their habitat: (70) TS 70a *G. monvillei*, Arroyo del Perchel, 934 m (photo: M. Wick); (71) TS 57 *G. monvillei*, Pampa de Olaén, 1,154 m; (72) TS 845 *G. monvillei*, San Gerónimo, 1,768 m; (73) TS 849 *G. monvillei*, Cuchilla Nevada, 1,941 m.

Fig. 74-75: Plant in its habitat and spination: (74) TS 846 *G. monvillei*, Cuchilla Nevada, 1,864 m; (75) TS 70a *G. monvillei*, Arroyo del Perchel, 934 m.

G. monvillei originating from these localities are medium to dark green in cultivation and vary only little. Spine position is uniform to a very large extent (fig. 75-76). Ten-year-old offspring from the higher areas have not (yet?) developed the protruding spines they show in nature (fig. 77-78). Sprouting plants are an exception, the few sprouts originate from areoles close to the base (fig. 80). Plants that have been damaged have a tendency to forming sprouts (fig. 79), which does not correspond with their natural sprouting manner. The seeds from all localities investigated possess a chromosome set of 4n=tetraploid.

Fig. 76-79: Spination: (76) TS 57 *G. monvillei*, Pampa de Olaén, 1,154 m; (77) TS 845 *G. monvillei*, San Gerónimo, 1,768 m; (78) TS 849 *G. monvillei*, Cuchilla Nevada, 1,941 m; (79): TS 59 *G. monvillei*, Pampa de Olaén, 1,160 m (the plant was damaged at the apex by spider mites).

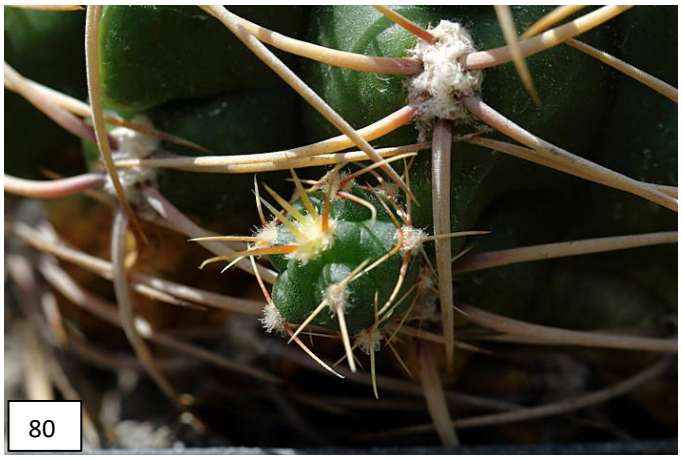


Fig. 80: Spination: TS 62 *G. monvillei*, La Falda, 1,002 m (The tendency to sprouting is not frequently found).

Flower structures of plants from low-lying areas (fig. 81-82) correspond with those of *G. monvillei* from the north-eastern distribution area. The plant from locality TS 57 is female by predetermination, anthers are missing (fig. 82). Flowers from the higher altitudes are slightly rose-coloured even in cultivation (fig. 83-84).

Fig. 81-84: Flower sections: (81) TS 70a *G. monvillei*, Arroyo del Perchel, 934 m; (82) TS 57 *G. monvillei*, Pampa de Olaén, 1,154 m (flower female by predetermination); (83) TS 845 *G. monvillei*, San Gerónimo, 1,768 m; (84) TS 849 *G. monvillei*, Cuchilla Nevada, 1,941 m.

The seeds have a compact to slightly elongated shape. The hilum varies from narrow to somewhat widened and occasionally possesses a slightly bulging rim (fig. 85). No differences from the seed structure of plants from the eastern area can be recognised.

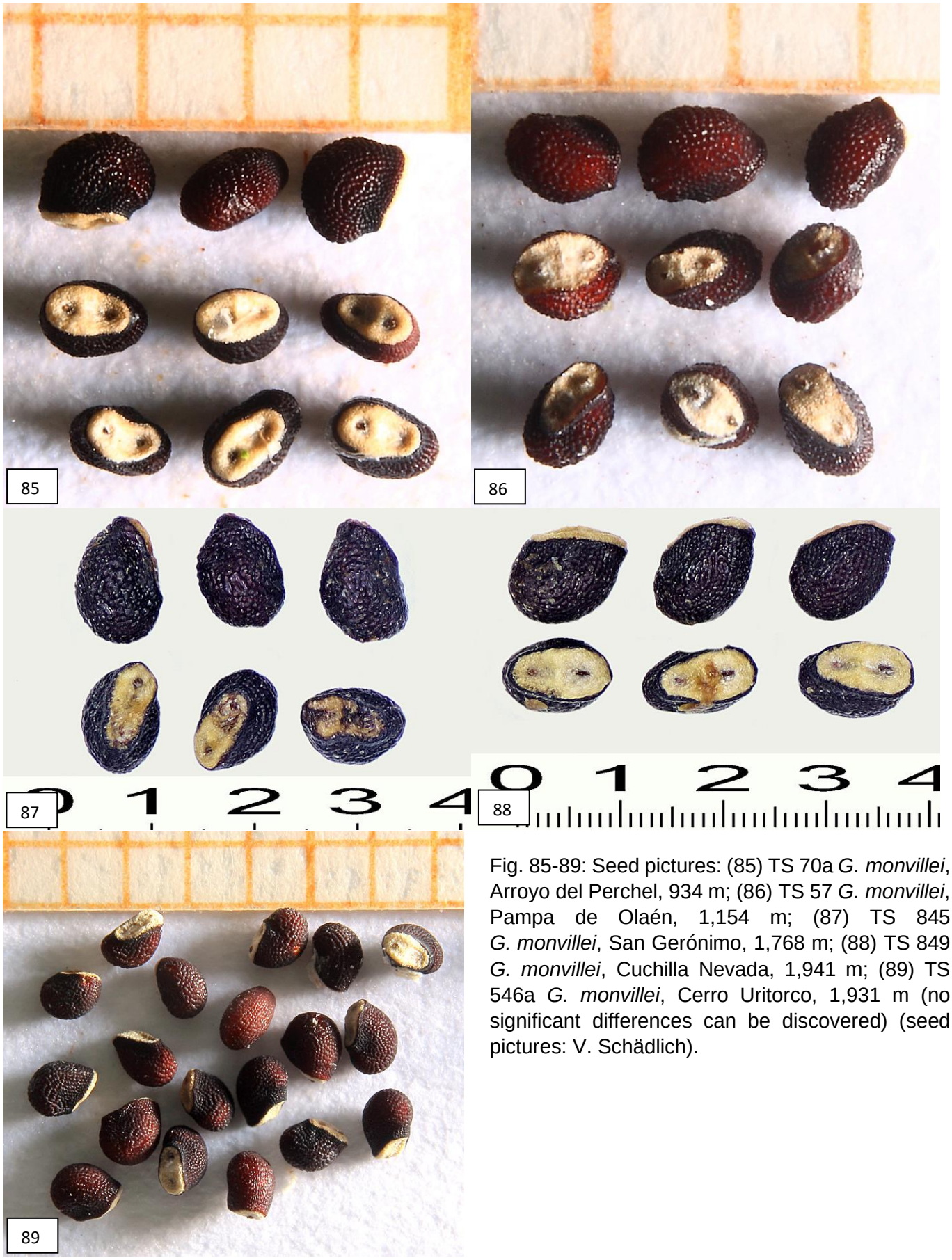


Fig. 85-89: Seed pictures: (85) TS 70a *G. monvillei*, Arroyo del Perchel, 934 m; (86) TS 57 *G. monvillei*, Pampa de Olaén, 1,154 m; (87) TS 845 *G. monvillei*, San Gerónimo, 1,768 m; (88) TS 849 *G. monvillei*, Cuchilla Nevada, 1,941 m; (89) TS 546a *G. monvillei*, Cerro Uritorco, 1,931 m (no significant differences can be discovered) (seed pictures: V. Schädlich).

G. monvillei grows together with *G. capillense* in the northern region of the Sierra Grande.

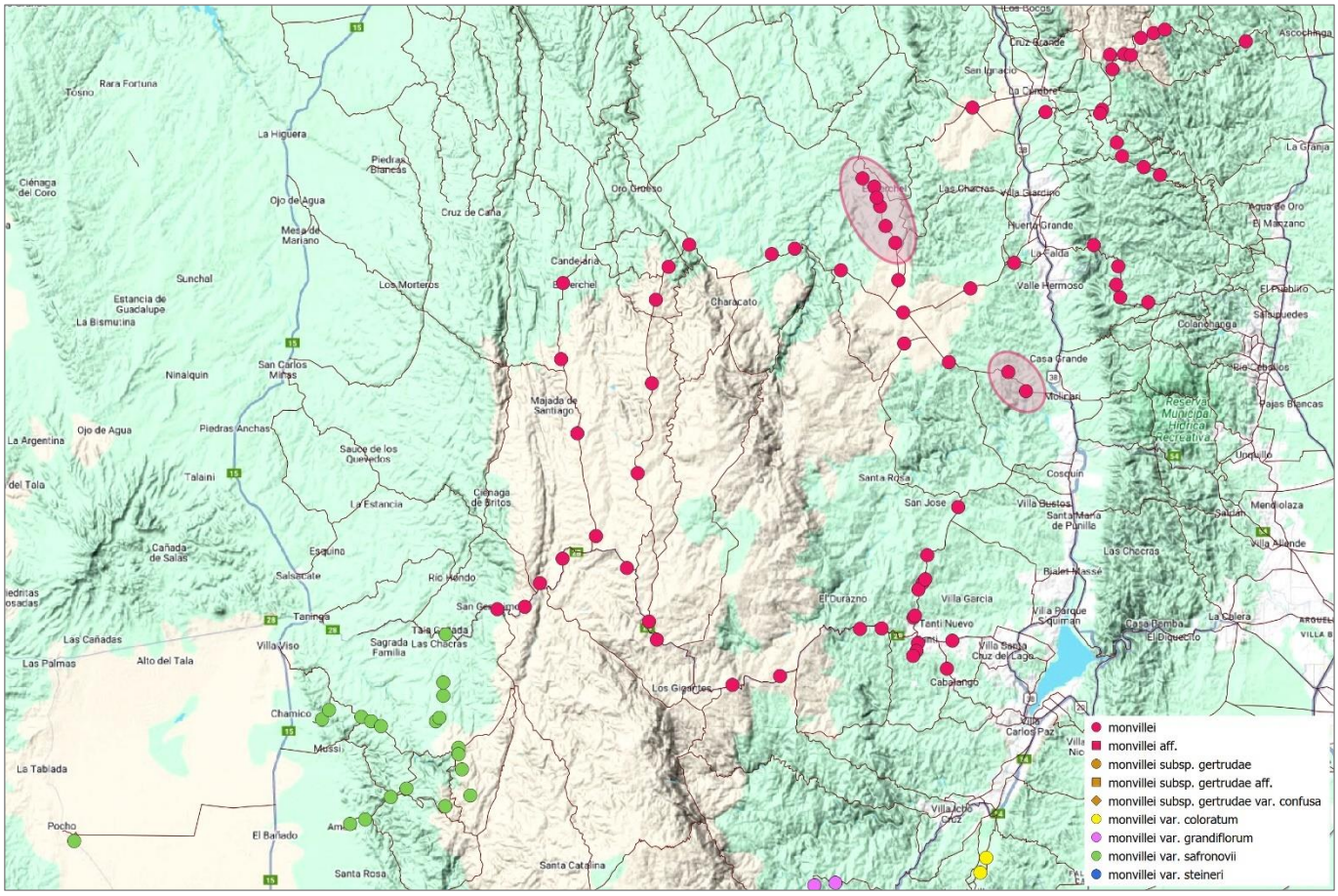


Fig. 90: Map distribution area of *G. monvillei* north-eastern Sierra Grande.

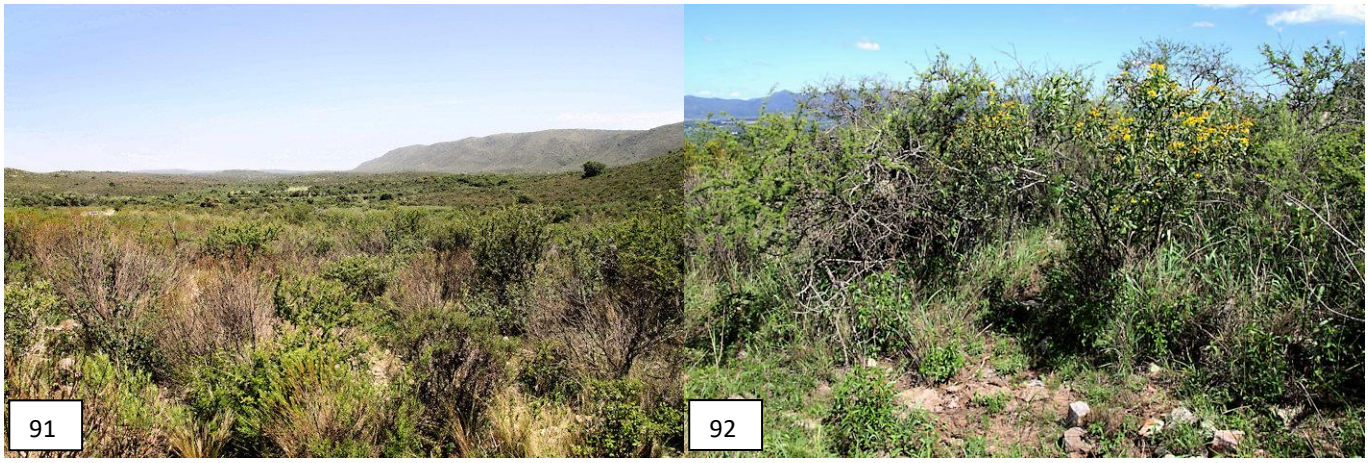


Fig. 91-92: Localities: (91) TS 66, Arroyo del Perchel, 1,030 m; (92) locality TS 54, Molinari, 970 m.

The plants growing in nature correspond with the typical *G. monvillei* habitus. *G. capillense* from the subgenus *Gymnocalycium* also grows at the localities.

The offspring's spines are partly less densely arranged and the spines have a more needle-like characteristic than with the typical *G. monvillei*. The shape of TS 54's ribs does not correspond with that of the typical *G. monvillei* (fig. 96-97). Not surprisingly, the plants start sprouting (fig. 98) as *G. monvillei* as well as *G. capillense* have an inclination to sprouting. The seeds investigated of *G. monvillei* and those of *G. capillense* from this region have a chromosome set of 4n=tetraploid.

Fig. 93-95: Plants in their habitat: (93) TS 66, *G. monvillei*, Arroyo del Perchel, 1,030 m; (94) TS *G. monvillei*, Molinari, 970 m; (95) TS 53, *G. capillense*, Molinari, 970 m.

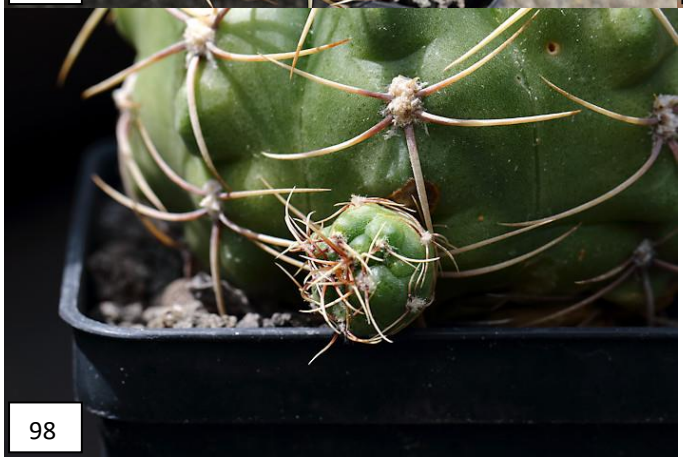


Fig. 96-98: Spination: (96) TS 66, *G. monvillei*, Arroyo del Perchel, 1,030 m; (97) TS 54, *G. monvillei*, Molinari, 970 m; (98) TS 54, *G. monvillei*, Molinari, 970 m (sprout).

The offspring from the localities TS 66 und TS 54 are hybrids (fig. 99-100). The *G. monvillei* female parent plants were most likely pollinated with pollen from *G. capillense*, which grows sympatrically. In contrast to the locality Inti Huasi (fig. 41-42) no natural hybrids could be found at the locality. The *G. monvillei* flowers look completely different (fig. 101-102).

Fig. 99-102: Flower sections: (99) TS 66, *G.* x *monvillei*, Arroyo del Perchel, 1,030 m (flower of a hybrid); (100) TS 54, *G.* x *monvillei*, Molinari, 970 m (flower of a hybrid); (101) TS 70a *G. monvillei*, Arroyo El Perchel, 934 m (*G. monvillei* flower); (102) TS 57 *G. monvillei*, Pampa de Olaén, 1,154 m (*G. monvillei* flower).

The seeds which produced the hybrids cannot be told apart from *G. monvillei* seeds (fig. 103-106). Here, too, all the features were determined by the female plant.

Fig. 103-104: Seed pictures: (103) TS 66, *G.* x *monvillei*, Arroyo del Perchel, 1,030 m; (104) TS 54, *G.* x *monvillei*, Molinari, 970 m (seeds from which hybrids originated) (photos: V. Schädlich).

Fig. 104a-106: Seeds: (104a) TS 53, *G. capillense*, Molinari, 970 m (subgenus *Gymnocalycium*); (105) TS 70a *G. monvillei*, Arroyo El Perchel, 934 m (seed of a *G. monvillei* plant); (106) TS 57 *G. monvillei*, Pampa de Olaén, 1,154 m (seed of a *G. monvillei* plant) (seed photos: V. Schädlich).

Offspring from hybrid locality TS 66 do not yield any uniform outward appearance (fig. 107-110). Arrangement and length of spines reminds of *G. monvillei* on the one hand (fig. 108), on the other hand the spines are substantially shorter than those of *G. capillense* (fig. 116). All seeds investigated 4n=tetraploid, which corresponds with the chromosome set of von *G. monvillei* and *G. capillense* likewise.

Fig. 107-108: Spination: (107) TS 66, *G. monvillei*, Arroyo del Perchel, 1,030 m (matches the habitus of a *G. monvillei* plant (108) TS 66, *G. x monvillei*, Arroyo del Perchel, 1,030 m (length and arrangement of spines do not match any *G. monvillei*).

Fig. 109-110: Spination: (109) TS 66, *G. monvillei*, Arroyo del Perchel, 1,030 m (arrangement and length of spines do not match any *G. monvillei* plant); (110) TS 66, *G. monvillei*, Arroyo del Perchel, 1,030 m (arrangement and length of spines do not match any *G. monvillei* plant).

Those flower structures which display completely different features are interesting. The plants of my no. 0071 and 1458 (fig. 111-114) have flowers resembling a typical *G. monvillei*. Plant no. 0569 (fig. 112) has a slightly rose-coloured throat. The elongated ovary of plant no. 0703 (fig. 113) does not correspond with the structure of a *G. monvillei* flower.

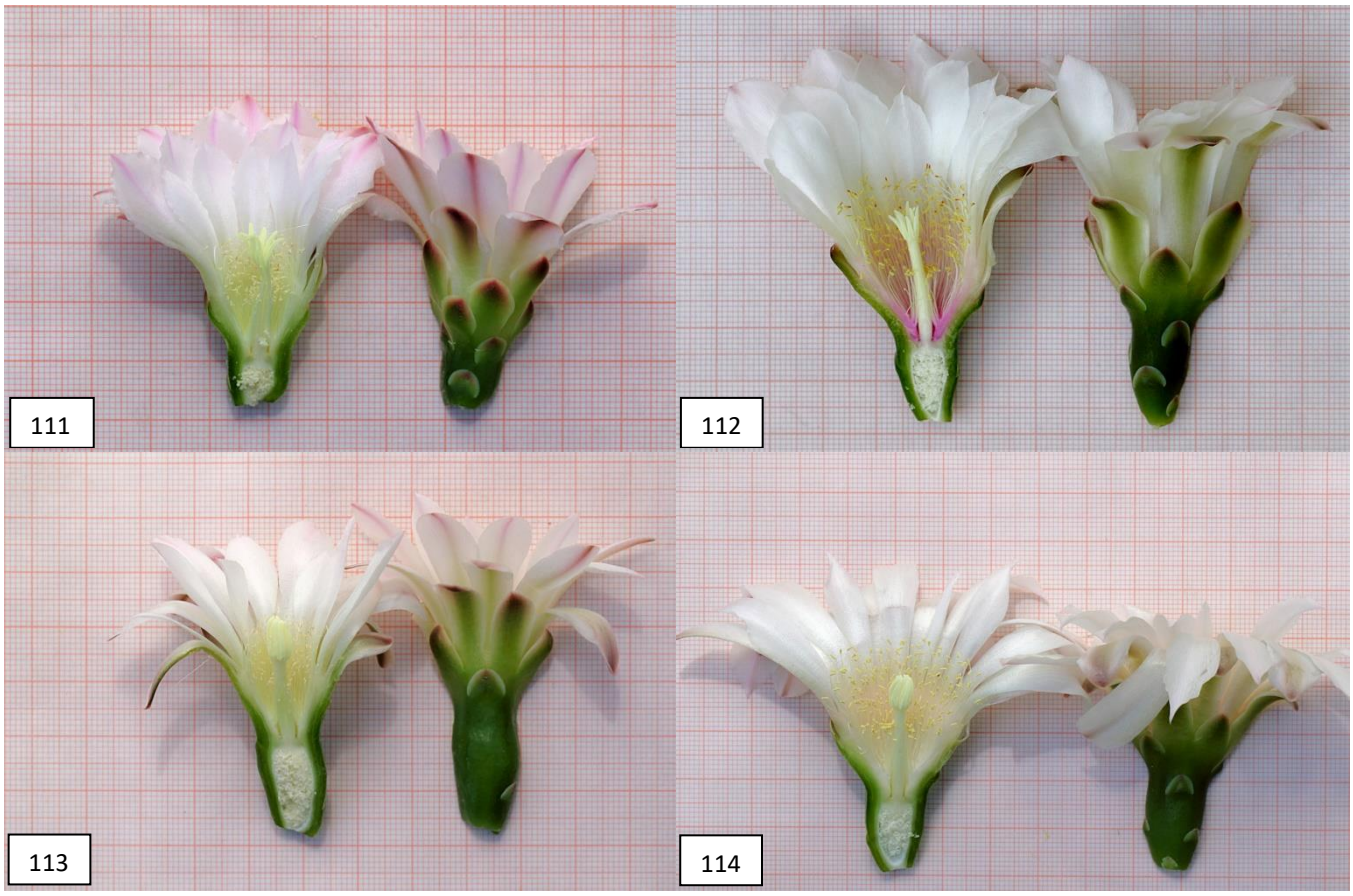


Fig. 111-114: Flower sections: (111) TS 66 (0071), *G. monvillei*, Arroyo del Perchel, 1,030 m (corresponds with *G. monvillei* flower); (112) TS 66 (0569), *G.* x *monvillei*, Arroyo del Perchel, 1,030 m (the rose-coloured throat does not match any *G. monvillei* flower); (113) TS 66 (0703), *G.* x *monvillei*, Arroyo del Perchel, 1,030 m (ovary is elongated and does not correspond with a *G. monvillei* flower); (114) TS 66 (1458), *G. monvillei*, Arroyo del Perchel, 1,030 m (ovary is slightly elongated, otherwise it looks like a normal *G. monvillei* flower).

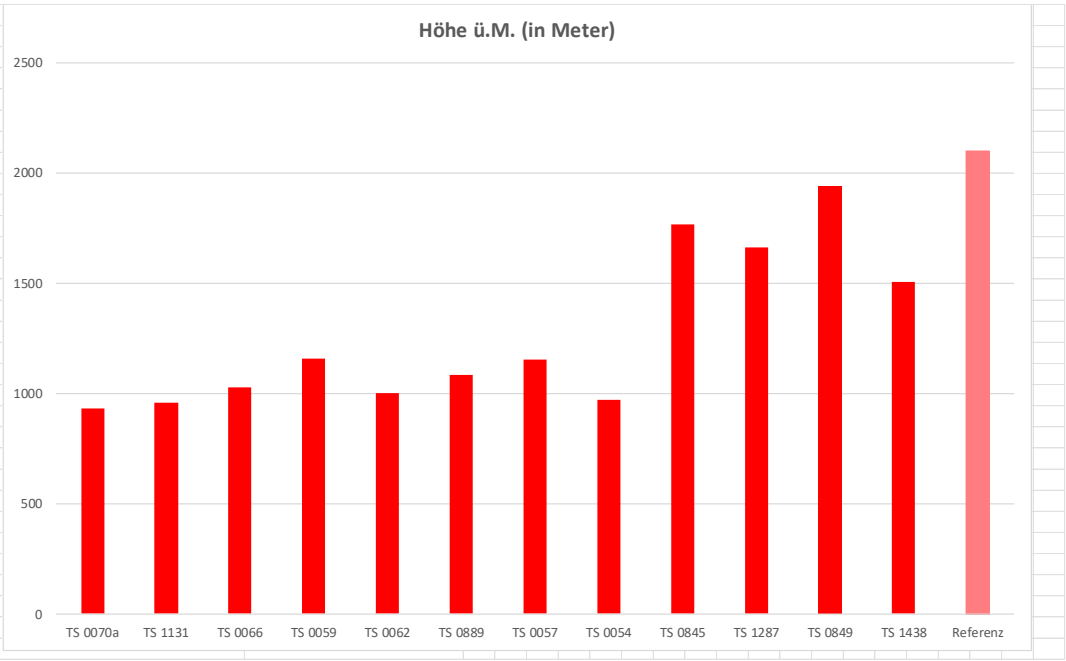
No significant differences could be noticed for the flowering periods. *G. monvillei* and the hybrid plants flower within the same period.

Feldnummer	Art	Ort	H.ü.M	März				April				Mai				Juni			
Sierras Grandes Zentrum																			
TS 0070a	monvillei	Arroyo del Perchel	934																
TS 1131	monvillei	Arroyo del Perchel	957																
TS 0066	monvillei x capillense	Arroyo del Perchel	1 030																
TS 0059	monvillei	Pampa de Olaén	1 160																
TS 0062	monvillei	La Falda	1 002																
TS 0066	monvillei x capillense	La Falda	1 030																
TS 0889	monvillei	La Falda	1 085																
TS 0057	monvillei	Molinari	1 154																
TS 0054	monvillei x capillense	Molinari	970																
TS 1986	monvillei	Río San Gregorio	1 300																
TS 0845	monvillei	San Gerónimo	1 768																
TS 1287	monvillei	San Gerónimo	1 665																
TS 0846	monvillei	Cuchilla Nevada	1 864																
TS 0849	monvillei	Cuchilla Nevada	1 941																
TS 1438	monvillei	Estancia Rancho Grande	1 508																
TS 0327	monvillei	Tanti	995																
TS 0039	monvillei	Tanti	902																

Tab. 4: Flowering period of *G. monvillei* from the Sierra Grande (Basel, 2022).

The localities of the plants are situated between an altitude of 900 m and 1,200 m a.s.l. in the northern region. In the central area of the Sierra Grande they are located between 1,700 and 2,000 m a.s.l..

Feldnummer	Höhe/M	Art
TS 0070a	934	monvillei
TS 1131	957	monvillei
TS 0066	1 030	monvillei
TS 0059	1 160	monvillei
TS 0062	1 002	monvillei
TS 0889	1 085	monvillei
TS 0057	1 154	monvillei
TS 0054	970	monvillei
TS 0845	1 768	monvillei
TS 1287	1 665	monvillei
TS 0849	1 941	monvillei
TS 1438	1 508	monvillei
Referenz	2 100	Ref.



Tab. 5: Altitudes of the localities in the Sierra Grande.

In the low-lying areas *Parodia submammulosa* (fig. 115) and *Echinopsis aurea* are again among the accompanying vegetation of *G. monvillei*. In addition, *G. capillense* (fig. 116) as well as plants from the form group of *G. amerhauseri* (fig. 117) grow together with *G. monvillei*. *G. quehlianum* from the subgenus *Trichomosemineum* (fig. 118) and *G. valnicekianum* from the subgenus *Scabrosemineum* (fig. 119) also prosper here.

At higher altitudes only cacti from the subgenus *Gymnocalycium* belong to the phytocenosis of *G. monvillei*. At the highest altitudes it is *G. andreae* (fig. 120), at medium height *G. bruchii* from the form group *G. bruchii* subsp. *brigittae* (fig. 121). *G. bruchii* without flowers is difficult to tell apart from *G. andreae* at its locality.

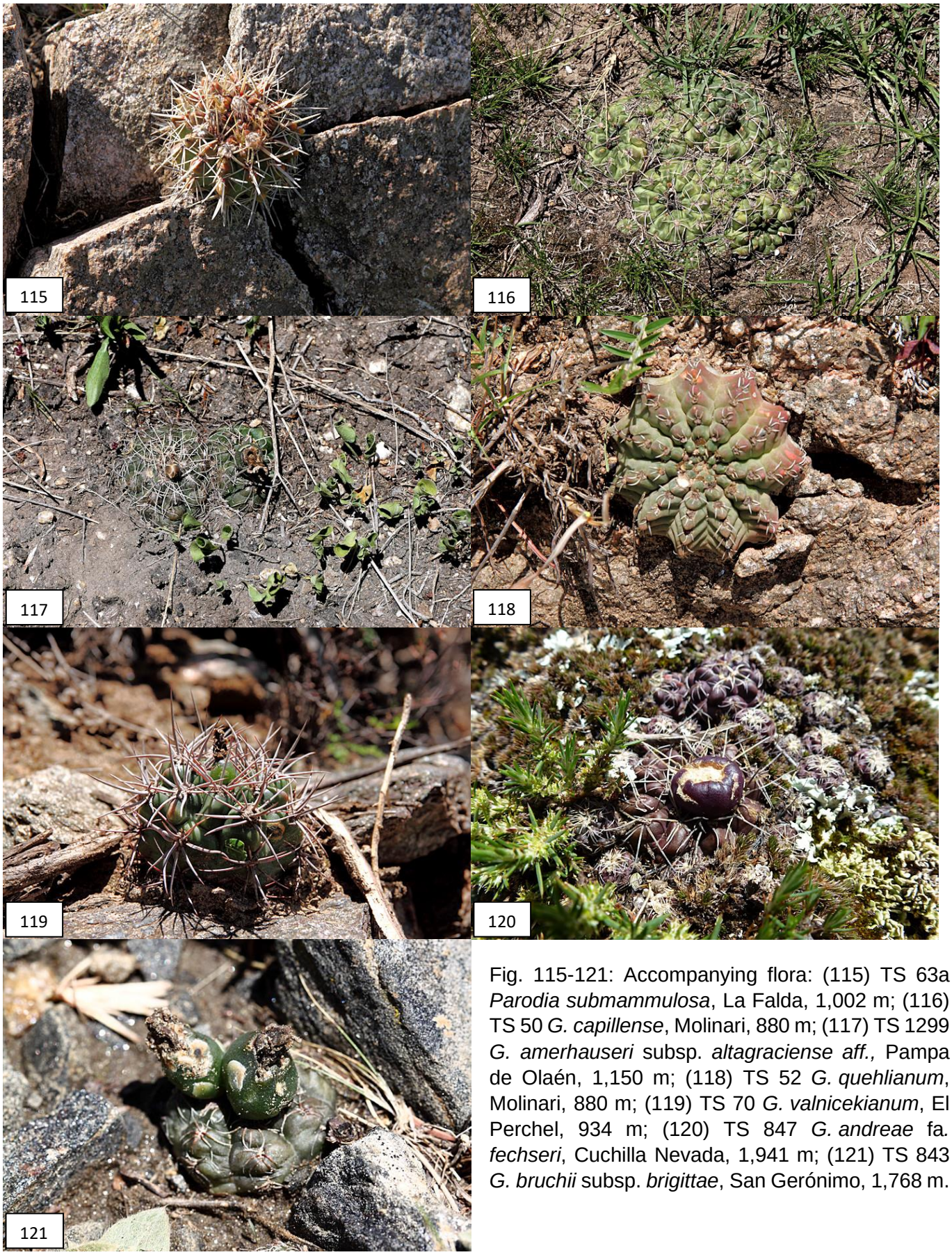


Fig. 115-121: Accompanying flora: (115) TS 63a *Parodia submammulosa*, La Falda, 1,002 m; (116) TS 50 *G. capillense*, Molinari, 880 m; (117) TS 1299 *G. amerhauseri* subsp. *altagraciense aff.,* Pampa de Olaén, 1,150 m; (118) TS 52 *G. quehlianum*, Molinari, 880 m; (119) TS 70 *G. valnicekianum*, El Perchel, 934 m; (120) TS 847 *G. andreae* fa. *fechseri*, Cuchilla Nevada, 1,941 m; (121) TS 843 *G. bruchii* subsp. *brigittae*, San Gerónimo, 1,768 m.

Distribution area on the western side of the Sierra Grande

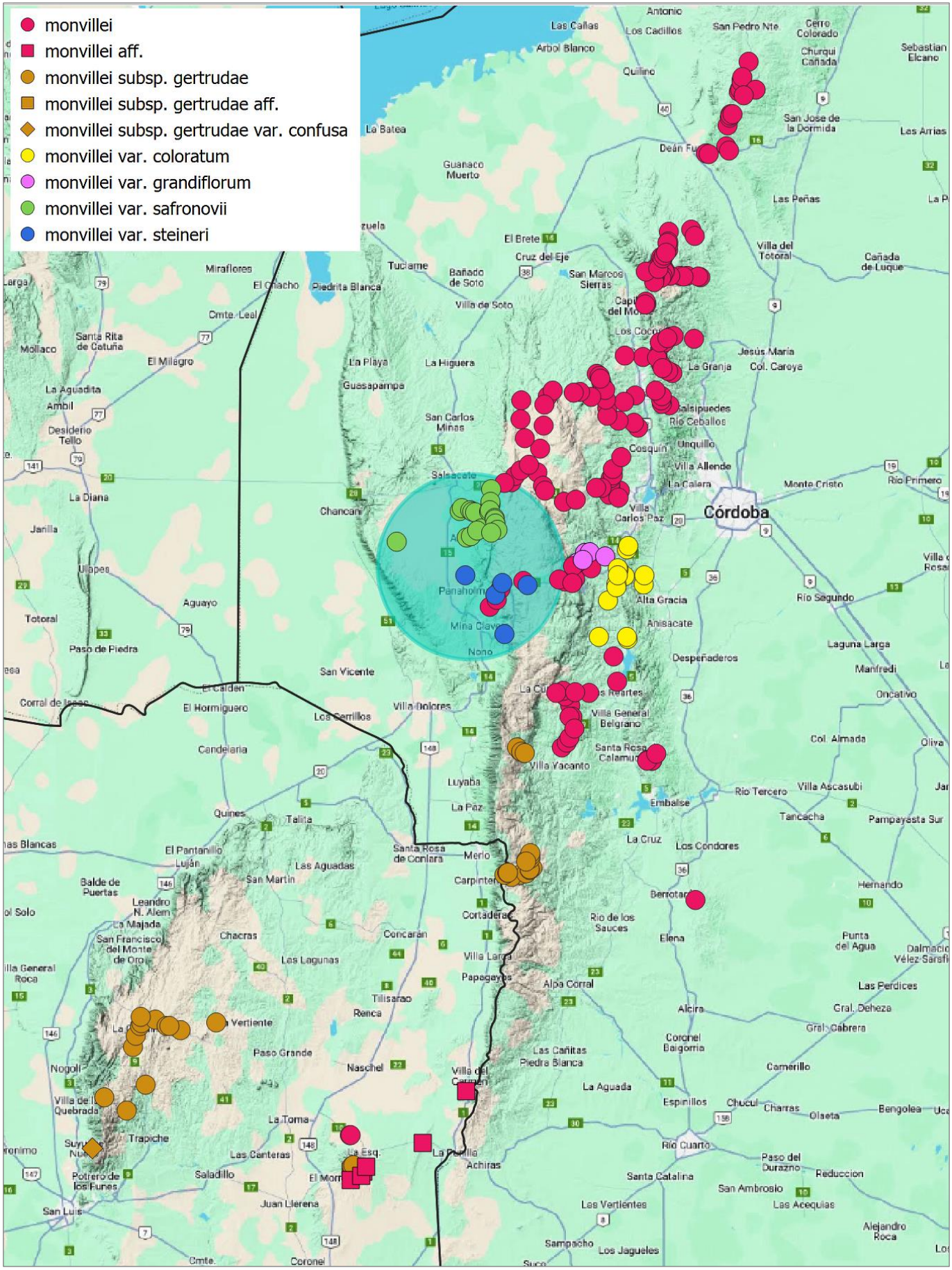


Fig. 122: Distribution area of *G. monvillei* on the western side of the Sierra Grande.

G. monvillei var. *safronovii* as well as *G. monvillei* var. *steineri* have been described originating from the western foothills of the Sierra Grande in the vicinity of the villages Ámbul and Villa Benegas.

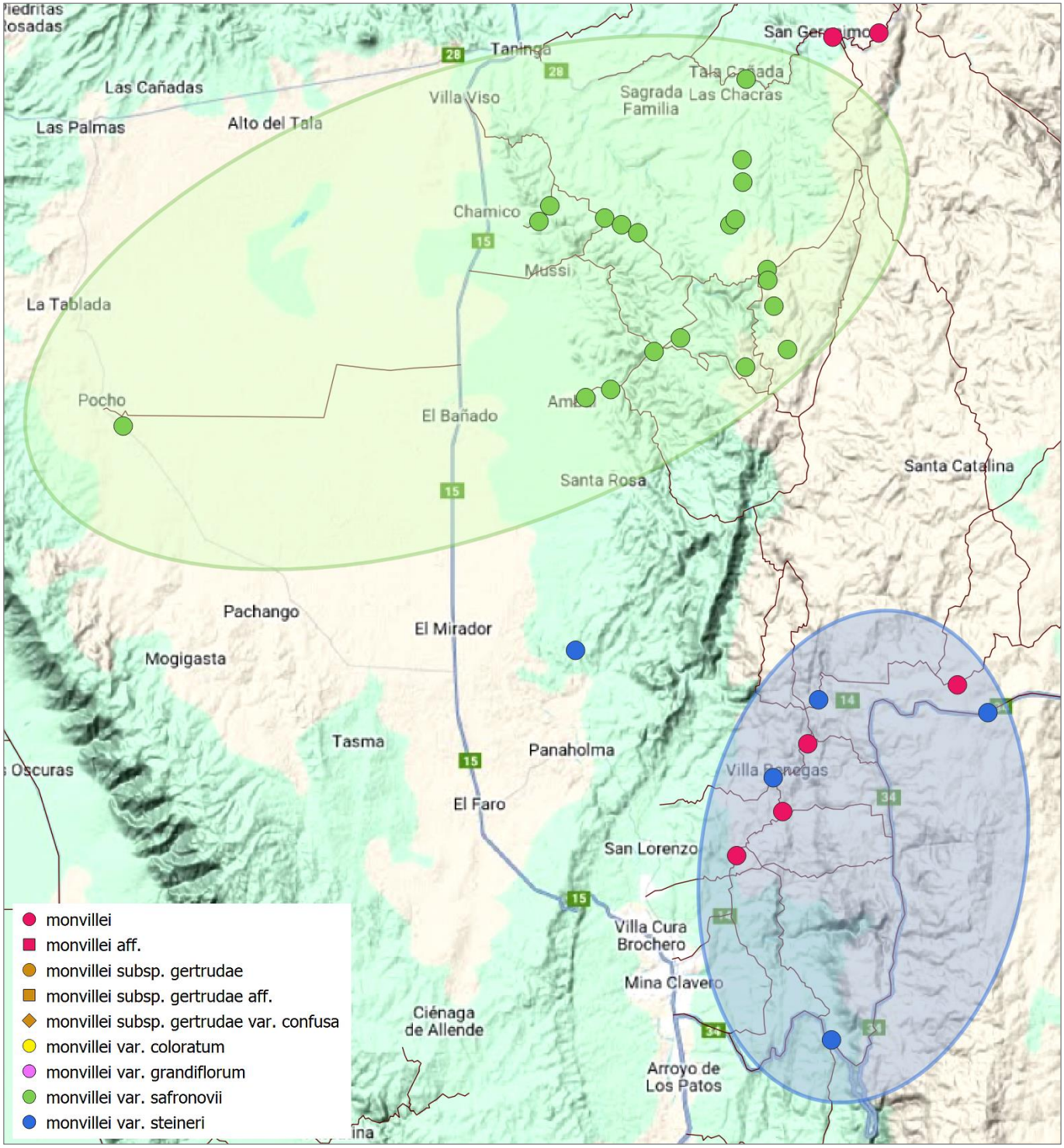


Fig. 123: Detailed map of the distribution are on the western slope of the Sierra Grande.

The localities of *G. monvillei* var. *safronovii* are grown over with low-density vegetation, often consisting of acacia. The terrain is hilly, the soil interspersed with rocks (fig. 124-125).

The localities of G. *monvillei* var. *steineri* are mountainous areas covered by slabs. The plants grow in small depressions filled with soil (fig. 126-127).

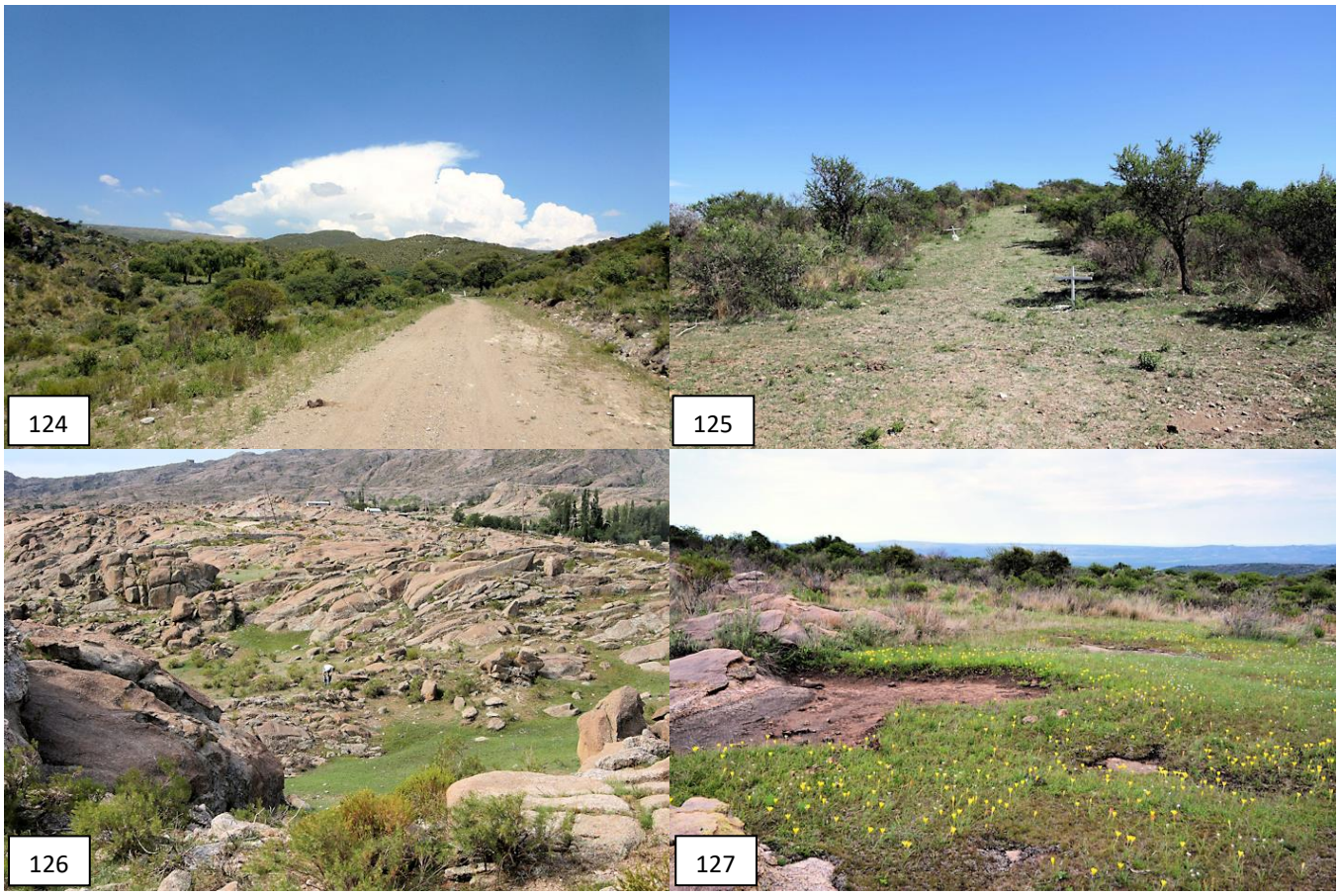


Fig. 124-127: Localities: (124) TS 738, Ámbul, 1,401 m; (125) TS 256, Ámbul, 1,146 m; (126) TS 264, Villa Benegas, 1,380 m (photo: V. Schädlich); (127) TS 1260, Niña Paula, 1,260 m.

G. monvillei var. *safronovii* mostly grows solitary. The spines are pressed to the body. According to the first description their colour is amber, the base of the spines is red and thickened (fig. 128, 129, 134).

Fig. 128-129: Plants in their habitat: (128) TS 738 *G. monvillei* var. *safronovii*, Ámbul, 1,401 m; (129) TS 256 *G. monvillei* var. *safronovii*, Ámbul, 1,146 m.

There are often forest respectively bush fires in this area during the summer season. The plants get completely scorched by fire. After the first rainfalls most of them sprout again from the apex. Judging from the sprouting capacity it appears to be a member of the *G. monvillei* family (fig. 133).

The bodies of *G. monvillei* var. *steineri* are covered with strong, slightly intertwined spines. The spines are yellowish and sometimes possess a reddish base. On older plants the spines are long

and protrude from the body (fig. 130-131). Those plants which do not develop impressive spines are members of the form group of *G. monvillei* (fig. 132). Although the plants grow to an impressive size, sprouting individuals could rarely be found at the locality.

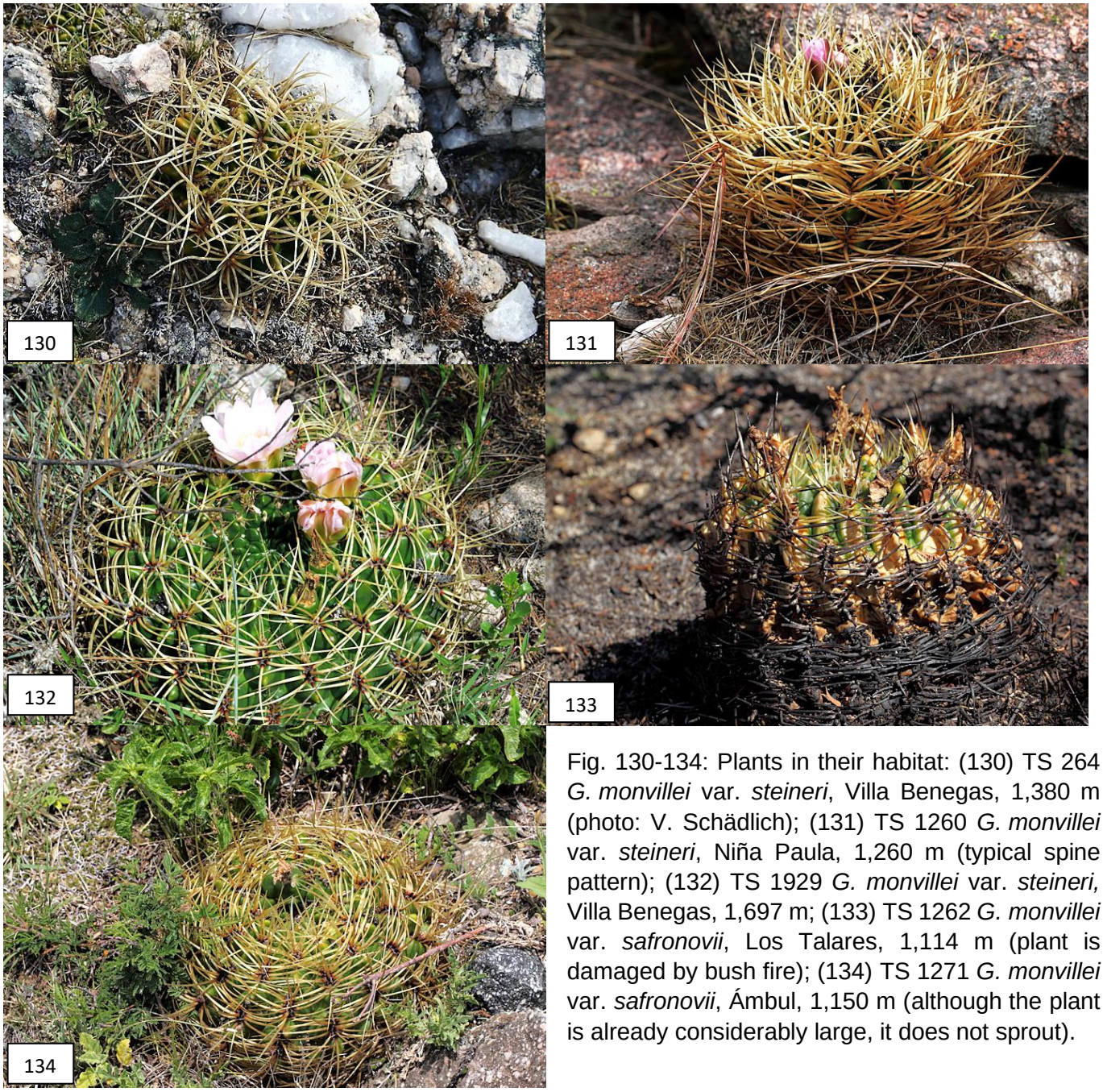


Fig. 130-134: Plants in their habitat: (130) TS 264 *G. monvillei* var. *steineri*, Villa Benegas, 1,380 m (photo: V. Schädlich); (131) TS 1260 *G. monvillei* var. *steineri*, Niña Paula, 1,260 m (typical spine pattern); (132) TS 1929 *G. monvillei* var. *steineri,* Villa Benegas, 1,697 m; (133) TS 1262 *G. monvillei* var. *safronovii*, Los Talares, 1,114 m (plant is damaged by bush fire); (134) TS 1271 *G. monvillei* var. *safronovii*, Ámbul, 1,150 m (although the plant is already considerably large, it does not sprout).

The epidermis of *G. monvillei* var. *safronovii* offspring is light to dark green. The spines are strong to medium strong. Their colour is yellowish (amber) with a reddish base. At an older age central spines are sometimes formed (fig. 135-136). The spines convey the image mentioned in the first description with amber-coloured spines, which are reddish and thickened at the base. (fig. 139). Sprouts are rarely formed in cultivation (fig. 140).

G. monvillei var. *steineri* does not show a dark green body. Even ten-year-old plants do not generate the protruding spine arrangement mentioned in the first description. The spines are pressed to the body, they are shining and of white to yellowish colour with slightly darker base. Central spines are infrequent.

Fig. 135-136: Spination: (135) TS 738 *G. monvillei* var. *safronovii*, Ámbul, 1,401 m; (136) TS 256 *G. monvillei* var. *safronovii*, Ámbul, 1,146 m.

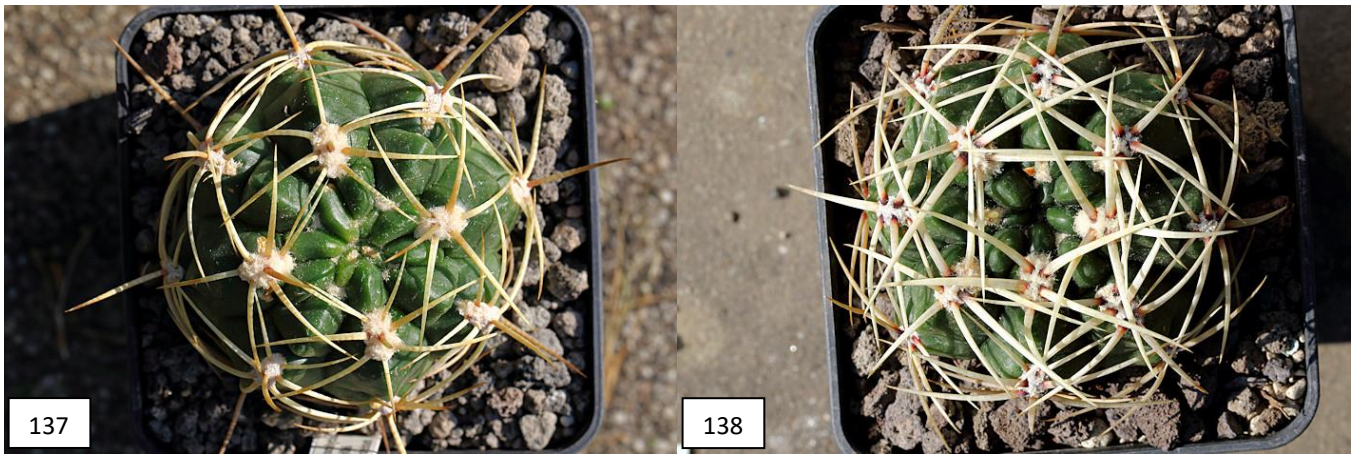


Fig. 137-138: Spination: (137) TS 264 *G. monvillei* var. *steineri*, Villa Benegas, 1,380 m; (138) TS 1260 *G. monvillei* var. *steineri*, Niña Paula, 1,260 m (both 10-year-old plants do not yet show the typical spine arrangement).

Fig. 139-140: Spination: (139) TS 738 *G. monvillei* var. *safronovii*, Ámbul, 1,401 m (spines are amber-coloured); (140) TS 256 *G. monvillei* var. *safronovii*, Ámbul, 1,146 m (sprouting plants can hardly be found).

As opposed to *G. monvillei* from the Sierra Chica and the Sierra Grande, flower colour is somewhat rose-coloured in cultivation. The flowers are hermaphroditic, being endowed with male as well as female sexual features. Significant differences among the varieties or from the type could not be perceived.

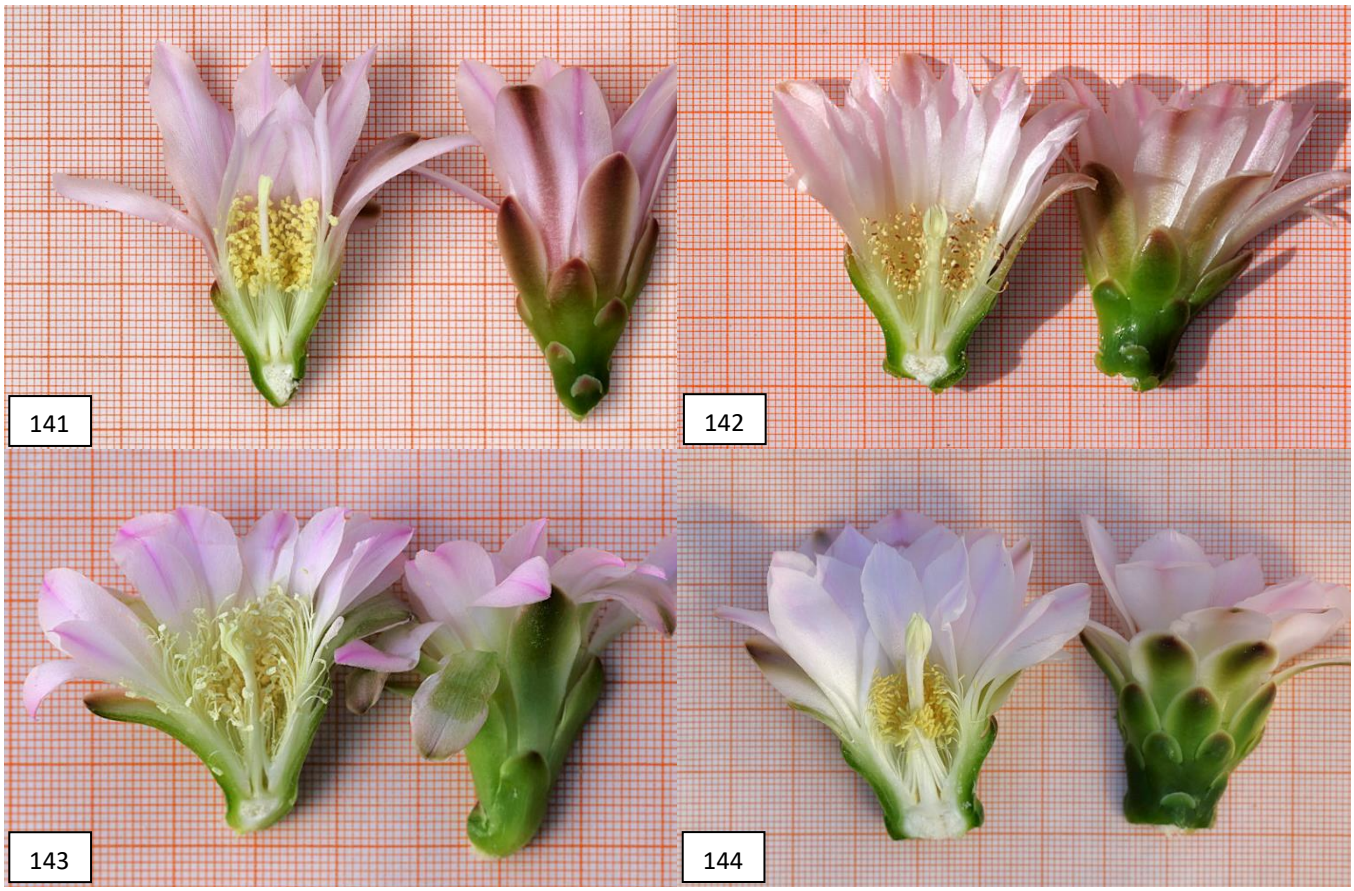


Fig. 141-144: Flower sections: (141) TS 738 *G. monvillei* var. *safronovii*, Ámbul, 1,401 m; (142) TS 256 *G. monvillei* var. *safronovii*, Ámbul, 1,146 m; (143) TS 264 *G. monvillei* var. *steineri*, Villa Benegas, 1,380 m; (144) TS 70a *G. monvillei*, Arroyo del Perchel, 934 m (*G. monvillei* flower rarely has a rose-coloured gleam in cultivation).

Seed structure is variable, from hat-shaped to elongated. In comparison with *G. monvillei* var. *monvillei* the hilum is somewhat narrower and distinctly elongated. Seeds of the plants investigated have a chromosome set of 4n=tetraploid in both varieties.

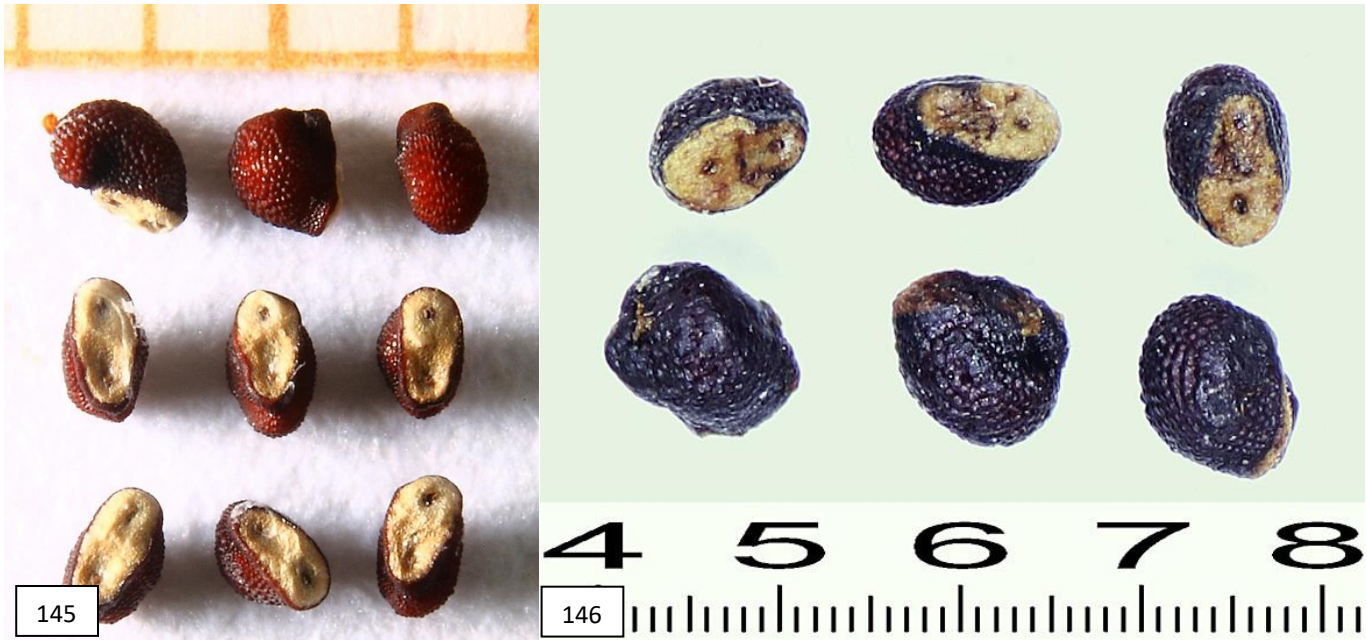


Fig. 145-146: Seed pictures: (146) TS 256 *G. monvillei* var. *safronovii*, Ámbul, 1,146 m (hilum is somewhat elongated); (146) TS 739 *G. monvillei* var. *safronovii*, Ámbul, 1,401 m (photos: V. Schädlich).

Fig. 147-148: Seed pictures: (147) TS 264 *G. monvillei* var. *steineri*, Villa Benegas, 1,380 m (hilum is elongated); (148) TS 70a *G. monvillei*, Arroyo El Perchel, 934 m (hilum of the principal form of *G. monvillei* seed is marginally wider) (photos: V. Schädlich).

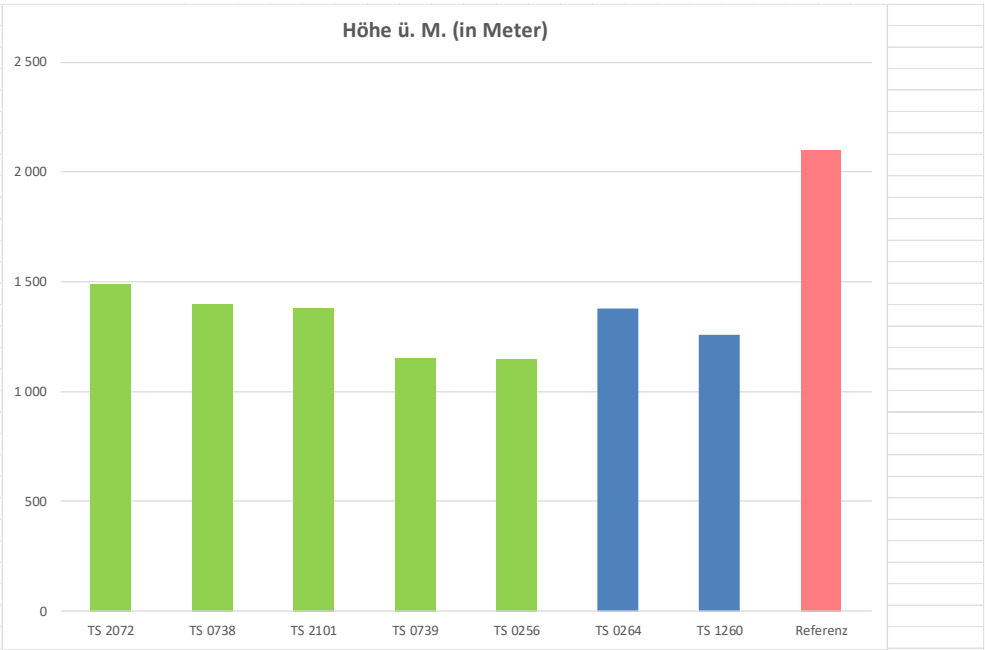
The flowering period of *G. monvillei* var. *safronovii* and *G. monvillei* var. *steineri* begins slightly earlier than that of the majority of plants which correspond with the type.

	Feldnummer	Art	Ort	H.ü.M	März				April				Mai				Juni			
	Sierras Grandes Westseite																			
	TS 0738	monvillei var. safronovii	Ámbul	1 401																
	TS 0256	monvillei var. safronovii	Ámbul	1 146																
	TS 0264	monvillei var. steineri	Rafael Benegas	1 380																

Tab. 6: Flowering period of *G. monvillei* from the western slopes of the Sierra Grande (Basel, 2022).

The plants were found at an altitude of between 1,100 m and 1,400 m a.s.l., which means that they populate medium altitudes within the whole distribution area.

Feldnummer	Höhe/M	Art
TS 2072	1 488	monvillei var. safronovii
TS 0738	1 401	monvillei var. safronovii
TS 2101	1 381	monvillei var. safronovii
TS 0739	1 154	monvillei var. safronovii
TS 0256	1 146	monvillei var. safronovii
TS 0264	1 380	monvillei var. steineri
TS 1260	1 260	monvillei var. steineri
Referenz	2 100	Ref.



Tab. 7: Comparison of altitudes of *G. monvillei* localities on the western slopes of the Sierra Grande.

Parodia submammulosa (fig. 149) also grows on the western slope of the Sierra Grande as a frequent companion of *G. monvillei*. Likewise *Acanthocalycium spiniflorum* is found growing

alongside *G. monvillei* var. *safronovii* and *G. monvillei* var. *steineri* (fig. 150). *G. monvillei* var. *safronovii* coincides with *G. capillense* (fig. 151) and *G. gaponii* subsp. *geyeri* (fig. 152) in this region. These two species are difficult to distinguish at their locality, although *G. capillense* flowers considerably later than *G. gaponii*. At higher altitudes *G. monvillei* var. *safronovii* and *G. monvillei* var. *steineri* generate a phytocenosis with members of the *G. bruchii* subsp. *brigittae* family (fig 153). At low-lying altitudes *G. monvillei* var. *steineri* grow combined with *G. parvulum* (fig. 154) and *G. monvillei* var. *safronovii* together with *G. ochoterenai* subsp. *intertextum* from the subgenus *Trichomosemineum* (fig. 155).

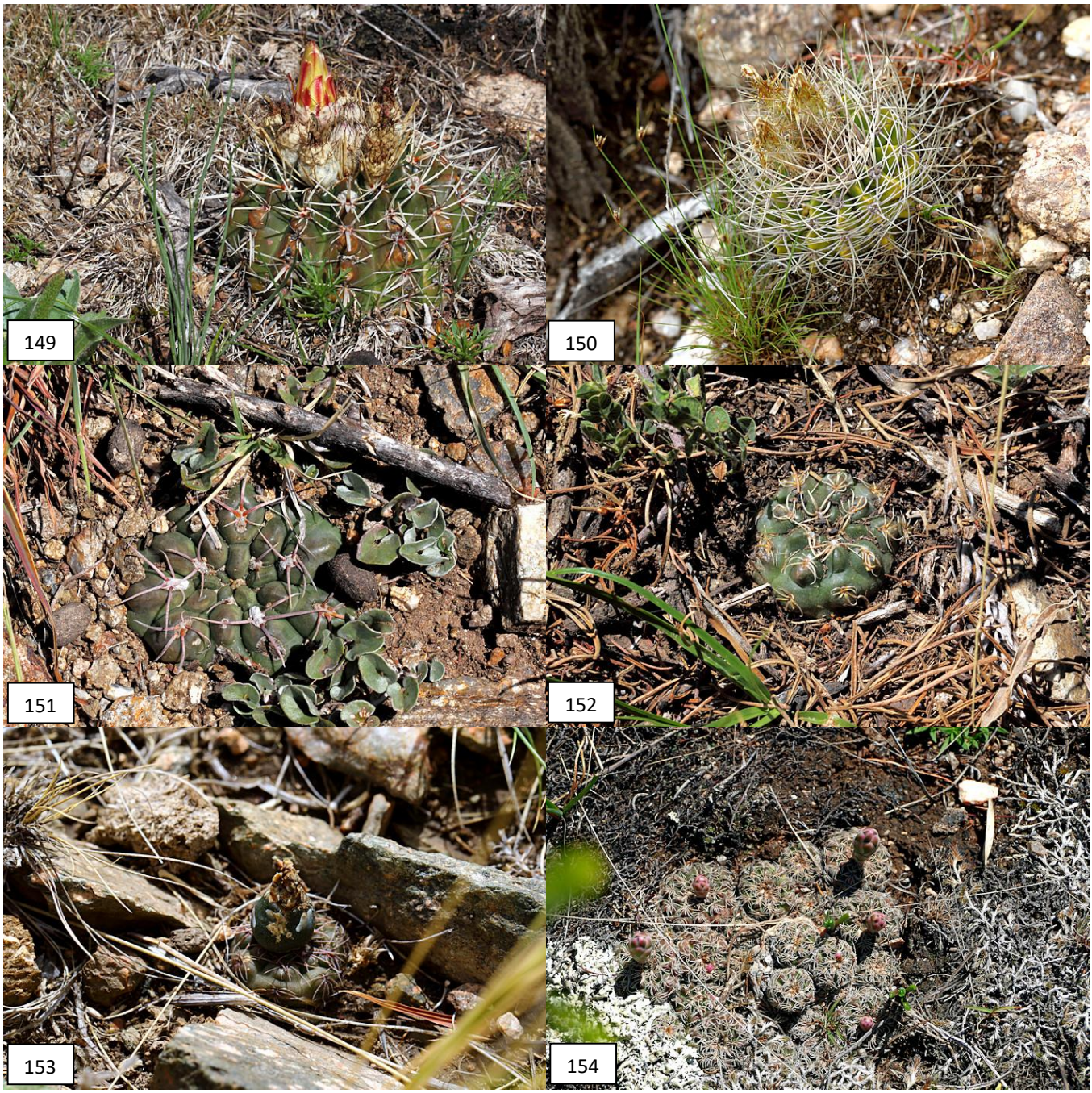


Fig. 149-154: Accompanying flora: (149) TS 1261a *Parodia submammulosa*, Niña Paula, 1,260 m; (150) TS 2107a *Acanthocalycium spiniflorum*, Villa Benegas, 1,506 m; (151) TS 736 *G. capillense,* Ámbul, 1,401 m; (152) TS 737 *G. gaponii* subsp. *geyeri*, Capilla El Huayco de Luján, 1,401 m; (153) TS 2105 *G. bruchii* subsp. *brigittae*, Río Jaime, 1,694 m; (154) TS 1261 *G. parvulum*, Niña Paula, 1,260 m.

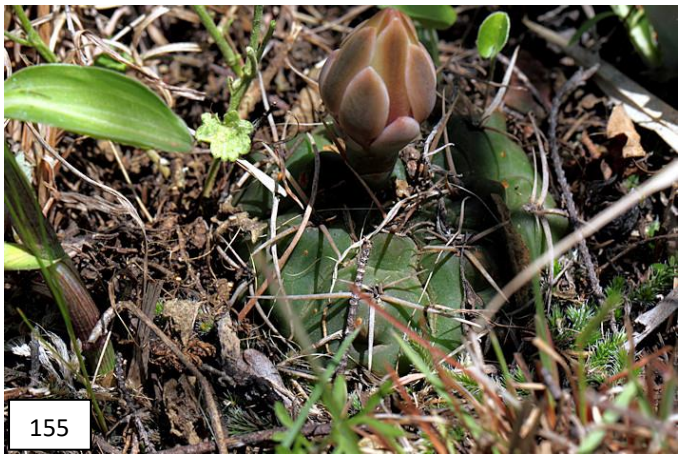


Fig. 155: TS 1263 *G. ochoterenai* subsp. *intertextum*, Los Talares, 1,114 m.

Distribution area between Villa Icho Cruz and Potrero de Garay.

According to its first description, *G. monvillei* var. *grandiflorum* originates from the southern area of the Sierra Grande, between the villages Icho Cruz and Potrero de Garay.

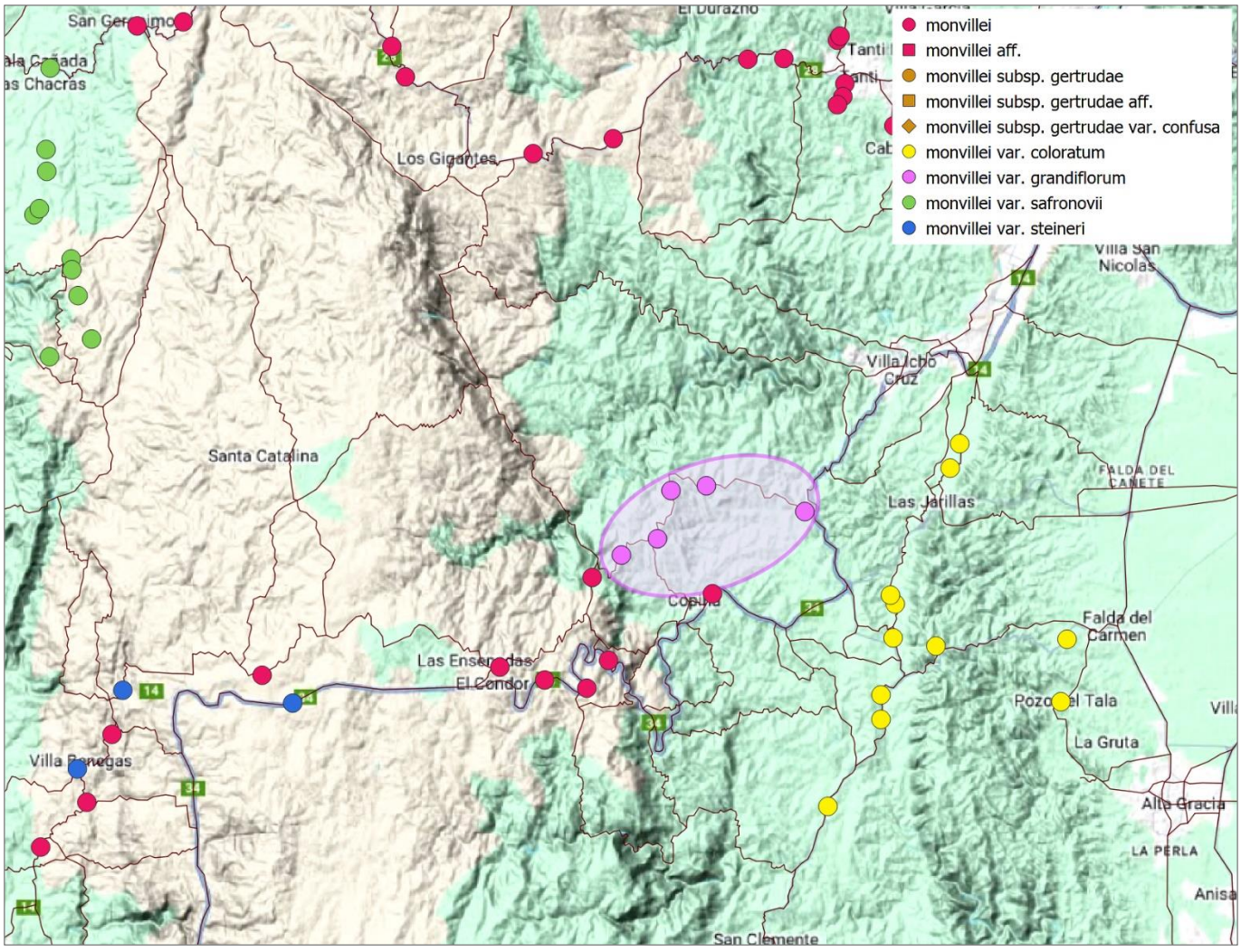


Fig. 156: Detailed map of *G. monvillei* var. *grandiflorum's* distribution area near Villa Icho Cruz.

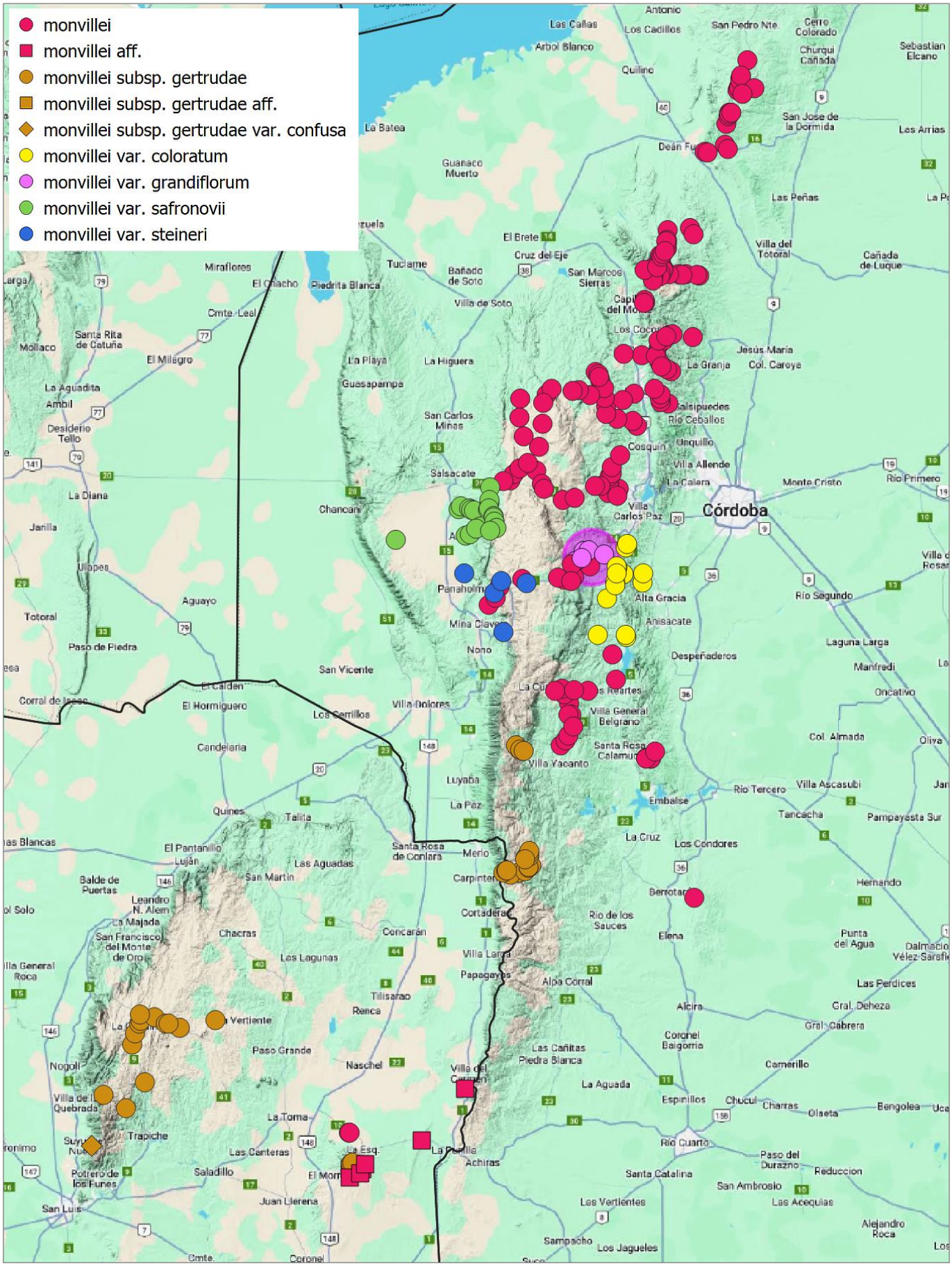


Fig. 157: Distribution area of *G. monvillei*.

The habitat is a hilly pasture area interspersed with rocks. It is situated in front of the Sierra Grande's western side where trees and bushes rarely occur.

Fig. 158-160: Localities: (158) TS 1186, Villa Icho Cruz, 1,240 m; (159) TS 821, Villa Icho Cruz, 1,337 m; (160) TS 1925, Copina, 1,386 m.

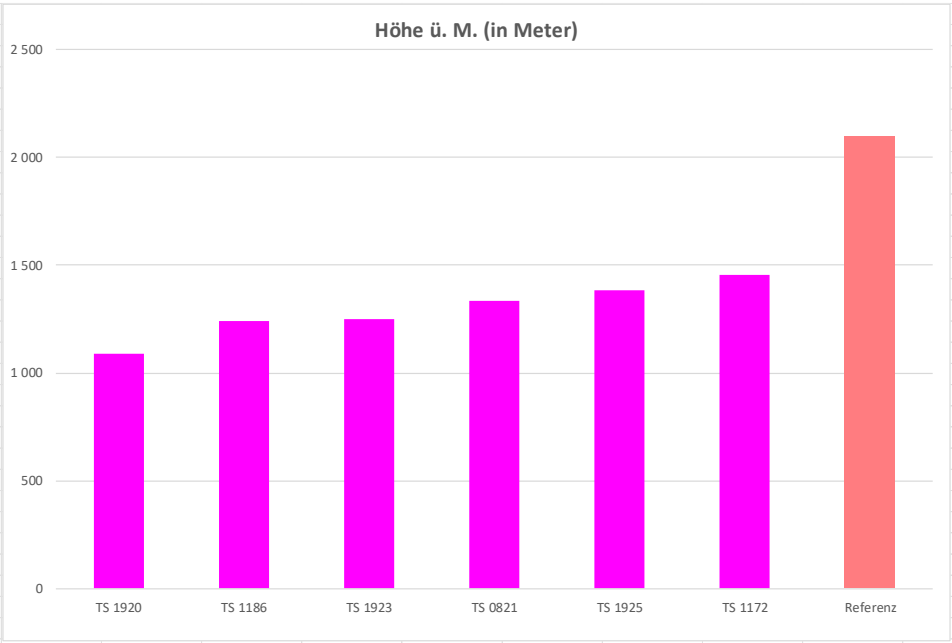
It is interesting that the plants do not flower before early summer, which means considerably later than those *G. monvillei* var. *coloratum* growing in close vicinity. Unfortunately, neither offspring nor seed pictures nor knowledge as to ploidy exist. Based on habitat pictures it cannot be established whether *G. monvillei* var. *grandiflorum's* flower is larger than that of *G. monvillei* var. *monvillei*. No visual comparison of flower size could be found in literature.

Fig. 161-162: Plants in their habitat: (161) TS 1186 *G. monvillei* var. *grandiflorum*, Villa Icho Cruz, 1,240 m; (162) TS 821 *G. monvillei* var. *grandiflorum*, Villa Icho Cruz, 1,337 m.

Fig. 163: TS 1925 *G. monvillei* var. *grandiflorum*, Copina, 1,386 m.

The plants grow between an altitude of 1,100 and 1,500 m a.s.l.. This is equivalent to medium altitudes within the distribution area.

Feldnummer	Höhe/M	Art
TS 1920	1 088	monvillei var. grandiflorum
TS 1186	1 240	monvillei var. grandiflorum
TS 1923	1 252	monvillei var. grandiflorum
TS 0821	1 337	monvillei var. grandiflorum
TS 1925	1 386	monvillei var. grandiflorum
TS 1172	1 456	monvillei var. grandiflorum
Referenz	2 100	Ref.



Tab. 8: Altitudes of the localities west of Villa Icho Cruz.

The distribution area of *G. monvillei* var. *coloratum* is located on the south-eastern foothills of the Sierra Grande, between the villages Villa Jarillas and Potrero de Garay.

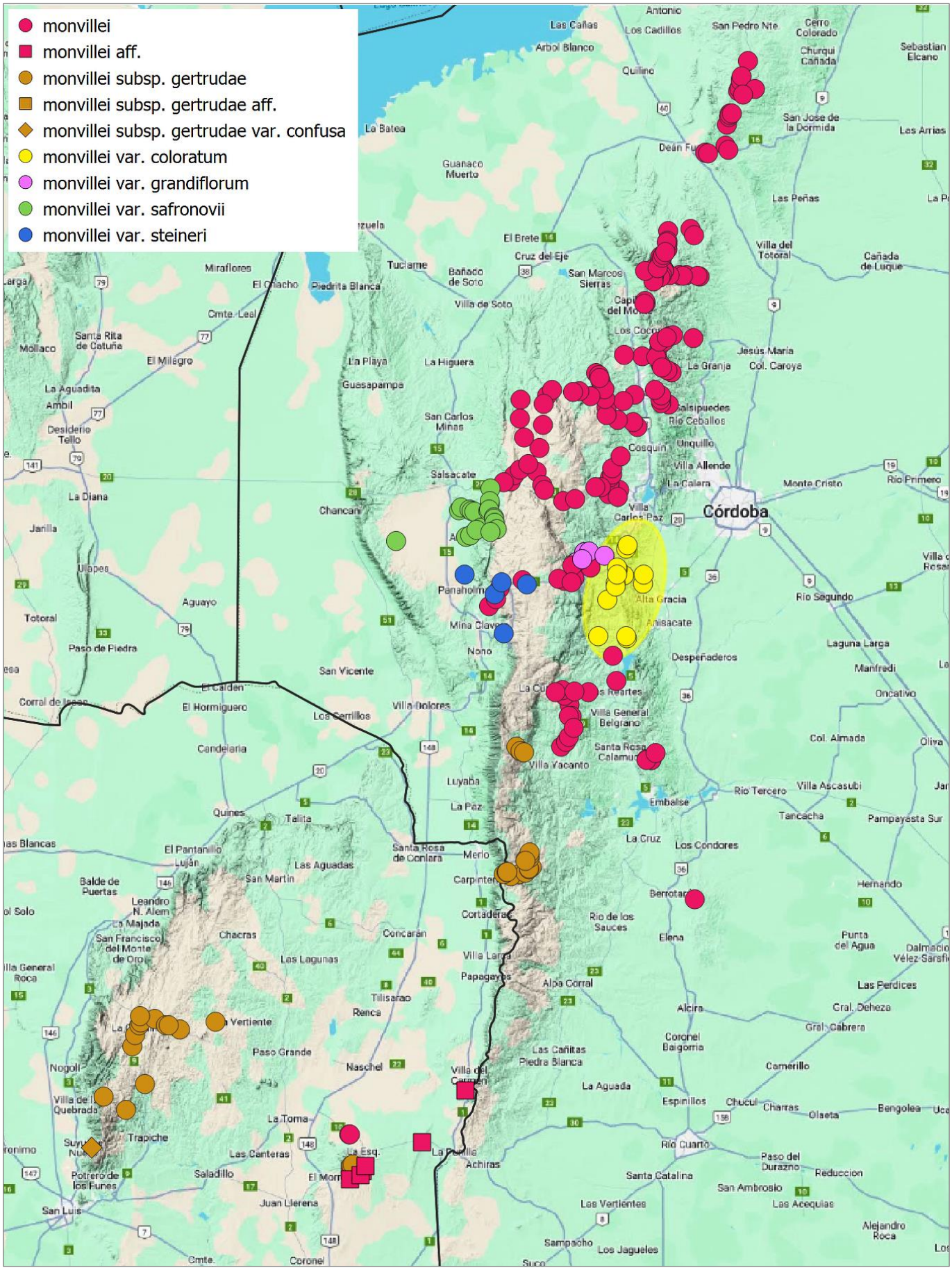


Fig. 164: Distribution area of *G. monvillei*.

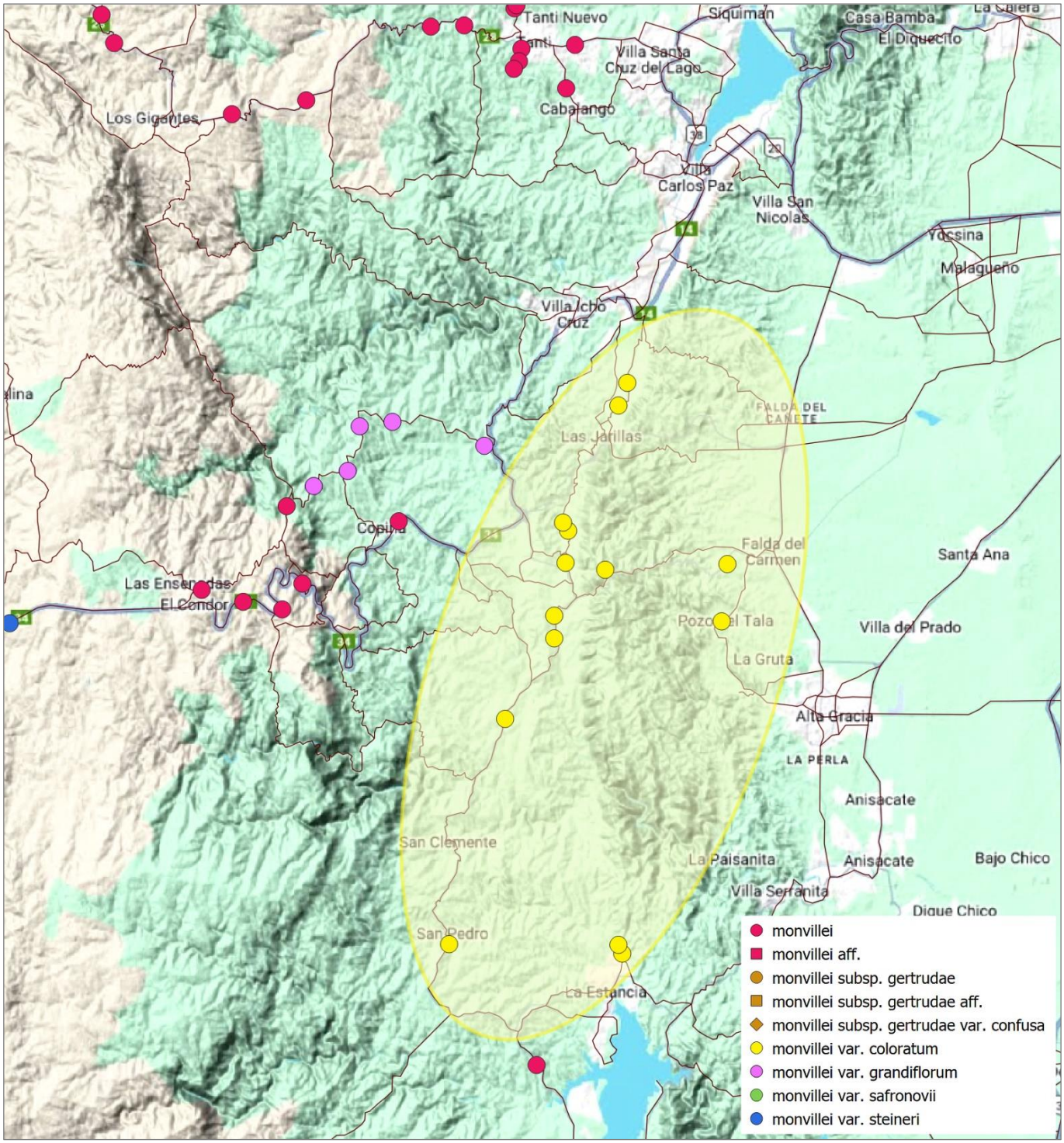


Fig. 165: Detailed map of *G. monvillei* var. *coloratum's* distribution area.

The respective habitat consists of rocky, hilly meadows, bordered by bushes and trees (fig. 166-167).

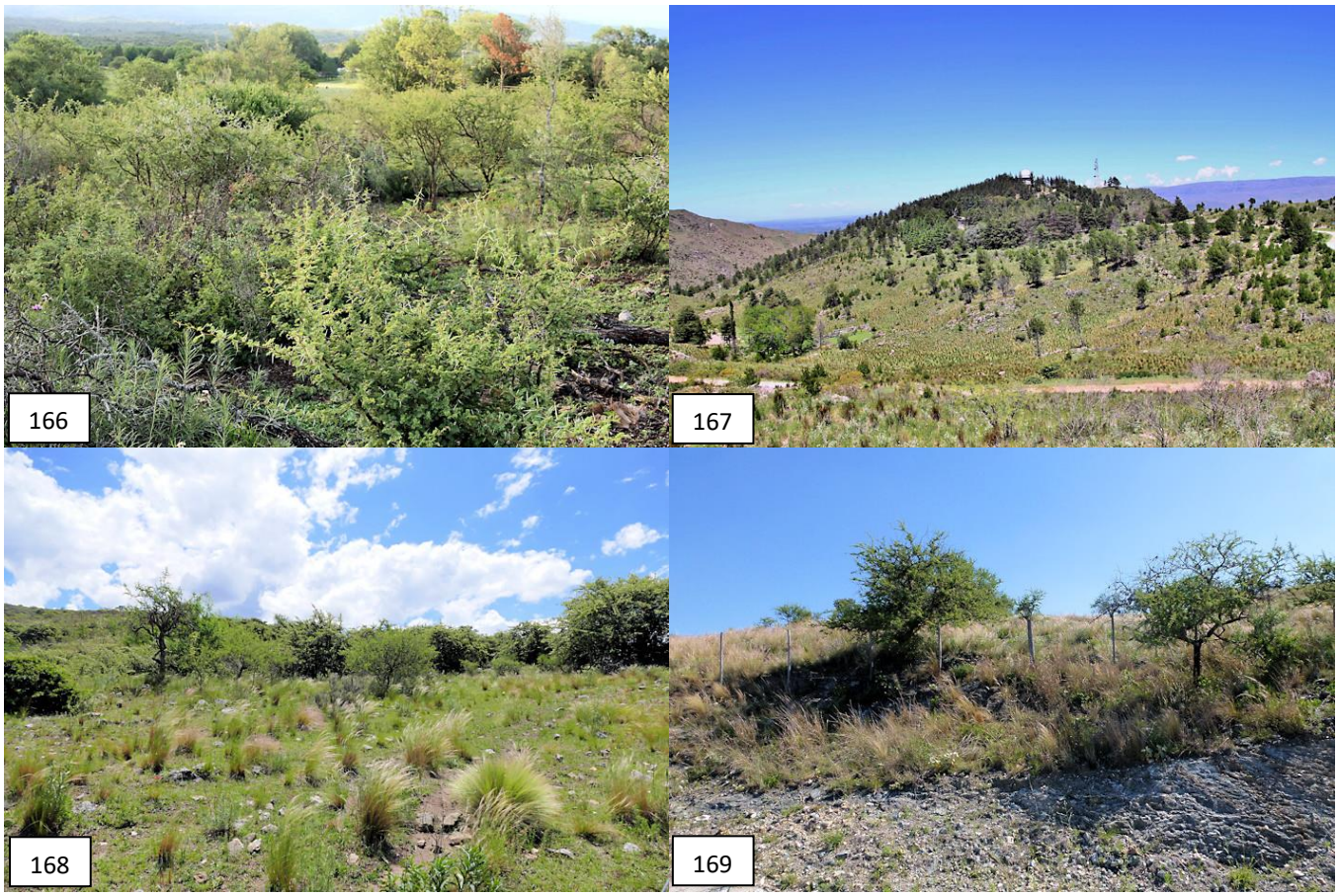


Fig. 166-169: Localities: (166) TS 1235, Villa Las Jarillas, 746 m (photo: V. Schädlich); (167) TS 781, Bosque Alegre, 1,190 m; (168) TS 1214, Bosque Alegre, 952 m; (169) TS 789, San Clemente, 1,010 m (photo: M. Strub).

The marginal spines of *G. monvillei* var. *coloratum* are yellowish, mostly with a reddish base. They are radial to forming nest-like arrangements, partly muddled and slightly bent towards the body. Central spines are rare, no pronounced sprouting tendency can be recognised (fig. 170-173). In nature the plants flower in early spring.

Fig. 170-171: Plants in their habitat: (170) TS 1235 *G. monvillei* var. *coloratum*, Villa Las Jarillas, 746 m; (171) TS 781 *G. monvillei* var. *coloratum*, Bosque Alegre, 1,190 m;

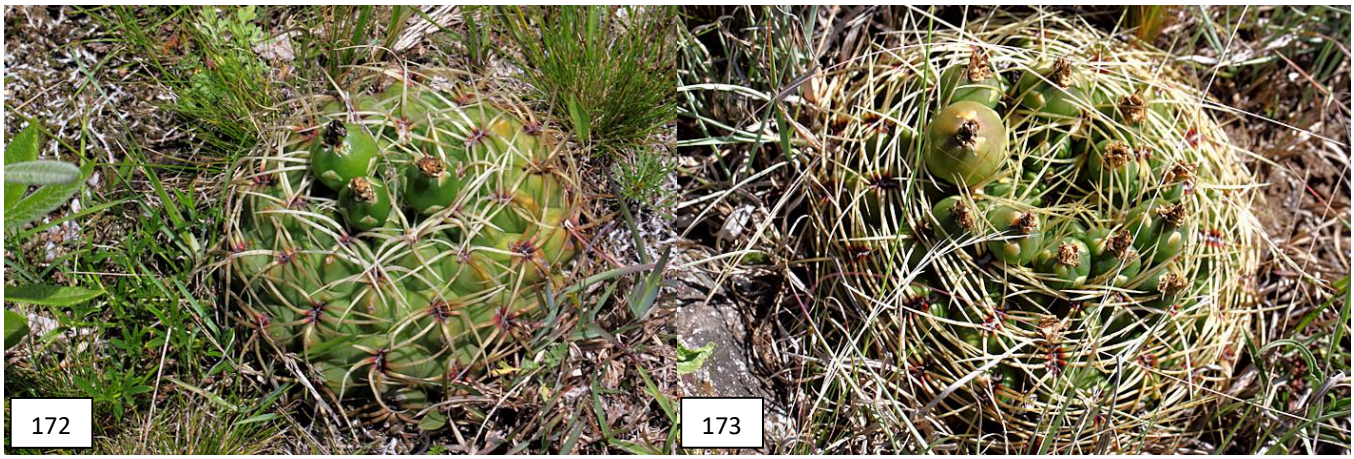


Fig. 172-173: Plants in their habitat: (172) TS 1214 *G. monvillei* var. *coloratum*, Bosque Alegre, 952 m; (173) TS 789 *G. monvillei* var. *coloratum*, San Clemente, 1,010 m.

The offspring is uniform with dark green body colour. Spines are yellowish, shining with a reddish base and mostly pressed to the body, central spines are rare. Although the plants are older than ten years they hardly sprout. The few sprouts originate from areoles close to the base. All seed samples investigated have a ploidy of 4n=tetraploid (fig. 174-178).

Fig. 174-175: Spination: (174) TS 1235 *G. monvillei* var. *coloratum*, Villa Las Jarillas, 746 m; (175) TS 781 *G. monvillei* var. *coloratum*, Bosque Alegre, 1,190 m.

Fig. 176-177: Spination: (176) TS 1214 *G. monvillei* var. *coloratum*, Bosque Alegre, 952 m; (177) TS 789 *G. monvillei* var. *coloratum*, San Clemente, 1,010 m.

Fig. 178: Spination: TS 781 *G. monvillei* var. *coloratum*, Bosque Alegre, 1,190 m (sprouting specimens are infrequent).

The flowers have a more or less intensively coloured rose-coloured throat. Apart from that, they display the characteristic funnel- to cup-shaped flower structure of *G. monvillei* and are predominantly hermaphroditic. Plants which have a rose-coloured or completely white throat occur at the same locality (fig. 179-183).

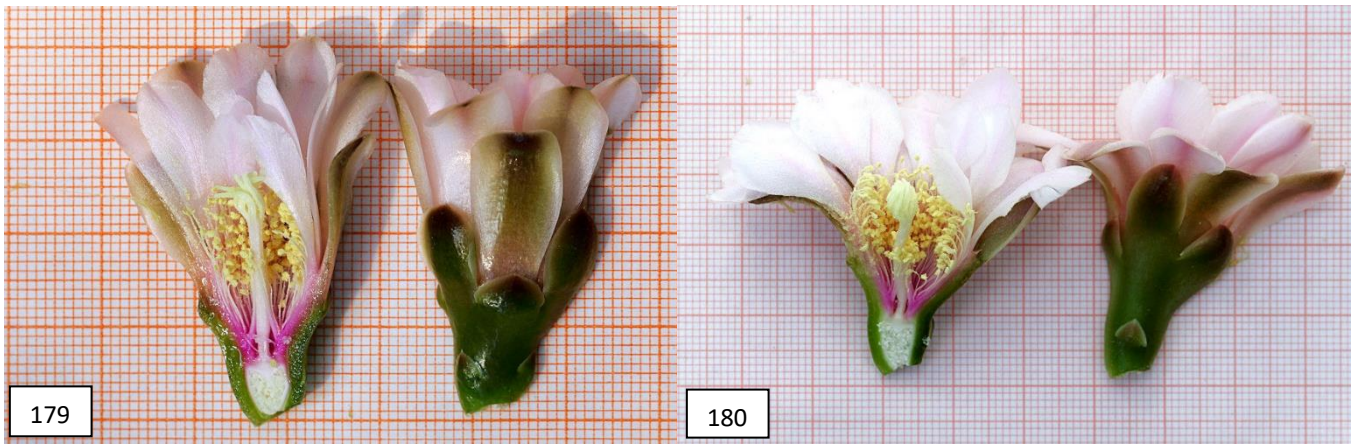


Fig. 179-180: Flower sections: (179) TS 1235 *G. monvillei* var. *coloratum*, Villa Las Jarillas, 746 m; (180) TS 781 *G. monvillei* var. *coloratum*, Bosque Alegre, 1,190 m.

Fig. 181-182: Flower sections: (181) TS 1214 *G. monvillei* var. *coloratum*, Bosque Alegre, 952 m; (182) TS 789 *G. monvillei* var. *coloratum*, San Clemente, 1,010 m.

Fig. 183: Flower sections: TS 789 *G. monvillei*, San Clemente, 1,010 m (at this locality not all the flowers possess the rose-coloured throat, this flower is female by predomination).

The form of the seeds is hat-shaped to slightly elongated with a relatively wide hilum which often shows a bulge-like arch which is less pronounced to non-existent in seeds from plants growing in the north.

Fig. 184-185: Seed pictures: (184) TS 1235 *G. monvillei* var. *coloratum*, Villa Las Jarillas, 746 m; (185) TS 781 *G. monvillei* var. *coloratum*, Bosque Alegre, 1,190 m (photos: V. Schädlich).

Fig. 186-187: Seed pictures: (186) TS 1214 *G. monvillei* var. *coloratum*, Bosque Alegre, 952 m; (187) TS 789 *G. monvillei* var. *coloratum*, San Clemente, 1,010 m.

Fig. 188: Seed pictures: TS 70a *G. monvillei*, Arroyo El Perchel, 934 m (hilum without bulge-like arch, photos: V. Schädlich).

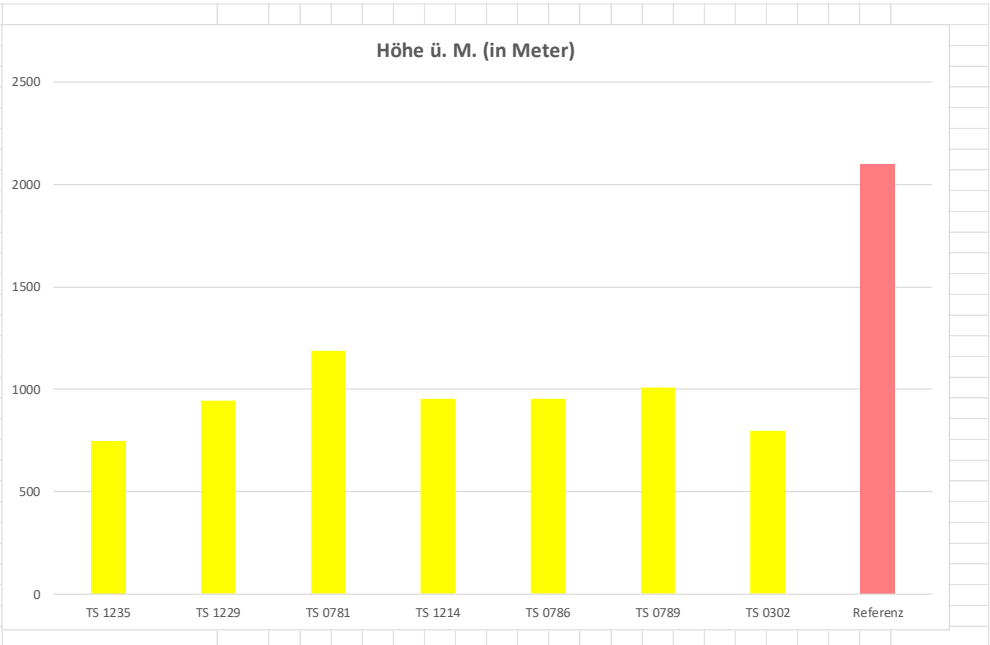
The flowering period of *G. monvillei* var. *coloratum* is before that of *G. monvillei* var. *monvillei, G. monvillei* var. *safronovii* and *G. monvillei* var. *steineri*. Together with *G. monvillei* subsp. *gertrudae* they are the early bloomers within the *G. monvillei* family.

Feldnummer	Art	Ort	H.ü.M	März				April				Mai				Juni			
Villa Icho Cruz - Potrero de Garay																			
TS 1235	monvillei var. coloratum	Villa Las Jarillas	746																
TS 1229	monvillei var. coloratum	Villa Las Jarillas	944																
TS 0781	monvillei var. coloratum	Bosque Alegre	1 190																
TS 1214	monvillei var. coloratum	Bosque Alegre	952																
TS 0786	monvillei var. coloratum	San Clemente	948																
TS 0789	monvillei var. coloratum	Potrero de Garay	1 010																
TS 0302	monvillei var. coloratum	La Estancia	795																

Tab. 9: Flowering period of *G. monvillei* var. *coloratum* (Basel, 2022).

The localities are relatively low-lying, between 750 and 1,200 m a.s.l..

Feldnummer	Höhe/M	Art
TS 1235	746	monvillei var. coloratum
TS 1229	944	monvillei var. coloratum
TS 0781	1 190	monvillei var. coloratum
TS 1214	952	monvillei var. coloratum
TS 0786	953	monvillei var. coloratum
TS 0789	1 010	monvillei var. coloratum
TS 0302	795	monvillei var. coloratum
Referenz	2 100	Ref.



Tab. 10: Altitudes of the localities between Villa Icho Cruz – Potrero de Garay.

G. monvillei var. *coloratum* grows together with *Echinopsis aurea* and *Parodia submammulosa* (fig. 189-190). Further accompanying plants originate from the subgenus *Gymnocalycium*, a species which is counted among the form group of *G. calochlorum* (*G. leptanthum*) and which possesses a chromosome set of 6n=hexaploid (fig. 191). Furthermore, *Gymnocalycium bruchii*

(fig. 192) and *Gymnocalycium quehlianum* from the subgenus *Trichomosemineum* (fig. 193) can be found.

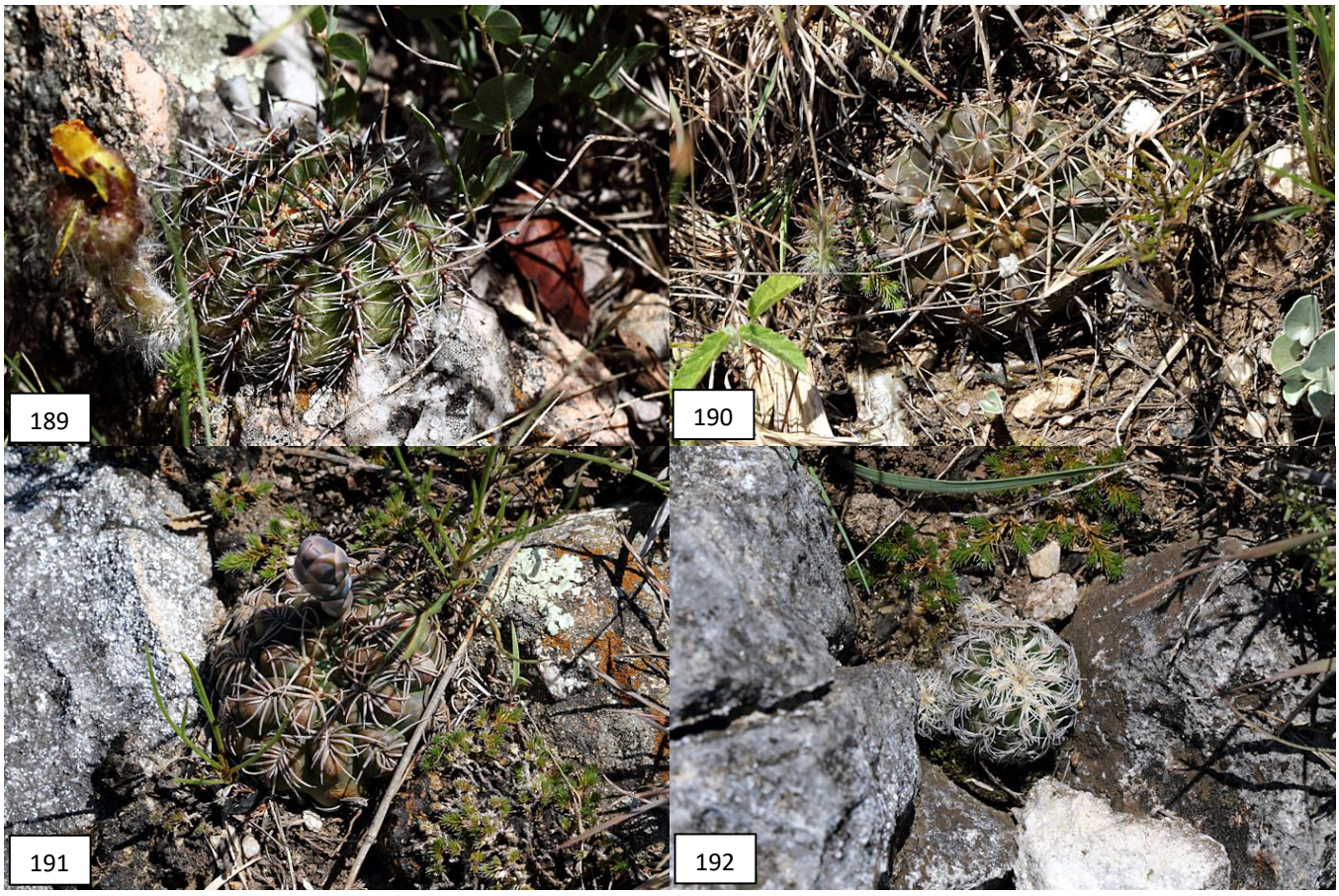


Fig. 189-192: Accompanying flora: (189) TS 781a *Echinopsis aurea*, Bosque Alegre, 1,190 m; (190) TS 1919b *Parodia submammulosa*, Bosque Alegre, 973 m; (191) TS 1917 *G. calochlorum*, Bosque Alegre, 973 m. (192) TS 1916 *G. bruchii*, Bosque Alegre, 973 m.

Fig. 193: TS 787 *G. quehlianum* var. kleinianum, Bosque Alegre, 953 m.

Distribution area southeast of Córdoba.

G. monvillei which do not display any rose-coloured flower throat grow southeast of the occurrence of *G. monvillei* var. *coloratum* on the foothills of the Sierra Grande, respectively the Sierra de Comechingones (fig. 195).

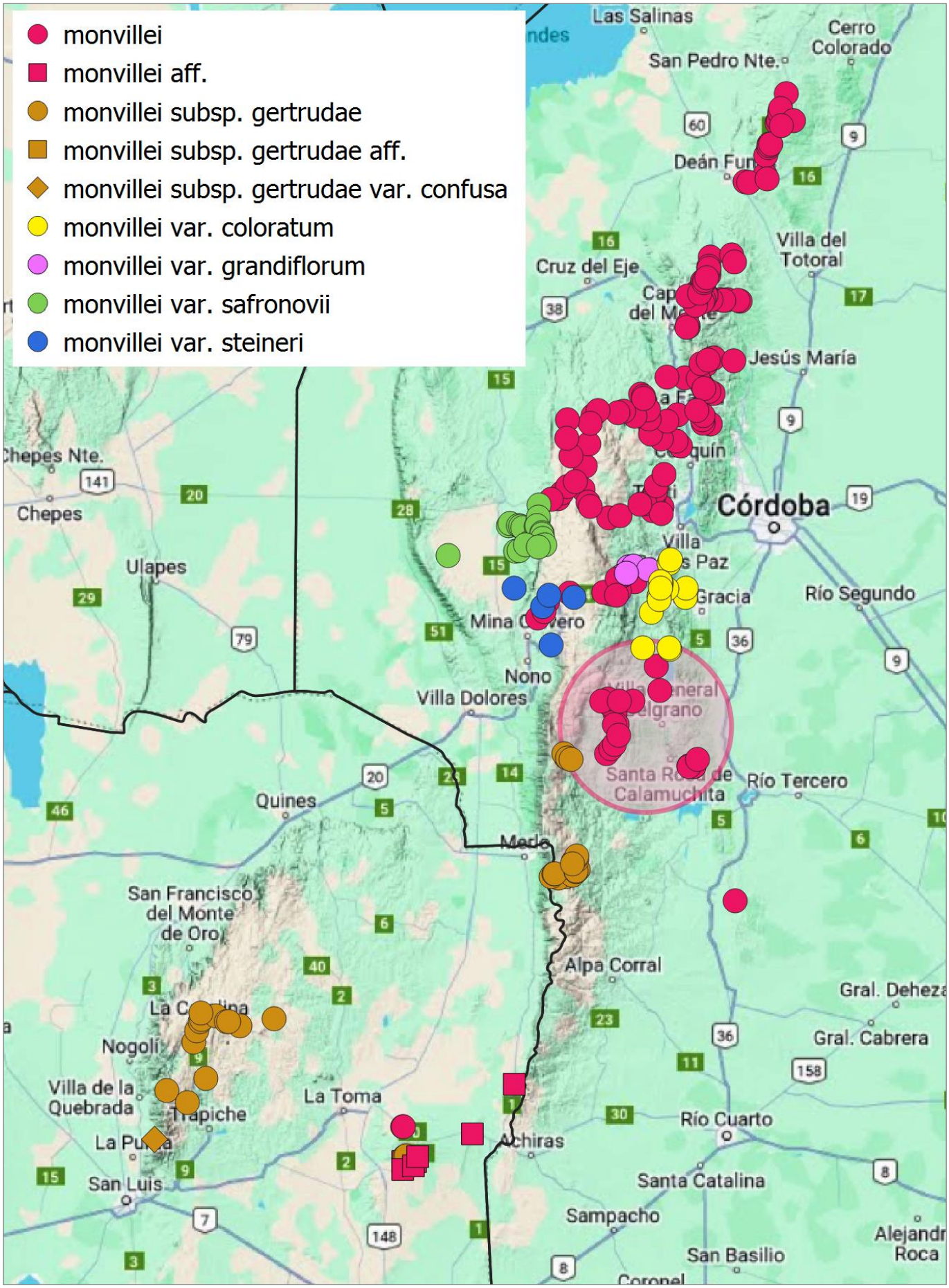


Fig. 194: Distribution area of *G. monvillei*.

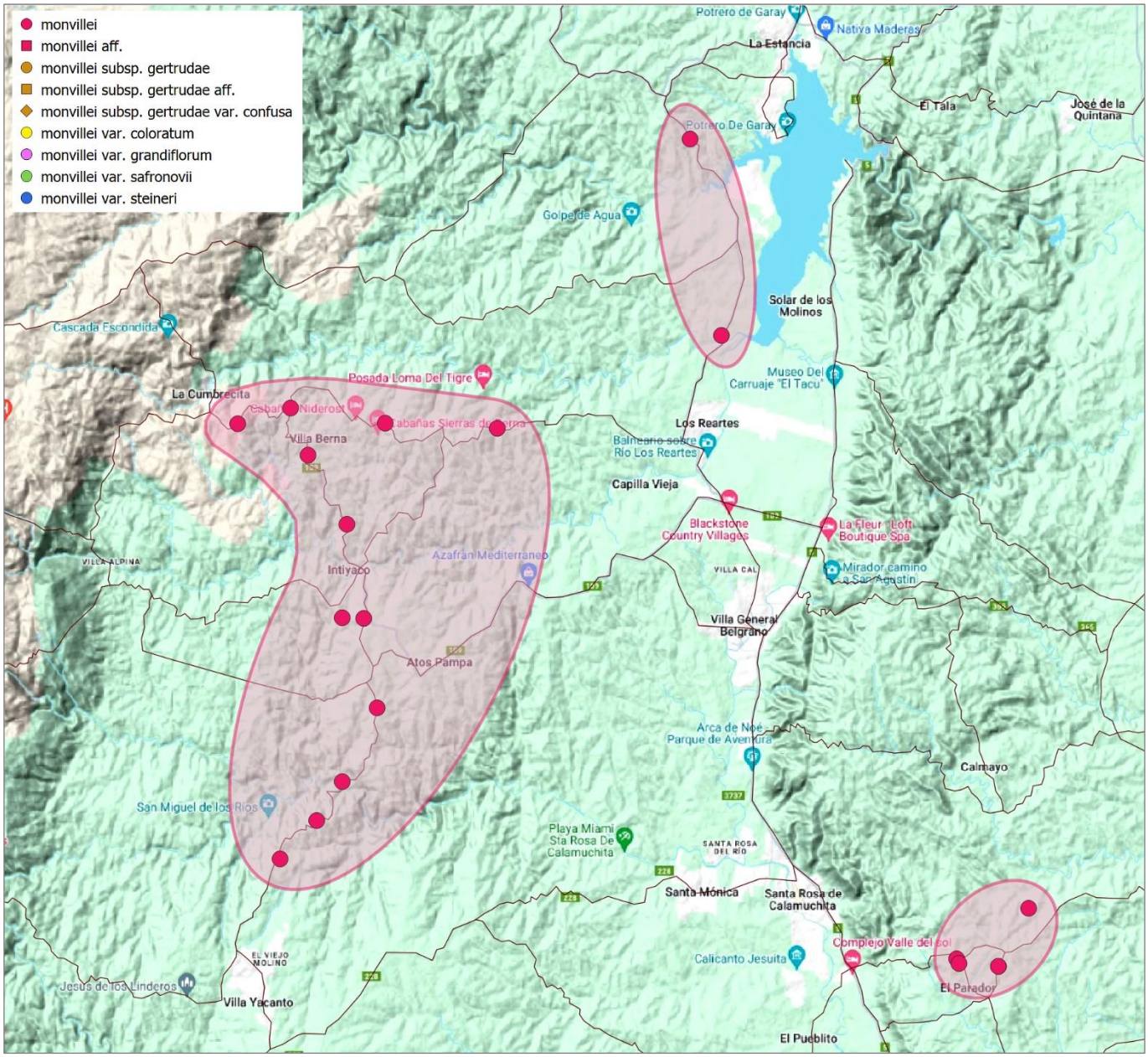


Fig. 195: Detailed map of the distribution area of *G. monvillei* in south-eastern Córdoba.

The localities are extensively used hilly meadows grown over with acacia or reforested with pine trees (fig. 196-199).

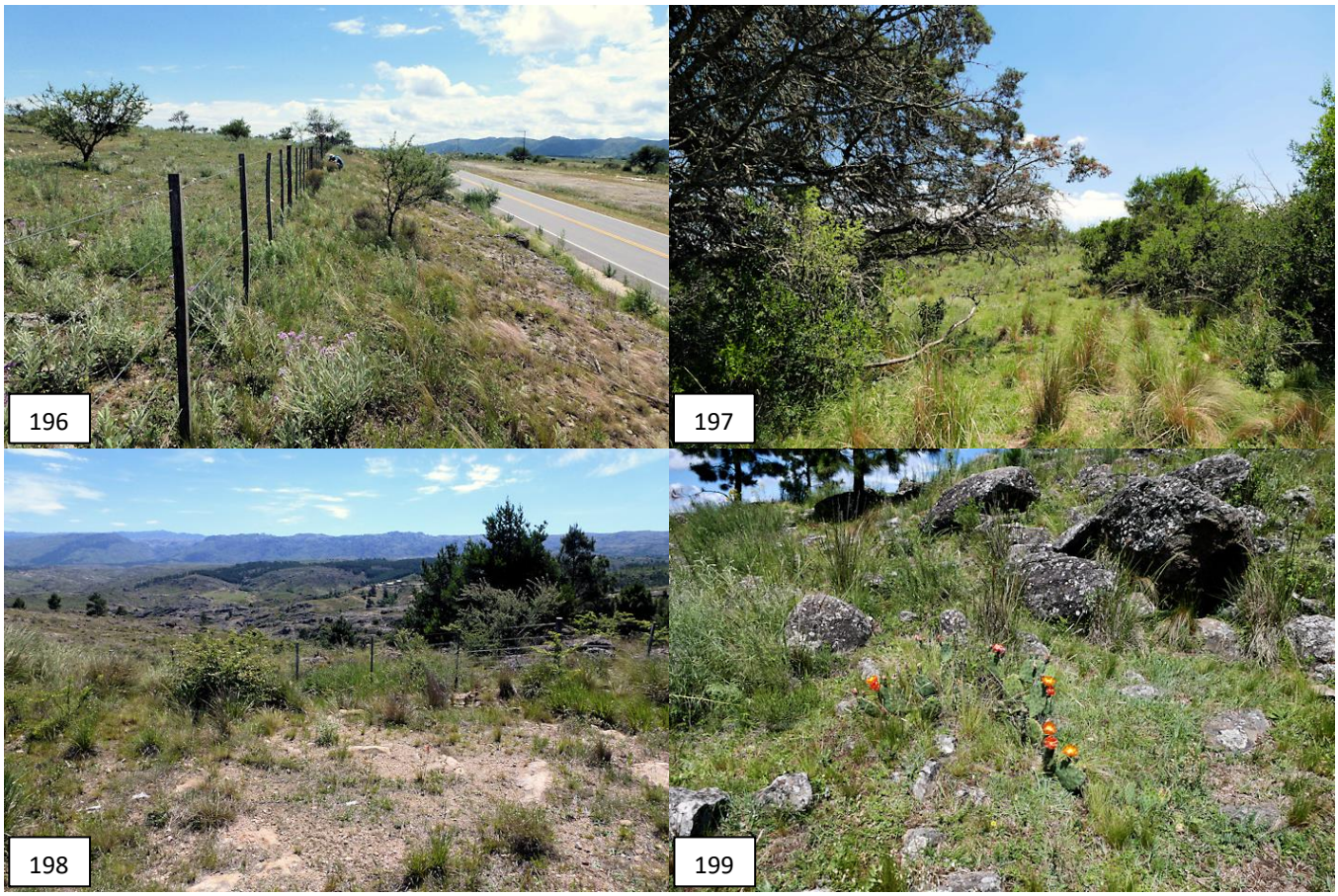


Fig. 196-199: Localities: (196) TS 813, Los Reartes, 785 m (fig. M. Strub): (197) TS 1246, El Parador de la Montaña, 767 m; (198) TS 1701, Villa Berna, 1,305 m; (199) TS 1699, Villa Berna, 1,154 m.

The plants grow to a considerable size in their habitats. No sprouting plants were discovered. The plants found near Los Reartes and El Parador de la Montaña do not show any differences from the *G. monvillei* var. *coloratum* (fig. 200-201) occurring in the north. The arrangement of spines on the plants from around Villa Berna reminds of the *G. monvillei* subsp. *gertrudae* (fig. 202-203) growing somewhat further to the west.

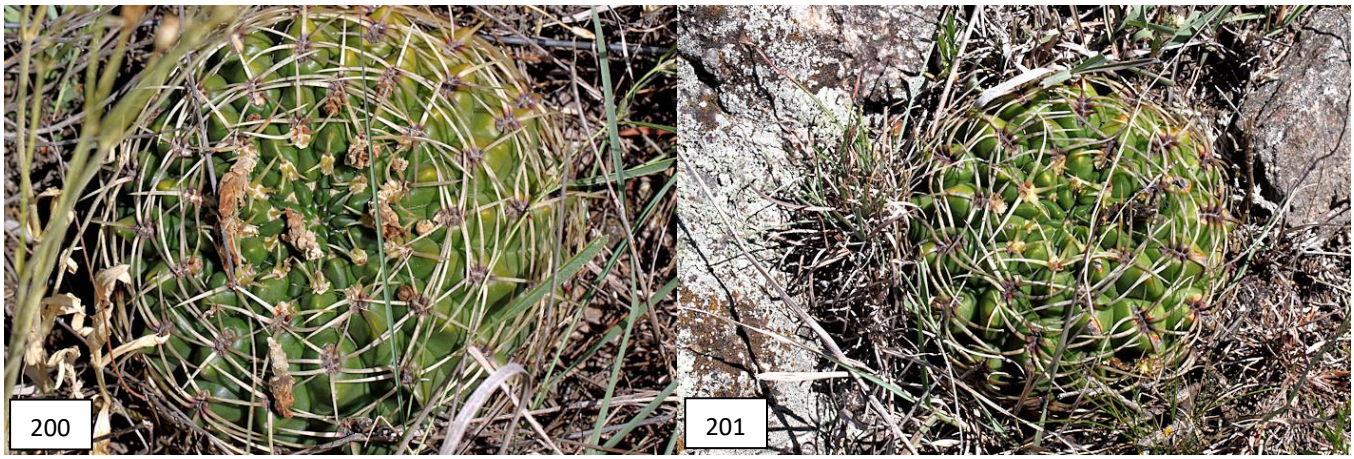


Fig. 200-201: Plants in their habitat: (200) TS 813 *G. monvillei*, Los Reartes, 785 m; (201) TS 1246 *G. monvillei*, El Parador de la Montaña, 767 m.

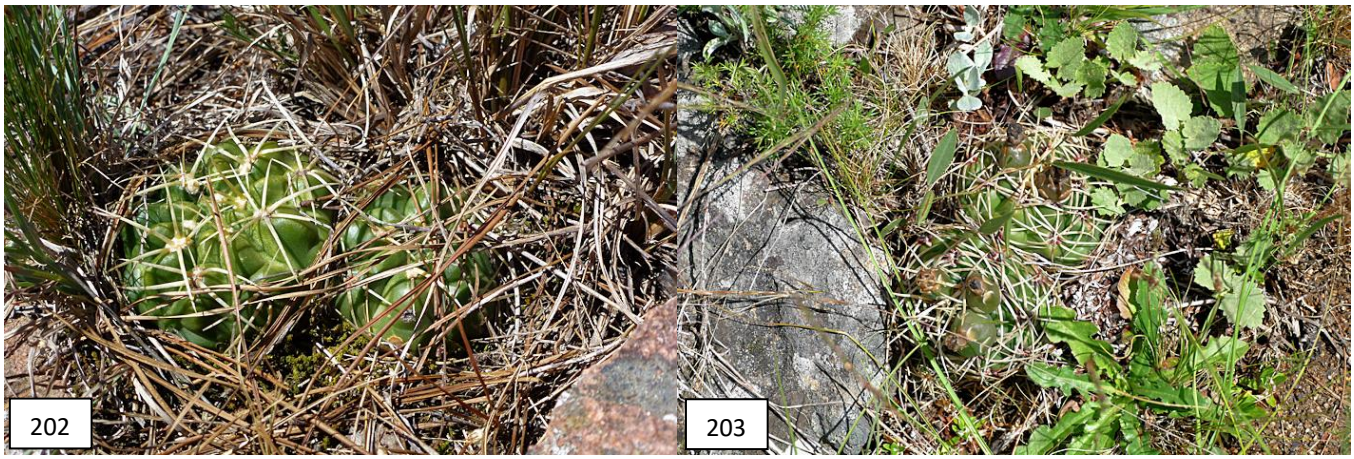


Fig. 202-203: Plants in their habitat: (202) TS 1701 *G. monvillei*, Villa Berna, 1,305 m: (203) TS 1699 *G. monvillei*, Villa Berna, 1,154 m.

The epidermis of plants originating from Los Reartes and El Parador de la Montaña is dark green in cultivation. The spines are bent towards the body and shining yellow, mostly with a somewhat darker base. There are hardly any differences noticeable when compared with *G. monvillei* var. *coloratum* (fig. 204-205).

The plants growing on the eastern foothills of the Sierra de Comechingones remind of *G. monvillei* subsp. *gertrudae* (fig. 206-207) because of their somewhat protruding spines. No pronounced sprouting tendency could be discovered. The rare sprouts originate from areoles close to the base (fig. 208). The investigated seed samples of plants from different localities are all 4n= tetraploid.

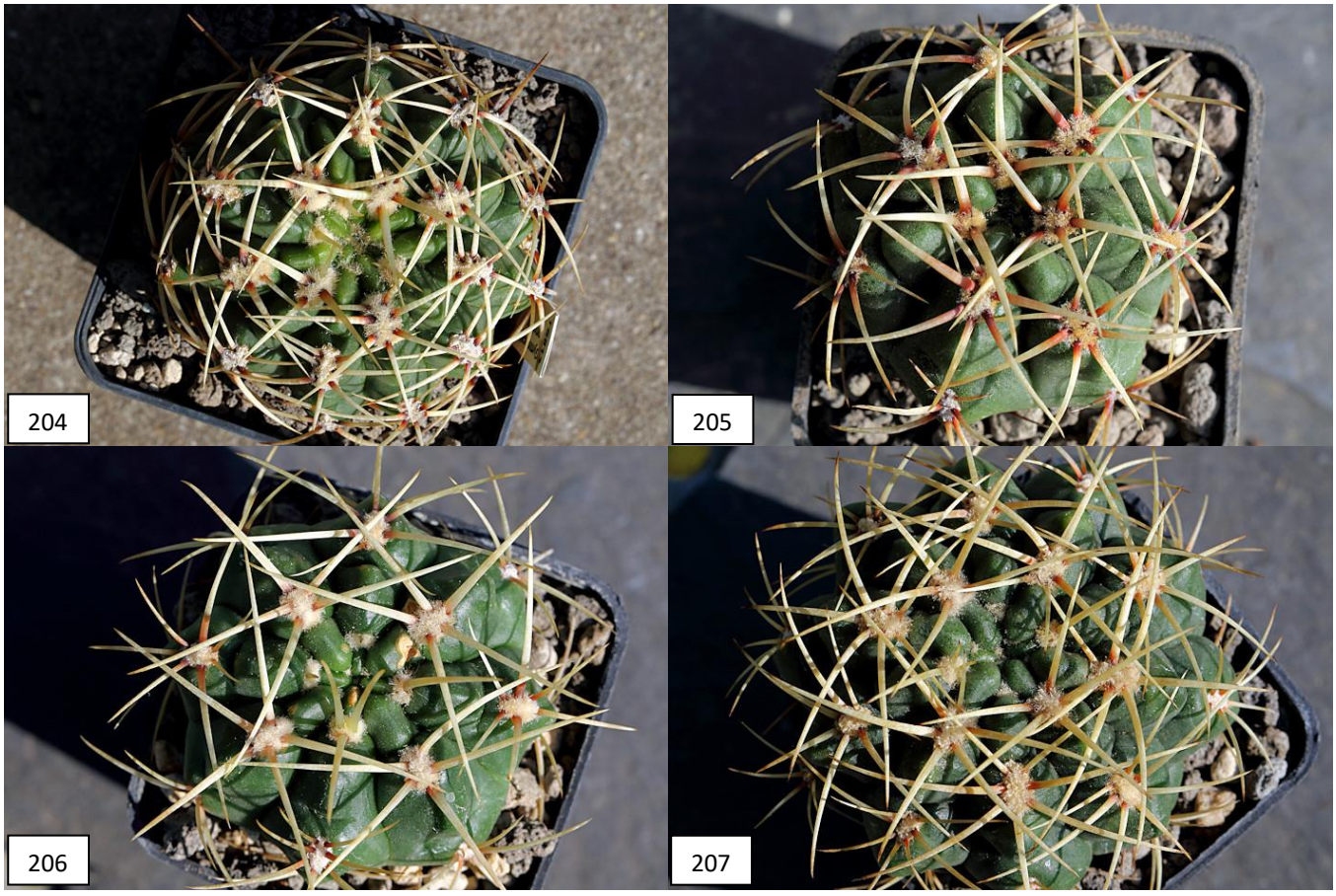


Fig. 204-207: Spination: (204) TS 813 *G. monvillei,* Los Reartes, 785 m; (205) TS 1246 *G. monvillei,* El Parador de la Montaña, 767 m; (206) TS 1701 *G. monvillei*, Villa Berna, 1,305 m; (207) TS 1699 *G. monvillei*, Villa Berna, 1,154 m.

Fig. 208: TS 1248 *G. monvillei*, El Parador de la Montaña, 763 m (sprouting plant).

They are typical G. monvillei flowers with a shortened ovary and funnel- to cup-shaped perianth. The petals are purely white. Flowers that are female by predetermination can be found relatively often (fig. 209+121). The flowers occurring in the west with their tendency towards forming a short tube are similar to *G. monvillei* subsp. *gertrudae* (fig. 211-212).

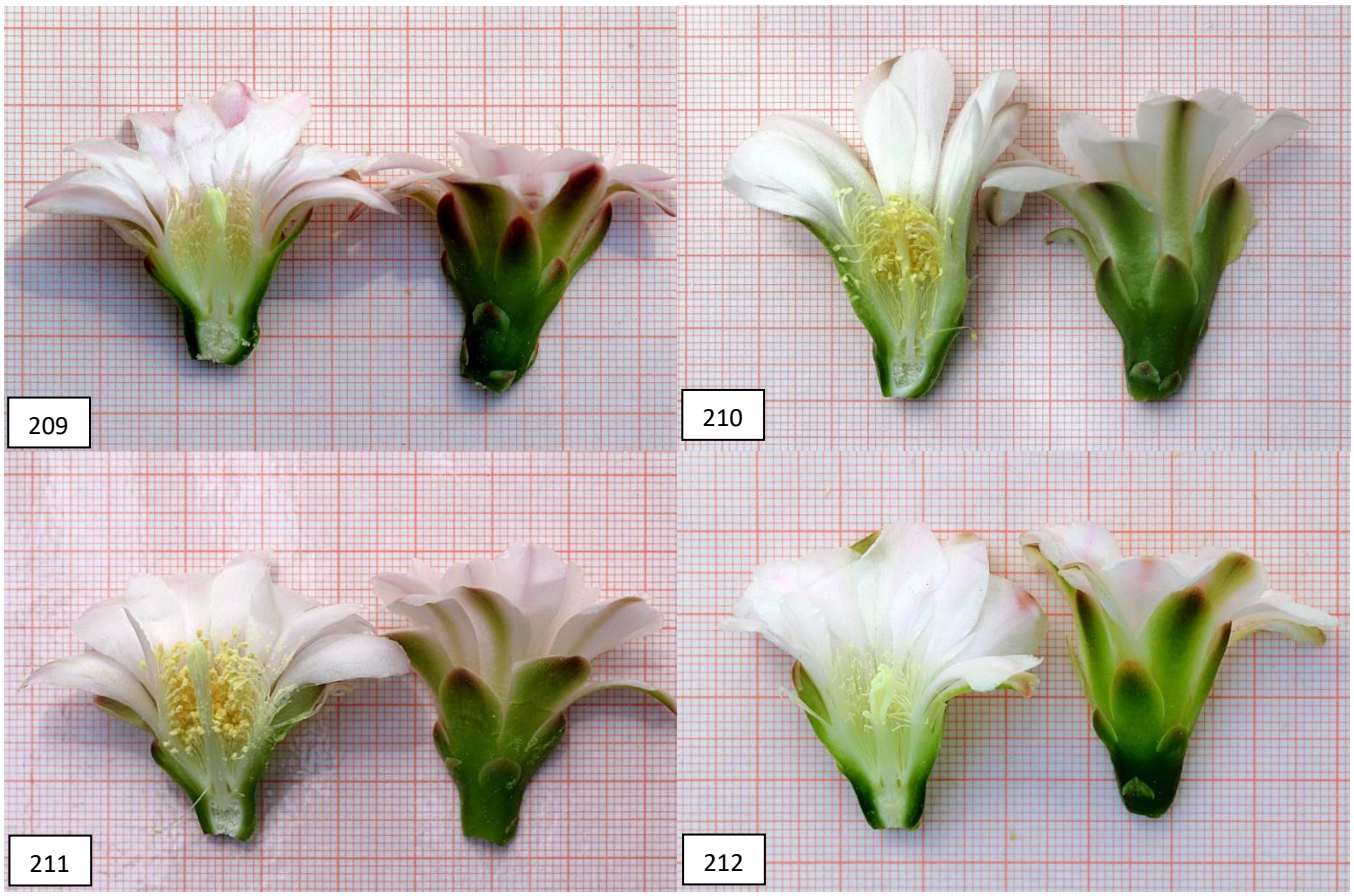


Fig. 209-212: Flower sections: (209) TS 813 *G. monvillei*, Los Reartes, 785 m (flower female by predetermination, pollen is missing); (210) TS 1246 *G. monvillei*, El Parador de la Montaña, 767 m; (211) TS 1701 *G. monvillei*, Villa Berna, 1,305 m; (212) TS 1699 *G. monvillei*, Villa Berna, 1,154 m (flower female by predetermination, pollen is missing).

The seeds are compact and hat-shaped and hardly diverge from the seeds of *G. monvillei* var. *monvillei* (fig. 213-217).

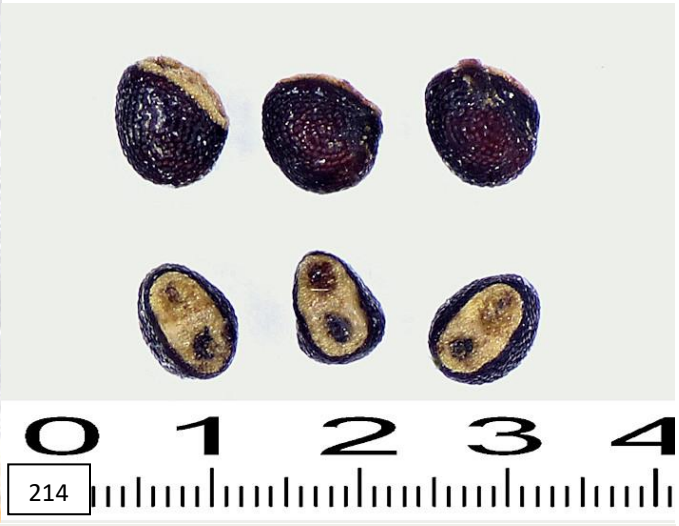


Fig. 213-217: Seed pictures: (213) TS 813 *G. monvillei*, Los Reartes, 785 m; (214) TS 1246 *G. monvillei*, El Parador de la Montaña, 767 m; (215) TS 1701 *G. monvillei*, Villa Berna, 1,305 m; (216) TS 1699 *G. monvillei*, Villa Berna, 1,154 m; (217) TS 70a *G. monvillei*, Arroyo El Perchel, 934 m (photos: V. Schädlich).

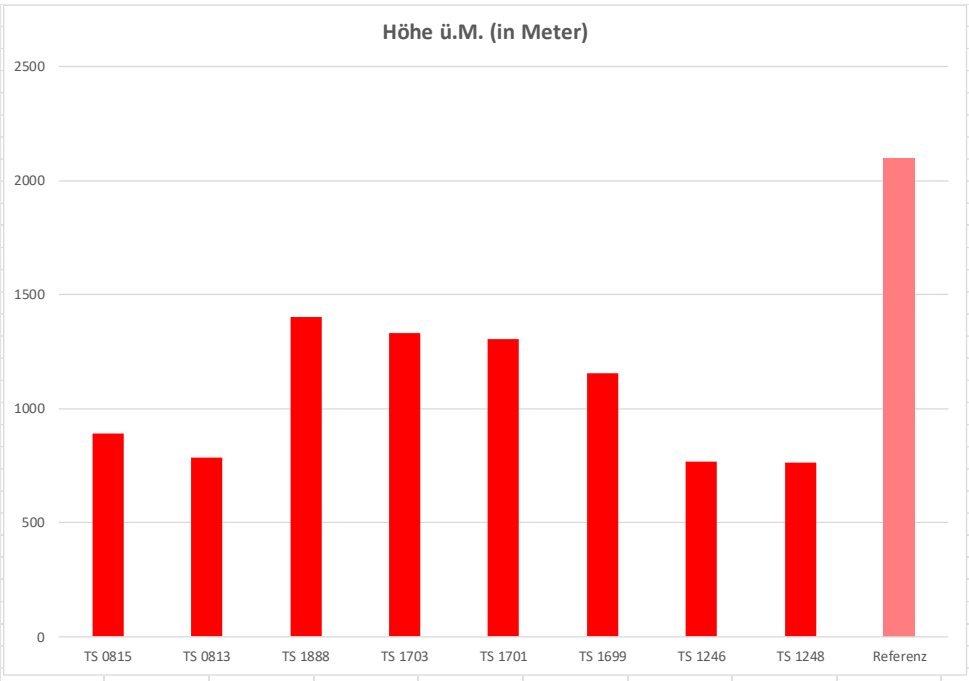
The flowering period is not concurrent. It corresponds with that of *G. monvillei* var. *coloratum* in the plants occurring in the east. The plants growing in the west and the Sierra Grande plants flower simultaneously.

Feldnummer	Art	Ort	H.ü.M	März				April				Mai				Juni			
Los Reartes - La Cumbrecita																			
TS 1888	monvillei	La Cumbrecita	1 401										■						
TS 1703	monvillei	La Cumbrecita	1 334										■						
TS 1701	monvillei	Villa Berna	1 305										■	■					
TS 1699	monvillei	Villa Berna	1 154									■	■						
TS 1246	monvillei	Parador Montaña	767								■	■							
TS 1248	monvillei	Parador Montaña	763								■								

Tab. 11: Flowering period of *G. monvillei* in the area Córdoba south-east (Basel, 2022).

The plants were found at altitudes between 700 and 1,400 metres a.s.l.. So there are different altitudes.

Feldnummer	Höhe/M	Art
TS 0815	892	monvillei
TS 0813	785	monvillei
TS 1888	1 401	monvillei
TS 1703	1 334	monvillei
TS 1701	1 305	monvillei
TS 1699	1 154	monvillei
TS 1246	767	monvillei
TS 1248	763	monvillei
Referenz	2 100	Ref.



Tab. 12: Altitudes, Córdoba south-east.

Here *Parodia submammulosa* occurs together with *G. monvillei* more frequently in low to medium altitudes (fig. 218). *Echinopsis aurea* could also be documented again (fig. 219). *G. monvillei* grows together with *G. bruchii* and other members of the subgenus *Gymnocalycium* in this area. These are *G. amerhauseri* subsp. *altagraciense* as well as *G. sutterianum* subsp. *tetraploideum*, furthermore *G. mostii*, another representative of the subgenus *Scabrosemineum* and *G. quehlianum* from the subgenus *Trichomosemineum.*

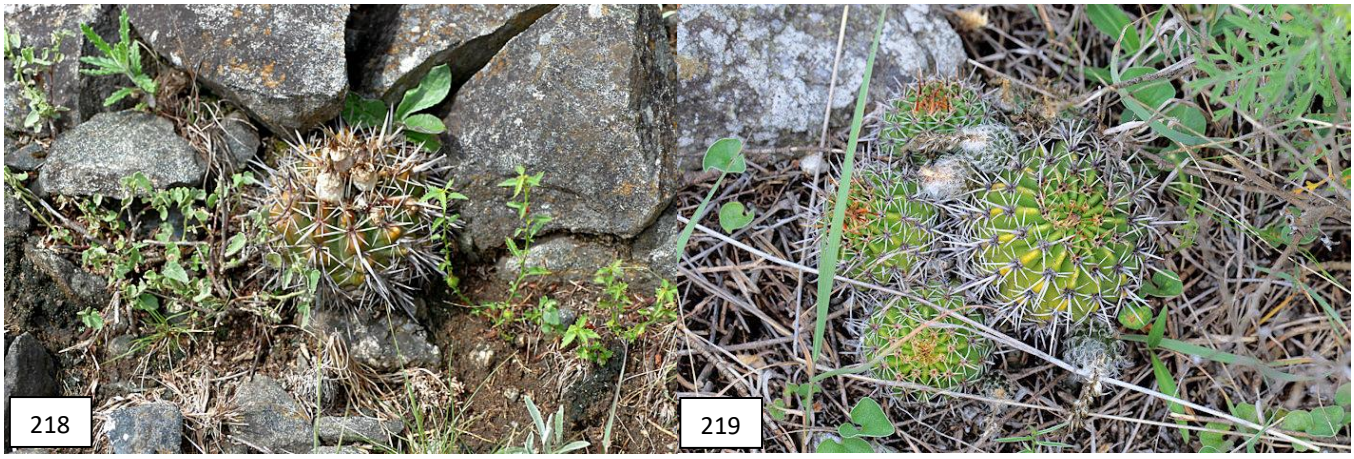


Fig. 218-219: Accompanying flora: (218) TS 1711b *Parodia submammulosa*, Potrero de Garay, 876 m; (219) TS 1901a *Echinopsis aurea*, El Parador de la Montaña, 748 m.

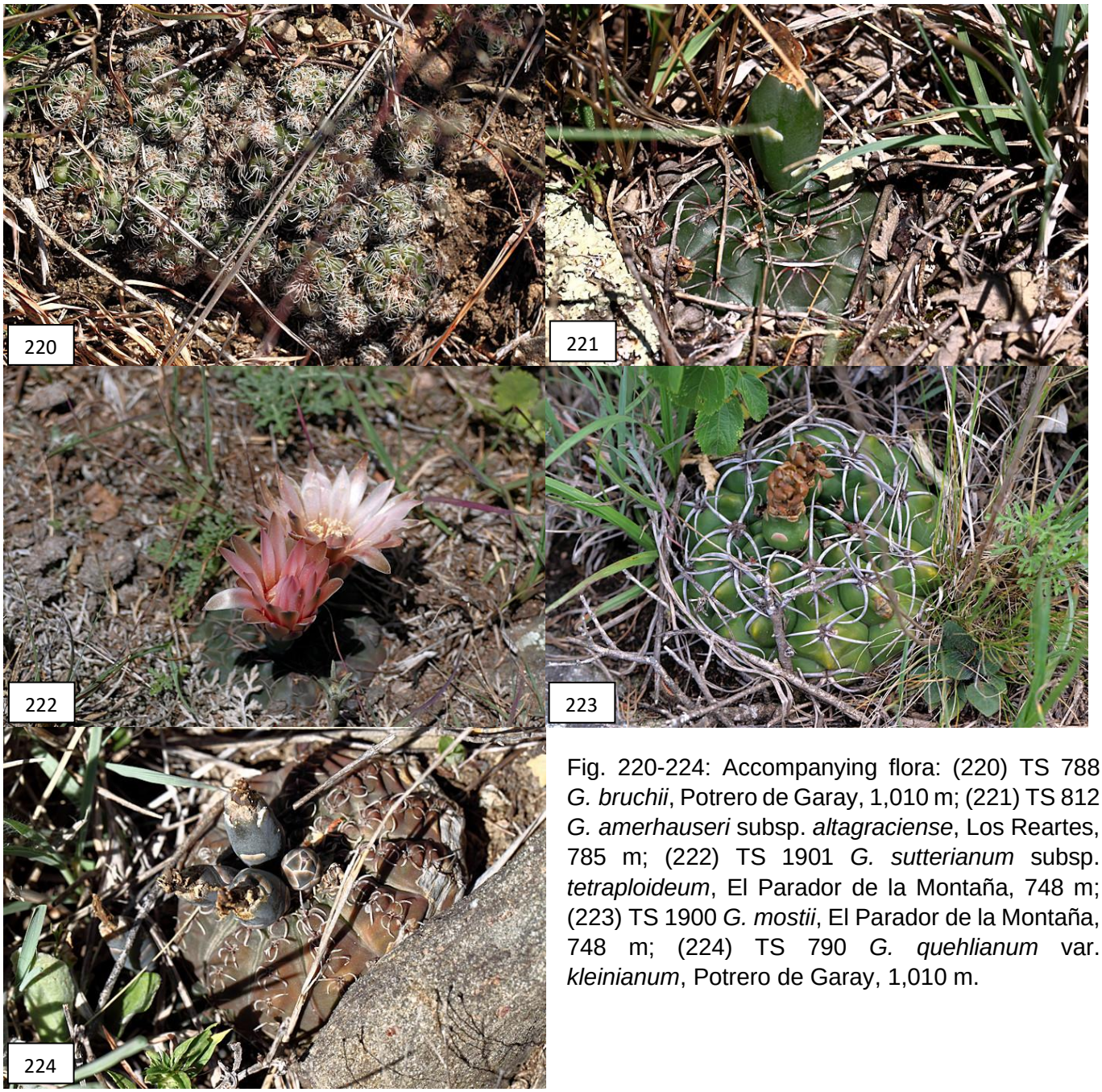


Fig. 220-224: Accompanying flora: (220) TS 788 *G. bruchii*, Potrero de Garay, 1,010 m; (221) TS 812 *G. amerhauseri* subsp. *altagraciense*, Los Reartes, 785 m; (222) TS 1901 *G. sutterianum* subsp. *tetraploideum*, El Parador de la Montaña, 748 m; (223) TS 1900 *G. mostii*, El Parador de la Montaña, 748 m; (224) TS 790 *G. quehlianum* var. *kleinianum*, Potrero de Garay, 1,010 m.

Distribution area in the Sierra Las Peñas.

The Sierra de las Peñas is situated In the south-eastern region of the distribution area. It is an isolated and flat-topped low-lying hill range. (fig. 225-226).

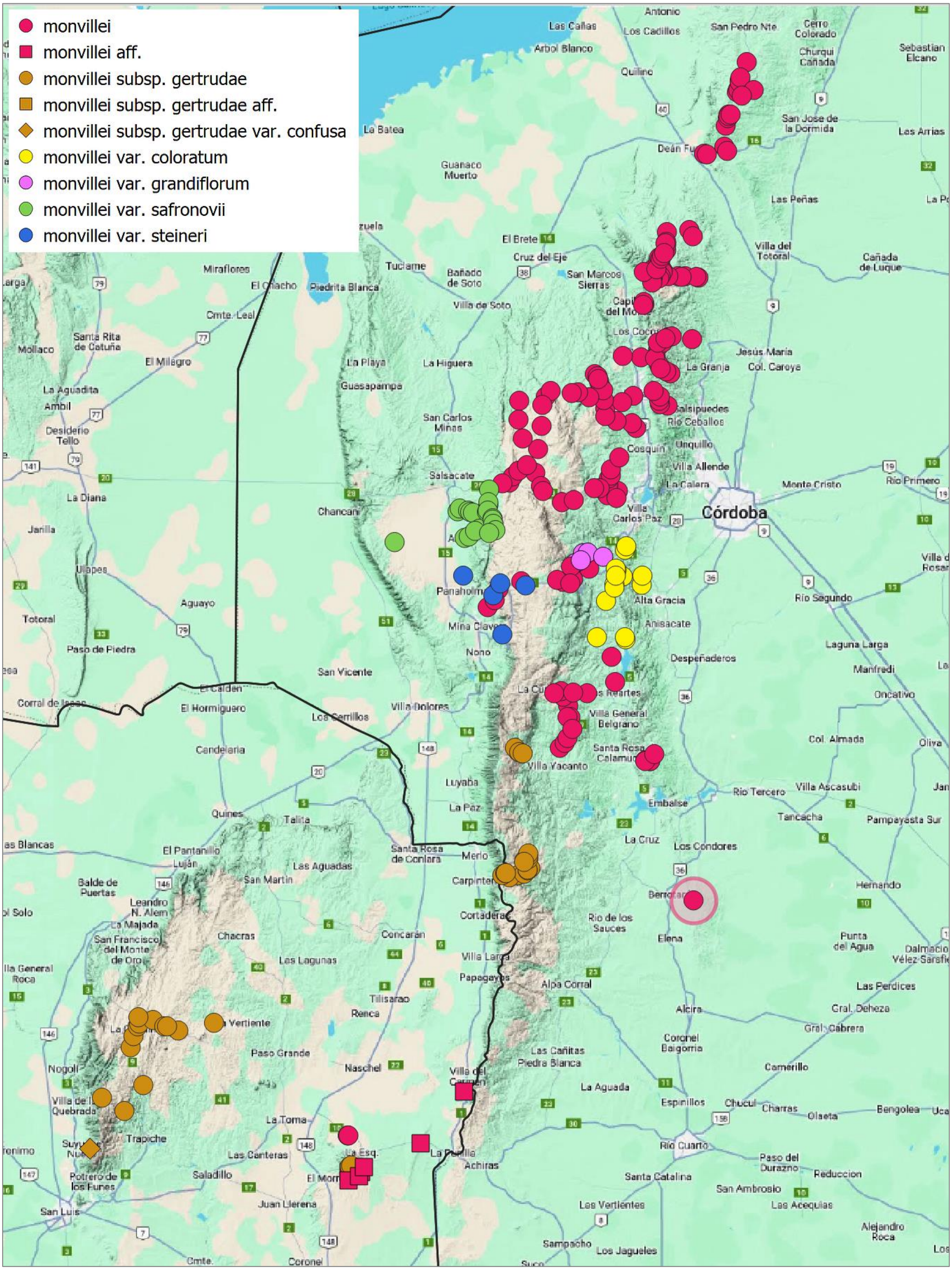


Fig. 225: Distribution area of *G. monvillei*.

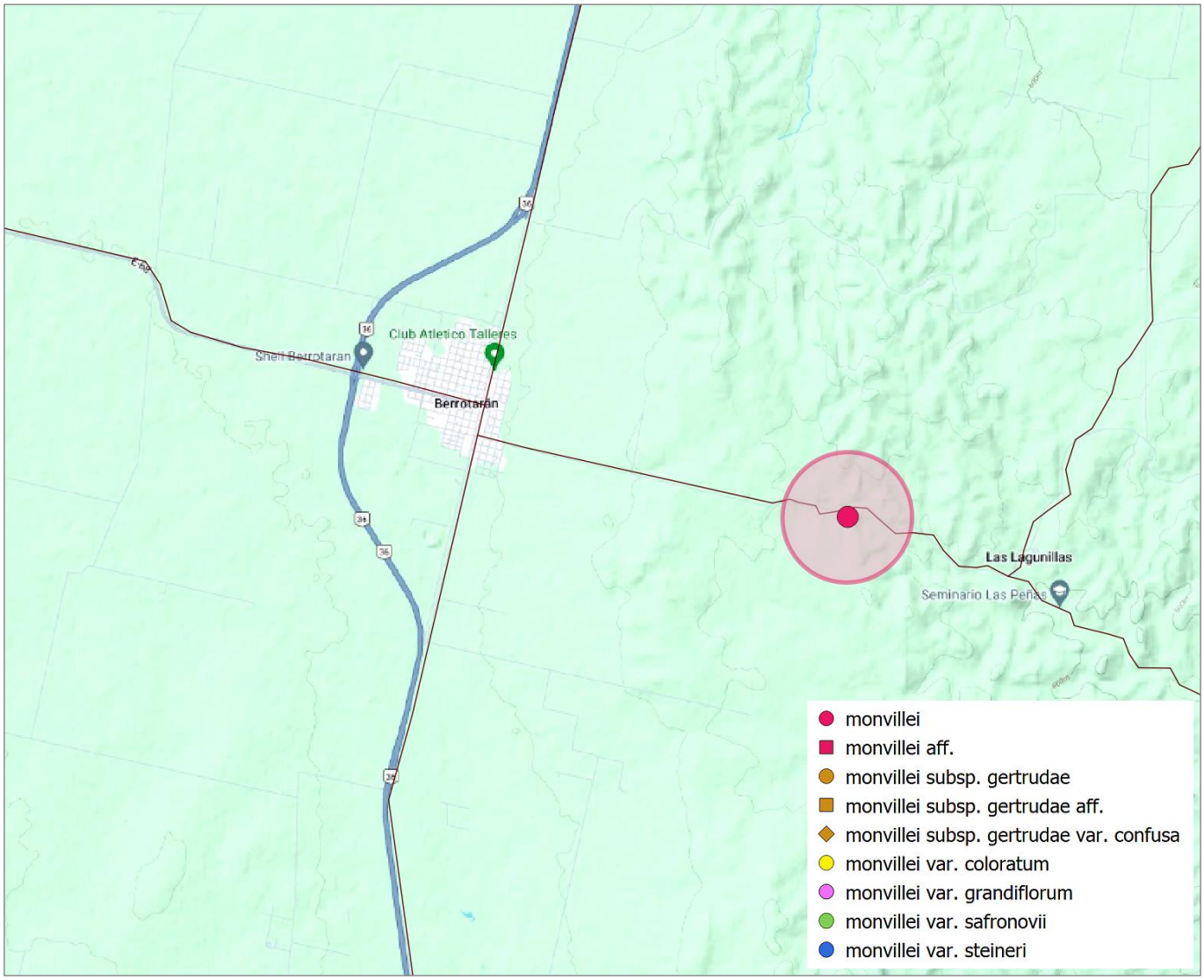


Fig. 226: Detailed map of the locality in the Sierra Las Peñas.

The habitat, which is used for livestock farming, is hilly terrain interspersed with rocks. The less rocky areas are dedicated to farming.

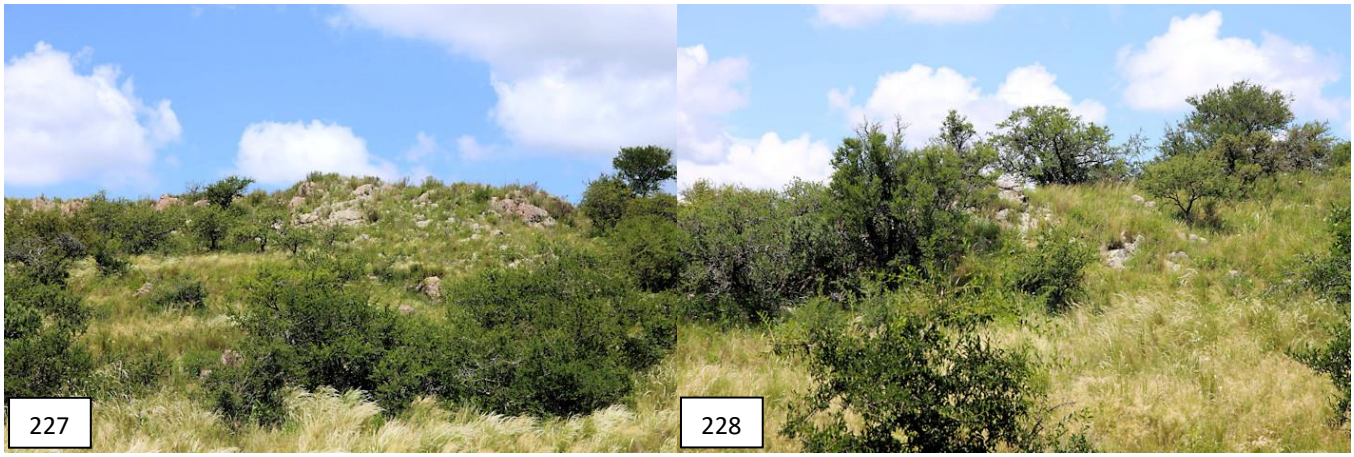


Fig. 227-228: Locality: TS 9, Los Poleos, 671 m.

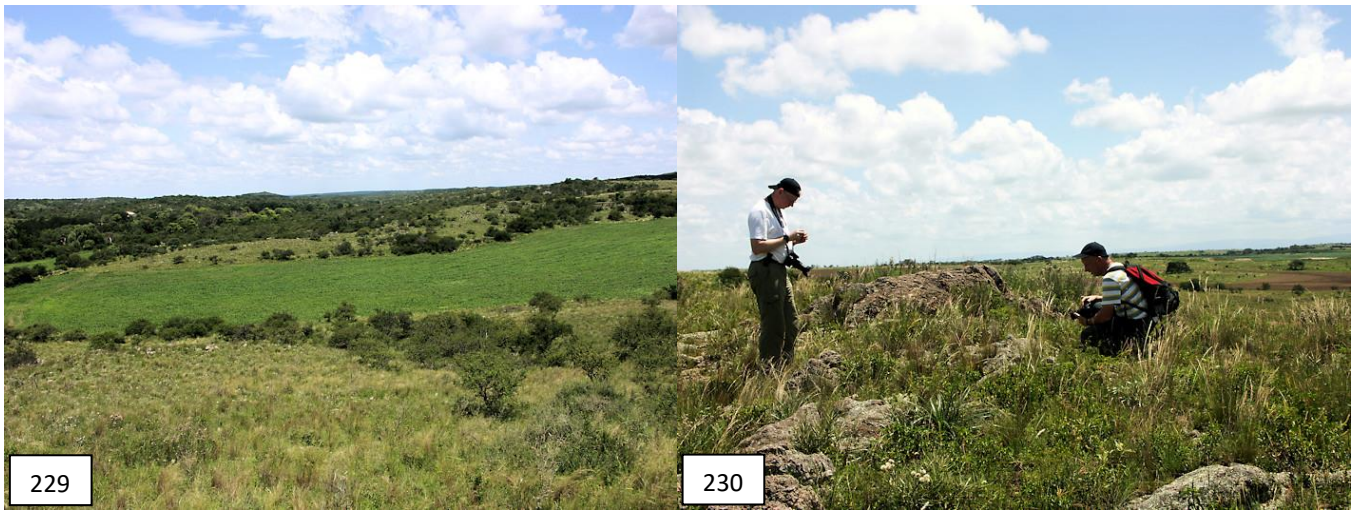


Fig. 229-230: Locality: TS 9, Los Poleos, 671 m.

G. monvillei's habitus does not display any uniform appearance. The plants vary between slightly columnar to flat spherical. Marginal spines are protruding, slightly shining, yellowish with a reddish base. Central spines are present (fig. 231-234).

Here, too, another species from the subgenus *Scabrosemineum* occurs which must be ascribed to the form group of *G. achirasense (G. orientale?)*. Older marginal spines of these plants are consistently matt grey, central spines are present. The typical red base, which can often be found, does not exist here (fig. 235). *G. monvillei* grows here together with *G. sutterianum* subsp. *arachnispinum* from the subgenus *Gymnocalycium* (fig. 236).

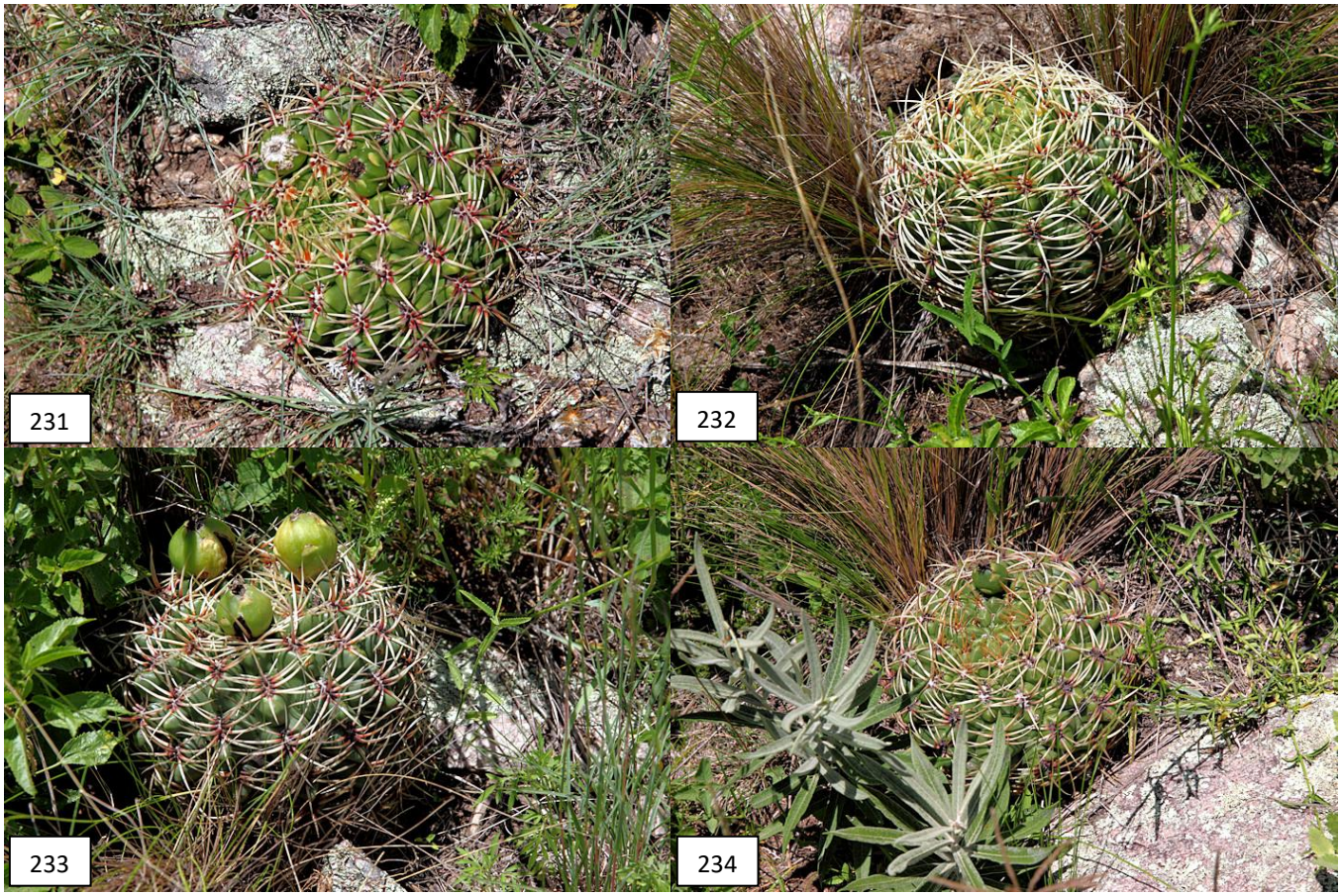


Fig. 231-234: Plants in their habitat: TS 9 *G. monvillei*, Los Poleos, 671 m.

Fig. 235-236: Accompanying flora: (235) TS 9a *G. achirasense* (G. orientale?), Los Poleos, 671 m; (236) TS 10 *G. sutterianum* subsp. *arachnispinum*, Los Poleos, 671 m.

The chromosome number of *G. monville*i is 4n=tetraploid here, too. Therefore it cannot be *G. achirasense* as the latter is diploid (fig. 237-238). Hybrids were also found among the offspring of habitat seeds (fig. 239-240), which is presumably the result of a crossbreed of *G. monvillei* and *G. sutterianum* subsp. *arachnispinum*.

Fig. 237-238: TS 9 *G. monvillei,* Los Poleos, 671 m.

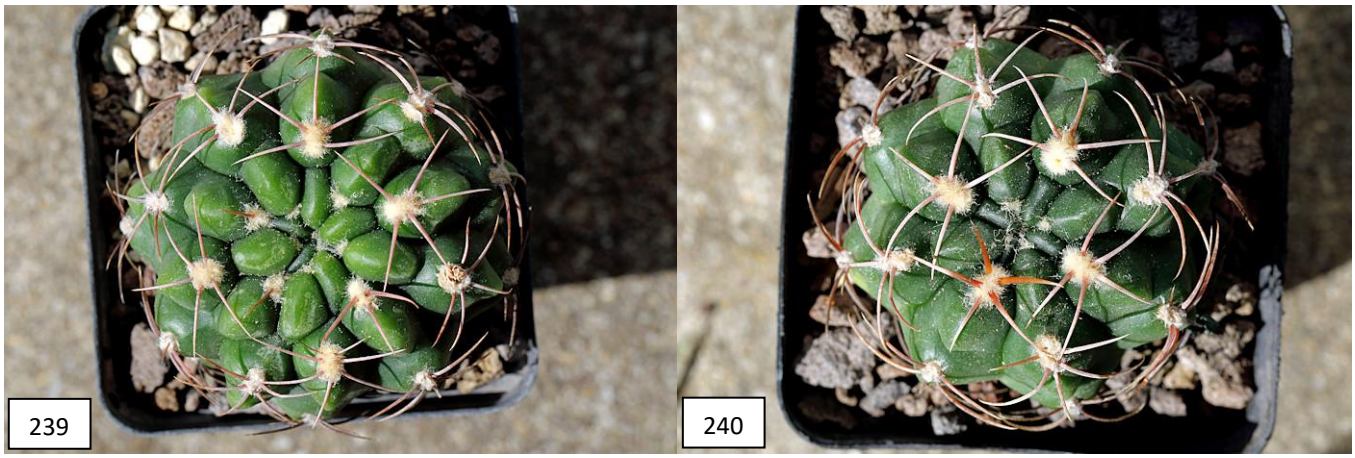


Fig. 239-240: TS 9 *G.* x *monvillei*, Los Poleos, 671 m (hybrids of *G. monvillei* and *G. sutterianum* subsp. *arachnispinum*?).

The flowers of *G. monvillei* are funnel-shaped and hermaphroditic at this locality. It cannot be seen as a *G. monvillei* flower in a stricter sense (fig. 241). The hybrid's flower deviates, of course, completely from the *G. monvillei* flower (fig. 242).

Fig. 241-242: Flower sections: (241) TS 9 *G. monvillei*, Los Poleos, 671 m; (242) TS 9 *G.* x *monvillei,* Los Poleos, 671 m (flower hybrid of *G. monvillei* x *G. sutterianum* subsp. *arachnispinum?*).

The seed shape is slightly to distinctly elongated and resembles the seeds of *G. monvillei* (fig. 243-244).

Fig. 243-244: Seed pictures: (243) TS 9 *G. monvillei*, Los Poleos, 671 m: (244) TS 70a *G. monvillei*, Arroyo El Perchel, 934 m (photos: V. Schädlich).

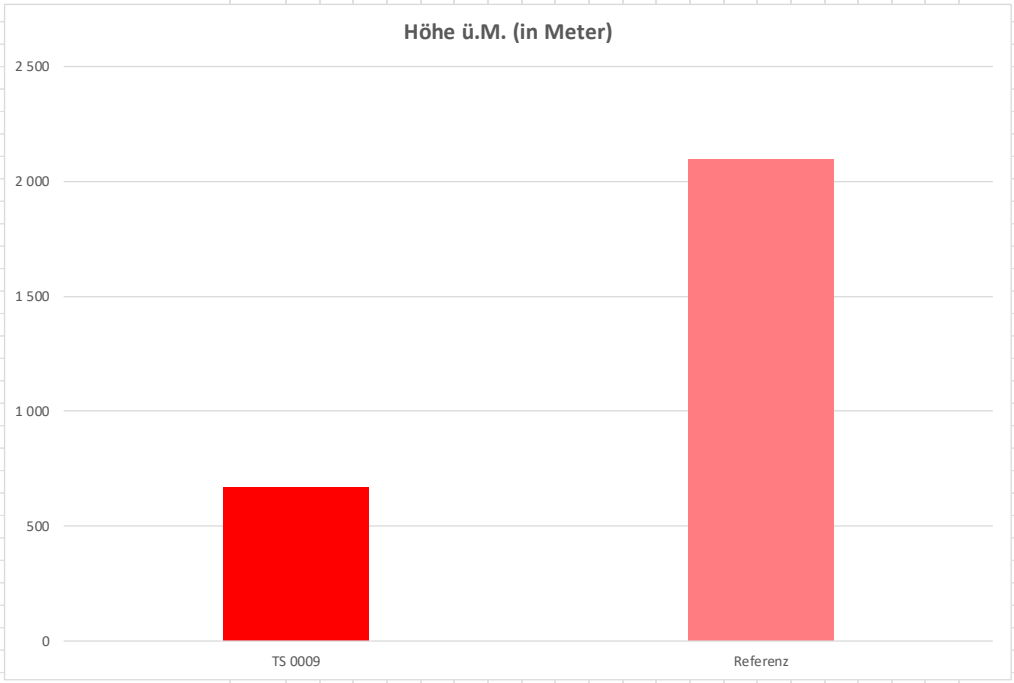
The flowering period starts earlier than that of other *G. monvillei* members from the southern distribution area. The hybrids flower significantly later.

	Feldnummer	Art	Ort	H.ü.M	März				April				Mai				Juni				
	Sierra Las Peñas																				
	TS 0009	monvillei	Los Poleos	671																	
	TS 0009	x monvillei	Los Poleos	671																	

Tab. 13: Flowering period of *G. monvillei* from the Sierra Las Peñas (Basel, 2022).

The plants grow at altitudes below 700 metres a.s.l., this is the lowest locality of *G. monvillei* known to us.

Feldnummer	Höhe/M	Art
TS 0009	671	monvillei
Referenz	2 100	Ref.



Tab. 14: Altitude of the locality in the Sierra Las Peñas.

Echinopsis aurea grows once more as accompanying plant in these low-lying regions (fig. 245).

Fig. 245: TS 10a *Echinopsis aurea*, Los Poleos, 671 m.

SUMMARY

The chromosome number of plants from all the localities investigated is 44 and thus 4n=tetraploid. Consequently, it is different from other representatives of the subgenus *Scabrosemineum* (*G. achirasense, G. mostii, G. orientale etc.*), which possess a chromosome number of 22 2n=diploid.

All *G. monvillei* plants display a spherical to flat spherical body. *G. monvillei* from the north-eastern distribution area shows a pronounced inclination to sprouting.

Spine colour is predominantly yellowish and slightly shining, never of matt grey colour and scaly. *G. monvillei's* variability is primarily limited to the spine arrangement. Plants generating spines of various strength even occur at the same locality. This refers in particular to *G. monvillei* var. *steineri*, where either plants with long, protruding, partly needle-like spines or with short, strong spines pressed to the body can be found at the same locality.

The flowers of *G. monvillei* are mostly hermaphroditic with female as well as male sexual characteristics. However, there are also predetermined flowers, with the purely female ones

outbalancing the purely male ones. *G. monvillei* var. *coloratum* differs from the other *G. monvillei* members in its rose-coloured throat.

The flowering period of the specimens originating from *G. monvillei* var. *coloratum's* distribution area is markedly earlier than that of *G. monvillei* var. *monvillei*.

Seed structure is little variable. *G. monvillei* var. *safronovii's* and *G. monvillei* var. *steineri's* hilum is somewhat elongated.

In the northern low-lying regions of the province Córdoba *G. monvillei* hybridises with plants from the subgenus *Gymnocalycium, G. campestre* and *G. capillense*. Hybrids from *G. monvillei* and *G. bruchii* or *G. andreae* from areas of higher altitude could not be discovered.

In areas of low and medium altitude *Parodia submammulosa* as well as *Echinopsis aurea* grow together with *G. monvillei*.

PREVIEW

In the next issue of SCHÜTZIANA edition part 2 of the *G. monvillei* article will be presented. There *G. monvillei* subsp. *gertrudae* as well as a summary of the whole *G. monvillei* family will be put forward and a bibliography will be included.

ACKNOWLEDGEMENT

I am indebted to Mario Wick for establishing the maps and to Volker Schädlich for providing the seed pictures. I am grateful, too, for habitat photographs to Mario Wick and Maja Strub. My thanks also go to Wolfgang Papsch, Mario Wick, Reiner Sperling, Holger Lunau, Christian Hefti and Volker Schädlich for critically reviewing the manuscript.