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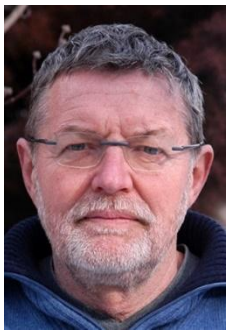

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Cover picture: *Gymnocalycium gaponii* TS 2359, Balneario La Quebrada, Province Córdoba, Argentina (photo: T. Strub)

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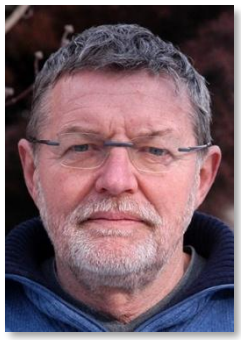
Editorial
Dear Gymnocalycium friends
Wolfgang Papsch

Meticulously and in great detail does Thomas Strub dedicate himself in this edition to *Gymnocalycium gaponii* and to plants which he considers more or less related to it. On browsing the paper and comparing the numerous pictures, it appears that traditional morphology, that is further differentiation or assignment based on visually established features, is not possible.

Last year a lot of genetic research of plants from this species group was carried out with the help of Michael Barfuss, PhD, from Vienna University. With the data gained so far the first makeshift cladograms can already be established.

In the time to come we will be more and more confronted with this kind of molecular investigation. It is exciting to realize as early as after the first evaluation of the analyses that plant morphology cannot be neglected despite these results and that it still continues to be necessary for classifying the taxa.

During the technical presentations in Linz and Coschütz interesting partial results were made public. Data of plants from the subgenus *Muscosemineum* were amplified by evaluating further samples and they are almost finished, similar to the phylogenetic tree of *Pirisemineum*. For certain areas within the subgenus *Gymnocalycium* there is already extensive data on hand and apparently there are going to be considerable changes as to taxonomy and nomenclature for the *Gymnocalycium* group.



During the International Knittelfeld Cacti Days PhD. Barfuss raised the question in his presentation of whether there is a barcode for cacti. He delivered the answer as well, yes, there is a barcode, we only have to find it.

At this point we want to repeat the request for financial donations to Vienna University. With your support further investigation can be carried out.

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Review of the 5th International Gymno Conference from 30th to 31st May 2025 in Linz (Austria)

Ulf Marx & Michael Barfuss

In the early afternoon on Friday, 30th May 2025 numerous Gymno-friends already appeared in Linz Botanical Garden's cultivation greenhouse in order to buy offspring and cacti literature, mainly offered by members of the organizing club "Cactus Gymno Tillandsia International".

At 5 p.m. Reiner Müller carried us off to "Chile, country of *Copiapoa*". He had travelled the country together with his wife Sylvia six weeks before.

After a homely dinner at Pizzeria Fortuna the evening ended with a cosy final round at Cactus GTI Bar in the Botanical Garden.

On Saturday morning, 31st May 2025, Ulf Marx welcomed further cacti friends from Poland, Italy, Germany, the Czech Republic, Austria and for the first time also from Switzerland. All the speakers were given sincere thanks for their troubles. We also commemorated our late cacti friends Helmut Amerhauser and Gert Neuhuber, the latter had bequeathed the Botanical Garden Linz his collection.

On this day the presentations' focus lay on the results of DNA research of the seed groups *Pirisemineum* and *Muscosemineum* of the genus *Gymnocalycium* and the species *G. gaponii* and *G. taningaense*. As the results of this scientific investigation are going to be presented in some articles over time only a brief review will be given here:

Volker Schädlich introduced the species and distribution area of the *Pirisemineum* representatives. Here *Gymnocalycium pflanzii* has got a large distribution area and its type locality is well-documented. *G. zegarrae*'s type locality was described by Cardenas in the Prov. Cochabamba, Dept. Campero, between Perez and Mairana, at 1,700 m a.s.l. *G. zegarrae* possesses a smaller distribution area. As opposed to *G. zegarrae*, the red fruits of *G. pflanzii* rip open transversally. *G. zegarrae*, on the other hand, has a white pulp, which is squeezed out of a vertical rift together with the seeds.

Furthermore, Volker Schädlich presented two localities of *G. chiquitanum* in eastern Bolivia, namely the endemic species *G. chacoense* and *G. paediophilum*. The icing on the cake was

G. cabreraense growing on Cerro Cabrera at an altitude of 555 m a.s.l. in Paraguay.

Michael Barfuss from Vienna University reported in his presentation about the hitherto carried out DNA research with respect to *Pirisemineum*, that the data was not complete yet, however, it appeared already that there was a distinct separation into individual groups and the known species could be accepted as verified species. He announced the presentation of further investigations at the next meeting.

With reference to the subgenus *Muscosemineum* the speaker started with an introduction into plant systematics and described the costly and time-consuming research methods in the laboratory. It was the aim of molecular systematics to form, based on genetic features, groups of individuals which can be traced back to a common hypothetical ancestor. Assignment to a phylogenetic rank, of which the most important one is the species, requires intensive further research and discussion. At the core of the investigation is the *ycf1*-gene of the circular plastid genome with its 5,500 base pairs, one out of three genomes of a plant cell. The identified DNA sequences are then conveyed to a matrix which can be analysed with the help of computer programs. With reference to the differences in the matrix, phylogenetic trees and relationships can be established. The investigated presently living individuals can be found at the tips. Branch points represent hypothetical ancestors which existed previously and from which two new species originated. Thus a time frame can be added to the tree, representing evolutionary development.

Up to the time of the conference Michael Barfuss had investigated 104 samples of the subgenus *Muscosemineum*. They are divided into three main groups, which were named after the oldest described species *G. schickendantzii*, *G. anisitsii* and *G. megatae*. The first results of the investigations were already published in the previous edition of SCHÜTZIANA.

After that Volker Schädlich introduced the distribution area of the subgenus *Muscosemineum*, starting with the 1,000 km long north-south distribution of *G. mihanovichii* in Paraguay and northern Argentina and *G. friedrichii* in Paraguay and Bolivia. Only one locality is so far known of *G. arzbergeri*, situated between Concepcion and Pozo Colorado. *G. megatae* could not be found so far at the presumed type locality of the plants. The species occurs in Bolivia too. The Brazil *G. matoense* was rediscovered 30 km away from its original type locality. The speaker rediscovered the type region, from which G. anisitsii, which was described by Prof Schumann, PhD, originated.

Presently the Bolivian *G. hamatum* cannot be distinguished from *G. megatae* with the applied method of DNA investigation, however, they grow

in geographically separate areas. In this case future DNA research will be fascinating. *G. eurypleurum*, which originates from northern Paraguay, is a typical sylvan plant and grows slightly column-like at old age. Volker Schädlich also showcased several varieties of *G. marekiorum* and the type locality of *G. mendozaense*. Further pictures of *G. pseudomalacocarpus* localities followed. The large distribution area of *G. schickendantzii*, *G. delaetii* in Salta and Tucuman and *G. marsoneri* from Salta and Catamarca came next.

After lunch break at the buffet in the Botanical Garden a part of the participants assembled for a group photograph and met again in the lecture room. A presentation by our Swiss cacti friend Thomas Strub followed. He introduced *G. gaponii* and *G. taningaense* and enlarged on the first descriptions, showed seed pictures and presented illustrative cacti material established by Mario Wick. To summarize it can be said that north-south extension of both species spans over 120 km and that the plants of the type localities can be clearly distinguished. Both belong to the subgenus *Gymnocalycium*, possessing diploid chromosome sets. Morphological investigations of the comparatively young subgenus *Gymnocalycium* and also hitherto existing DNA investigations reach their limits. In this case insight can certainly be gained by analyses of nucleus DNA.

After that Reiner Sperling turned to the topic *G. gaponii* and *G. papschii* and described the variability of the plants in the individual habitats. He also took a closer look at *G. gertii* and *G. gertii* subsp. *evelyniae*. In his opinion the type plants of *G. gaponii* and *G. papschii* can be distinguished easily, yet, localities in between are extremely varied and the plants' assignment is difficult. *G. gertii* subsp. *evelyniae* also exhibits great variability depending on its altitude. The type of *G. gertii* differs only insignificantly from *G. gertii* subsp. *evelyniae* according to him.

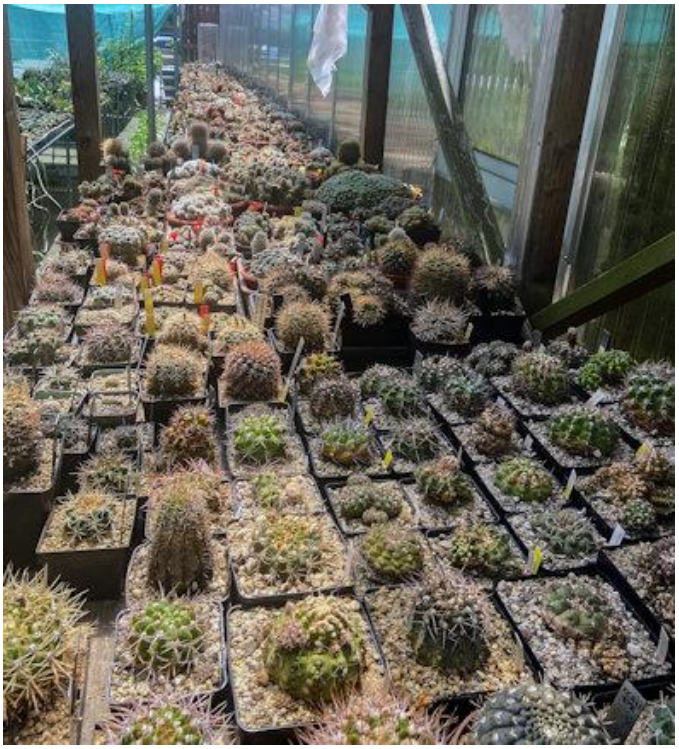
The Czech field researcher Tomáš Kulhánek subsequently presented *G. lukasikii*, *G. lukasikii* var. *emilii* and *G. taningaense* subsp. *fuschilloi* by means of numerous habitat pictures and supplemented these with pictures of his own cultivated plants and flower sections. The distribution area of the species in question extends from Province San Luis in the south with *G. taningaense* subsp. *fuschilloi*, *G. lukasikii* and *G. papschii* as far as Córdoba with *G. gaponii*, *G. gaponii* subsp. *geyeri*, *G. taningaense* and finally *G. gaponii* subsp. *occidentale*. The problem is that the type locality of *G. gaponii* has not been found again due to building activities and therefore it is not clear to the speaker what is meant by the name *G. gaponii*.

After a lively discussion we switched to the Bolivian *Sulcorebutia*. Peter Lechner and Michael Barfuss deal with DNA investigation into this genus, too, in order to better understand their relatedness. So far 250 samples of a part of the *ycf1* gene from *Sulcorebutia* have been investigated in the lab. It appeared that all plants originating from the same area, such as *Sulcorebutia cantargalloensis*, *S. crispata*, *S. luteiflora*, S. crispata subsp. *rebutioides*, *S.* sp. Conahuayco, *S. viridis*, *S. tarvitaensis* and *S. intermedia*-forms between *S. crispata* and *S. viridis* are all assigned to one

branch. The geographical distance between *S. crispata* and *S. viridis* amounts to between 10 and 20 km. *S. intermedia* forms occur there as well. *Sulcorebutia luteiflora* possesses yellow flowers, although it has the appearance of *S. crispata*, so that a genetic difference can be assumed. There are intermediate forms, too, between the *S. crispata* group and the plants close to *S. hertusii*. *Sulcorebutia tarvitaensis* (*S. crispata* branch) does in fact occur together with *S. azurduyensis* in habitat, yet they are genetically far apart. Further branches like those of *S. roberto-vasquezii*, *S. tororensis* and the branch *S. hertusii*/*tarabucoensis* were introduced. *S. hertusii* and *S. patriciae* are not closely related, while *S. rauschii* is found on the *S. hertusii* branch.

The speakers made clear that DNA research of this young genus has just started. Here, too, it will probably be necessary to revert to nucleus DNA so as to make more distinct differences visible. Another goal is elucidation of the differences between the genera *Weingartia* and *Aylostera.*

After dinner Franz Kühhas gave interesting insight into his journeys to Argentina, Bolivia, Chile and Peru.



It is a tradition to finish the day at the GTI bar, where old memories were revived among international friends and new ideas for further projects were discussed.

We look forward to meeting again in Botanical Garden Linz on the 5th and 6th June 2026. The scheduled subject of the conference is the seed group *Pirisemineum* with a focus on DNA research results concerning *G. pflanzii* and *G. zegarrae* (for details go to: https://cactusgti.eu).

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39th International *Gymnocalycium* Conference from 5th to 7th September 2025 in Dresden-Coschütz

Holger Lunau

The meeting's topic was *Gymnocalycium pflanzii* and *Gymnocalycium zegarrae*.

Between September, 5th and 7th this year the Inn Coschütz in Dresden turned into a Mecca for Gymno friends for the third time already. During the 39th International *Gymnocalycium* Conference more than forty interested persons from several European countries followed again the technical presentations relating to the main topic "*Gymnocalycium pflanzii* and *Gymnocalycium zegarrae*" as well as various travelogues. Further professional contributions and a plant exchange made the meeting perfect.

It is a tradition that a welcoming address to the participants is given by the meeting's presenter, Reiner Sperling, (Salzkotten, Germany), on Friday night. But before *G. pflanzii* and *G. zegarrae* were going to become the centre of attention on the following day, a vespertine travelogue by Holger Lunau (Berlin, Germany) transported the guests to a tour across Uruguay. He had travelled the country in 2024 and thus could report about new experiences as to plants, country and people. Apart from seeing beautiful pictures, it also dawned on the participants that Uruguay's *Gymnocalycium* species might probably provide some taxonomic surprises.

On Saturday the subject was revolving around *G. zegarrae* and *G. pflanzii* for a start. Like at previous meetings Wolfgang Papsch (Kalsdorf, Austria) introduced the conference subject based on extensive literature research in his well-known meticulous way. In doing so many names for both taxa came up without clear differences between them becoming apparent.

It would have been up to Volker Schädlich (Spremberg, Germany) – at the same time orchestrator of the conference – to provide clarity in this respect. However, family reasons prevented him from taking part in the meeting. Reiner Sperling stepped into the breach for him ad hoc in an excellent manner and presented Volker Schädlich's lecture.

First of all, numerous habitat pictures of *G. zegarrae*, which originates from Bolivia, were shown. The conclusion of part 1 of the picture presentation is that the plants appear relatively uniform regarding habitus, spines, flowers and seeds. Volker Schädlich, who has investigated and documented more than 100 localities, accepts just the variety *G. zegarrae* var. *riograndense* beside the

type form. It is characterized by a dark green, gleaming epidermis. All the other names belong to the type form in his opinion.

In part 2 of the presentation just as many habitat pictures of *G. pflanzii* could be admired, apart from photographs of spines, flowers, seeds and greenhouse plants. The relatively large distribution area spans Argentina, Bolivia and Paraguay. In contrast to *G. zegarrae*, significant differences between the individual localities can be discerned. This refers to spination in particular. In Volker Schädlich's opinion there exist apart from the type form the subspecies *G. pflanzii* subsp. *millaresii*, *G. pflanzii* subsp. *dorisiae* and *G. pflanzii* subsp. *argentinense*. The G. pflanzii species growing in Paraguay belong to the type form.

The fundamental result of the research is, according to Volker Schädlich, the fact that *G. pflanzii* and *G. zegarrae* are two verified species. They can be told apart especially by their fruits. *G. pflanzii* possesses red fruits, which rip open horizontally at the upper third and have a red pulp. *G. zegarrae*'s fruits are green to bluish green at full maturity, hardly ever orange, they rip open vertically and have a white pulp.

After all those pictures and information the participants enjoyed their lunch, then relaxed during Uwe Lindner's (Erlau, Germany) presentation. He continued his travelogue, whose first part was presented the previous year and which is called "Not only *Gymnocalycium* – cacti left and right of Ruta 40 in Argentina". In doing so he whisked the participants away to a partly bizarre world of the Andes with its manifold cacti landscape. Part three is to follow next year.

After coffee break Thomas Strub (Binningen, Switzerland) introduced initial DNA analysis results with respect to *G. taningaense* and *G. gaponii*. It turns out that many plants regarded as *G. gaponii* belongs to *G. taningaense*, rarely the other way round. This group of plants proves once again that only research on a molecular level allows relatively trustworthy conclusions about relationship. Traditional taxonomy is often confirmed, but just as often it is not. The precise results are going to be published at a later date.

The same statement also applies to the whole subgenus *Muscosemineum*. In the previous edition of SCHÜTZIANA recombination in this respect was offered. And there is no end in sight. This point was emphasized by Mag. PhD Michael H. J. Barfuss from Vienna University (Austria). He carries out all DNA analyses with his team. In this context he also stressed the fact that any financial support from the cacti lovers is welcome as the University bears only part of the expenses. Without sponsoring further analysis would be progressing only very slowly.

After dinner Konrad Müller (Leipzig, Germany) took the interested audience on a journey to Peru, titled "The little known north of Peru – excavation sites – fantastic landscapes – cacti and tillandsia". The title lived up to its promise. Apart from wonderful plant pictures, buildings constructed by long perished indigene cultures were showcased, but it was also reported about city life and humans. The audience could come to terms with the fact that no Gymnos could be seen.

Before conference presenter Reiner Sperling summed up the meeting's result on Sunday it was Horst Kallenowsky's (Hamburg, Germany) turn to thrill the audience with his presentation "Argentina 2025 – a trio of pensioners on the road". The title refers to a common journey together with Volker Schädlich and Thomas Strub. The trio could visit many cacti localities on their tour, which Horst Kallenowsky was also able to show from above with his drone.

The next *Gymnocalycium*-meeting in Dresden-Coschütz has already been planned. Then we are going to celebrate the 40th anniversary of our conference from 4th to 6th September 2026, again at the Inn Coschütz. The topic will revolve around *Gymnocalycium baldianum* and more or less related species.

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Plants of the Subgenus *Gymnocalycium* from the western slope of the Sierras Grandes / Sierra de los Comechingones

Thomas Strub

Part 2: *Gymnocalycium gaponii*

ABSTRACT

This article provides an overview of the plants from the subgenus *Gymnocalycium* growing on the western slopes of the Sierras Grandes as well as the Sierra de los Comechingones. The main focus of this part 2 on hand lies on the species *Gymnocalycium gaponii*, which occurs in the Argentine province Córdoba. Map sections of the localities, pictures of habitats, plants in nature and cultivation as well as flower sections and also seeds are presented. In addition, flowering periods in cultivation and the altitudes of the localities are introduced. Moreover, the ploidy of the plants is identified.

KEYWORDS: *Cactaceae, Gymnocalycium, gaponii, gaponii* subsp. *geyeri, gaponii* subsp. *occidentale, taningaense*

INTRODUCTION

Gymnocalycium gaponii was, together with *Gymnocalycium taningaense,* the main subject of the Conference 2024 in Dresden-Coschütz. *Gymnocalycium taningaense* was already introduced in the last edition of SCHÜTZIANA.

G. gaponii also belongs to the subgenus *Gymnocalycium* (subgenus *Ovatisemineum*, Schütz), just like *G. taningaense.*

Gymnocalycium gaponii

The first description of *G. gaponii* was compiled by Gert Neuhuber in the year 2002.

G. gaponii grows on promontories which are situated west of the Sierras Grandes as well as the Sierra de los Comechingones. In addition, these species can be found in the Sierra de Pocho, which lies west of the main distribution area (fig. 1).

Gymnocalycium gaponii sensu stricto (s.s.)

We are going to begin with those plants which were introduced in the first description of *G. gaponii.* The localities of *G. gaponii* in the stricter sense are located in the central and southern part of the distribution area (fig. 2, yellow shaded areas). According to the first description, these plants occur between Tala Cañada in the north as far as Mina Clavero in the centre of the distribution area as well as Villa Las Rosas in the south. The plants found around Tala Cañada were later recombined to *G. gaponii* subsp. *geyeri*.

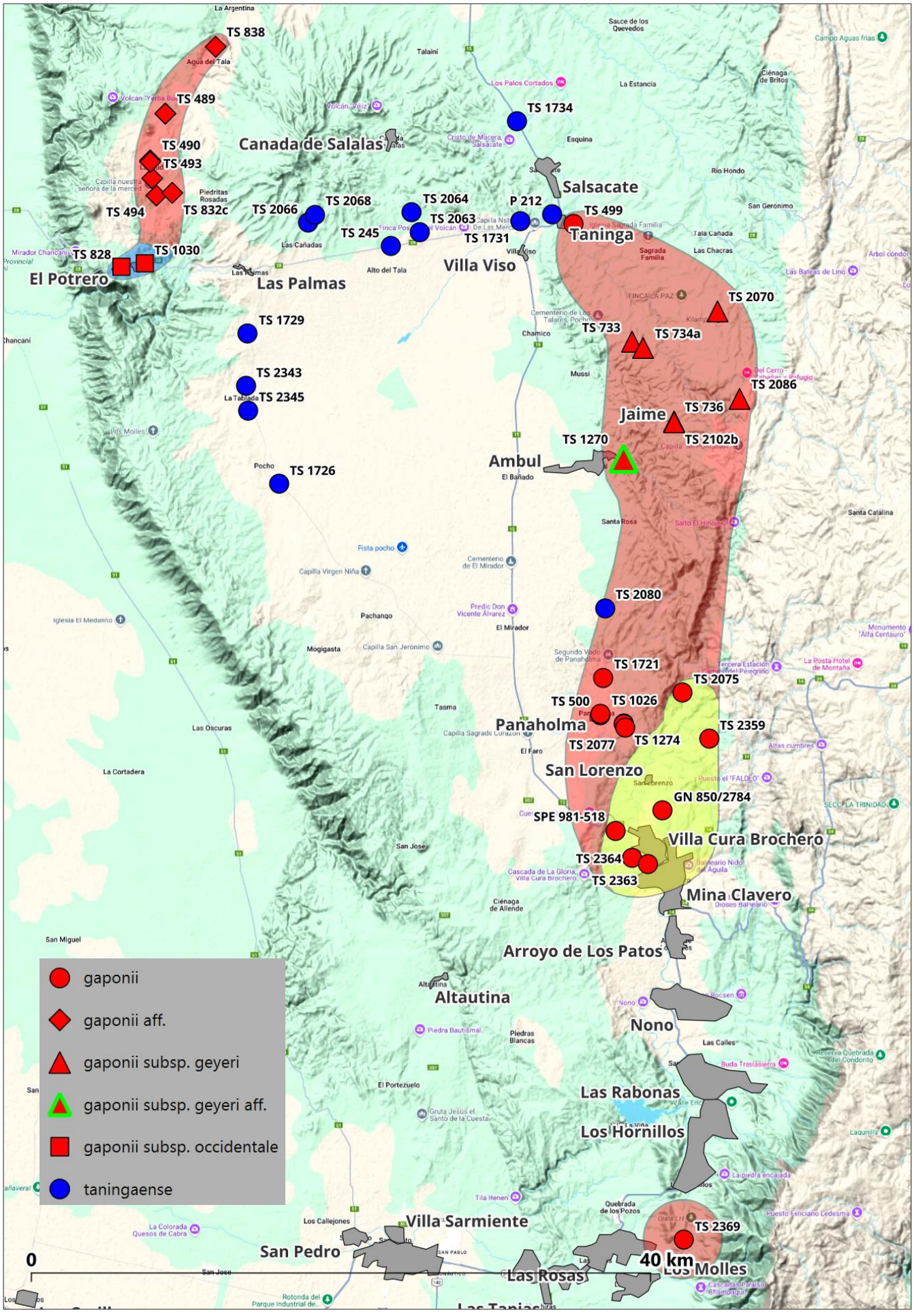


Fig 1: Distribution area of *G. gaponii* (red and yellow shaded area) (all maps: Mario Wick, map backgrounds: Google).

The geographical specifications quoted in the first description were not precise, especially the statement referring to the type locality "near Villa Benegas, 900 m" is misleading. Villa Benegas is situated at about 1,500 m a.s.l. No more *G. gaponii* sensu stricto grow at this altitude. After having consulted Gert Neuhuber, the actual type locality is located around the village San Lorenzo, along the road to Villa Benegas, at about 900 m a.s.l. (fig. 3). The village San Lorenzo has spread considerably. No *G. gaponii* plants have been found around San Lorenzo for some time.

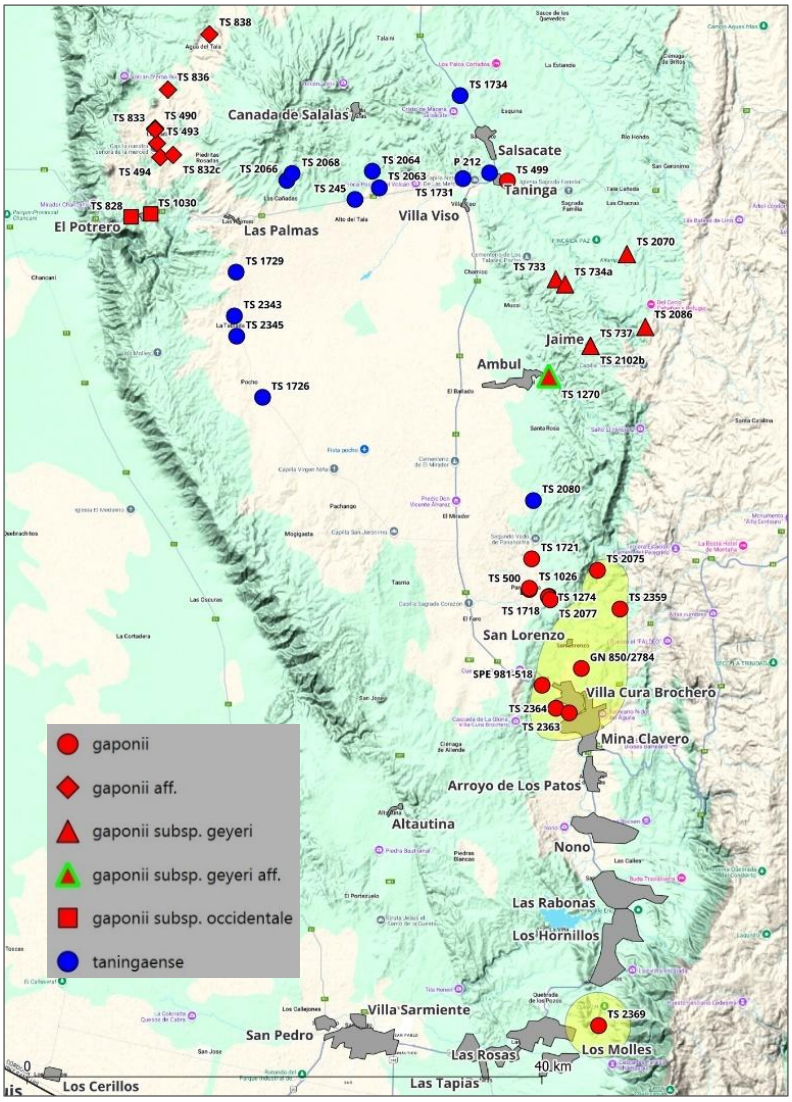


Fig. 2: Distribution area of *G. gaponii* sensu stricto (yellow shaded areas).

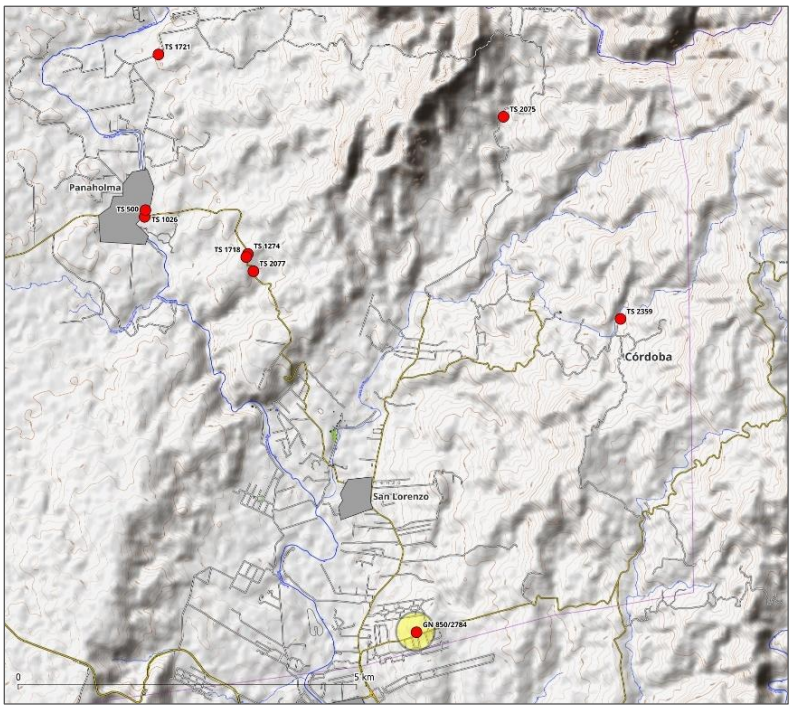


Fig. 3: Yellow shaded spot = type locality of *G. gaponii*, GN 850-2784, San Lorenzo, 900 m a.s.l.

The *G. gaponii* sensu stricto plants grow mostly solitarily. The plant's body is dark green. The spines are a little elongated, slightly hard and rest on the body. The spines are grey to horn-coloured with a reddish-brown base. Old plants rarely form central spines (fig. 4+5).

Fig. 4: GN 850/2784 *G. gaponii*, San Lorenzo (type locality). The plant's body is dark green. The spines are a little elongated and slightly hard. Spine colour is greyish with reddish-brown at the base.

Fig. 5: GN 850/2784 *G. gaponii*, San Lorenzo (type locality). The plant's body is medium to dark green. The spines are grey to horn-coloured with a reddish-brown base. The marginal spines rest on the plant's body.

The outer petals are pure white to slightly gleaming rose-coloured. The pericarp is more or less intensively rose-coloured. Style and filaments turn into rose-coloured towards the base. The ovary is wide (fig. 6+7).

Fig. 6: GN 850/2784 *G. gaponii* type. Flower with rose-coloured pericarp and wide ovary (photo: Reiner Sperling).

Fig. 7: GN 850/2784 *G. gaponii* type. Flower with petals gleaming rose-coloured and filaments and style turning rose-coloured towards the base.

Another locality mentioned in the first description is situated north of the type locality near Estancia Norte resp. at Salto Toro Muerto (TS 2075 = WP 356) (fig. 8). The locality is a stony hill grown over with acacia (fig. 9).

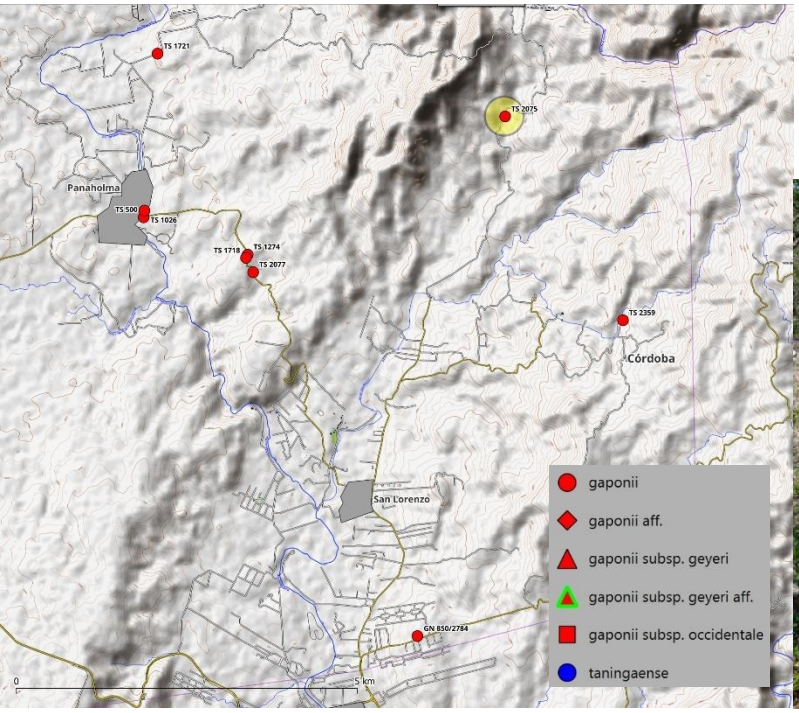


Fig. 8: Yellow shaded spot = locality TS 2075 *G. gaponii* s.s., Estancia Norte, 1,047 m a.s.l.

Fig. 9: The habitat of TS 2075 is a stony hill grown over with acacia (photo: Maja Strub).

The plants' body colour is light to dark green. The marginal spines are elongated, slightly hard and protrude from the body in a scattered manner. Spine colour is grey to horn-coloured, changing into reddish-brown towards the base. Older plants tend to have harder spines and possess central spines, younger plants have delicate spines and no central ones (fig.10-13).

Fig. 10: TS 2075 *G. gaponii* s.s. Plant with a light green epidermis. The marginal spines are elongated, slightly hard, protruding in a scattered manner from the body, greyish to horn-coloured, turning into brownish-red towards the base. Central spines are present.

Fig 11: TS 2075 *G. gaponii* s.s. Plant with green fruit and spines resting on the body.

Fig. 12: TS 2075 *G. gaponii* s.s. The plant is totally covered by *Selaginella*.

Fig. 13: TS 2075 *G. gaponii* s.s. The young plant does not yet possess central spines.

The seedlings are uniform. The epidermis is light to dark green and the spines are grey to horn-coloured with a reddish-brown base (fig. 14+15).

The chromosome set of the plants is diploid = 2n.

Fig. 14: TS 2075 *G. gaponii* s.s. Seedlings with light to dark green epidermis.

Fig. 15: TS 2075 *G. gaponii* s.s. The seedlings' spines are grey to horn-coloured with a reddish-brown base.

The southernmost locality of *G. gaponii* mentioned in the first description is situated near Villa Las Rosas, which is located around 40 km south of the type locality. No *G. gaponii* localities between Mina Clavero in the north and Villa Las Rosas in the south are known to the author.

The localities of GN 851a/4200 and TS 2369 resp. SPE 900-526 are very close together (fig. 16+17). They consist of stony hills grown over with acacia.

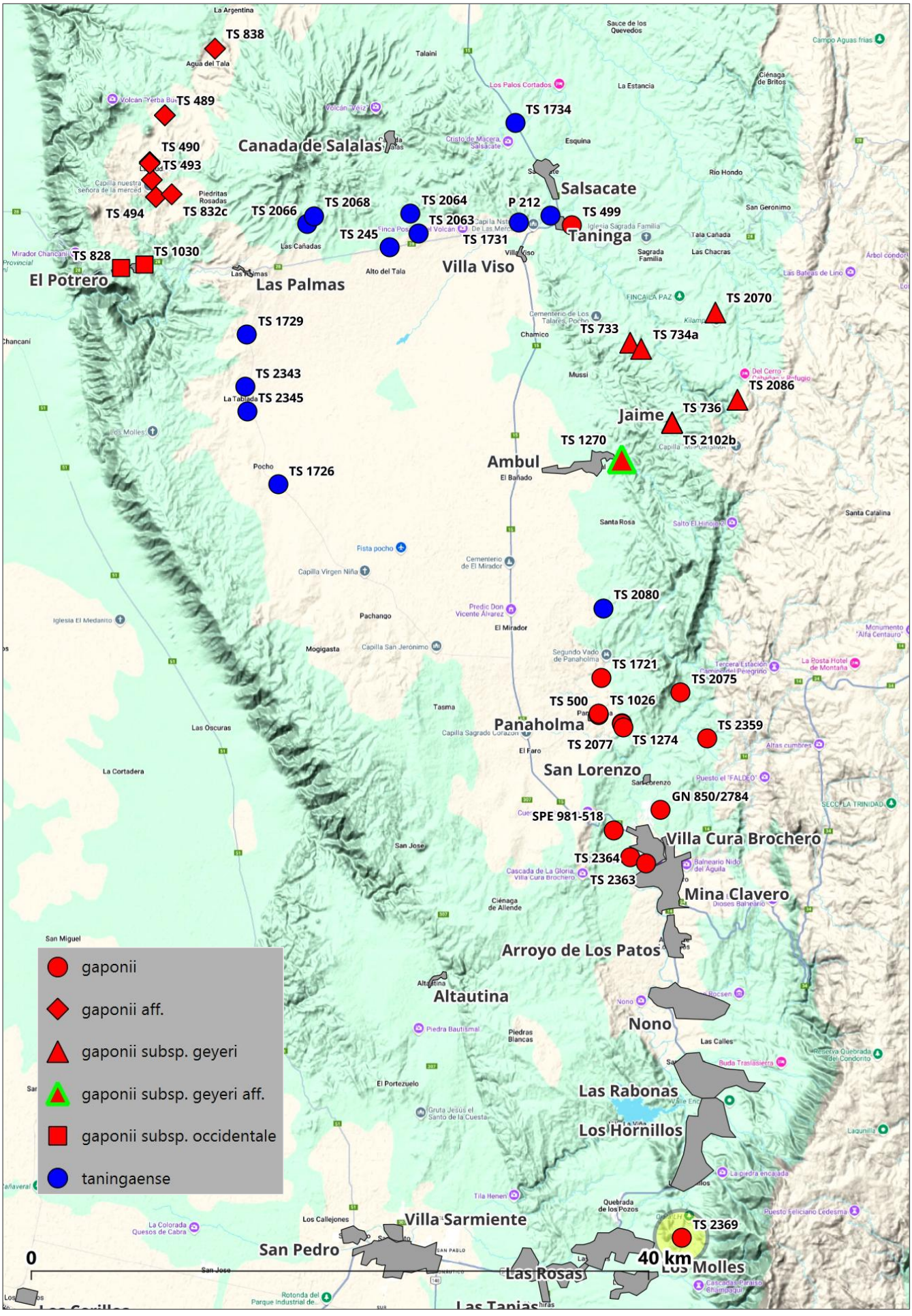


Fig. 16: Yellow shaded spot = locality TS 2369 *G. gaponii* s.s., Villa Las Rosas, 1,015 m a.s.l.

Fig. 17: Habitat of TS 2369.

Although this locality is relatively far south of the type locality, the plants look like typical *G. gaponii*. The epidermis is dark green, the spines are greyish with a reddish-brown base, short and resting on the body (fig. 18-21).

Fig. 18: TS 2369 = SPE 900-526 *G. gaponii* s.s. The plant possesses a dark green epidermis (photo: Reiner Sperling).

Fig. 19: TS 2369 = SPE 900-526 *G. gaponii* s.s. The plants grow in granite grit (photo: Reiner Sperling).

Fig. 20: TS 2369 *G. gaponii* s.s. The spines are greyish with a reddish-brown base.

Fig. 21: TS 2369 *G. gaponii* s.s. The spines are short and rest on the plant's body.

In 2009 the author received the seeds taken of the plants cultivated from this locality from Gert Neuhuber. The seedlings originating from these seeds have a somewhat lighter green body than those from the *G. gaponii* type locality. The spines have a tendency towards being more yellowish and needle-like than those of the type. They rest on the body and possess a reddish base. Central spines are absent. It was already mentioned in the first description that the plants from this locality deviate slightly from those of the type locality (fig. 22-25).

The chromosome set of the plants is again diploid = 2n.

Fig. 22: TS 2369 = GN 851a/4200 *G. gaponii* s.s. Plant with a green epidermis.

Fig. 23: TS 2369 = GN 851a/4200 *G. gaponii* s.s. Plant with relatively short greyish marginal spines which turn reddish towards the base.

Fig. 24: TS 2369 = GN 851a/4200 *G. gaponii* s.s. The spines are needle-like and rest on the plant's body.

Fig. 25: TS 2369 = GN 851a/4200 *G. gaponii* s.s. Plant with a slightly lighter green epidermis.

The outer petals are pure white, the pericarp is rose-coloured. The style is greenish-yellow. The filaments are yellowish to rose-coloured towards the base. The ovary is elongated to somewhat wide (fig. 26-29).

Fig. 26: TS 2369 = GN 851a/4200 *G. gaponii* s.s. The petals are pure white.

Fig. 27: TS 2369 = GN 851a/4200 *G. gaponii* s.s. The pericarp and the base of the filaments are rose-coloured. The ovary is relatively narrow.

Fig. 28: TS 2369 = GN 851a/4200 *G. gaponii* s.s. The filaments are rose-coloured towards the base. The ovary is somewhat wide.

Fig. 29: TS 2369 = GN 851a/4200 *G. gaponii* s.s. The style is purely greenish-yellow.

Comparing *G. gaponii* sensu stricto (s.s.)

The bodies of the plants from the type locality are dark green. The plants growing in the south are somewhat lighter green and their spines are slightly needle-like resp. somewhat thinner (fig. 30+31). The chromosome set of the plants from both localities is diploid = 2n.

The inner petals are white to gleaming rose-coloured. The filaments are yellow to rose-coloured at the base. The style is greenish-yellow with a rose-coloured base occasionally. The pericarp is rose-coloured. The ovary is relatively wide (fig. 32+33).

The seeds are large and covered with a cuticula that comes off. The hilum is drop-shaped (fig. 34-36).

Fig. 30: GN 850/2784 *G. gaponii* s.s., San Lorenzo (type locality). The plant's body is dark green. The spines are slightly elongated and somewhat hard. The spine colour is greyish with a reddish-brown base.

Fig. 31: TS 2369 = GN 851a/4200 *G. gaponii* s.s., Villa Las Rosas. Plant with slightly light green epidermis and relatively short, greyish marginal spines, which turn reddish towards the base.

Fig. 32: GN 850/2784 *G. gaponii* s.s., San Lorenzo. Flower with intensively rose-coloured pericarp, filaments and style rose-coloured towards the base, as well as a wide ovary.

Fig. 33: TS 2369 = GN 851a/4200 *G. gaponii* s.s., Villa Las Rosas. The pericarp is rose-coloured, the filaments are rose-coloured towards the base. The ovary is slightly wide, the style is greenish-white.

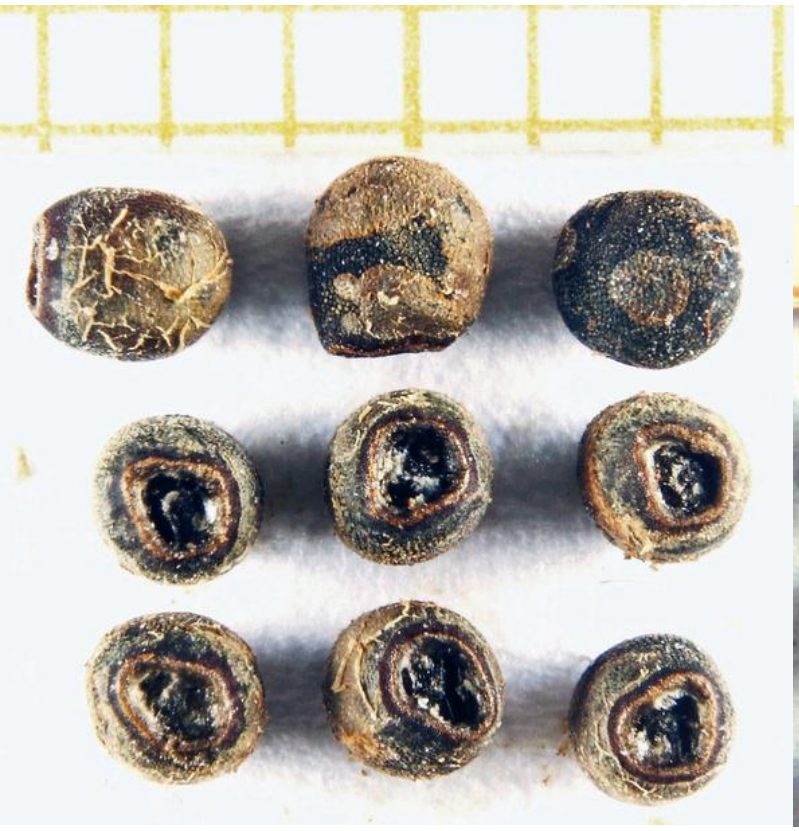


Fig. 34: GN 850/2784 *G. gaponii* s.s., San Lorenzo. The seeds are large and covered with a cuticula that comes off. The hilum is narrow to slightly wide and appears drop-shaped.

Fig. 35: TS 2369 = GN 851a/4200 *G. gaponii* s.s., Villa Las Rosas. The seeds are large and covered with a cuticula that comes off. The hilum is very narrow and appears drop-shaped.

Fig. 36: TS 2075 *G. gaponii* s.s., Estancia Norte. The seeds are large and covered with a cuticula that comes off. The hilum is slightly wide and appears drop-shaped.

G. gaponii sensu stricto is an early bloomer. It grows at altitudes between 900-1,000 m a.s.l.

Flowering period of *Gymnocalycium gaponii* sensu stricto.

Field number	Species	Locality	m a.s.l.	March				April				May				June			
GN 850/2784	*gaponii* sensu stricto	San Lorenzo	900																
TS 2369	*gaponii* sensu stricto	Villa Las Rosas	1015																

Tab. 1: Flowering period of *G. gaponii* sensu stricto, Basel in the year 2025.

Gymnocalycium gaponii sensu lato (s.l.).

Plants similar to *G. gaponii* are known to the author growing north of the *G. gaponii* type locality, resp. west of a promontory to the Sierras Grandes (fig. 37). They possess some features which do not correspond with *G. gaponii* according to its first description. However, they definitely do not correspond with *G. taningaense.*

The northernmost population (TS 499) known to the author grows near the *G. taningaense* type locality. The rock of this locality does not consist of volcanic sediments but primarily of granite deposits of the Sierra Grandes, which are located to the east (fig. 38).

The habitat consists of hilly meadows and pastures, interspersed with stones and covered with acacia. The volcanoes are visible from this locality, too (fig. 39).

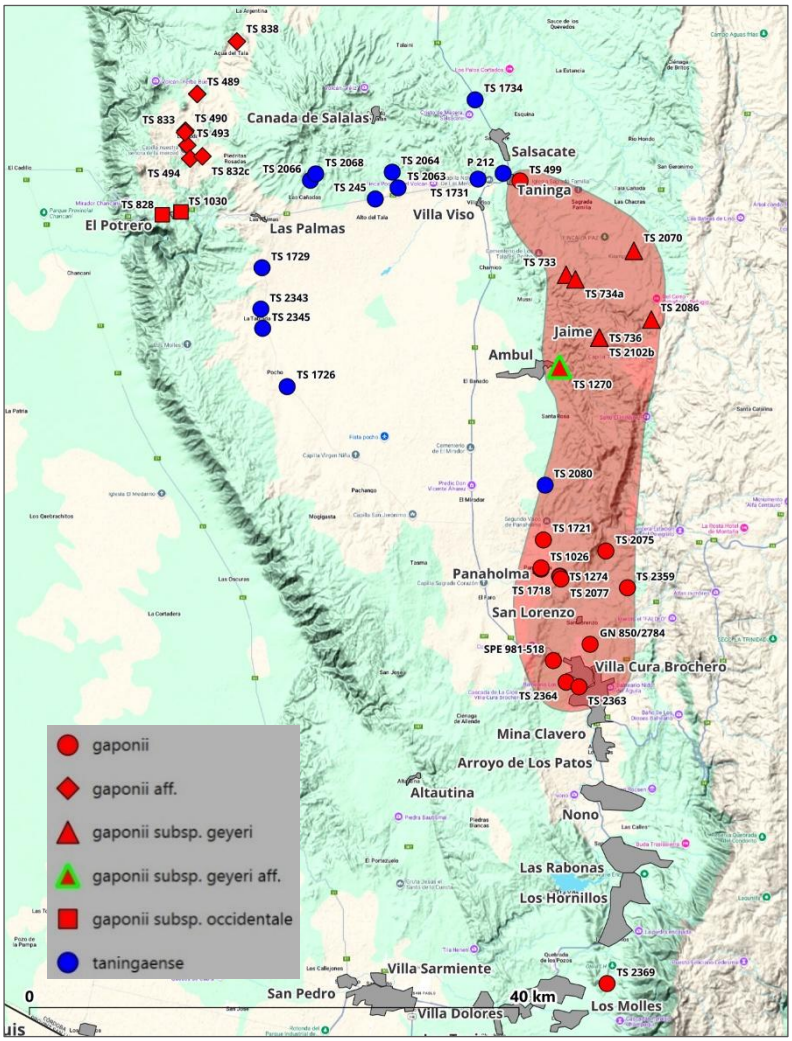


Fig. 37: Distribution area of *G. gaponii* s.l. (red shaded area).

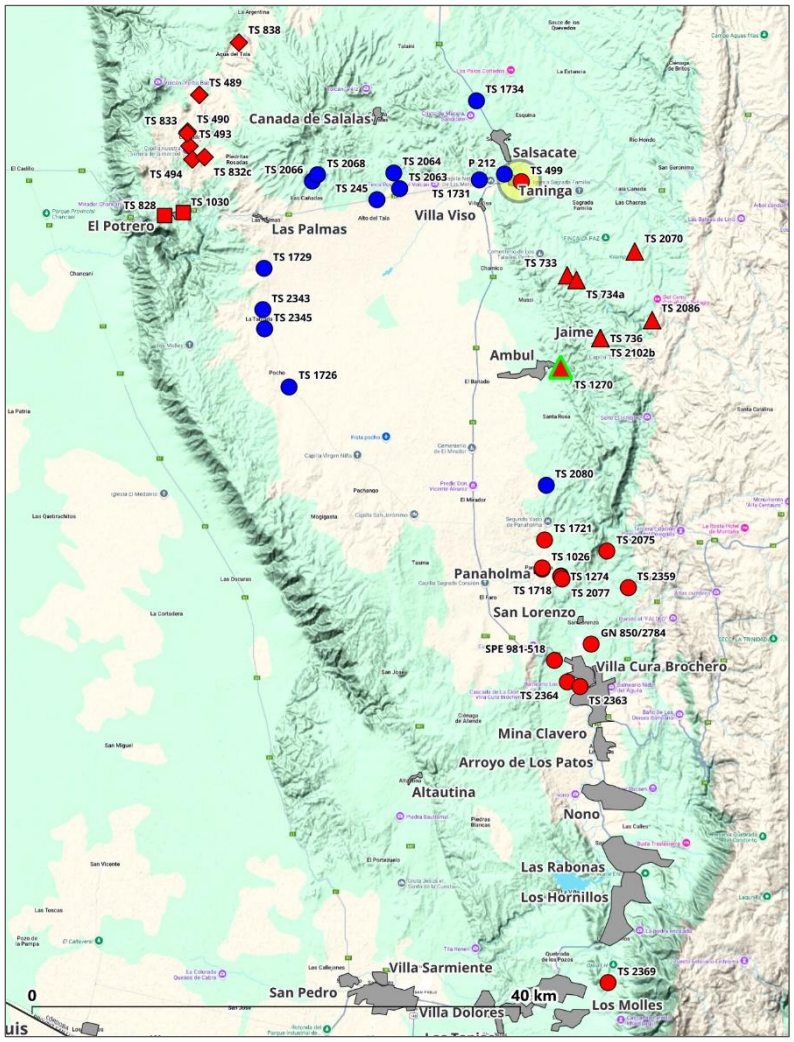


Fig. 38: Yellow shaded spot = locality of TS 499, Taninga, 997 m a.s.l.

Fig. 39: habitat of TS 499.

The plants merely grow about 0.5 km away from the *G. taningaense* type locality. Their appearance is extremely variable.

The pictures 40 and 41 were taken on a journey in early summer in Argentina. The plants are slightly grey and resemble *G. taningaense* although a lot of influence from *G. gaponii* can be noticed. The spines are predominantly whitish, rest on the body and a dark base is not always present. Central spines are missing, the fruit colour is greenish-grey.

Pictures 42+43 were taken at the same locality during a later journey in midsummer. The spines are white to white-grey, partly unicoloured or with a darker base. Central spines are missing, the bodies are grey-greenish, especially the plant in fig. 42 exhibits a typical *G. gaponii* appearance.

Fig. 40: TS 499 *G. gaponii* s.l. Plant with slightly grey epidermis and whitish spines, which rest on the body and have a somewhat darker base.

Fig. 41: TS 499 *G. gaponii* s.l. Plant with greenish-grey fruits.

Fig. 42: TS 499 *G. gaponii* s.l. Plant with a typical *G. gaponii* appearance. The plant's body is dark green and the marginal spines are greyish with a darker base.

Fig. 43: TS 499 *G. gaponii* s.l. Plant with a dark green epidermis and short, overall greyish spines which rest on the body.

The plants have a slightly variable appearance in cultivation. The body is dark green to somewhat greyish. The spines are mostly resting on the body, hard to a little needle-like. Their colour is yellowish to horn-coloured and not pure white. Part of the marginal spines possess a reddish-brown to brownish-yellow base. Central spines are missing. Epidermis colour, position and type of spines are similar to *G. gaponii* and do not correspond with *G. taningaense* (fig. 44-47)

The chromosome set of the plants is diploid = 2n.

Fig. 44: TS 499 *G. gaponii* s.l. Plant with dark green to slightly greyish epidermis. The marginal spines are hard and rest on the body. The spines are greyish to horn-coloured with a reddish base.

Fig. 45: TS 499 *G. gaponii* s.l. Plant with dark green epidermis and marginal spines which rest on the body. The spines are greyish to horn-coloured without a reddish base.

Fig. 46: TS 499 *G. gaponii* s.l. Plants with dark green to slightly greyish epidermis and marginal spines which rest on the body. The spines are greyish to horn-coloured with a reddish-brown base.

Fig. 47: TS 499 *G. gaponii* s.l. Plants with a dark green epidermis and marginal spines which rest on the body. The spine colour is greyish to horn-coloured with a yellowish base.

The flower structure is very variable, too. The petals are pure white, the inner part of the flower is more or less intensively rose-coloured. The filaments are yellow. The style is yellow-greenish with a rose-coloured base occasionally. The ovary's shape differs, elongated to compressed. The ovary of the flowers in fig. 48 + 51 matches the *G. gaponii* structure perfectly, the colour of the pericarp, however, rather corresponds with *G. taningaense* (fig. 48-51).

The colour of the pericarp in fig. 49 is similar to that of the *G. taningaense* type, the form of the ovary again rather matches *G. gaponii*.

The plant which produced the flower shown in fig. 50 always forms an oblong flower shape and ovary. The pericarp, which is more intensively rose-coloured, recalls *G. gaponii*.

Fig. 48: TS 499 *G. gaponii* s.l. Flower with a wide ovary just as with *G. gaponii*. The pericarp and the filaments are slightly rose-coloured towards the base.

Fig. 49: TS 499 *G. gaponii* s.l. Flower with slightly wide ovary, delicately rose-coloured pericarp and rose-coloured filaments.

Fig. 50: TS 499 *G. gaponii* s.l. Flower with an oblong ovary and intensively rose-coloured pericarp as well as rose-coloured filaments.

Fig. 51: TS 499 *G. gaponii* s.l. Flower with a wide ovary like with *G. gaponii*. The pericarp is slightly rose-coloured and the filaments are slightly rose-coloured towards the base.

The next locality is situated between Ámbul and Panaholma, respectively about 18 km north of the *G. gaponii* type locality as well as few km south of the *G. taningaense* s.l. locality TS 2080 (see part 1 of this article series). This habitat is characterized by a meadow consisting of lush grass (fig. 52-54).

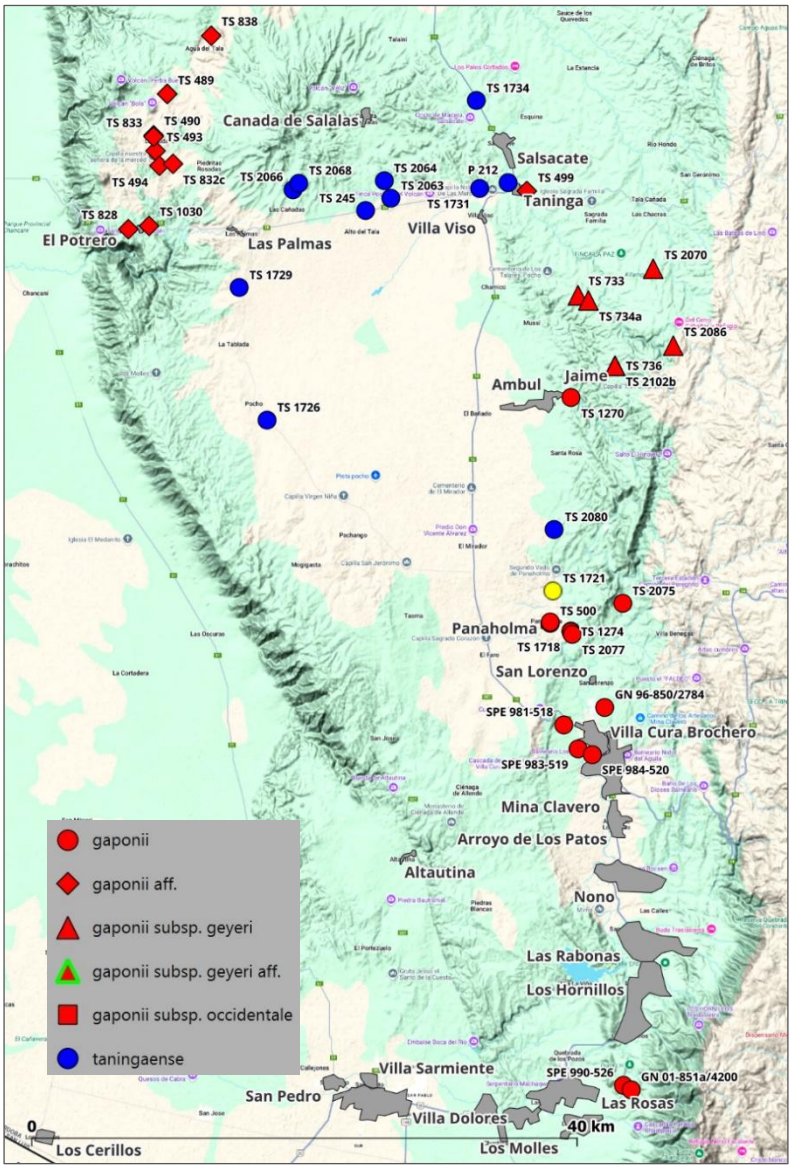


Fig. 52: Yellow spot = locality of TS 1721, Panaholma, 1,005 m a.s.l.

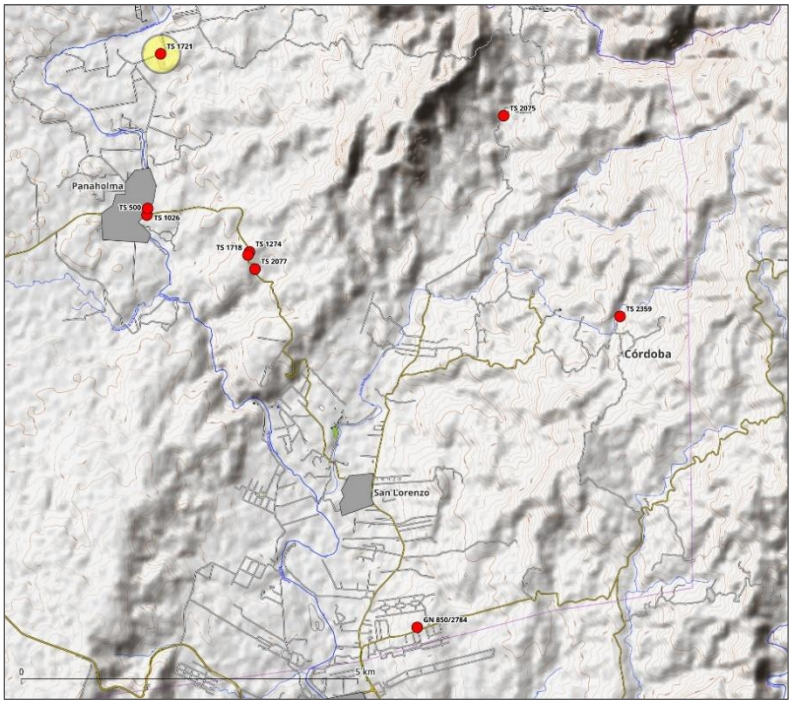


Fig. 53: Yellow shaded spot = locality of TS 1721, Panaholma, 1,005 m a.s.l.

Fig. 54: Habitat of TS 1721 = SPE 818-421 (photo: Reiner Sperling).

The plants have a dark green epidermis. The spine form of this population's plants is more delicate as well as shorter and the base of the spines is darker than with the *G. gaponii* type. Central spines are missing (fig. 55-57).

Fig. 55: TS 1721 = SPE 818-421 *G. gaponii* s.l. The spines of the plants are delicate and short (photo: Reiner Sperling).

Fig. 56: TS 1721 = SPE 818-421 *G. gaponii* s.l. Plant with dark green epidermis (photo: Reiner Sperling).

Fig. 57: TS 1721 = SPE 818-421 *G. gaponii* s.l. The base of the spines is reddish-brown (photo: Reiner Sperling).

The body colour of the seedlings is dark green. The spines rest on the body, they are greyish to horn-coloured with a reddish-brown base. Central spines are missing, the spine type is somewhat more needle-like and more delicate than with the *G. gaponii* type (fig. 58-61).

Fig. 58: TS 1721 = SPE 818-421 *G. gaponii* s.l. Plant with dark green body colour.

Fig. 59: TS 1721 = SPE 818-421 *G. gaponii* s.l. The spines are greyish to horn-coloured.

Fig. 60: TS 1721 = SPE 818-421 *G. gaponii* s.l. The spine type is delicate.

Fig. 61: TS 1721 = SPE 818-421 *G. gaponii* s.l. The marginal spines have a reddish-brown base.

The outer petals are pure white. The inner part of the pericarp is rose-coloured. The filaments are yellow, slightly rose-coloured at the base. The upper part of the style is greenish-yellow, turning rose-coloured towards the base. The ovary is narrow and of medium length. Flower structure and flower colour match *G. gaponii*, this applies less to the type locality than to the locality situated far to the south near Villa Las Rosas (fig. 62-65).

Fig. 62: TS 1721 = SPE 818-421 *G. gaponii* s.l. The inner part of the pericarp is rose-coloured. The ovary is slightly elongated.

Fig. 63: TS 1721 = SPE 818-421 *G. gaponii* s.l. The ovary is shortened.

Fig. 64: TS 1721 = SPE 818-421 *G. gaponii* s.l. The inner part of the pericarp is delicately rose-coloured.

Fig. 65: TS 1721 = SPE 818-421 *G. gaponii* s.l. The filaments are yellow, turning slightly rose-coloured at the base. The upper part of the style is greenish-yellow, turning rose-coloured towards the base.

The next locality is situated near Panaholma, which is located about 15 km north of the type locality of *G. gaponii* and 3 km south of the locality of TS 1721 (fig. 66).

The plants grow in a meadow interspersed with stones. The holiday resort of Panaholma is visible in the background (fig. 67).

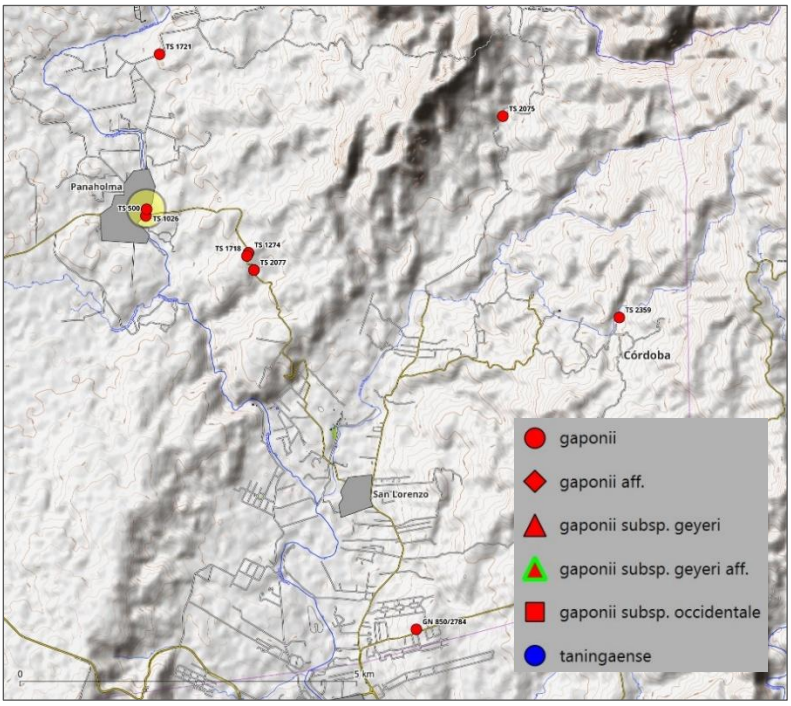


Fig. 66: Yellow shaded spot = locality of TS 500, Panaholma, 991 m a.s.l.

Fig. 67: Habitat of TS 500.

The localities are often covered with *Selaginella*. The body and the fruit colour are medium green. The plants possess delicate thin spines whose colour is greyish with a reddish-brown base. The spine arrangement is a little random (fig. 68-71).

Fig. 68: TS 500 *G. gaponii* s.l. The plant has got a medium green epidermis.

Fig. 69: TS 500 *G. gaponii* s.l. The spine arrangement is a little random.

Fig. 70: TS 500 *G. gaponii* s.l. The fruit colour is medium green.

Fig. 71: TS 500 *G. gaponii* s.l. The spines are greyish with a reddish-brown base.

The epidermis is medium to dark green. The plants start to offset at old age. The spines are delicate, yellowish to white and slightly protruding from the body. The spines' base is somewhat reddish-brown. At old age the plants usually have central spines.

With respect to habitus the plants differ from the *G. gaponii* type locality representatives and rather remind of the plants from Villa Las Rosas (fig. 72-75).

The chromosome set is diploid = 2n.

Fig. 72: TS 500 *G. gaponii* s.l. The base of the spines is slightly reddish-brown.

Fig. 73: TS 500 *G. gaponii* s.l. The body colour is medium to dark green.

Fig. 74: TS 500 *G. gaponii* s.l. The spines are delicate, yellowish to white and protrude slightly from the body.

Fig. 75: TS 500 *G. gaponii* s.l. The plants possess central spines at old age and form offsets.

The flowers are variable. The outer petals are pure white to gleaming rose-coloured. The inner part of the pericarp is more or less intensively rose-coloured. The filaments are rose-coloured, the style is greenish-yellow or rose-coloured. The ovary is somewhat wide to narrow and of medium length. The flower structure reminds partly of *G. taningaense*, the flower colour corresponds with *G. gaponii* (fig. 76-79).

Fig. 76: TS 500 *G. gaponii* s.l. The ovary is somewhat wide and of medium length. The style is rose-coloured.

Fig. 77: TS 500 *G. gaponii* s.l. The inner part of the pericarp is intensively rose-coloured.

Fig. 78: TS 500 *G. gaponii* s.l. The filaments are rose-coloured.

Fig. 79: TS 500 *G. gaponii* s.l. The ovary is narrow and of medium length. The style is greenish-yellow.

The locality of TS 1274 is located between Panaholma and San Lorenzo at a distance of roughly 13 km north of the *G. gaponii* type locality (fig. 80+81).

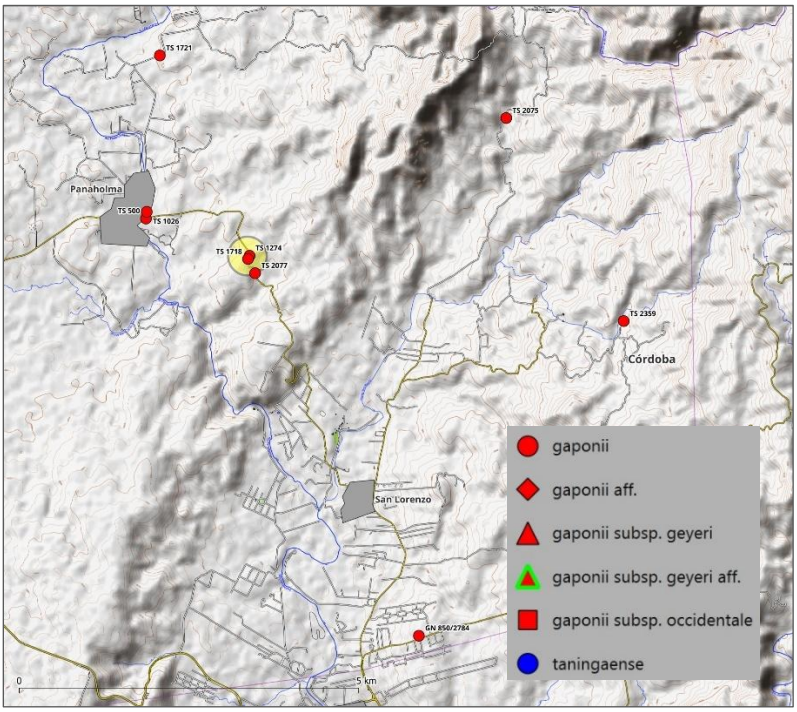


Fig. 80: Yellow shaded spot = locality of TS 1274, Panaholma, 1,028 m a.s.l.

Fig. 81: Habitat of TS 1274. The dirt road meanders in direction of the *G. gaponii* type locality. The western foothills of the Sierras Grande are visible in the background.

The plants' bodies are light to dark green in nature. Spine colour varies, it is often overall greyish, sometimes with a darker base. At old age central spines are formed, the spines are more delicate than with the *G. gaponii type* (fig. 82-85).

Fig. 82: TS 1274 *G. gaponii* s.l. Plant with a dark green epidermis and dark grey spines with a reddish-brown base.

Fig. 83: TS 1274 *G. gaponii* s.l. Plant with a light green epidermis and overall light grey spines.

Fig. 84: TS 1274 *G. gaponii* s.l. The base of the spines is reddish-brown. Central spines are formed.

Fig. 85: TS 1274 *G. gaponii* s.l. Plant with a dark green epidermis and greyish spines with a reddish-brown base.

The appearance of the cultivated plants is variable. They are of medium green to light grey-green colour. The spines are extended and needle-like, yellow to whitish grey with a base mostly reddish-brown to light brownish. The spines rest on the body and are partly somewhat interwoven. Central spines are missing with those young plants (fig. 86-89).

The chromosome set of the plants is diploid = 2n.

Fig. 86: TS 1274 *G. gaponii* s.l. Plant with middle to light green epidermis.

Fig. 87: TS 1274 *G. gaponii* s.l. Plant with light green epidermis.

Abb. 88: TS 1274 *G. gaponii* s.l. The spines are yellow to whitish-grey with a reddish-brown base. The spines rest on the body, they are partly slightly interwoven.

Fig. 89: TS 1274 *G. gaponii* s.l. The spines are interwoven.

The flowers vary considerably. The outer petals are pure white to gleaming delicately rose-coloured. The inner part of the pericarp is rose-coloured. The style is partly overall greenish-yellow, sometimes rose-coloured at the base. The filaments are rose-coloured. The style is greenish-yellow to rose-coloured. The ovary is somewhat wide to narrow. The flower form shown in fig. 90 tends to resemble *G. taningaense*. The form of the other flowers matches to a great extent the southern *G. gaponii* from Villa Las Rosas. The intensive colour of the pericarp recalls *G. gaponii* subsp. *geyeri* (fig. 90-93).

Fig. 90: TS 1274 *G. gaponii* s.l. The outer petals are gleaming delicately rose-coloured. The style and the filaments are rose-coloured.

Fig. 91: TS 1274 *G. gaponii* s.l. The inner part of the pericarp is rose-coloured. The style is overall greenish-yellow and the filaments are predominantly yellow.

Fig. 92: TS 1274 *G. gaponii* s.l. The ovary is slightly wide. Style and filaments are rose-coloured.

Fig. 93: TS 1274 *G. gaponii* s.l. The style is greenish-yellow and the filaments are rose-coloured.

Comparison of *G. gaponii* sensu stricto (s.s.) with *G. gaponii* sensu lato (s.l.)

The *G. gaponii* in the narrower sense are depicted in fig. 94+95. The bodies are dark green. The spines mostly rest on the body and are yellowish-white to greying. Central spines are formed only as an exception.

The plant from Taninga with its dark green body colour and spines which rest on the body is very similar to the typical *G. gaponii* (fig. 96).

The plant from Panaholma rather matches the plants from Villa Las Rosas with respect to spine colour, type and arrangement of spines (fig. 97).

Body colour as well as spine type and spine arrangement of the TS 1274 plant does not match any *G. gaponii* sensu stricto (fig. 98).

The chromosome set of the plants from all localities is diploid = 2n.

Fig. 94: GN 850/2784 *G. gaponii* s.s., San Lorenzo (type locality). The body of the plant is dark green. The spines are slightly elongated and somewhat hard. The spine colour is greyish with a reddish-brown base.

Fig. 95: TS 2369 = GN 851a/4200 *G. gaponii* s.s., Villa Las Rosas. Plant with relatively short, greyish marginal spines which turn reddish-brown at the base.

Fig. 96: TS 499 *G. gaponii* s.l., Taninga. Plant with a dark green to somewhat greyish epidermis and horn-coloured marginal spines, which possess a reddish-brown base and rest on the body.

Fig. 97: TS 500 *G. gaponii* s.l., Panaholma. Plant with dark green epidermis and delicate, yellowish to white spines, which slightly protrude from the body.

Fig. 98: TS 1274 *G. gaponii* s.l., Panaholma. Plant with light green epidermis and yellow to whitish-grey spines with a reddish-brown base. Arrangement of spines is slightly intertwined and resting on the body.

The inner part of the pericarp of *G. gaponii* sensu stricto is more or less intensively rose-coloured. The style is mostly purely yellow and a delicately rose-coloured base occurs only as an exception (fig. 99+100).

The flower of the plant from the vicinity of Taninga matches the flower of the type with respect to ovary structure and colour of the pericarp (fig. 101).

The flowers of the plants found near Panaholma rather match the Villa Las Rosas plants in structure and the type plants in colour of the pericarp (fig. 102+103).

Fig. 99: GN 850/2784 *G. gaponii* s.s., San Lorenzo, Flower with intensively rose-coloured pericarp, filaments and style rose-coloured towards the base as well as with a wide ovary.

Fig. 100: TS 2369 = GN 851a/4200 *G. gaponii* s.s., Villa Las Rosas. The pericarp is rose-coloured. The filaments are rose-coloured towards the base. The ovary is somewhat wide.

Fig. 101: TS 499 *G. gaponii* s.l., Taninga. Flower with a wide ovary like with *G. gaponii*. The pericarp and the filaments are slightly rose-coloured towards the base.

Fig. 102: TS 500 *G. gaponii* s.l., Panaholma. The inner part of the pericarp, the filaments as well as the base of the style are rose-coloured. The ovary is somewhat wide.

Fig. 103: TS 1274 *G. gaponii* s.l., Panaholma. The ovary is somewhat wide, the inner part of the pericarp is rose-coloured. The style is overall greenish-yellow and the filaments are predominantly rose-coloured.

At old age some plants start offsetting from old areoles positioned close to the base (fig. 104+105).

Fig. 104: HV 1036a *G. gaponii* s.s., San Lorenzo. At old age the plants develop offsets from areoles close to the base.

Fig. 105: TS 500 *G. gaponii* s.l., Panaholma. Starting at around ten years of age the plants develop offsets.

The hilum of seeds from all localities is markedly narrow and drop-shaped. Almost the whole seed is covered by a cuticula which comes off. The seeds from most localities are large, about 1.1-1.3 mm long (fig. 106-110). The seeds of the plants from Panaholma are clearly smaller, just about 1 mm long (fig. 109+110).

Fig. 106: GN 850/2784 *G. gaponii* s.s., San Lorenzo. Large seed with a cuticula which comes off noticeably and a narrow as well as drop-shaped hilum (all seed photos: Volker Schädlich).

Fig. 107: TS 2369 = GN 851a/4200 *G. gaponii* s.s., Villa Las Rosas. Large seeds with a cuticula which comes off and an extremely narrow as well as drop-shaped hilum.

Fig. 108: TS 499 *G. gaponii* s.l., Taninga. Large seeds with a cuticula coming off noticeably and a small, predominantly drop-shaped hilum.

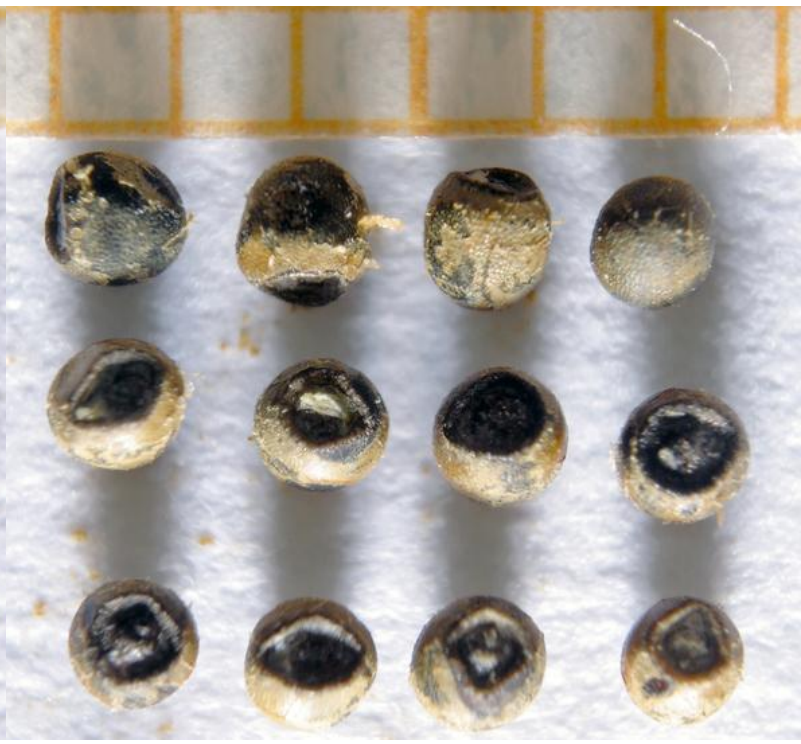


Abb. 109: TS 500 *G. gaponii* s.l., Panaholma. Medium large seeds and a cuticula that comes off as well as with a variable hilum form.

Fig. 110: TS 1274 *G. gaponii* s.l., Panaholma. Medium large seeds with a cuticula which comes off and with a narrow, drop-shaped hilum.

G. gaponii sensu stricto and sensu lato are early bloomers. The flowering period is identical for the majority. *G. gaponii* sensu lato flower at the same time as *G. gaponii* sensu stricto.

Flowering period of *Gymnocalycium gaponii* sensu stricto.

Field number	Species	Locality	m a.s.l.	March	April	May	June
GN 850/2784	*gaponii* sensu stricto	San Lorenzo	900				
TS 2369	*gaponii* sensu stricto	Villa Las Rosas	1015				

Flowering period of *Gymnocalycium gaponii* sensu lato.

Field number	Species	Locality	m a.s.l.	March	April	May	June
TS 0499	*gaponii* sensu lato	Taninga	991				
TS 0500	*gaponii* sensu lato	Panaholma	991				
TS 1274	*gaponii* sensu lato	Panaholma	1028				
TS 1721	*gaponii* sensu lato	Panaholma	1005				

Tab. 2: Flowering period of *G. gaponii* sensu stricto and *G. gaponii* sensu lato, Basel in the year 2025.

Gymnocalycium gaponii* subsp. *geyeri

The first description was compiled by Gert Neuhuber in 2008.

G. gaponii subsp. *geyeri* grow at higher altitudes northeast of the village Ámbul (fig. 111).

The essential differences between *G. gaponii* subsp. *geyeri* and *G. gaponii* are, according to the first description, the higher altitudes of the localities, the darker epidermis as well as the rose-coloured filaments of the plants.

G. gaponii subsp. *geyeri's* type locality is situated at an altitude of 1,660 m a.s.l. It is a stony slope on which shrubs grow. There are no more acacias at this altitude (fig. 112+113).

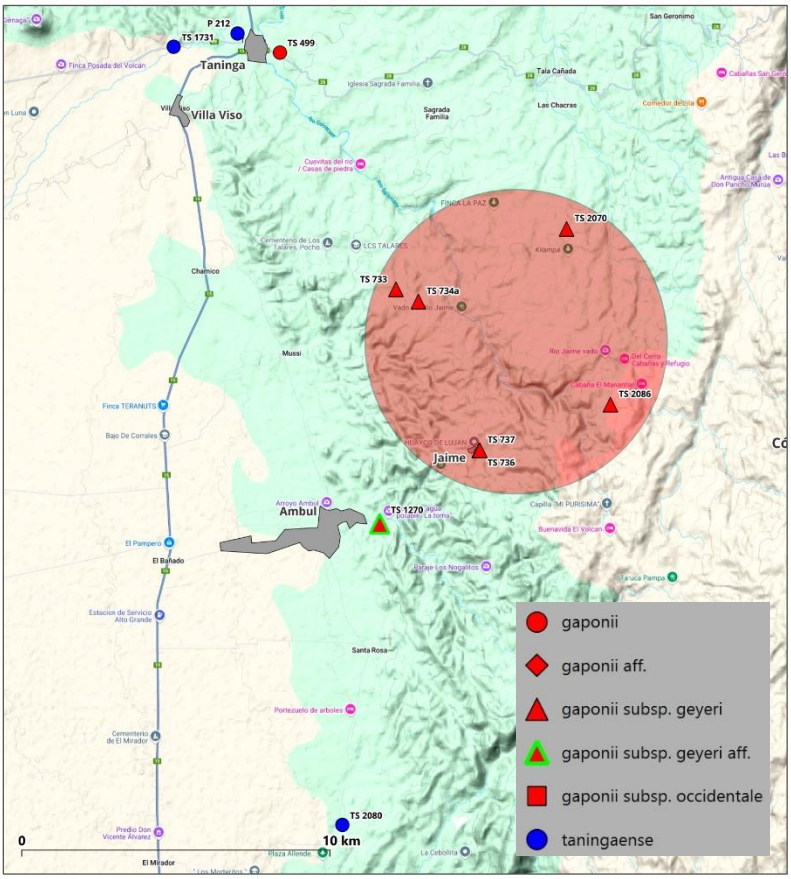


Fig. 111: Distribution area of *G. gaponii* subsp. *geyeri* (red shaded area).

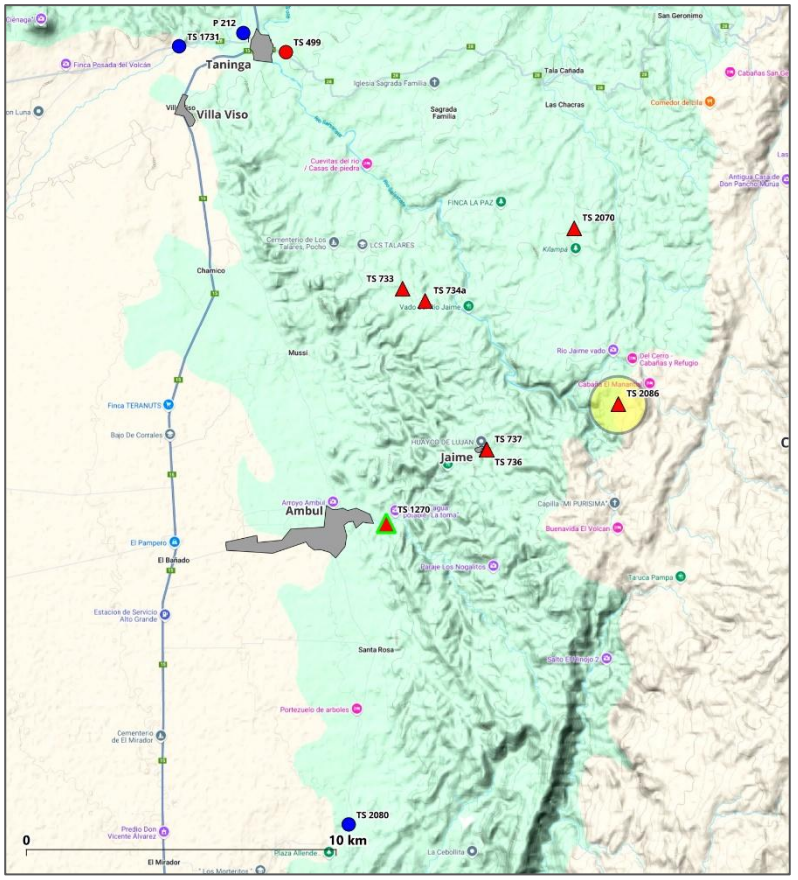


Fig. 112: Yellow shaded triangle = locality of TS 2086, Paraje la Sierrita, 1,664 m a.s.l.

Fig. 113: Habitat of TS 2086 (photo: Maja Strub).

The plants grow between stones in grass and are difficult to make out when they have no flowers or fruits. The plant bodies are dark green, the marginal spines are needle-like, horn-coloured with a darker base. Central spines are partly present (fig. 114-117).

Fig. 114: TS 2086 *G. gaponii* subsp. *geyeri*. The plant body is dark green. Marginal spines are greyish with a brownish-red base.

Fig. 115: TS 2086 *G. gaponii* subsp. *geyeri*. The plants' bodies are often grown over with a grass covering.

Fig. 116: TS 2086 *G. gaponii* subsp. *geyeri*. The marginal spines are relatively long.

Fig. 117: TS 2086 *G. gaponii* subsp. *geyeri*. The plants grow between stones.

The seedlings originate from Gert Neuhuber. The epidermis of the cultivated offspring is dark green. Spine arrangement is from protruding radially from the body to slightly intertwined. The spines are needle-like and horn-coloured with a reddish-brown base (fig. 118-121).

Fig. 118: TS 2086 = GN 1679 *G. gaponii* subsp. *geyeri*. The plant's body is dark green.

Fig. 119: TS 2086 = GN 1679 *G. gaponii* subsp. *geyeri*. The spines are horn-coloured with a reddish-brown base.

Fig. 120: TS 2086 = GN 1679 *G. gaponii* subsp. *geyeri*. The marginal spines are partly slightly intertwined.

Fig. 121: TS 2086 = GN 1679 *G. gaponii* subsp. *geyeri*. Central spines are not (yet?) present.

The petals are white with a rose-coloured gleam. The inner part of the pericarp, the filaments as well as the style are intensively rose-coloured. The ovary of those young plants is short (fig. 122-124).

Fig. 122: TS 2086 = GN 1679 *G. gaponii* subsp. *geyeri*. The petals are white with a rose-coloured gleam.

Fig. 123: TS 2086 = GN 1679 *G. gaponii* subsp. *geyeri*. The inner part of the pericarp is intensively rose-coloured.

Fig. 124: TS 2086 = GN 1679 *G. gaponii* subsp. *geyeri*. The filaments as well as the style are intensively rose-coloured.

The fruit colour is medium green, the body of the plant is medium to dark green (fig. 125-127).

The seeds are large and covered by a cuticula that comes off. The hilum is narrow and drop-shaped (fig. 128).

Fig. 125-126: TS 2086 = GN 1679, *G. gaponii* subsp. *geyeri*. The fruit colour is medium to dark green.

Fig. 127: TS 2086 = GN 1679, *G. gaponii* subsp. *geyeri*. The fruit colour is medium to dark green.

Fig. 128: TS 2086 *G. gaponii* subsp. *geyeri*. The seeds are large and covered with a cuticula that comes off. The hilum is slightly narrow.

Plants which do not match *G. gaponii* subsp. *geyeri* in all features can be found east of Ámbul. They grow along the edge of a meadow which is sparsely grown over, under the cover of acacia or along the edge of the route (fig. 129+130).

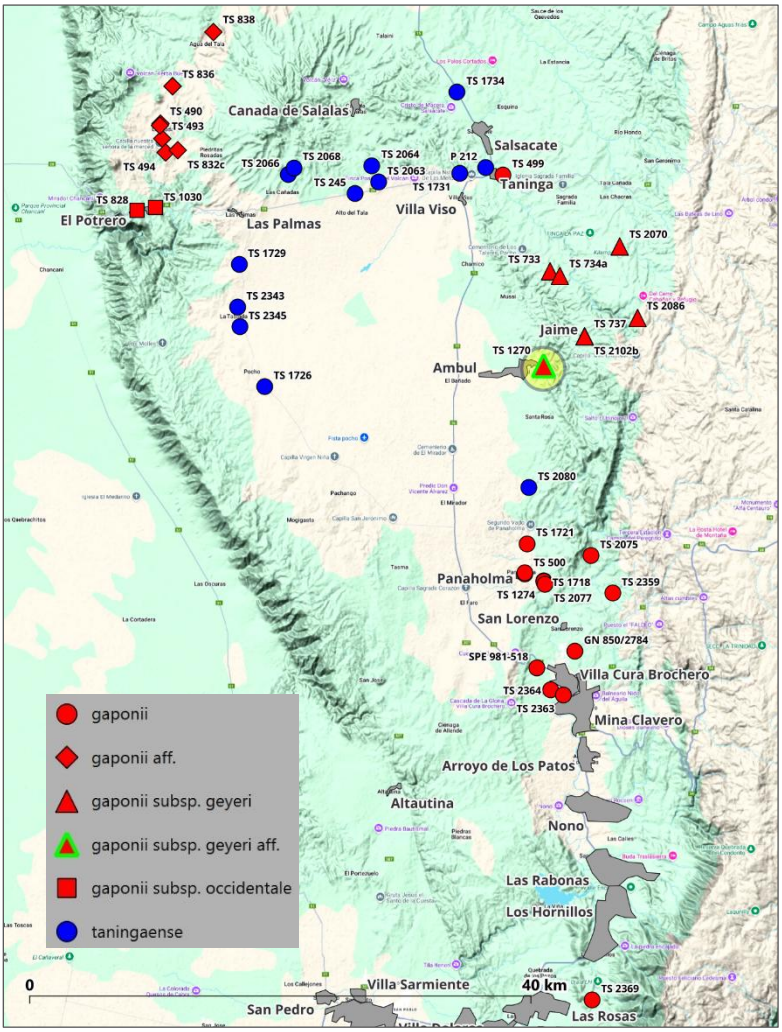


Fig. 129: Yellow shaded triangle = locality of TS 1270, Ámbul, 1,150 m a.s.l.

Fig. 130: Habitat of TS 1270.

The plants' bodies are dark green to light green. It is interesting to note that their spine colour is uniformly whitish horn-coloured. Central spines are missing. The plants suffer when the protective acacia have been removed (fig. 131-134).

Fig. 131: TS 1270 *G. gaponii* subsp. *geyeri* aff. Plants with a dark green epidermis. The spines are uniformly whitish horn-coloured.

Fig. 132: TS 1270 *G. gaponii* subsp. *geyeri* aff. The plant suffers because the protective acacia have been removed.

Fig. 133: TS 1270 *G. gaponii* subsp. *geyeri* aff. The plant is grown over with grass.

Fig. 134: TS 1270 *G. gaponii*. subsp. *geyeri* aff. The plants are sunk into the ground.

The epidermis of the cultivated offspring is light green. The spines rest on the body and are partly intertwined. The spine colour is white yellowish to horn-coloured. A dark base is not visible. Central spines are not formed. Their appearance resembles neither *G. gaponii* nor *G. gaponii* subsp. *geyeri* in the stricter sense (fig. 135-138).

Fig. 135: TS 1270 *G. gaponii*. subsp. *geyeri* aff. Plant with a light green epidermis.

Fig. 136: TS 1270 *G. gaponii*. subsp. *geyeri* aff. Plant with pure white-yellowish marginal spines which rest on the body.

Fig. 137: TS 1270 *G. gaponii*. subsp. *geyeri* aff. The spines do not possess a darker base.

Fig. 138: TS 1270 *G. gaponii*. subsp. *geyeri* aff. The spines are needle-like and slightly intertwined.

The outer petals are pure white. The interior of the flower is intensively rose-coloured. The style is greenish-yellow with a rose-coloured base. The filaments are rose-coloured. The ovary is compressed to somewhat wide. The flower recalls *G. gaponii* subsp. *geyeri* (fig. 139-142).

Fig. 139: TS 1270 *G. gaponii*. subsp. *geyeri* aff. The outer petals are pure white. The ovary is somewhat wide.

Fig. 140: TS 1270 *G. gaponii*. subsp. *geyeri* aff. The pericarp is intensively rose-coloured.

Fig. 141: TS 1270 *G. gaponii*. subsp. *geyeri* aff. The filaments are rose-coloured.

Fig. 142: TS 1270 *G. gaponii*. subsp. *geyeri* aff. The style is greenish-yellow with a rose-coloured base.

The fruit colour is greenish-grey (fig. 143-146).

Fig. 143-146: TS 1270 *G. gaponii*. subsp. *geyeri* aff. The fruit colour is greenish-grey.

The flowering period of *G. gaponii* subsp. *geyeri* is uniform to a very great extent.

Flowering period of *Gymnocalycium gaponii* subsp. *geyeri*.																							
Field number	**Species**	**Locality**	**m a.s.l.**	**March**				**April**				**May**				**June**							
TS 2086	*gaponii* subsp. *geyeri*	La Sierrita	1664																				
TS 1270	*gaponii* subsp. *geyeri* aff.	Ámbul	1150																				

Tab. 3: Flowering period of *G. gaponii* subsp. *geyeri*. Basel in the year 2025.

Gymnocalycium gaponii subsp. *occidentale*

The first description was generated by Victor Gapon and was published in 2025.

The localities are located east and west of the small village El Potrero (fig. 146a+146b).

The locality of TS 828 can be found 8 km to the south of the closest *G. gaponii* aff. locality of La Mudana (TS 832c), resp. 13 km west of the first *G. taningaense* sensu lato locality (TS 2066) (fig. 147). The habitat is a stony hill grown over with acacia (fig. 148).

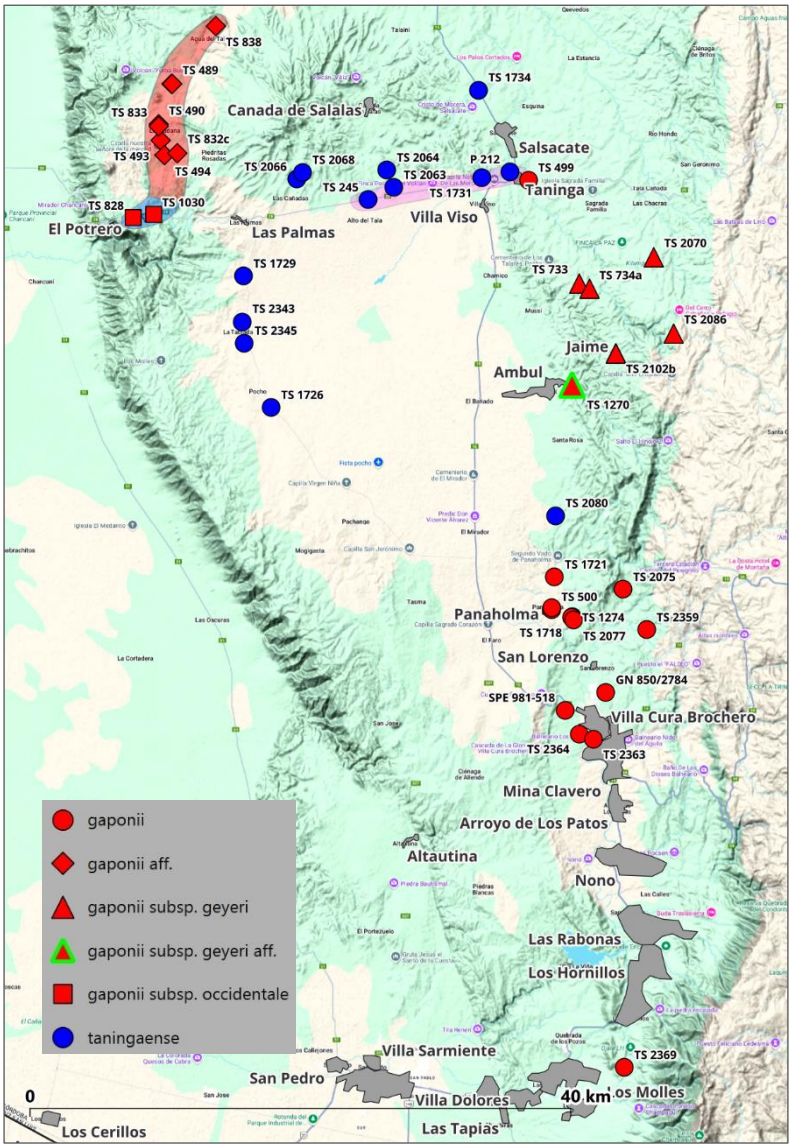


Fig. 146a: Distribution area of *G. gaponii* subsp. *occidentale*, Sierra de Pocho (blue shaded area in the north-eastern part of the map section).

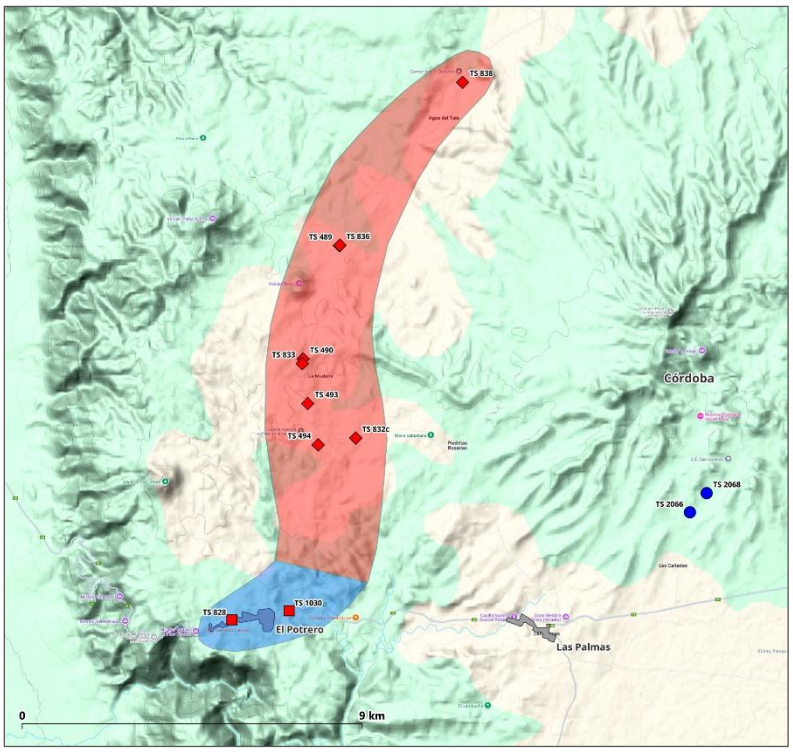


Fig. 146b: Distribution area of *G. gaponii* subsp. *occidentale*, Sierra de Pocho (blue shaded area).

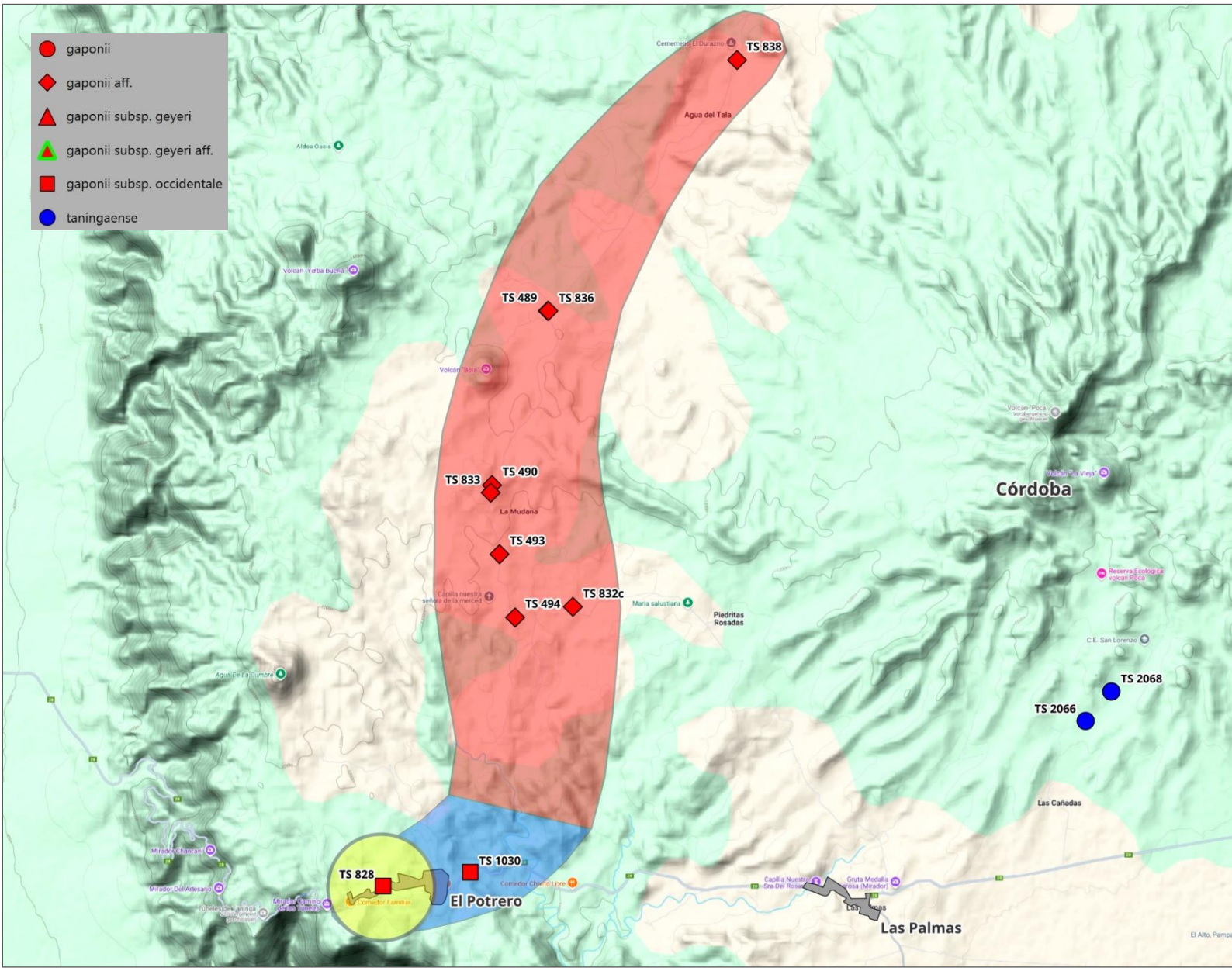


Fig. 147: Yellow shaded square = locality of TS 828, El Potrero, 1,169 m a.s.l.

Fig. 148: Habitat of TS 828 (photo: M. Strub).

The plants' bodies in nature have a grey frosty appearance. The fruits are green-grey. The spines are grey, rest on the body and are slightly intertwined. Central spines are missing. The plant in fig. 149 has a typical *G. gaponii* appearance (fig. 149-152).

Fig. 149: TS 828 *G. gaponii* subsp. *occidentale*. The plant's body has a grey frosty appearance.

Fig. 150: TS 828 *G. gaponii* subsp. *occidentale*. The marginal spines are grey. Only an indication of a darker base can be discerned.

Fig. 151: TS 828 *G. gaponii* subsp. *occidentale*. The marginal spines are lightly intertwined. Central spines are missing.

Fig. 152: TS 828 *G. gaponii* subsp. *occidentale*. Plant with green-grey fruit.

The bodies of cultivated plants are predominantly green to greyish. The marginal spines are yellowish to horn-coloured, often with a darker tip and sometimes with a reddish-brown base. Central spines are not formed. The plants closely resemble *G. gaponii* sensu stricto (fig. 153-156).

The plants have a diploid = 2n chromosome set.

Fig. 153: TS 828 *G. gaponii* subsp. *occidentale*. The plant's body is dark green.

Fig. 154: TS 828 *G. gaponii* subsp. *occidentale*. The plant's body is greyish-green. The marginal spines are greyish with a darker tip.

Fig. 155: TS 828 *G. gaponii* subsp. *occidentale*. The marginal spines are yellowish with a reddish-brown base.

Fig. 156: TS 828 *G. gaponii* subsp. *occidentale*. The tip and the base of the marginal spines are reddish-brown.

The style is greenish-yellow with a rose-coloured base occasionally. The filaments are yellow. The pericarp is rose-coloured. The ovary is somewhat thickened and elongated. The flower structure is close to the *G. gaponii* type (fig. 157-160).

Fig. 157: TS 828 *G. gaponii* subsp. *occidentale*. The pericarp is slightly rose-coloured. The style is greenish-yellow. The ovary is thickened.

Fig. 158: TS 828 *G. gaponii* subsp. *occidentale*. The ovary is slightly wide.

Fig. 159: TS 828 *G. gaponii* subsp. *occidentale*. The ovary is wide.

Abb. 160: TS 828 *G. gaponii* subsp. *occidentale*. The petals are purely wide.

The flowering period of *G. gaponii* subsp. *occidentale* is uniform. The altitude of the localities is between 1,000 and 1,200 m a.s.l.

Flowering period of *Gymnocalycium gaponii* subsp. *occidentale*.

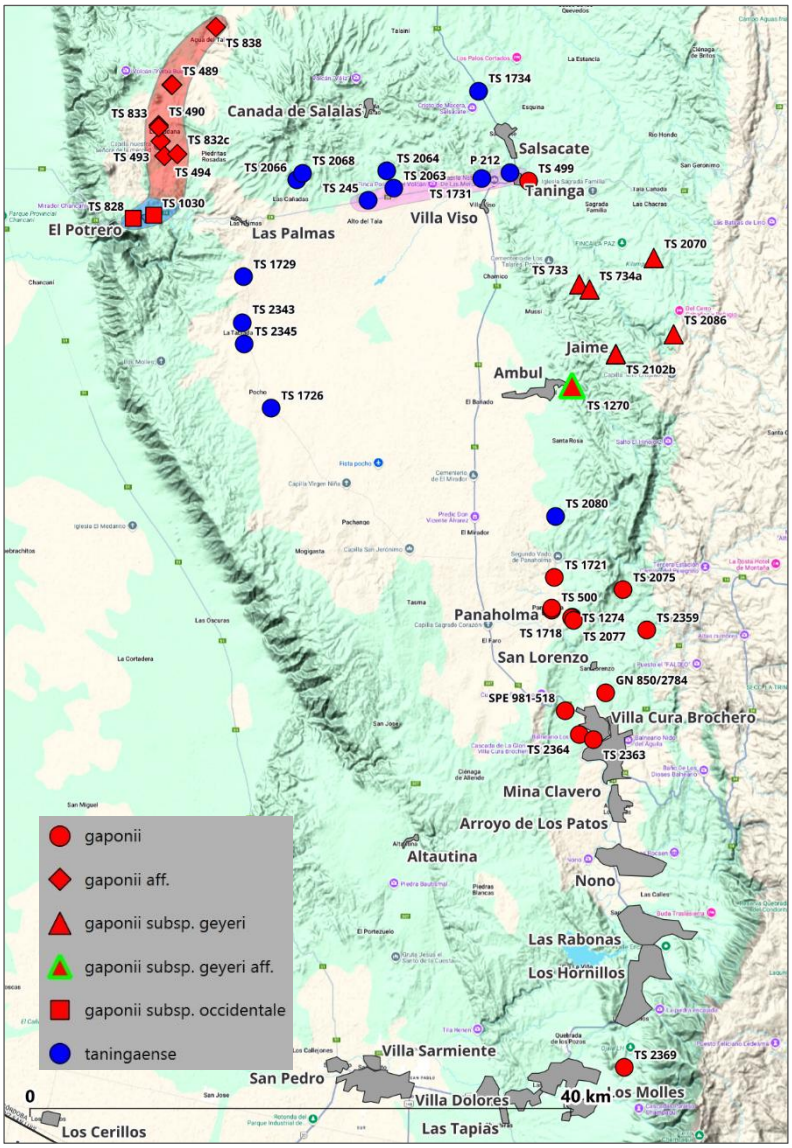
Field number	Species	Locality	m a.s.l.	March	April	May	June
TS 0828	*gaponii* subsp. *occidentale*	El Potrero	1169				
TS 1030	*gaponii* subsp. *occidentale*	El Potrero	1095				

Tab. 4: Flowering period of *G. gaponii* subsp. *occidentale*. Basel in the year 2025.

***Gymnocalycium gaponii* aff.**

Another distribution area of plants which do not match all features of the type form of *G. gaponii* or *G. taningaense* is located in the Sierra de Pocho. The north-south extension of this distribution area is around 30 kilometres. There are volcanoes in the west and south-east of the area (fig. 161+162).

Since there are plants which possess intermediate features of both species even at the same locality the author uses *G. gaponii* aff. as a working title.



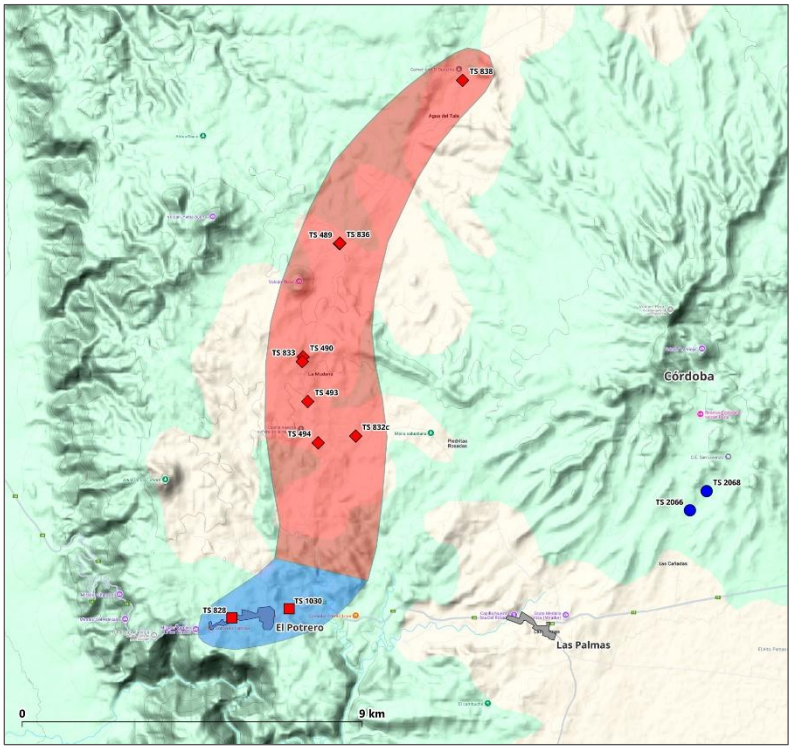


Fig. 161+162: Distribution area of *G. gaponii* aff., Sierra de Pocho (red shaded area).

The northernmost locality known to the author where plants from the extended from group of *G. gaponii* grow is located north of Agua del Tala (fig. 163). There are large boulders in this region. *Trithrinax campestris* is among the accompanying vegetation, volcanoes can be discerned in the background (fig. 164).

The subspecies *G. gaponii* subsp. *macrocarpum* grows in subsequent northern direction. Its flowering period starts clearly later than that of *G. gaponii*. This subspecies is not closely related to *G. gaponii* in the author's opinion.

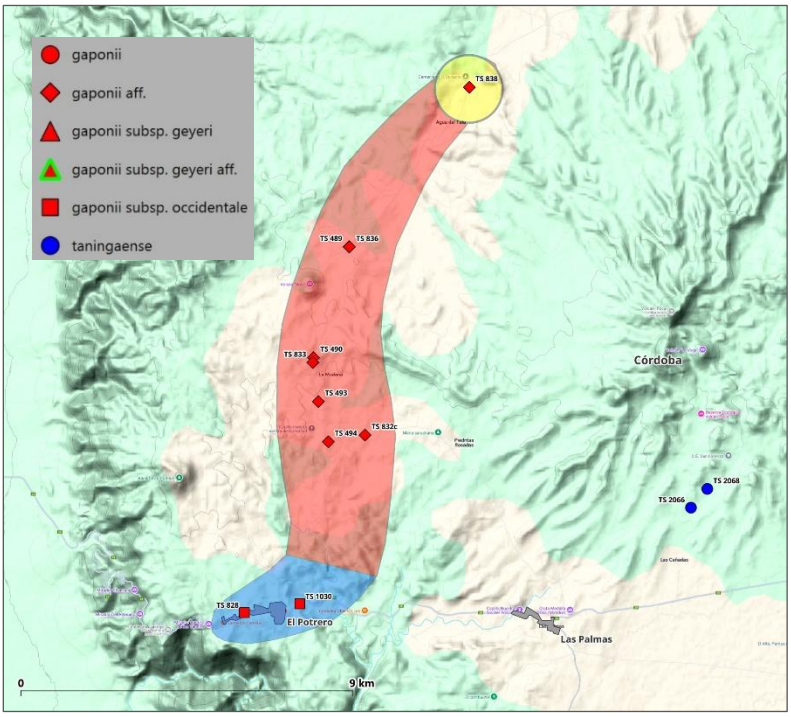


Fig. 163: Yellow shaded rhombus = locality of TS 838, Agua del Tala, 1,067 m a.s.l.

Fig. 164: Habitat of TS 838.

The plants mostly grow between stones. Due to the grey-green epidermis their habitus strongly recalls *G. taningaense*. The spines are grey-white and rest on the body. A dark base is hardly discernible. Central spines are missing (fig. 165-168).

Fig. 165: TS 838 *G. gaponii* aff.? Plant with grey-green epidermis.

Fig. 166: TS 838 *G. gaponii* aff.? The spines are grey-white and rest on the body.

Fig. 167: TS 838 *G. gaponii* aff.? The plant grows in *Selaginella*.

Fig. 168: TS 838 *G. gaponii* aff.? Central spines are missing.

The body colour changes from grey to grey-green and even green. The appearance is very diverse. There are two phenotypes.

The phenotype 1 plants possess whitish-yellow spines with a slightly brownish base. The body colour is medium green. Central spines are rarely formed (fig. 169+171).

Body colour as well as spine colour of the phenotype 2 plants are darker than with phenotype 1. The chromosome set of these plants is diploid = 2n (fig. 170+172).

Both phenotypes neither match the habitus of *G. taningaense* nor that of *G. gaponii*.

Fig. 169: TS 838 *G. gaponii* aff.? Phenotype 1: Plant with medium green epidermis.

Fig. 170: TS 838 *G. gaponii* aff.? Phenotype 2: Plant with grey-green epidermis.

Fig. 171: TS 838 *G. gaponii* aff.? Phenotype 1: The plants possess whitish-yellow spines with a slightly brownish base.

Fig. 172: TS 838 *G. gaponii* aff.? Phenotype 2: The spines are horn-coloured with a faintly dark base. Central spines are formed.

The flowers of phenotype 1 have a greenish-yellow style. The inner part of the pericarp is washed-out rose-coloured. The filaments are yellow. The ovary is of medium length and narrow (fig. 173+175).

The flowers of phenotype 2 do not differ from those of phenotype 1 (fig. 174+176). The flower structure and the colour of the pericarp of both phenotypes remind of *G. taningaense*.

Fig. 173: TS 838 *G. gaponii* aff.? Phenotype 1: The inner part of the pericarp is washed-out rose-coloured. The ovary is of medium length.

Fig. 174: TS 838 *G. gaponii* aff.? Phenotype 2: The inner part of the pericarp is washed–out rose-coloured. The ovary is of medium length.

Fig. 175: TS 838 *G. gaponii* aff.? Phenotype 1: The filaments are yellow, the style is greenish-yellow.

Fig. 176: TS 838 *G. gaponii* aff.? Phenotype 2: The filaments are yellow, the style is greenish-yellow.

The next locality is situated about 5 km south of the last locality, on the earth road from Agua del Tala to La Mudana, the type locality of *G. horridispinum* (fig. 177).

The plants grow in humous granite gravel. The accompanying vegetation is open. *Trithrinax campestris* also occur again. The volcanoes are visible from here as well (fig. 178).

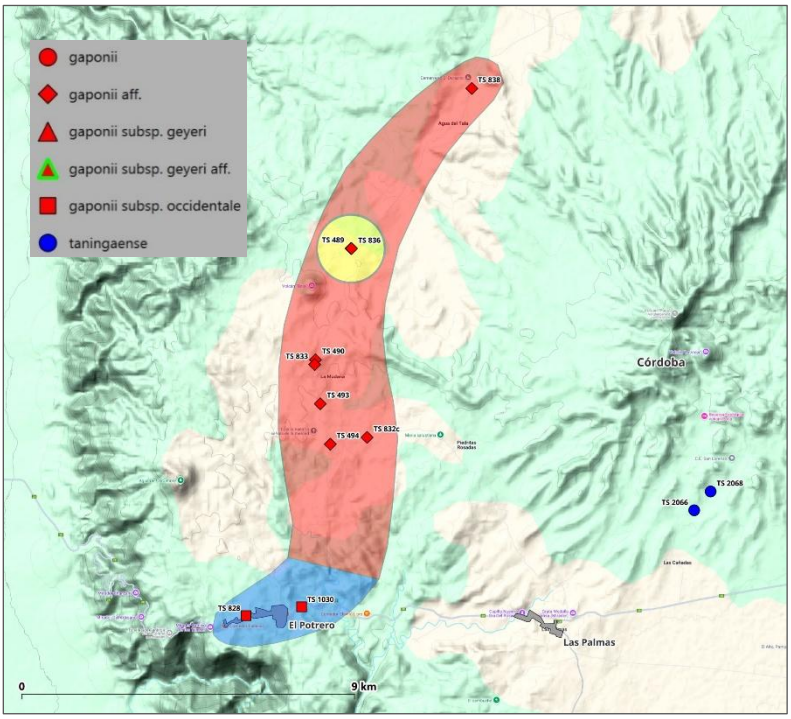


Fig. 177: yellow shaded rhombus = locality of TS 489 / TS 1173, Agua del Tala – La Mudana, 1,188 m a.s.l.

Fig. 178: Habitat of TS 489 / TS 1173.

The author has visited the locality several times. The pictures in fig. 179+180 were taken during an earlier journey, those in fig. 181+182 during a later one.

In a spell of drought the plants' habitus in nature strongly reminds of *G. taningaense*. This applies not only to body colour, but also to the needle-like spines. However, fruit colour is greenish and not greyish as with *G. taningaense* (fig. 179+180).

When the plants start to shoot they lose their grey, frosty appearance and get a distinctly greener epidermis (fig. 181+182). This phenomenon can also be observed in cultivation. In winter the plants have a grey body colour which turns greener again in spring.

Fig. 179: TS 489 *G. gaponii* aff. In a dry spell the plants remind of *G. taningaense*.

Fig. 180: TS 489 *G. gaponii* aff. The fruit colour is dark green, not grey-green as with *G. taningaense*.

Fig. 181: TS 1173 *G. gaponii* aff. Shooting plant with distinctly green epidermis.

Fig. 182: TS 1173 *G. gaponii* aff. The spines are horn-coloured with a slightly darker base.

The cultivated offspring from the two journeys have developed differently.

The habitus of the plants from the earlier journey is uniformly dark green in cultivation. The spines are grey-whitish with a reddish-brown base and somewhat protruding from the body. Central spines are missing. This phenotype recalls *G. gaponii* (TS 489, fig. 183+184).

The cultivated offspring from the later journey differ in their light green body colour, spine colour as well as central spines from those of the earlier journey (TS 1173, fig. 185+186). The plants can neither be assigned to *G. gaponii* nor to *G. taningaense* in a stricter sense.

The chromosome set of both phenotypes is diploid = 2n.

The plants grow in the same place, flower at the same time and possess the same set of chromosomes. Therefore they must be the same species with a varying habitus resp. phenotype (fig. 183-186).

Fig. 183: TS 489 *G. gaponii* aff., the plant bodies of the offspring from the previous trip are dark green.

Fig. 184: TS 489 *G. gaponii* aff., the spines of the offspring from the previous trip are greyish-white with a reddish-brown base. There are no central spines.

Fig. 185: TS 1173 *G. gaponii* aff. The bodies of the cultivated offspring from the later journey are light green.

Fig. 186: TS 1173 *G. gaponii* aff. The spines of the cultivated offspring from the later journey are horn-coloured with a somewhat darker base. Central spines are distinctly present.

The flowers have a greenish-yellow style. The inner part of the pericarp is washed-out rose-coloured. The filaments are yellow to slightly rose-coloured. The ovary is of medium length, narrow to wide. Flower structure and colour of the pericarp of TS 489 correspond to a very great extend with *G. gaponii* (fig. 187+188).

The flower features of TS 1173 are not uniform. The form of the ovary and the colour of the pericarp in fig. 189 recall *G. taningaense*. The form of the ovary of the flower in fig. 190 tends to resemble *G. gaponii*, the colouring, however, *G. taningaense*.

Fig. 187: TS 489 *G. gaponii* aff. This flower of the cultivated offspring from the earlier journey has a markedly wide ovary and a washed-out rose-coloured pericarp.

Fig. 188: TS 489 *G. gaponii* aff. This flower of the cultivated offspring from the earlier journey has a slightly wide ovary and a washed-out rose-coloured pericarp.

Fig. 189: TS 1173 *G. gaponii* aff. This flower of the cultivated offspring from the later journey has a clearly elongated ovary as well as a washed-out rose-coloured pericarp.

Abb. 190: TS 1173 *G. gaponii* aff. This flower of the cultivated offspring from the later journey has an ovary of medium length as well as a washed-out rose-coloured pericarp.

The next locality (TS 490) is situated around 3 km south of the last locality (fig. 191).

The locality is on a small pass. From there in northern direction, resp. towards the previous locality, a high plateau is visible (fig. 192).

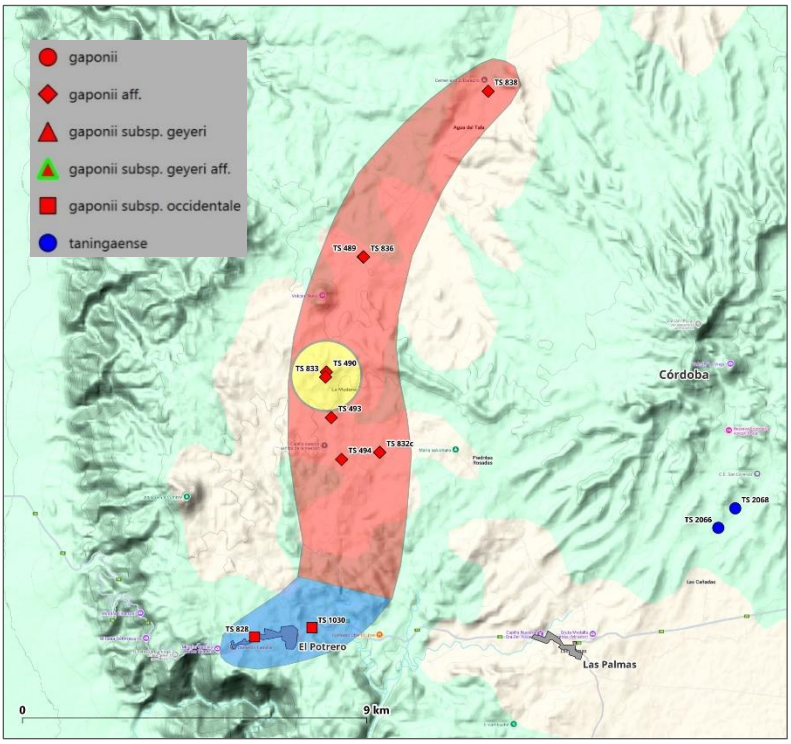


Fig. 191: Yellow shaded rhombus = locality of TS 490, La Mudana, 1,258 m a.s.l.

Fig. 192: Habitat of TS 490.

The author found just two plants at the locality. The plant in figure 193 (with fruit) and in figure 194 (without fruit) reminds very much of *G. gaponii*. The body is dark green. The spines are greyish with a reddish-brown base.

The other plant in figure 195 (with fruit) and figure 196 (without fruit) resembles *G. taningaense*. The body is greenish-grey and the spines are greyish, a dark base cannot be recognised.

Fig. 193: TS 490 *G. gaponii* aff. Plant with dark green body and dark green fruit.

Fig. 194: TS 490 *G. gaponii* aff. The spines are greyish with a reddish-brown base.

Fig. 195: TS 490 *G. gaponii* aff. Plant with greenish-grey body and dark green fruit.

Fig. 196: TS 490 *G. gaponii* aff. The spines are greyish, a dark base is not recognisable.

The plants' bodies are dark green to green-grey in cultivation, they are equipped with needle-like spines which may either rest on or protrude from the body. The spines are horn-coloured to greyish with a reddish-brown base. Central spines are formed at old age. *G. gaponii's* influence is stronger than that of *G. taningaense* (fig. 197-200).

The plants possess a diploid = 2n chromosome set.

Fig. 197: TS 490 *G. gaponii* aff. The plant's body is dark green. The spines are yellowish to horn-coloured with a reddish-brown base. Central spines are present.

Fig. 198: TS 490 *G. gaponii* aff. The plant's body is green-grey. The spines are greyish to horn-coloured with a reddish-brown base. Central spines are present.

Fig. 199: TS 490 *G. gaponii* aff. The plant's body is dark green. The spines are slightly intertwined. They are yellowish to horn-coloured with a reddish-brown base. Central spines are present.

Fig. 200: TS 490 *G. gaponii* aff. The marginal spines are not intertwined.

The inner part of the pericarp is washed-out to more intensively rose-coloured. The style is unicolour greenish-yellow. The filaments are yellow or rose-coloured. The ovary is short to long, narrow to somewhat elongated. The flowers tend to resemble *G. gaponii* (fig. 201-204).

Fig. 201: TS 490 *G. gaponii* aff. The ovary is short and somewhat wide. The pericarp is slightly rose-coloured.

Fig. 202: TS 490 *G. gaponii* aff. The filaments are yellow and the style is greenish-yellow.

Fig. 203: TS 490 *G. gaponii* aff. The ovary is somewhat elongated and wide.

Fig. 204: TS 490 *G. gaponii* aff. The ovary is short and slightly wide.

The next locality is situated about two kilometres south of La Mudana (fig. 205). It is a stony habitat with open vegetation (fig. 206).

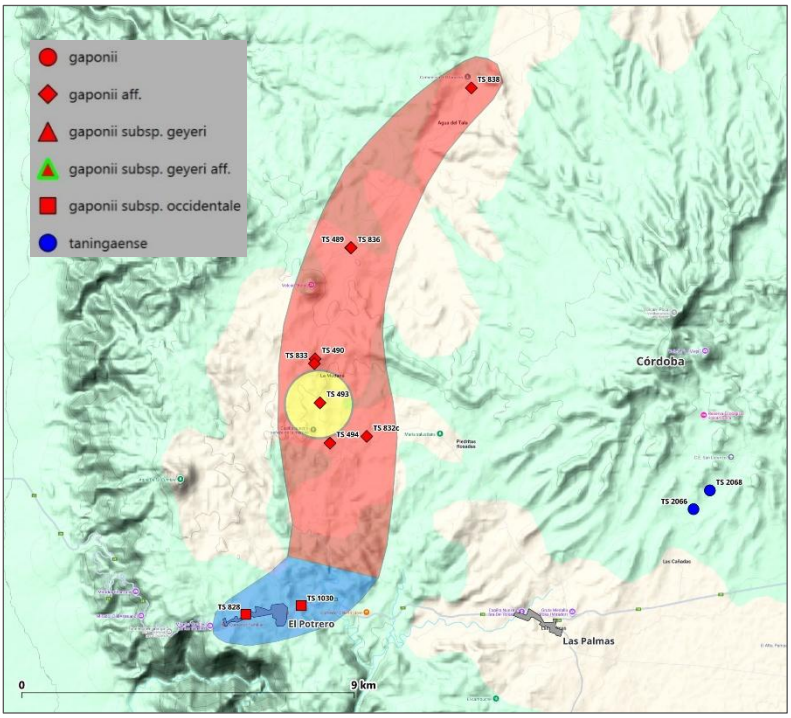


Fig. 205: Yellow shaded rhombus = locality of TS 493, La Mudana, 1,196 m a.s.l.

Fig. 206: Habitat of TS 493 (photo: Volker Schädlich).

The plants have a green-grey to dark green epidermis. When they shoot they remind of *G. gaponii*. Their spine colour is greyish with a slightly reddish-brown base (fig. 207-210).

Fig. 207: TS 493 *G. gaponii* aff. Plant in its habitat with green-grey epidermis and green fruits.

Fig. 208: TS 493 *G. gaponii* aff. The spines are greyish with slightly reddish-brown base.

Fig. 209: TS 493 *G. gaponii* aff. The plant grows in granite gravel.

Fig. 210: TS 493 *G. gaponii* aff. The plants are often covered with grass.

The cultivated plants' habitus is somewhat diverse. The bodies are dark green. The spines are horn-coloured with a reddish-brown base. Spine position varies a lot. On the one hand central spines are not at all formed, on the other hand they already appear in young plants. The plant's bodies recall *G. gaponii* (fig. 211-214).

These plants also have a diploid = 2n chromosome set.

Fig. 211: TS 493 *G. gaponii* aff. The epidermis is dark green. The spines slightly protrude from the body. Central spines are present.

Fig. 212: TS 493 *G. gaponii* aff. The spines are greyish to horn-coloured with a darker base. Central spines are present.

Fig. 213: TS 493 *G. gaponii* aff. Central spines are present, they protrude from the body conspicuously.

Fig. 214: TS 493 *G. gaponii* aff. Marginal spines are short and slightly intertwined. No central spines are visible.

The flower structure is uniform. The flowers possess a unicolour greenish-yellow style. The inner part of the pericarp is washed-out to somewhat more intensively rose-coloured. The filaments are yellow and rose-coloured at the base. The ovary is short to long, narrow to slightly elongated. These flowers, too, take up an intermediate position between *G. taningaense* and *G. gaponii.* The flower structure reminds of *G. gaponii*, its colouring partly of *G. taningaense* (fig. 215-218).

Fig. 215: TS 493 *G. gaponii* aff. The ovary is short and slightly wide. The pericarp and the bottom of the filaments are rose-coloured.

Abb. 216: TS 493 *G. gaponii* aff. The style is greenish-yellow.

Fig. 217: TS 493 *G. gaponii* aff. The ovary is a bit wide, the pericarp is washed-out rose-coloured.

Fig. 218: TS 493 *G. gaponii* aff. The ovary is somewhat wide. The pericarp is rose-coloured.

Another locality is situated about 3 km south of La Mudana (fig. 219).

The habitat is a stony hill with sparse bush and grass vegetation. Volcanoes are again visible in the background (fig. 220).

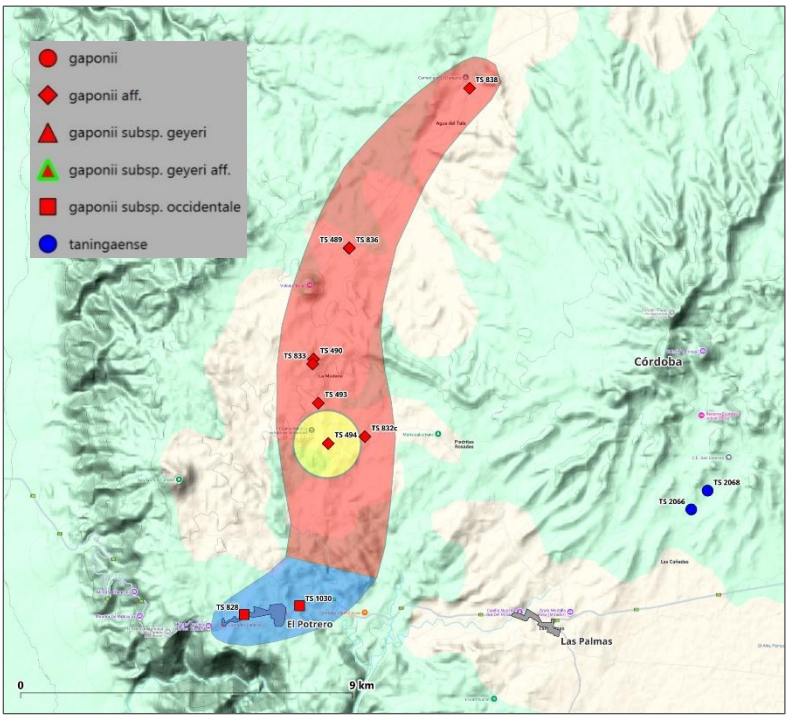


Fig. 219: Yellow shaded rhombus = locality of TS 494, La Mudana – Piedritas Rosadas, 1,193 m a.s.l.

Fig. 220: Habitat of TS 494 (photo: M. Strub).

The plants grow in fine granite gravel. Their body colour is greenish-grey and the fruit colour is greenish. The spines vary from resting on the body to protruding from it. Spine colour is greyish with a reddish-brown base. The plants' habitus reminds of *G. gaponii* (fig. 221-224).

Fig. 221: TS 494 *G. gaponii* aff. Plant with greenish-grey body colour.

Abb. 222: TS 494 *G. gaponii* aff. The fruit colour is greenish.

Fig. 223: TS 494 *G. gaponii* aff. The spines vary from resting on the body to protruding from it.

Abb. 224: TS 494 *G. gaponii* aff. The spine colour is greyish with a reddish-brown base.

The appearance of the plants in cultivation is a little varied. The epidermis colour is dark green to green-grey. The spines are horn-coloured to grey, with an often reddish-brown base. They are mostly arranged in a slightly scattered manner. Central spines are sometimes missing (fig. 225-228).

The chromosome set of the plants is diploid = 2n.

Fig. 225: TS 494 *G. gaponii* aff. The spines are horn-coloured with a reddish-brown base. Central spines are present.

Fig. 226: TS 494 *G. gaponii* aff. Plant with a dark green epidermis. Central spines are missing.

Fig. 227: TS 494 *G. gaponii* aff. The spines are arranged in a scattered manner.

Abb. 228: TS 494 *G. gaponii* aff. Plants with a green-grey epidermis.

The pericarp is washed-out rose-coloured. The flower possesses a unicolour greenish-yellow style. The filaments are yellow, sometimes with a rose-coloured base. The ovary is of medium length to long, narrow to slightly wide. Some flowers tend to resemble *G. gaponii* (fig. 231+232) with respect to their structure, however, the washed-out rose-coloured pericarp rather reminds of *G. taningaense* (fig. 229-232).

Fig. 229: TS 494 *G. gaponii* aff. The colour of the pericarp is washed-out rose-coloured. The ovary is long and narrow.

Fig. 230: TS 494 *G. gaponii* aff. The flower possesses a unicolour greenish-yellow style. The filaments are yellow, sometimes with a rose-coloured base.

Fig. 231: TS 494 *G. gaponii* aff. The ovary is of medium length and wide.

Fig. 232: TS 494 *G. gaponii* aff. The flower has got a unicolour greenish-yellow style. The filaments are yellow. The ovary is slightly wide.

Another locality can be found about 5 km south of La Mudana (fig. 233). This locality is situated about 7 km in linear distance away from the El Potrero *G. gaponii* subsp. *occidentale* and about 10 km from the *G. taningaense* sensu lato localities of Las Cañadas. The habitat is located on a small stony hill with sparse grass and bush vegetation (fig. 234).

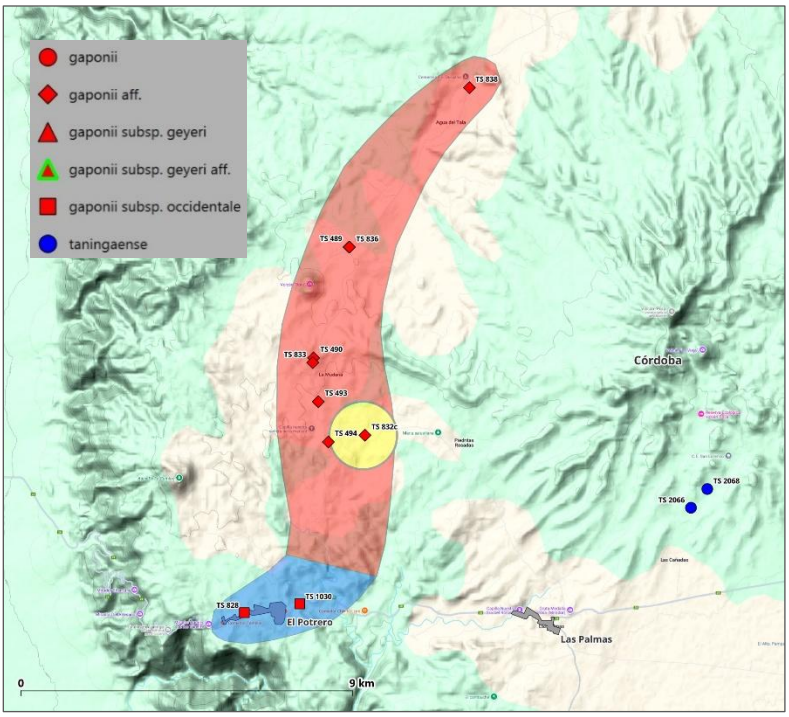


Fig. 233: Yellow shaded rhombus = locality of TS 832c / TS 1946, Piedritas Rosadas, 1,186 m a.s.l.

Fig. 234: Habitat of TS 832c / TS 1946 = VoS 2807 (photo: Volker Schädlich).

The plant photographs in fig 235+236 were taken on an earlier journey. In a dry spell the plants have a greyish appearance. Their body colour recalls *G. taningaense*. The spines are varied, greyish to horn-coloured and they have a reddish-brown or yellowish base.

In a subsequent year we visited the locality after rain showers. When the plants shoot their epidermis turns greener. Then the plants resemble *G. gaponii* (fig. 237+238).

The spines are white-grey with a darker base. Central spines are formed at old age (fig. 235-238).

Fig. 235: TS 832c *G. gaponii* aff. Plant with a greyish epidermis. The spines are greyish with a reddish-brown base.

Fig. 236: TS 832c *G. gaponii* aff. The spines are yellowish to horn-coloured with a yellowish base.

Fig. 237: TS 1946 = VoS 2807 *G. gaponii* aff. Plants with green-grey epidermis and a reddish-brown base (photo: Volker Schädlich).

Fig. 238: TS 1946=VoS 2807 *G. gaponii* aff. The plant grows in the shadow of grass in granite gravel (photo: Volker Schädlich).

The appearance of the plants from the earlier journey is very diverse in cultivation. Both phenotypes possess dark green bodies.

Phenotype 1's marginal spines rest on the body, central spines are missing. The spines are grey with a reddish-brown base (fig. 239).

Phenotype 2's spines protrude from the body, central spines are often formed at old age. The spines are horn-coloured to grey or yellowish with a reddish-brown bas (fig. 240-242).

Both phenotypes' chromosome set is diploid = 2n.

Fig. 239: TS 832c *G. gaponii* aff. Phenotype 1 with spines which rest on the body. Central spines are missing. The spine colour is grey with a reddish-brown base.

Fig. 240: TS 832c *G. gaponii* aff. Phenotype 2 with marginal spines which protrude from the body and central spines. The spines are horn-coloured to grey with a reddish-brown base.

Fig. 241: TS 832c *G. gaponii* aff. Phenotype 2 with central spines and marginal spines which protrude from the body.

Fig. 242: TS 832c *G. gaponii* aff. Phenotype 2: The spines are horn-coloured to yellowish with a reddish-brown base.

The cultivated offspring from the later journey reveal that the plants do not have a lot in common with *G. taningaense*. This applies to body and spine colour as well as position of spines (fig. 243-245).

Fig. 243: TS 1946 = VoS 2807 *G. gaponii* aff. Dark green plant body, the spines are horn-coloured with a reddish-brown base. Central spines are present.

Fig. 244: TS 1946 = VoS 2807 *G. gaponii* aff. The spines rest on the body and are slightly intertwined.

Fig. 245: TS 1946 = VoS 2807 *G. gaponii* aff. The dark green body does not match *G. taningaense*.

The flowers of the cultivated offspring from the earlier journey possess a unicolour greenish-yellow style. The inner part of the pericarp is more or less intensively rose-coloured. The filaments are yellow or rose-coloured. The ovary is of medium length to very short, narrow to slightly wide. The flowers' structure rather reminds of *G. gaponii*, the colour of the pericarp is intermediate between *G. gaponii* and *G. taningaense* (fig. 246-249).

The flowers of the plants from the second journey do also not match the *G. taningaense* sensu stricto flowers. However, the plants are still too young to make a definite statement (fig. 250-252).

Fig. 246: TS 832c *G. gaponii* aff. Phenotype 1: The pericarp is washed-out rose-coloured. The style is greenish-yellow. The filaments are yellow, turning rose-coloured towards the base. The ovary is short and slightly wide.

Fig. 247: TS 832c *G. gaponii* aff. Phenotype 2: The pericarp is intensively rose-coloured. The style is greenish-yellow. The filaments are rose-coloured. The ovary is slightly elongated.

Fig. 248: TS 832c *G. gaponii* aff. Phenotype 2: The pericarp is washed-out rose-coloured. The style is greenish-yellow. The filaments are yellow. The ovary is somewhat elongated.

Fig. 249: TS 832c *G. gaponii* aff. Phenotype 2: The pericarp is washed-out rose-coloured. The style is greenish-yellow. The filaments are rose-coloured. The ovary is slightly wide.

Fig. 250: TS 1946 = VoS 2807 *G. gaponii* aff. The pericarp is rose-coloured. The style is greenish-yellow. The filaments are yellow.

Abb. 251: TS 1946 = VoS 2807 *G. gaponii* aff. The pericarp is rose-coloured. The style is greenish-yellow. The filaments are yellow to rose-coloured. The ovary is slightly wide.

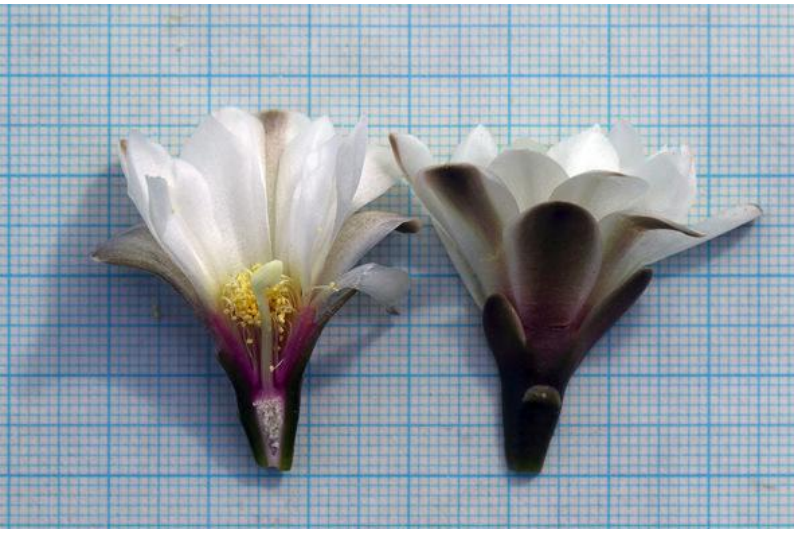


Fig. 252: TS 1946 = VoS 2807 *G. gaponii* aff. The petals are pure white.

The flowering period is very similar at all *gaponii* aff. localities. The altitude of the localities is between 1,000 and 1,300 m a.s.l.

Flowering period of *Gymnocalycium gaponii* aff.

Field number	Species	Locality	m a.s.l.	March	April	May	June
TS 0838	*gaponii* aff.	Agua del Tala	1067		■ ■		
TS 0489	*gaponii* aff.	Agua del Tala - La Mudana	1188		■ ■ ■		
TS 1173	*gaponii* aff.	Agua del Tala - La Mudana	1188		■ ■		
TS 0490a	*gaponii* aff.	La Mudana	1258		■ ■		
TS 0493	*gaponii* aff.	La Mudana	1196		■ ■		
TS 0494	*gaponii* aff.	Piedritas Rosadas - La Mudana	1193	■	■ ■		
TS 0832c	*gaponii* aff.	Piedritas Rosadas	1186		■ ■		

Tab. 5: Flowering period of *G. gaponii* aff. Basel, 2025.

Comparison of *G. gaponii* sensu stricto (s.s.) and *G. taningaense* sensu stricto (s.s.) with *G. gaponii* aff.

Body and spines

In fig. 253 and 254 the type forms of *G. gaponii* and *G. taningaense* are presented for comparison.

In fig. 255–262 photographs of the plants from the Sierra de Pocho are shown, arranged according to their occurrence from north to south.

The plant from locality TS 838 can neither be assigned unequivocally to *G. gaponii* nor to *G. taningaense* (fig. 255).

The appearance of the plant from locality TS 489 reminds more of *G. gaponii* than of *G. taningaense* (fig. 256).

The plants from the localities TS 490 and TS 493 rather recall *G. gaponii* (fig. 257+258), influences of *G. taningaense* can be discerned in fig. 257. Spine position of the plant in fig. 258 does not match *G. gaponii* and definitely not *G. taningaense*.

The plants from the localities TS 494 and TS 832 remind rather of *G. gaponii,* although spine position and type of spines rather correspond with *G. gaponii* sensu lato from Panaholma (fig. 259+260).

TS 2068 can neither be assigned to *G. gaponii* nor *G. taningaense* unambiguously. Yet the seedling is still too young to make a definite statement (fig. 261).

All populations investigated have a diploid = 2n chromosome set.

Fig. 253: GN 850/2784 *G. gaponii* s.s., Type locality of San Lorenzo. The body is dark green. The spines are slightly elongated and somewhat hard. Spine colour is greyish with a reddish-brown base.

Fig. 254: P 212 *G. taningaense* s.s., type locality of Taninga. The body is grey-green. The spines are grey to grey-brown, needle-like and delicate.

Fig. 255: TS 838 *G. gaponii* aff.?, Agua del Tala. The body is medium green. The spines are whitish-yellow with a slightly brownish base.

Fig. 256: TS 489 *G. gaponii* aff., La Mudana. The body is dark green. The spines are grey-whitish with a reddish-brown base. Central spines do not exist.

Fig. 257: TS 490 *G. gaponii* aff., La Mudana. The body is green-grey. The spines are greyish to horn-coloured and have a reddish-brown base. Central spines are present.

Fig. 258: TS 493 *G. gaponii* aff., La Mudana. The body is dark green. The spines are greyish to horn-coloured with a darker base. Prominently protruding central spines are present.

Fig. 259: TS 494 *G. gaponii* aff., Piedritas Rosadas - La Mudana. The epidermis is dark green. The spines are horn-coloured with a reddish-brown base. Central spines exist.

Fig. 260: TS 832c *G. gaponii* aff., Piedritas Rosadas. The plant's body is dark green to grey. The spines are horn-coloured to grey with a reddish-brown base.

Fig. 261: TS 2068 *G. taningaense* s.l.?, Las Cañadas. The epidermis is greenish-grey, the marginal spines are greyish.

Flowers

For comparison: Flowers of the type forms of *G. gaponii* (fig. 262) and *G. taningaense* (fig. 263).

The flower of TS 838 rather matches that of *G. taningaense* (fig. 264). The flower of TS 489 corresponds with *G. gaponii*. However, it possesses intermediate features of both species (fig. 265).

The flowers of TS 490 and TS 493 take an intermediate position between *G. taningaense* (colour of the pericarp) and *G. gaponii* (form of the ovary) (fig. 266+267).

The flower of TS 494 resembles *G. taningaense* and that of TS 832c rather *G. gaponii* (fig. 268+269).

The flower of TS 2068 *G. taningaense* sensu lato conforms to *G. gaponii* (fig. 270).

Fig. 262: GN 850/2784 *G. gaponii* s.s., Type locality of San Lorenzo. Flower with intensively rose-coloured pericarp, filaments and style that turn rose-coloured towards the base as well as a wide ovary.

Fig. 263: P 212 *G. taningaense* s.s., Type locality of Taninga. Flower with a greenish-yellow style and pale rose-coloured pericarp as well as narrow ovary.

Fig. 264: TS 838 *G. gaponii* aff.?, Agua del Tala. The inner part of the pericarp is washed-out rose-coloured. The ovary is of middle length.

Fig. 265: TS 489 *G. gaponii* aff., La Mudana. The ovary is slightly wide and the pericarp is rose-coloured.

Fig. 266: TS 490 *G. gaponii* aff., La Mudana. The ovary is short and a bit narrow. The pericarp is rose-coloured. The filaments are yellow and the style is greenish-yellow.

Fig. 267: TS 493 *G. gaponii* aff., La Mudana. The ovary is a bit wide, the pericarp is washed-out rose-coloured.

Fig. 268: TS 494 *G. gaponii* aff., Piedritas Rosadas - La Mudana. The colour of the pericarp is washed-out rose-coloured. The ovary is long and narrow.

Fig. 269: TS 832c *G. gaponii* aff., Piedritas Rosadas. The pericarp is intensively rose-coloured. The style is greenish-yellow. The filaments are rose-coloured. The ovary is somewhat elongated.

Fig. 270: TS 2068 *G. taningaense* s.l.?, Las Cañadas. The ovary has got a narrow shape. The pericarp is rose-coloured.

Seeds

The type plants of *G. gaponii* and *G. taningaense* possess a similar seed. This applies to size, form of the hilum and the cuticula which comes off (fig. 271+272).

The plants growing in the vicinity of La Mudana have a similar size of seeds and form of the hilum. All seeds investigated have a cuticula which comes off (fig. 273-278).

The *G. taningaense* sensu lato plants of Las Cañadas, too, have a similar seed structure. This is true for the size of the seeds, form of the hilum and the cuticula which comes off (fig. 279).

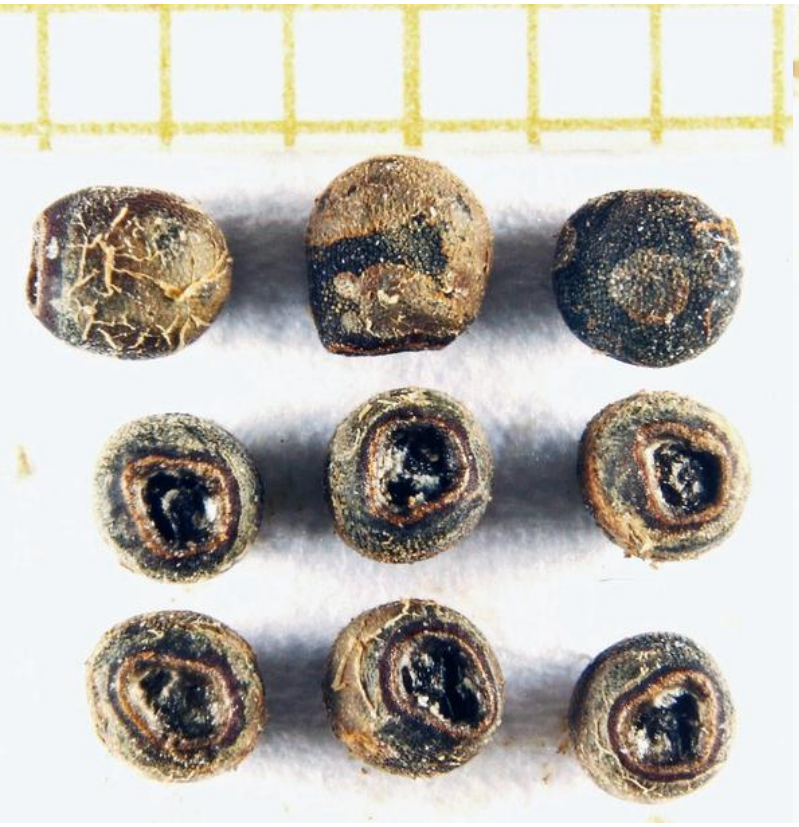


Fig. 271: GN 850/2784 *G. gaponii* s.s., type locality of San Lorenzo. Large seeds with a cuticula which clearly comes off and a narrow as well as drop-shaped hilum.

Fig. 272: P 212 *G. taningaense* s.s., type locality of Taninga. Large seeds with a cuticula that comes off, as well as a drop-shaped hilum.

Fig. 273: TS 838 *G. gaponii* aff.?, Agua del Tala. Large seeds with a cuticula that comes off as well as a drop-shaped hilum.

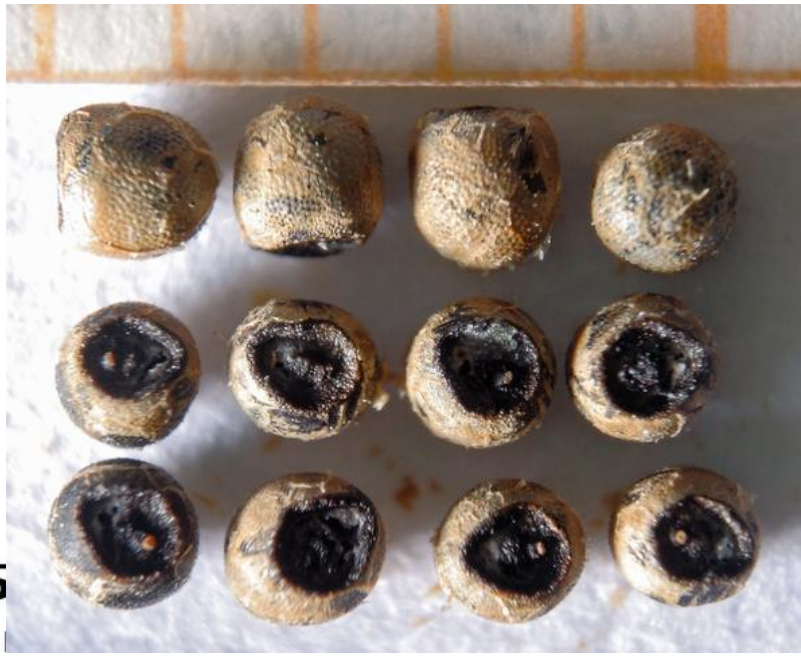


Fig. 274: TS 489 *G. gaponii* aff., La Mudana. Large seeds with a cuticula which comes off heavily as well as a drop-shaped hilum.

Fig. 275: TS 490 *G. gaponii* aff., La Mudana. Large seeds with a cuticula that comes off with varying intensity as well as drop-shaped hilum.

Fig. 276: TS 493 *G. gaponii* aff., La Mudana. Large seeds with a cuticula which comes off as well as a narrow, drop-shaped hilum.

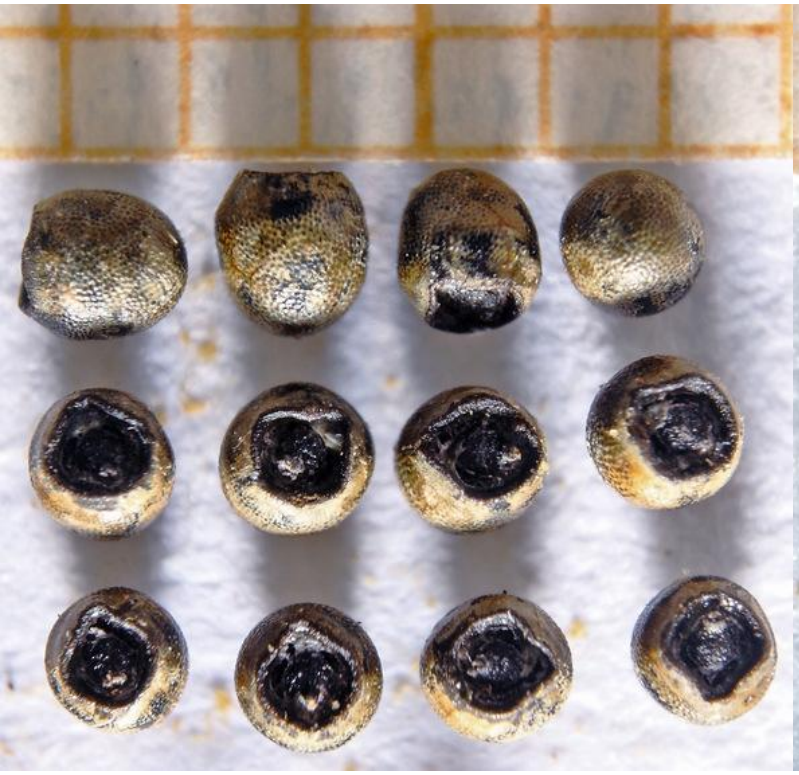


Fig. 277: TS 494 *G. gaponii* aff., Piedritas Rosadas - La Mudana. Large seeds with a cuticula that comes off as well as a drop-shaped hilum.

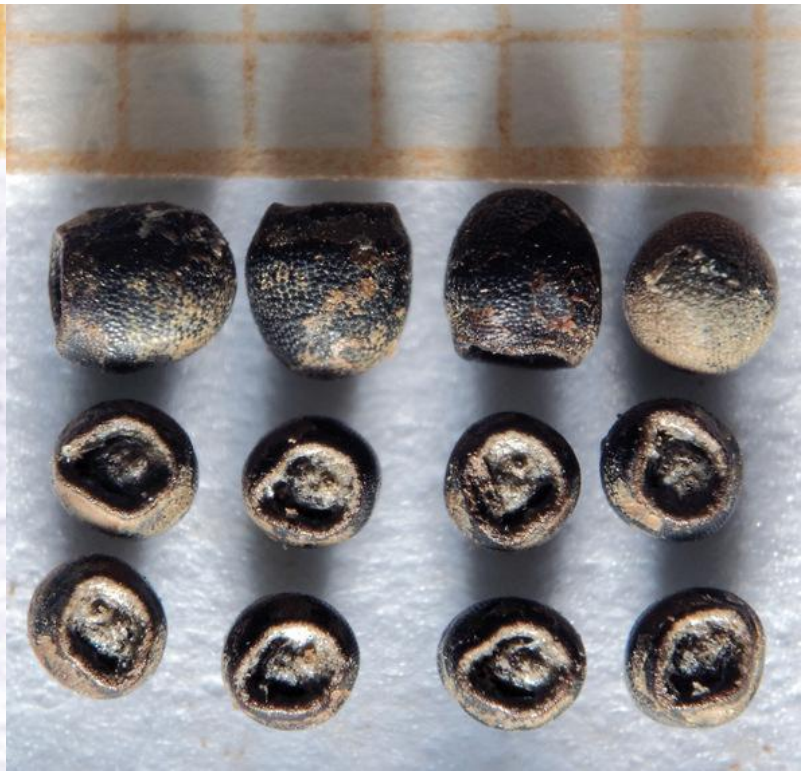


Fig. 278: TS 832c *G. gaponii* aff., Piedritas Rosadas. Seeds of different size with a cuticula that comes off as well as drop-shaped hilum.

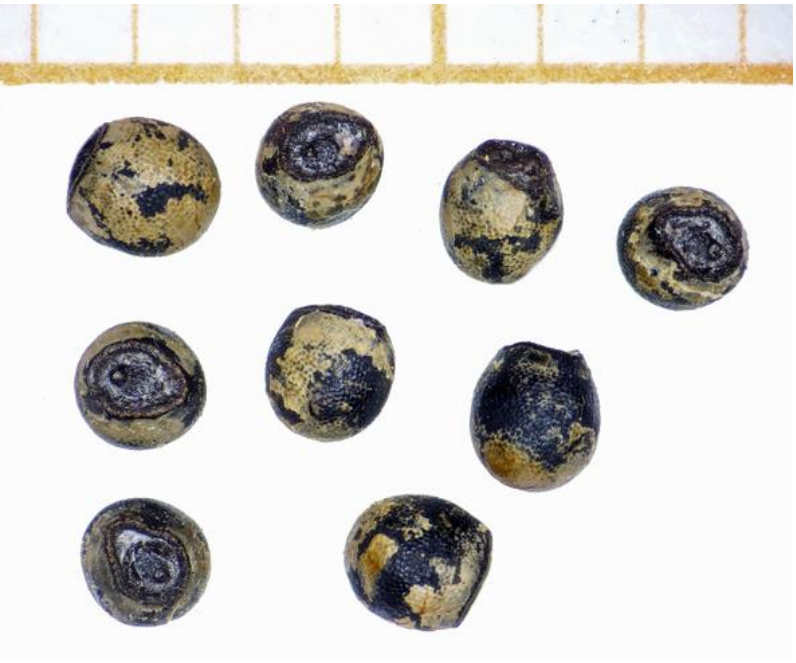


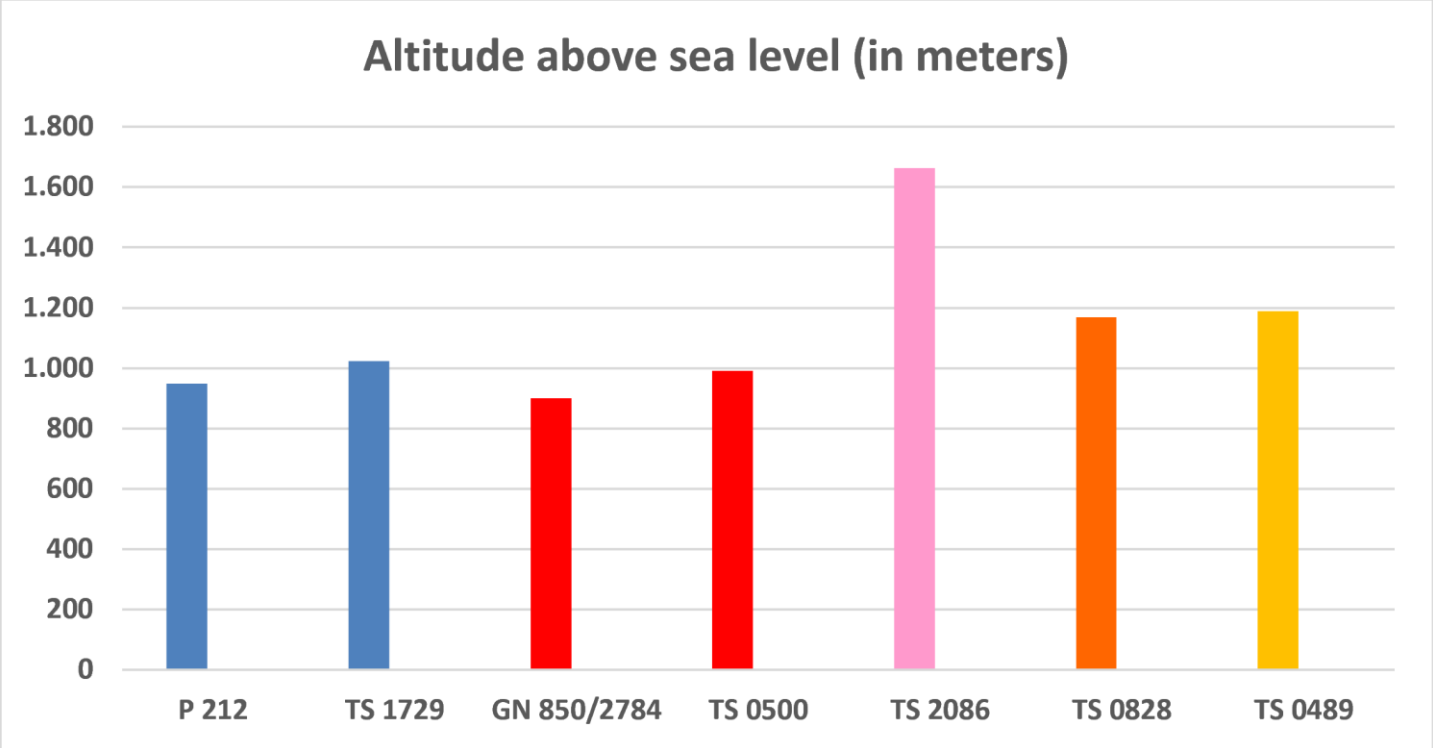
Fig. 279: TS 2068 *G. taningaense* s.l.?, Las Cañadas. Large seeds with a cuticula that comes off as well as drop-shaped hilum.

The flowering period of all investigated species and populations coincide to a very great extent. This applies to both *G. taningaense* sensu lato as well as to *G. taningaense* sensu stricto, *G. gaponii* sensu stricto, *G. gaponii* sensu lato, *G. gaponii* subsp. *geyeri* and *G. gaponii* subsp. *occidentale*. It becomes evident that the *G. gaponii* aff. plants from the Sierra de Pocho flower somewhat earlier.

Flowering period of *Gymnocalycium taningaense* sensu stricto.				March				April				May				June			
Field number	**Species**	**Locality**	**m a.s.l.**																
P 212	*taningaense* sensu stricto	Taninga	950																
TS 1731	*taningaense* sensu stricto	Taninga	940																
TS 0245	*taningaense* sensu stricto	Taninga - Las Palmas	1079																
Flowering period of *Gymnocalycium taningaense* sensu lato.																			
Field number	**Species**	**Locality**	**m a.s.l.**																
TS 1734	*taningaense* sensu lato	Salsacate	924																
TS 2063	*taningaense* sensu lato	Cañada de Salas	1063																
TS 2064	*taningaense* sensu lato	Cañada de Salas	1053																
TS 2068	*taningaense* sensu lato	Las Cañadas	1163																
TS 1729	*taningaense* sensu lato	La Tablada	1023																
TS 1726	*taningaense* sensu lato	Villa de Pocho	1077																
TS 2080	*taningaense* sensu lato	Los Morteritos	1086																
Flowering period of *Gymnocalycium gaponii* sensu stricto.																			
Field number	**Species**	**Locality**	**m a.s.l.**																
GN 850/2784	*gaponii* sensu stricto	San Lorenzo	900																
TS 2369	*gaponii* sensu stricto	Villa Las Rosas	1015																
Flowering period of *Gymnocalycium gaponii* sensu lato.																			
Field number	**Species**	**Locality**	**m a.s.l.**																
TS 0499	*gaponii* sensu lato	Taninga	991																
TS 0500	*gaponii* sensu lato	Panaholma	991																
TS 1274	*gaponii* sensu lato	Panaholma	1028																
TS 1721	*gaponii* sensu lato	Panaholma	1005																
Flowering period of *Gymnocalycium gaponii* subsp. *geyeri*.																			
Field number	**Species**	**Locality**	**m a.s.l.**																
GN 1679/5039	*gaponii* subsp. *geyeri*	La Sierrita	1664																
TS 1270	*gaponii* subsp. *geyeri* aff.	Ámbul	1150																
Flowering period of *Gymnocalycium gaponii* subsp. *occidentale.*																			
Field number	**Species**	**Locality**	**m a.s.l.**																
TS 0828	*gaponii* subsp. *occidentale*	El Potrero	1169																
TS 1030	*gaponii* subsp. *occidentale*	El Potrero	1095																
Flowering period of *Gymnocalycium gaponii* aff.																			
Field number	**Species**	**Locality**	**m a.s.l.**																
TS 0838	*gaponii* aff.	Agua del Tala	1067																
TS 0489	*gaponii* aff.	Agua del Tala - La Mudana	1188																
TS 1173	*gaponii* aff.	Agua del Tala - La Mudana	1188																
TS 0490a	*gaponii* aff.	La Mudana	1258																
TS 0493	*gaponii* aff.	La Mudana	1196																
TS 0494	*gaponii* aff.	Piedritas Rosadas - La Mudana	1193																
TS 0832c	*gaponii* aff.	Piedritas Rosadas	1186																

Tab. 6: Comparison of flowering periods of the species investigated, Basel in the year 2025.

G. taningaense sensu stricto, *G. taningaense* sensu lato, *G. gaponii* sensu stricto, *G. gaponii* sensu lato as well as *G. gaponii* subsp. *occidentale* and *G. gaponii* aff. populate similar altitudes. The localities of *G. gaponii* subsp. *geyeri* are situated at a clearly higher altitude than those of the other representatives of the *G. gaponii* and *G. taningaense* family.



Tab. 7: Comparison of the species' altitudes.

- P 212 = *G. taningaense* sensu stricto
- TS 1729 = *G. taningaense* sensu lato
- GN 850/2784 = *G. gaponii* sensu stricto
- TS 0500 = *G. gaponii* sensu lato
- TS 2086 = *G. gaponii* subsp. *geyeri*
- TS 0828 = *G. gaponii* subsp. *occidentale*
- TS 0489 = *G. gaponii* aff.

The differing features (highlighted red) of the *G. gaponii* sensu stricto, compared with the *G. gaponii* sensu lato, are illustrated in the following chart.

Field Number	Species	Body	Spine Type	Spine Position	Spine Colour	Central Spines	Petals	Pericarp	Filaments	Style	Ovary	Seed	Cuticula	Hilum
GN 850/2784	gaponii s.s.(type)	dark green	slightly elongated and somewhat hard	resting on the body	grey to horn-coloured with a reddish-brown base	0(-1)	white to gleaming rose-coloured	rose-coloured	yellow	greenish-yellow	wide	large	coming-off clearly	narrow to slightly wide and drop-shaped
TS 2075	gaponii s.s.	light to dark green	elongated and somewhat hard	protruding in a scattered manner	greyish to horn-coloured,red-brownish towards the base	0-1						large	coming-off	very narrow, drop-shaped
GN 851a/4200	gaponii s.s.	light to dark green	short and needle-like	resting on the body	greyish, reddish towards the base	0	overall white	rose-coloured	yellowish with a rose-coloured base	greenish-yellow	narrow to slightly wide	large	coming-off	extremely narrow and drop-shaped
TS 0499	gaponii s.l.	dark green to greyish	hard to needle-like	resting on the body	yellowish to horn-coloured with a red-brownish base	0	overall white	rose-coloured	yellowish with a rose-coloured base	greenish-yellow (with a rose-coloured base)	narrow to wide	large	coming-off clearly	small and drop-shaped
TS 1270	gaponii s.l.	light green	needle-like	resting on the body and slightly intertwined	white-yellowish without a darker base	0	overall white	intensively rose-coloured	rose-coloured	greenish-yellow with a rose-coloured base	narrow to wide	large	coming-off	relatively narrow and drop-shaped
TS 1721	gaponii s.l.	dark green	delicate and short	resting on the body	greyish to horn-coloured with a reddish-brown base	0	overall white	rose-coloured	yellowish with a rose-coloured base	greenish-yellow with a rose-coloured base	narrow	large	coming-off	
TS 0500	gaponii s.l.	medium to dark green	delicate and short	resting on the body (slightly intertwined)	white to greyish with a reddish-brown base	0-1	white (to delicately rose-coloured)	rose-coloured	rose-coloured	greenish-yellow to rose-coloured	narrow to slightly wide	medium large	coming-off clearly	very small to medium large
TS 1274	gaponii s.l.	medium to light grey green	needle-like and elongated	resting on the body (slightly intertwined)	yellow to whitish-grey with a reddish-brown to light brownish base	0	white (to delicately rose-coloured)	intensively rose-coloured	rose-coloured	yellowish (with a rose-coloured base)	narrow to slightly wide	medium large	coming-off	narrow drop-shaped

Tab. 8: Differing features of *G. gaponii* sensu stricto and sensu lato.

Comparison and next steps

Large areas in the regions west of the Sierras Grandes and the Sierra de los Comechingones are undeveloped, as there are neither streets, dirt roads, footpaths nor settlements. Thus potentially new cacti localities can hardly be reached. It would not come as a surprise if a lot of additional *Gymnocalycium gaponii* localities existed with plants possessing slightly differing features (fig. 280).

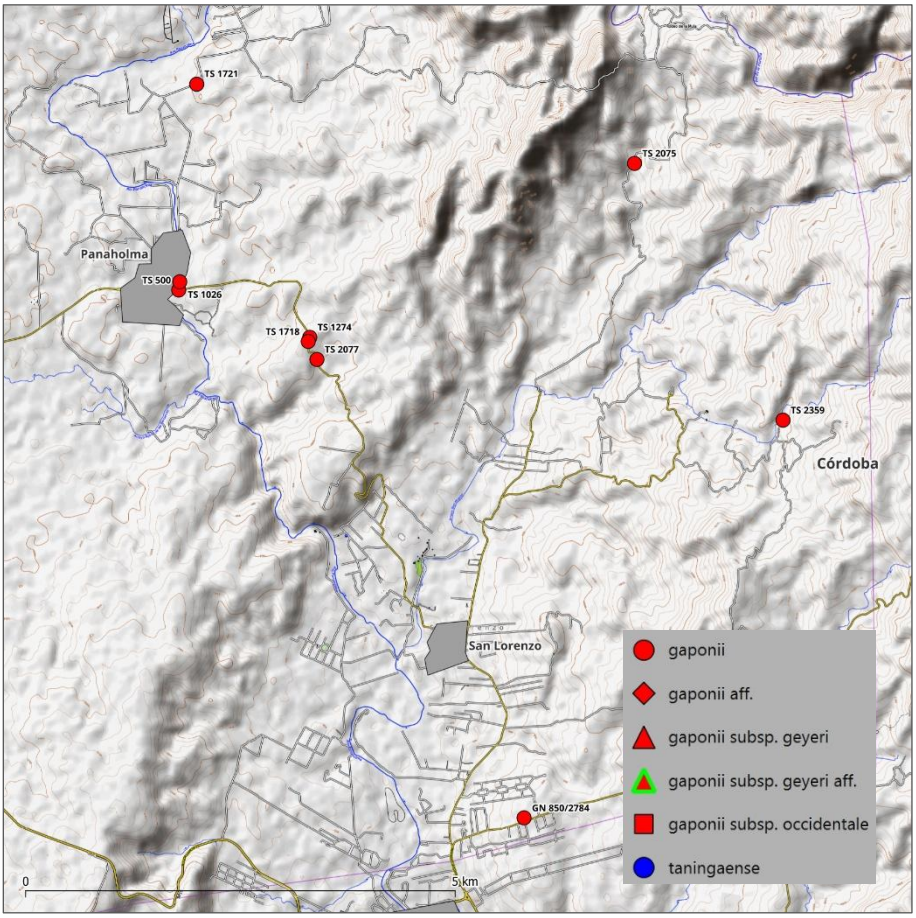


Fig. 280: Looking at the region around Panaholma it becomes apparent that large areas are undeveloped as streets or dirt roads are missing.

The species *G. taningaense* and *G. gaponii* from the subgenus *Gymnocalycium* were described in a small area with a north-south extension of about 120 km.

G. gaponii and *G. taningaense* from the type localities can be told apart easily. Plants which take an intermediate position concerning habitus and flower features of both species grow in the vicinity of the type localities.

All investigated plants belong to the subgenus *Gymnocalycium* and have a diploid = 2n chromosome set.

All investigated plants possess a similar flowering period and populate a uniform habitat.

Morphology, the visual assessment of plant features reached its limits a long time ago.

By identifying ploidy levels we could gain new insight in many places. However, this is not the case with *G. taningaense* / *G. gaponii* since both of them have a chromosome set of diploid = 2n.

As a next step we intend to analyse the DNA of the plants to determine the relationships of the species and to depict them in a phylogenetic tree.

From the phylogenetic tree we hope to deduce if the type plants of *G. taningaense* and *G. gaponii* are extreme forms of an identical species. If this should not be the case, either the first descriptions will have to be emended or several new species/subspecies or varieties will have to be described.

EXPLANATION OF TECHNICAL TERMS

Ovary:	Bulging part of the pistil in which the seed is developed.
Hilum:	Place where the seed is attached to the seed-bearing device respectively the fruit
Pericarp:	Cup-shaped encasement of the ovary
Ploidy:	Number of chromosome sets in one nucleus
sensu stricto:	In a narrow sense
sensu lato:	In a wider sense

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