

# THE CHILEANS '95

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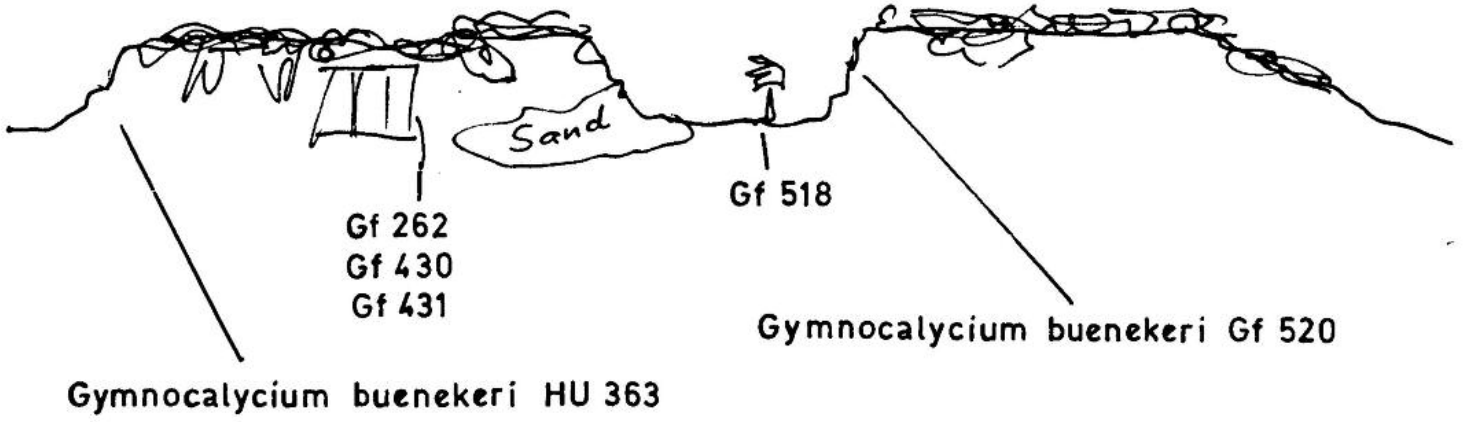
*Gymnocalycium buenekeri*

SAO FRANCISCO DE ASSIS

Site 1

Site 4

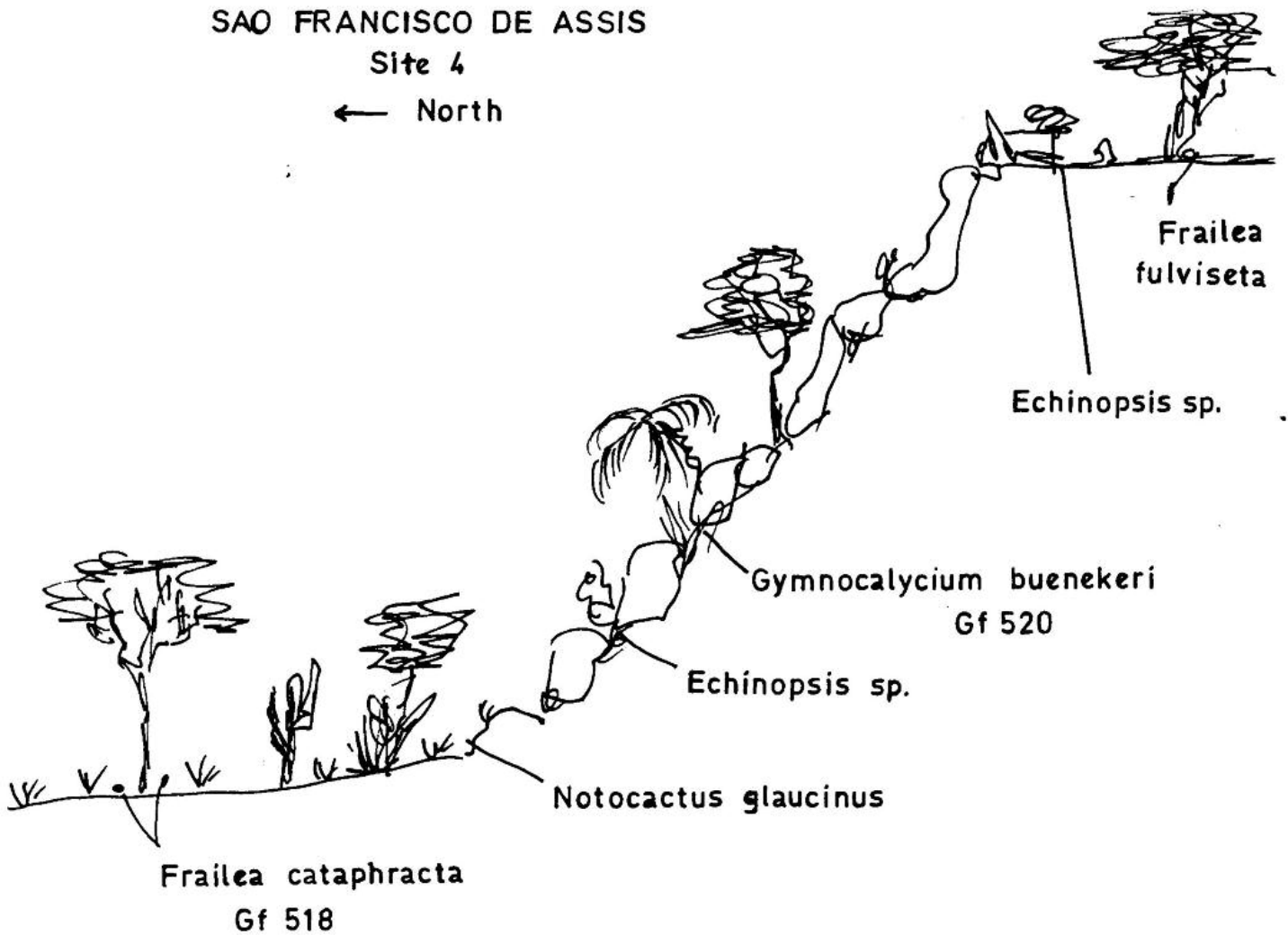
← North



SAO FRANCISCO DE ASSIS

Site 4

← North



Sketches - N.Gerloff

## GYMNOCALYCIUM BUENEKERI From A.Hofacker

In the course of my visit to Rio Grande do Sul it was possible to look for the habitat of *Gymnocalycium buenekerii*. This is not far from San Francisco de Assis and it is the only known habitat locality of this species. My original reason for visiting this particular spot was to study the type locality of *Frailea fulviseta*, but my travelling companion was more anxious to see *G.buenekerii*. Now I have seen this plant in habitat I would also come here to see *G.buenekerii*.

The location of *G.buenekerii* is on a mountain with almost vertical sides and an absolutely flat top. The *Fraileas* only grow on the flat top and the *Gymnocalyciums* only grow at the sides. On the top there grows only grass and some bromeliads. Below the almost vertical sides is a rocky slope which is not exceptional, as we are here talking about a rocky slope of the type which occurs by the thousands in Rio Grande do Sul. Here there are stones and boulders between 20 cm and 2 m across. Among the stones grow tall bunches of grass and moderately high trees and shrubs. Sometimes they grow close together like a copse but at other places they grow quite open. Mostly the vegetation is too dense for cacti to grow. The actual spot where *G.buenekerii* is found is most unusual. The large stones are only partially embedded in the earth so that they overhang the immediately surrounding ground. In places the stones touch each other leaving a passage between their overhanging parts. The *G.buenekerii* grows underneath these overhanging parts of the stones and boulders. We have never seen such an unusual growing location for any other sorts of cacti. A most remarkable habitat, as the plants receive barely any sun at all. However, within the immediate surroundings of this habitat, these were perhaps the only spots where the plants could have some possibility of survival. The substrate here is very fine sandy soil with barely any humus content. These plants are in a poor condition and look rather like potatoes; there were neither flowers nor remains of flowers to be seen.

In addition to this Type location, there exists at least a second habitat locality in the immediate vicinity where this species can be found growing. In spite of this, one can certainly not speak of there being several habitats, but simply a larger, more widespread population than was previously known to exist. Only very few plants remain growing at the place where the Type was collected. This factor, together with the manner in which the plant grows in the wild, are probably the reasons why it has only been discovered in habitat by very few collectors.

As to the frequently mentioned distinguishing feature with regard to the differentiation of *G.buenekerii*, namely a rough (velvety) epidermis, compared with the smooth body of *G.horstii*, the author could find no basis for this argument. The two forms of epidermis can be developed in both taxa, both even being displayed by plants growing next to one another at the same location.

For a long time I had problems distinguishing between *G.horstii* and *G.denudatum*; they grow close besides each other at least at one location. Now that I have studied the first description of *G.horstii* by Buining I do believe that I know the difference between *G.horstii* and *G.denudatum*.

Not far from Minas do Camaqua we visited one location of *G.horstii* when we were descending into a valley, down sloping sides which were not really very steep. There were grasses, bushes, and trees here too, although the trees were probably rather shorter. There were very few stones around, perhaps a certain amount of gravel, and the ground was almost flat. We always found the *Gymnos* growing under low bushes in a sort of half-shadow. The bushes grew up to two metres in height and to be able to see the *Gymnos* you had to pull the branches to one side. There were clumps of *G.horstii* which occasionally attained a diameter of about one metre, with individual heads becoming up to 15 to 20 cm broad; we also saw a few flowering plants. Close to Minas do Camaqua is the habitat location for *G.horstii*, but we have not been at the original habitat location. At this site we also found *Notocactus neobuenekerii*, a form of *N.ottonis*, *N.uebelmannianus* and *Frailea phaeodisca*.

Near Cordilheira a flat stretch of rock rises from the flat pampa, at the edge of a broad valley. Here we found *Notocactus scopa*, *N.ottonis*, *N.linkii*, as well as *Gymnocalycium horstii* AH 67. This is an interesting discovery, not least because this location occurs outside of the area of distribution of *G.horstii* known to date. In addition, the plants also display a few peculiarities as regards their habit. This plant (AH 67) is very rare and grows scattered around at the margins of a small pond, in the shade of rocks. This population is likely to have been wiped out since its discovery, because the rocks in the immediate vicinity were being quarried for use in road construction. It remains to be established whether or not any further plants may be found growing elsewhere where this rock outcrops. Amongst its features, the reddish to red-brown buds are striking. This red colouration is retained up until the buds reach 1 cm or so in length and thus is very noticeable. The plants appear to grow slowly and evidently offset only sparingly. Whether or not this form also displays differences in its fruit and seeds was difficult to establish since they rarely flower, as is generally the case with the not very free-flowering type of this species. But plants of AH 67 in my travelling companion's collection have now set seed, which are quite like those of *G.denudatum*.

Both at the habitat of *G.buenekerii* and of *G.horstii* the bedrock was sandstone.

.....from H.Middleditch

The above contribution came with one or two excellent photographs of the plants in habitat and their immediate surroundings. These were on display at the 1993 Chileans' Weekend.

It is suggested by A.Hofacker that both matt and glossy bodied plants were found at the habitat locations of both *G.buenekerii* and *G.horstii*. Does this comment apply to all three locations, i.e Sao Francisco de Assis AH 219, Minas do Camaqua AH 89, and Cordilheira AH 67?

.....from A.Hofacker

At each of these locations the epidermis we have seen is variable. so that you cannot say that *G.horstii* always has a pale or glossy epidermis. It varies. In my opinion it is not possible to differentiate between *G.horstii* and *G.buenekerii* on this basis.

.....from H.Middleditch

But could this not be accounted for by both *G.horstii* (glossy epidermis) and *G.buenekerii* (matt epidermis) growing at all three locations? This could be settled by the seed collected at one site from plants with the two sorts of epidermis.

.....from A.Hofacker

We have not seen any plants with fruits in Nature.

.....from G.Charles

When imported plants were coming into this country in fairly large numbers, there were specimens of *G.buenekerii* to be seen by the dozens in many cactus nurseries in this country. When talking to A.Hofacker, he did express appreciable surprise at this on account of this plant only being seen in quite small numbers in habitat. However if very great numbers had been removed from habitat it is not altogether surprising that those which were left tended to be growing in fairly

small numbers and in partially hidden spots. Having had a few imported *G.buenekeri* for several years now, my own experience is that they do not set fruit readily in cultivation, just as A.Hofacker reports from the field. For many years now I have crossed a lot of flowers on several plants of *G.buenekeri*, always without any success in setting fruit. However, after I had cross pollinated flowers on two old imported *G.buenekeri* this year, two fruits were set on one plant and nothing on the other plant. The fruits certainly are quite surprisingly large.

....from M.Meregali

Two years ago I was able to visit the collection of K-H.Prestle where I could study some particularly interesting *Gymnos* he had found in Rio Grande do Sul. Subsequently I was also able to obtain seed from some of these plants. Amongst these was some seed of PR 437 which Prestle had included in with *G.horstii*. But the seed leaves no doubt that this PR 437 is from a population of *G.buenekeri* which was collected at Encruzilda, not far from Cacapava. There are some small differences in this seed, for example the cuticle is black and matt whereas that of the typical seed of *G.buenekeri* has a reddish and glossy cuticle. But apart from the HU *G.horstii* it has proved almost impossible to obtain seeds from plants of *G.horstii* - very strange indeed. On the other hand it can be very difficult to distinguish between *G.horstii* and *G.denudatum* either by external morphological characters or the flower. The plants of *G.horstii* which are in general cultivation all come from only one or two populations.

From the plants which I have seen in Prestle's collection, and from other collectors who have been to Rio Grande do Sul, there is a conspicuous variability in the *Gymnos* from there, not only in body habit but also in the flowers. Usually the plants of *horstii* have a pinkish flower, but they can also be a whitish colour. Sometimes the body is almost matt. The flower on *G.denudatum* can have a thicker or a slender tube, bodies can be with five flat ribs up to eleven tuberculate ribbed forms, particularly in the north-eastern part of the province. Some of these plants you would never take to be *G.denudatum*. And there are also morphological intermediates between *denudatum* and *uruguayense*. The region around Livramento and Alegrete is particularly rich in unusual forms. They can, however, be separated by the seeds.

### **GYMNOCALYCIUM HORSTII and GYMNOCALYCIUM BUENEKERI IN HABITAT. By N.Gerloff Translated by H.Middleditch from Frankfurter Kakteenfreund 1/93**

First of all I familiarised myself with the references to these *Gymnos* in the literature, as I prefer to keep a methodical record of my own discoveries and my impressions of travelling in cactus habitats. This study of the descriptions threw up some questions, which we clarified with the help of some *Gymno* friends. Nevertheless I am inclined to hold the view that I regard both aforementioned species as particular developments of *G.denudatum* Pfeiffer and whose taxonomic value has been accepted only with a shrug of the shoulders. For me the undoubted existing differences in body characteristics are of less material weight than the real and evident difference in relationship of the habitats in comparison with *G.denudatum*.

I have found *G.denudatum* at many places almost always drawn down into the ground, in colonies of around a dozen plants, which have produced still more offsets. These plants are quite widely distributed in the southern Brazilian state of Rio Grande do Sul. Whilst *G.horstii* grows in the midst of the distribution area of *G.denudatum*, *G.buenekeri* only occurs further to the west, from an area where no plants typical of *G.denudatum* are known to me.

I found *G.horstii* Buining 1970 at a spot 5 to 6 km distant from Minas da Camaqua in three colonies. In general these were in well hidden locations in rock crevices over a stretch of several metres. This had already been alluded to by Buining (1970). My field number Gf 175 applies to two colonies which grow 15 m apart at the foot of a rocky eminence the height of a house. The third clump was found at a distance of 100 m away in a similar situation on another rocky outcrop.

Around and upon these rocks I found three different *Notocacti*, *G.horstii*, an *Echinopsis* sp. with pink-coloured flowers and any amount of *Tillandsia lorentziana*. Close besides the three colonies of *G.horstii* there grows in the earth *G.denudatum*, adjacent to *N.uebelmannianus*. The location is so well hidden by bushes the height of a man, that a Brazilian friend who had repeatedly gathered seed from *Notocactus neobuenekeri* from this spot over a period of ten years, had not come across these *Gymnos*.

According to Buining, *G.horstii* differs from *G.denudatum* on account of:

- the taller, rounded body, with five ribs
- the more robust and more widely spreading spination
- the rounder and stouter fruit with slower ripening of the fruit

The pink coloured flowers mentioned in the original description prove to be as variable in 20 years of cultivation as when first noted. Swales (1978) mentions as additional body features the deep green and shiny epidermis of *G.horstii* as differentiating it from *G.buenekeri*. That is however a characteristic which in cultivation under similar conditions soon allows of verification, as in Nature, where it is often found in colonies in different conditions. Thus I found the first colony of Gf 175 on an anthill. Those plants were pale green and not so sturdily spined as the seedlings documented by Heyer in K.u.a.S. 37(9) 1986.

There is a problem when trying to photograph the flowers of the *G.denudatum* group. Either one selects a camera setting to suit the flowers, when the details of the body are lost by under-exposure, or with a setting midway between the requirements for the flower and the body, which gives too little contrast for the pale petals.

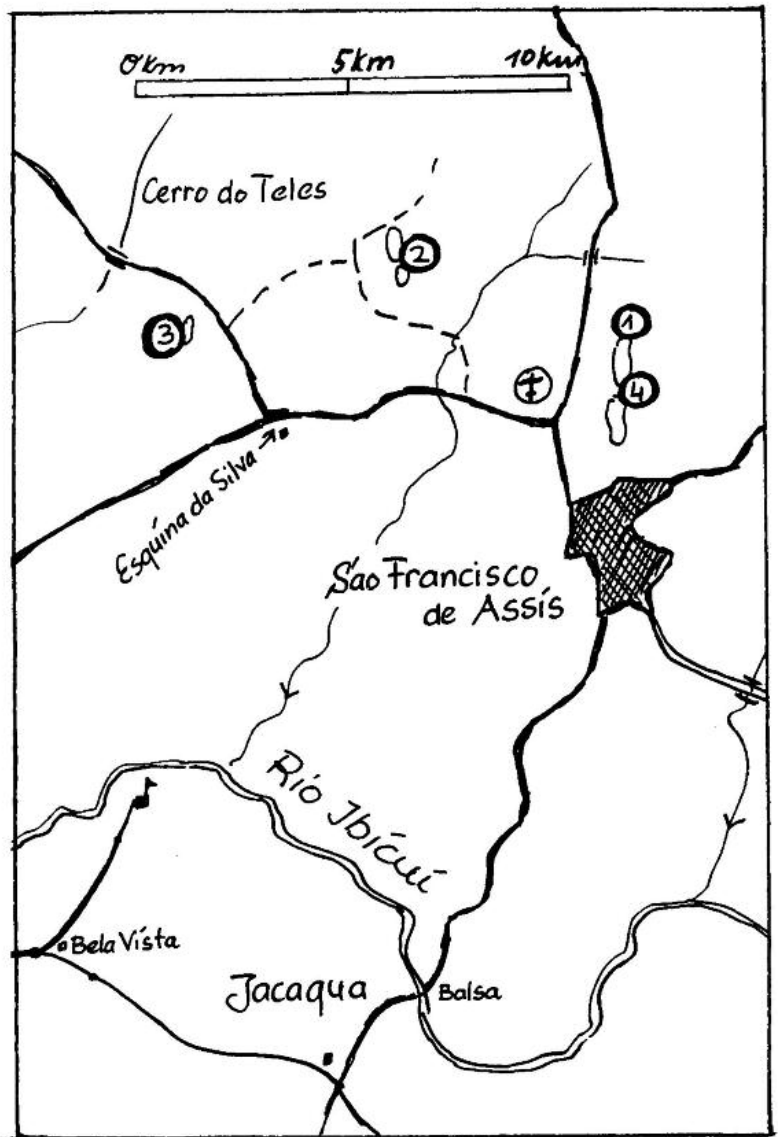
In 1989 a Brazilian friend found a clump of *G.horstii* in the company of *Notocactus scopa*, *N.linkii*, and *N.ottonis*, near Cordilheira. In 1990 I gave this plant my field number Gf 105 with the provisional name of *G.denudatum* as the spination was similar to *G.denudatum* and no fruit was to be found. I brought back with me only two small offsets, which after two years had still not flowered. But the same material had already flowered for a fellow-collector in 1990 and he identified it as a form of *G.horstii*. In 1991 my own plants also put out typical buds and flowers. The flowers were a disappointment since the pale pink was transformed after a couple of days into almost white. The flowers lasted approximately for one week. On the last day I was still able to cross pollinate them and obtain a fruit. This has now convinced me that this plant is a *G.horstii*. It is the northernmost location of this species.

Long after the fruit of *G.denudatum* (which only grows to a spindle shape) had fallen off, on *G.horstii* the fruit still stood on the plant. It was up to 2 cm long and 1.5 cm in diameter, then it split lengthways and exposed the abundant pale fruit flesh between the dark seeds, just as Buining had described.

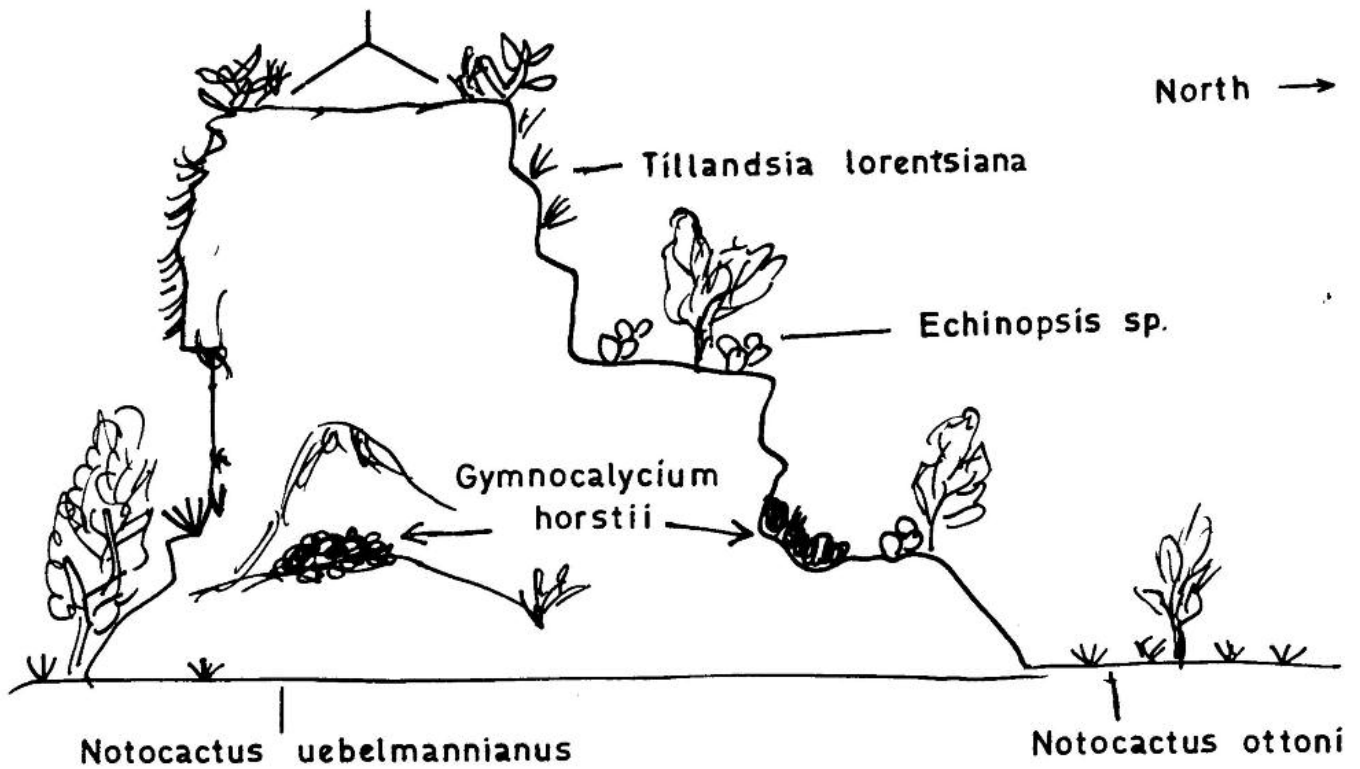
The plant with the field number HU 363 had already been described by A.Buining in 1970 as a variety of *G.horstii*, but not documented by an illustration. That was not in accordance with Article 37 of the ICBN Regulations at that date. Hence the fact that *G.horstii* v. *buenekeri* was a *nomen invalidum* proves to be convenient, since the observations by

Map - N. Gerloff

Numbers in circles are site locations for *Gymnocalycium buenekeri*



*Notocactus neobuenekeri*



Swales about a decade later encouraged him to describe the plant at the taxonomic level of species. He quoted the following differences for *G.buenekeri* from *G.horstii*:

- a matt epidermis (wax-like)
- a more intensive flower colour (deep pink)
- the longer style with female flowers
- a shorter flower-opening time, only two or three days
- different seed characteristics

The seed of *G.buenekeri* was stated by Buining to be distinctly smaller than that of *G.horstii* and he also placed it close to that of *G.mostii*. That is not borne out by the excellent SEM photographs of Swales (1978). Both almost naked Gymnos belong in the Macrosemineae seed group as does *G.denudatum* and its related *G.uruguayense* and *G.netrelianum* from Uruguay.

Also *G.buenekeri* does not grow drawn down into the ground, but in clefts in the rocks and between stones half way up the mountain near Sao Francisco de Assis. Sometimes it is also to be found under bushes or in rock crevices. I do not know the habitat myself, but am able to rely on the notes and slides from three friends who have been there. In 1991 Konrad Herm took photographs of the habitat location and of the plants - HU 363. At that time most of the plants were partially perished or in such poor condition that it was not worth the risk of taking even a single voucher specimen. There is finally sufficient propagation of it by Kurt-Ingo Horst in Arroio da Seca, as also of *G.horstii*, HU 79. A well-known Dutchman has also found *G.buenekeri* on another mountain some 20 km away, near to Sao Francisco de Assis.

On the original mountain habitat there grows *Frailea fulviseta* Buining and occasional *Notocactus glaucinus v.gracilis* in company with *G.buenekeri*, whilst at the newly-found habitat the *G.buenekeri* grows together with an as yet unidentified, columnar *Frailea*. Both sorts should not be overwintered quite so cool as the *Notocacti*, which easily tolerate a minimum temperature of +5°C. I believe, therefore, that the winter temperature recommended by Buining of 12-15°C is struck a little too high, since in their natural habitat they must endure colder days. In our collections both Gymnos can be propagated true to type by seed only with the greatest difficulty. The question was posed by F.Strigl (1975) "Why does *G.horstii* not set seed?". It may perhaps be due to the first plants of HU 79 being of one clone. On the other hand, seeds of *G.buenekeri* are often to be found in lists from seed distributors and from cactus-fanciers.

Both species are not always five ribbed. Occasionally the offsets of these five-ribbed plants have one extra rib, which may be the influence of feeding (Heyer, K.u.a.S. 37(9), 1986). There are also 4 ribbed specimens of *G.horstii* in collections. Even when out of flower, these plants with their geometrical bodies are eye-catching in any collection.

.....from H.Middleditch

This contribution was received together with excellent photographs of the habitat location, the plants, and a flower section taken at the spot. These were also on display at the Chileans' 1995 Weekend. The "well-known Dutchman" who found yet a further location for *G.buenekeri* was L.Bercht, who showed slides of the plants there at our 1995 Weekend.

.....from J.Arnold

The writer mentions the variation observed in the colour of the flowers on *G.buenekeri*. My plants of this species which were received as ex-habitat offsets produce flowers with wide petals of a pinkish colour. In addition I have three seed-grown plants of LB 584 *G.buenekeri*, which have flowers of a darker hue - a more salmon colour - and with longer, thinner, petals. Somewhat surprisingly it has not been possible to set fruit on these LB 584 plants despite active use of the brush on several occasions! It is difficult to understand this as there appeared to be copious pollen; although the stigma was well down the filaments it could be seen easily.

Flowers do appear on *G.buenekeri* on plants only one inch across, whereas my *G.horstii* flowering for the first time is 4.5 inches across. This *G.horstii* came to me as an offset from a supposedly ex-habitat plant and it does display the bright shiny dark green body as one expects to see. In addition I have obtained several seedlings of *G.horstii* HU 79 which have a duller and more yellowish green body so that they look very much like *G.buenekeri*; in consequence I am suspicious that these are of questionable or hybrid origin.

.....from H.Middleditch

But might this not be a reflection in cultivation of the above habitat observations about body colour not being absolutely consistent?

.....from G.J.Swales

The comment made by N.Gerloff that *Gymnocalycium horstii* is reluctant to set seed, is one that I would agree with wholeheartedly from my own experience. There are quite a few plants of *G.horstii* in my collection and I suppose that each plant will produce two or three flowers every year. But at no time do I recollect having any ripe fruit. On one occasion it did appear that a fruit had set, but this fell off the plant after a short period of time and an examination was found to be quite empty of seed.

.....from N.Gerloff

Between Christmas 1992 and New Year I finally had an opportunity to see the habitat of *G.buenekeri* for myself. Starting from Porto Alegre, we travelled via Bossoroca and Jaguari to Sao Francisco de Assis. Here we made our way out to the mountain on which *G.buenekeri* grows. As we approached closer to this location, it became clear that the mountain was really comprised of two parts. The southern part is effectively surrounded by a broad zone of sandstone. We walked a good kilometre around this belt of sandstone and first ascended the lower, northern, portion of the mountain. Here we found *Notocactus megapotamicus v.crucicentrus* (GF 261), *N.fuscus* (GF 263) and *N.glaucus v.gracilis*. However, we did not find a single *Frailea* there. We then crossed over to the second peak, and after only a few metres of ascent we found the rare *G.buenekeri* (GF 260) growing in large numbers and in good condition. After the thirtieth colony we gave up counting.

.....from H.Middleditch

In his article (above) N.Gerloff observes that "*G.horstii v.buenekeri* was a nomen invalidum ... because it was not documented by an illustration ... thus it was not in accordance with Article 37 of the ICBN requirements at that time." Is this statement correct?

.....from G.J.Swales

My copy of the ICBN Rules is the 1972 issue. The Article 37 requires that on or after January 1958 the publication of a new species is only valid when the nomenclatural Type is indicated. Neither in Article 37 nor in Recommendation 37a is there any specific requirement for an illustration to accompany the publication of a new species. In Article 37 there is a reference to Articles 7 to 10 inclusive, but in none of these latter is there any specific requirement for an illustration to accompany the publication of a new species.

The original description of *G.horstii* in K.u.a.S 21.9; 1970 states that the Type species was deposited in the herbarium of the University of Utrecht. Under the heading of *G.horstii* v. *buenekeri*, there is no reference to any Type specimen having been provided.

.....from H.Middleditch

But does that preclude all possibility of a Type specimen of *G.horstii* v. *buenekeri* having been deposited.

.....from G.J.Swales

Not necessarily.

**AT THE HABITAT LOCATION OF GYMNOCALYCIUM BUENEKERI By W.Gemrich and N.Gerloff.  
Translated by H.Middleditch from Gymnos 12.23;1995**

By the Easter of 1994 we had succeeded in locating three habitat populations of *G.buenekeri*, more than the well-known collectors Leopoldo Horst, A.F.H.Buining, and F.Ritter. These locations were as follows:-

First location: 4.5 km north of Sao Francisco de Assis. This is the classical Type location for HU 363. The nearest table mountain lies 3 km to the north of the town; it was not thoroughly searched by us. The second table mountain is about 1 km in length, rising about 10 m above the surrounding pasture land at the north side and about 20 m above at the south side. *Gymnocalycium buenekeri* grows only at the one place on the northern flank of this table mountain, at 2 to 3 m above the pasture land, between large boulders. The surroundings of this habitat location and the following one are very similar. The boulders are of sandstone of about 50 cm to over 2 m in size and are not easy to get over. Growing at the lower part of the scarp where there is plenty of earth there grow bushes, trees, groups of *Cereus*, *Dyckias* and grasses. This residual population of *G.buenekeri*, difficult to find, consists of barely 15 clumps, displaying fire damage, and extending over some 50 square metres, about one thousandth of the scarp around the table mountain. This explains how some collectors have searched here in vain. Even in October 1994 one search was only successful at the end of six hours, because his travelling companion on his third visit to find this plant would not give up the search with nothing to show for it.

The epidermis colour varies from pale green to dark green, without recognisable correlation to any one habitat location. Perhaps the grey waxy coat on the epidermis becomes more substantial in full sun. One very old specimen of 14 cm diameter and 25 cm long had 7 ribs, whilst the offset from this plant had only the customary five ribs. Roughly 1% of the plants had 4 ribs. Field numbers HU 363, AH 219, WG 63. On 26 October most specimens had buds about a centimetre long. At the time of the visit in December, plants were photographed in flower. At Easter not a single fruit was to be seen. But there were ants, termites, and birds at each of the habitats. As to other cacti at this site, *Frailea fulviseta* grows - but sparsely - on the flat top whilst *Notocactus glaucinus* v. *gracilis*, *Echinopsis oxygona*, and a bromeliad with red topped leaves, grow almost everywhere around the sides of the mountains.

Second location. Once again this was a twin table mountain. The site lies some 15 km WNW of Sao Francisco de Assis. It was visited by W.Gemrich on 7.12.92, 29.12.92, 30.3.94, and 29.10.94, with a travelling companion. Here is *G.buenekeri* Gf 260 = WG 63. On the more northerly of the two table mountains grows *Notocactus fuscus* GF 263 = WG 64, *Notocactus megapotamicus* Gf 261 = WG 66, *Notocactus glaucinus* v. *gracilis* Gf 262 = WG 65, and *Cereus alacriportanus* Pfeiffer. The mountain is only 4 to 8 metres higher than the surrounding pasture land, but only capable of ascent at one point, over a rock fall.

The southern table mountain is altogether higher, up to 15 m, but smaller in area. At the foot of the southside of this mountain there is to be found a deep half-moon shaped sand bed, which is visible from a considerable distance away. Numerous groups of *G.buenekeri* grow on the NW corner of this mountain and some on the NE corner, even close to the meadow there, between large boulders or in crevices. Many plants occur deep inside crevices or under the overhang of boulders so that they receive at the very most only one hour of sunshine per day. Some of them are even in complete shade. Only *Notocactus glaucinus* v. *gracilis* is also to be found here. The almost horizontal mountain top carries no cacti. Of *G.buenekeri*, open flowers of both gender, with a strong tinge of red, and up to 8 cm in diameter, were recorded in December 1992. At this spot only 5 ribbed plants were found, with only two exceptions out of some 50 clumps. At each location the spines (radial spines) are white to grey, usually 3 to 5 in number. The globular fruit is steel blue, 2 to 3 cm broad and is slow to ripen.

The third habitat location is the most westerly for this species of *Gymnocalycium*, where WG 50 = LB 584 originated and LB 586 somewhat more to the north. This is a small table mountain about 20 km WNW of Sao Francisco de Assis. The growing place is still quite open. The grass and small bushes offer just as much shade as the larger boulders. *Notocactus glaucinus* v. *gracilis* WG 49 grows almost everywhere, even in the surrounding meadowland. *Notocactus fuscus* WG 51 grows on the flat top of the mountain and on an adjacent table mountain which is 75% surrounded by marsh. *Frailea gracillima* WG 52 = LB 558 is to be found on the flat top in small numbers.

Of *Gymnocalycium buenekeri* there were not many specimens here, only 4 or 5 clumps amounting to some 20-25 plants. Here the colour of the epidermis is a real dark blue green, but some are paler green. At all three locations plants were seen that had already survived fire. In the late Brazilian summer it is customary to set fire to the dry grass to encourage growth of fresh green grass.

.....from H.Middleditch

The greater part of this account, together with one or two pieces of data which did not appear in the foregoing publication, were received as part of the following contribution. For convenience of reference, this additional information has been incorporated at the appropriate point in the above text.

.....from N.Gerloff

Over the Easter of 1995 I was able to pay my fifth visit to Rio Grande do Sul, this time in company with A.Nilson and M.G.Hamester. In the forefront of our interests were *Notocactus* and *Frailea*. This trip brought us on 13 April in to the area of Sao Francisco de Assis, where the rare *Gymnocalycium buenekeri* grows. It was the fourth time I had been to this area. For M.G.Hamester it was the sixth time since 1988 that he had been here, with other collectors. On the last occasions in 1992 and 1994 it was a weeklong stay with W.Gemrich in order to study *Notocactus fuscus*.

In the previous December of 1994, W.Gemrich and M.G.Hamester spent from 10.00 a.m. to 6.00 p.m. at this spot where *G.buenekeri* had first been found. At this juncture my opinion regarding the safe publication of precise habitat location data can be expressed, since this example demonstrates that it is nevertheless still very time consuming to find the correct spot. During this search their driver stopped with the vehicle, parked in the shade under a tree which rose from

the meadow between the two table mountains. At one point during this wait he saw a small plant deceptively reminiscent of *Frailea cataphracta* WG 77 = Gf 518. One objective of my trip to this region was the recollection of this small plant, whose occurrence here is truly a sensation. Normally *Frailea cataphracta* grows about 400 km further north in Paraguay.

It was late afternoon before we arrived at the Hacienda. The necessary work was rapidly accomplished, as the well known *Frailea* collector K-H Prestle had been there only about two weeks prior to our own visit and had hung a soft-drink can on a tree at the spot where the *Frailea* was to be found. Now we had time in hand to go and thoroughly investigate the north flank of the mountain lying some 3 km north of Sao Francisco de Assis. First I made a record of the variability of the *Echinopsis* at that spot, at the request of H.Middleditch, whilst my two travelling companions climbed a few metres up the side of the first mountain. After a few minutes they met with the first clump of *Gymnocalycium buenekeri* Gf 520 at 5 m up the slope under a palm. It was also noticed that one only needed to search where this small palm grows - of 7 clumps that we found within quarter of an hour, 5 of them stood under the shade of this palm. Most of the plants were in poor condition. The plants had gone partially corky, and partially coated with blotches, so we had difficulty in finding one presentable specimen for the [Porto Alegre] herbarium. Most of these plants had five ribs, only two offsets had four ribs. In association with *G.buenekeri* grows here at this fourth habitat location, *Notocactus glaucinus v.gracilis* Gf 521, *Cereus alacriportanus* Gf 519, and the very variable *Echinopsis oxygona* Gf 522. With our fourth habitat location the distribution area for *G.buenekeri* is now established from mountains which are all situated to the north of the R.Ibicui.

On this same day we were obliged to travel south of the R.Ibicui for almost 150 km over dirt roads, taking about six and a half hours from Manoel Viana towards Cacequi. Unfortunately a bridge over the river near Jacaqua, south of Sao Francisco de Assis, had been carried away only two months previously by a flood. That forced us to make this diversion. On that account we went through an area which has as good as never before been traversed by any cactus collectors. Near Jacaqua we saw on the north side two large mountains which rose 60m above the plains. I strongly suspect that *G.buenekeri* may be found on their northern flanks under the small palms.

Plants of *G.buenekeri* are still offered for sale by the major European nurseries. They have a matt, pale green epidermis and pink flowers. The intensity of the pink colour of the flowers in habitat amazed W.Gemrich and he was disappointed at the decidedly pale flowers produced by the same plants in cultivation in Europe. But for the last ten years *G.horstii* has been offered neither as plants or seed; even ex-habitat plants do not set seed in cultivation.

.....from H.Middleditch

In the foregoing accounts there is only one reference to *Cereus* growing at the same location as *G.buenekeri*. Does this mean that this is a solitary and unusual occurrence?

.....from L.Bercht

To the best of my recollection, there were no columnar cerei growing in the vicinity of the rocky slope where we found *G.buenekeri*. There were flatter rocky patches which occurred at various spots in the pasture land around the table-top mountains. It was here where *Notocactus fuscus* was frequently to be found, as well as numbers of columnar cerei, which I would consider to be of the *peruvianus* affinity.

.....from N.Gerloff

At all four locations for *G.buenekeri* the *Cereus alacriportanus* is also to be found, from 10 cm up to 4 m high. Every couple of metres short or tall columns of this species can be found between the stones. I have always seen the fruit on this *Cereus* looking as if it had been pecked or nibbled; as there are a great many birds with nesting places on these mountains I suspect that it is they who are responsible for the distribution of this species all over the mountains.

.....from H.Middleditch

If the *Cerei* are dotted at odd places round these four sites then it is not entirely surprising that they could be obvious at some places and absent at others.

When the collection of J.Forrest was sold up, I was able to acquire a *G.buenekeri* with five or six heads of varying size. It was suggested that it was probably an ex-habitat plant which had been in cultivation for well over ten years. The size and appearance of the plant would tend to bear out this view; in addition, it must be twenty years since such plants were brought into this country. It would consequently appear to fall into the category of HU 363. In the course of 1995 it budded up and opened one or two flowers; these were pollinated from other *Macrosemineae* *Gymnos* and one of the flowers set fruit. The fruit grew to a height of some 25 mm and remained on the plant until the onset of winter.

An illustration and detailed description of the fruit on *G.buenekeri* may be found in Chileans No.44.

## **IN THE ARGENTINIAN CORDILLERA By A.V.Fric Translated by W.Atkinson from Succulenta January 1936**

[At Puerta Tastil, after trekking along the lower half of the Quebrada del Toro - see Chileans No.51 p.105]

I noticed to the north the mighty Volcano Chani covered in permanent snow. It is difficult to convey the impression of this scene, let alone describe it in words. Even though I was standing here at 2400m, the snow-capped peak rose imposingly upwards in the height of summer.

I took advantage of the opportunity to join a caravan of carts which was going to Salinas in order to fetch salt. And so I came to Tore, which lies at 4000 m altitude. When I attempted to acquire a guide and assistant, the leader of the donkey caravan recommended an elderly native and his two sons; the eldest son would look after the pack animals and the younger of six or seven years of age, would act as cook. He acquitted himself well of his task.

Then I crossed the trail of my celebrated compatriot Roetzl and clambered even higher, and thus came upon the most beautiful plant that I ever saw. It was shielded against the icy winds and the solar heat by white wool, and armed with yellow and red spines against the unfriendly foes. Such a cross between a lamb and a porcupine out of the plant kingdom! I named it *Oreocereus irigoyenii* Fric sp.nov. in honour of the present president of the Argentine. And then yet higher into the mountains, to the edge of the permanent snows; even there, where continuous gales permit no plant to raise its head above the boulders, where century-old trees hardly attain a height of a few cms, but yet have thick stems and root, even there I found cacti.

I lingered in the mountains for fourteen days. Of the larger plants, I discovered there *Lobivia bruchii v.nivalis*. The plant which I found at the highest place of all was the subsequently named *Rebulobivia einsteinii*, of which I was able to bring back with me only one solitary example.

The acclimatisation in Europe of these inhabitants of the great mountains was very difficult. Those plants which in their homeland were small, little bullets scarcely 1 cm tall, were in the beginning very diminutive mushrooms. After four years *R.einsteinii* flowered for the first time, golden yellow from a bronzy-red bud. Easier was the acclimatisation of



*Rebutia haagei*, which I was able to collect successfully in great numbers. This plant grew close close to our temporary camp in the mountains, where our horses and pack animals could go no further, so that we had to retrace our steps. This place was very radioactive, since both the compass and the barometer were persistently erratic. To those forces and phenomena I must attribute the great variability of the colour of the flowers of *R. haagei*. Because the habitat is completely isolated, it entirely rules out any attempt to explain the variability through hybridisation. So far among the collected plants I have found eighteen different colour tones. In addition, at these great heights there are no insects which would be able to provide pollination.

.....from H.Middleditch

In this account there is a reference made by Fric to a place called Tore, evidently on the route between Tastil and the Altiplano, but I am unable to find any place of this name on the maps in my possession.

.....from R.Kiesling

Fric travelled through the Quebrada del Toro and went as far as Puerta Tastil in Salta province. I do not know any place at all called "Tore" around there, but it seems to me it could be an error for "Toro" which is an estancia near to Puerta Tastil

.....from Baron E.Nordenskiold, Travels on the boundaries of Bolivia and Argentina, Geographical Journal, May 1903

On May 12th Fries, Bowman and I arrived at Salta, chief town of the province of the same name, having 16,000 inhabitants. We at once set about our preparations, engaging servants, procuring mules, provisions, etc. We left Salta for the Puna de Jujuy; We chose the route through the Quebrada del Toro. These quebradas leading to the tableland are of a peculiar character. The rich vegetable life of the lower regions reign a part of the way, but by degrees the landscape becomes monotonous, columnar cacti being seen in vast numbers.

Our headquarters were made at Moreno, about 11,500 ft above sea level. The vegetable formation is a "puna", a dry high-lying plain with low bushes. The central point of the puna contains a large salt lake or salt marsh, the shores bearing sparse halophyte vegetation. Animal life is very deficient. High fells surround this elevated tableland, the highest being the Nevado de Chani, about 20,000 ft. The mountain slopes bear numerous cacti, many with beautiful flowers. The rainfall in the puna is very slight, the puna forming a closed water basin. The streams are few in number and come to an abrupt termination. The brooks simply carry down to the plain fine silt and sand, leaving stones and gravel in the vicinity of the mountain. The salina only receiving the salts dissolved in the water. There are large fields of drift sand. The plain is utterly devoid of large stones.

The central portion of the salina consists of common salt, while the outer, at any rate on the east side, are of borax. The salt crystallises into visible layers, from which the puna indians hew out blocks of about 25 kgs in weight, two of these forming the ordinary burden of a donkey. These puna indians then take the salt to the valleys, for sale.

.....from H.Middleditch

Evidently this trade in salt was still being undertaken in 1929 when Fric joined a caravan of carts to go from the Quebrada del Toro to the Salinas. He went through Toro, which lies in the valley of the Rio del Toro, upstream from its junction with the Rio Tastil, which means that he probably crossed the Sierra de Chani by the Abra de Palomar.

.....from The Editor, Succulenta [1936]

*Lobivia staffeni* and a closely spined variety *lagunilla*, found by Fric at fairly high altitude, were described by Backeberg in 1933 as *Lobivia jansenensis* and *v. leucacantha* respectively.

.....from H.Middleditch

Having crossed the watershed between the Quebrada del Toro and the Altiplano, Fric observes that his route crossed the path of his fellow-countryman Roetzl. From the general accounts of the plant hunting trips undertaken by Roetzl, in Alice Coats' "The Quest for Plants", and elsewhere, it would appear that Fric has allowed his imagination full rein. The general drift of the available references suggest that Roetzl was primarily interested in collecting orchids and other hothouse plants which were in great demand at the time of his journeyings on account of the booming Victorian fad for heated conservatories and hothouses. As far as it has been possible to establish with certainty, Roetzl did not travel any further south in the Andes than Bolivia. Hence it would appear that the route taken by Fric not only did not cross any path taken by Roetzl, but the nearest their paths came were several hundred kilometres apart. This is yet another example of how careful it is necessary to be in accepting at face value a number of statements made by Fric.

In the Fric biography by K.Crkal there is a photograph of Fric standing over an *Oreocereus* growing on a mountainside, with the peak of the Vulcan Chani in the background; owing to the clarity of the air at this sort of altitude, that peak could be a considerable distance from the camera, up to twenty five miles or even more. The mountain side rises to the left and presumably falls to the Altiplano to the right. This would suggest that the photograph was taken whilst travelling on the mountain slopes which lie to the east of the Salinas Grandes, which form the eastern border of that part of the altiplano and separate it from the Quebrada Humahuaca. Presumably this is where Fric came across his *Oreocereus irigoyenii*. From the map in Chileans No.43 p.32 showing the distribution of *Oreocereus*, it will be evident that the *Oreocereus* found by Fric to the north of the Vulcan Chani lies at the very southern limit of the distribution area for this genus.

*Soehrensia korethroides* has been reported from places near the crown of the passes used by travellers from the Quebrada Humahuaca to the Salinas Grandes. These plants may well occur at many more places at similar altitudes along this extensive mountain range and it does seem to be highly probable that it was at one or other of these places that Fric came across his *Lobivia bruchii v. nivalis* = *Soehrensia korethroides*.

The genus *Rebutia* is to be found distributed over a wide extent, from near Eucalyptos in Bolivia, to the Quebrada Escoipe in Argentine. The *Rebutias* discovered by Fric were not right at the very southernmost point of the distribution area of this genus, but they lay not far from that limit. The comments about the variation in the flower colour of *Rebutia haagei* would hardly excite comment today, but in the 1930's it was commonly accepted that a named plant should conform very closely indeed to the official description - including flower colour!

The results of this part of Fric's last trip to South America attracted much interest and attention in the cactus world. In just the same way that Fric had endeavoured to identify and seek out the discovery places of plants described by Spegazzini, Fric was followed in turn by other collectors who sought the plants which Fric had found in habitat, in order to import quantities of those plants to Europe and thus cash in on the interest generated by Fric's discoveries.

**THE STORY OF LOBIVIA DUCIS-PAULI By B.Schutz**  
**Translated by H.Middleditch from Sukkulentenkunde II.1948**

In the years preceding the last world war there had been built up a relatively comprehensive and logical taxonomy for cacti, which clearly defined the distinctions between the individual genera. Our present approach was only to classify each of those species whose identity is uncertain or debatable. Only in this manner is it possible to work within the present-day state of our knowledge and to guard against the new formation of synonyms in the future. This objective is served in the following study.

As is evident from the literature, even *Lobivia ducis-pauli* belongs to the above-mentioned debatable and uncertain species. It was described by A.V.Fric in the Czech monthly cactus journal *Kaktusar* for 1931. The description included a photograph of a flowering imported plant and another of a cristate plant. The original description in the Czech language with the two appended photographs is entirely valid in the sense of the ICBN, since at the time of its publication (1931) the requirement for a latin description was not yet in force.

According to Fric, this plant reaches a height of about 1 m and a diameter of up to 50-60 cm and is to be regarded as a transition between *Lobivia* and *Echinopsis*. It resembles the first-named genus in its habit, i.e. in the tuberculated areoles, which in the young growth break up the uniformity of the ribs, and secondly in the fruit, which at maturity does not split lengthways as in *Echinopsis*, but goes soft. The characters marking a transition to *Echinopsis* are the longer flowering tube and the white flower colour, whilst *Lobivia ducis-pauli* distinguishes itself from *Echinopsis* by flowering during the day instead of at night.

The grand, sturdy, hooked spines do not always display the self-same colour with individual specimens. On many plants these are white, on others red or even ebony coloured and attain a length of up to 30 cm. *Lobivia ducis-pauli* grows in the mountains up to 4000m altitude, but it never reached the altitude at which *Lobivia bruchii nivalis* occurs i.e up to 5500m.

Concerning the circumstances under which *Lobivia ducis-pauli* was found, Fric wrote in his articles as follows:-

“I travelled on a clumsy cart, which was drawn by six mules along impossible tracks into the mountains, where the thin mountain air was good for my inflamed lungs. I could indeed have had just as good a ride, but my mule had such a stiff and ambling gait that I gave preference to the jolting cart. Anyone who has once had the doubtful pleasure of experiencing an inflamed lung, knows that every shake causes indescribable pain. The attack of fever had left me extraordinarily weak and so I lay half asleep in the bottom of the cart, opening my eyes only from time to time to look at the surroundings. Endless banks of huge pasacanas, here and there a clump of *Airamboa*, steep rocky cliffs and bottomless precipices alternated in endless monotony, and as I was unwell it had no interest for me.

With one bend in the road however, I saw up on the steep rocky cliff a fantastic plant with a wild tangle of spines. I took it to be an illusion on account of my feverish state, since I had seen nothing like it up until then. The cart rumbled onwards and the plant vanished from my sight. It was quite sometime before I summoned up sufficient energy to unfasten my riding animal from the cart and to climb onto its back with immense difficulty, and to ride back to satisfy myself whether I had perhaps just been imagining it. Even before getting back to the steep rock face, I came across some very large specimens of this unknown plant, whilst on arriving at the rock face itself my eyes lit upon a fine specimen in cristate form, which I took with me on my return from the mountains. Later I found some more cristates of this species whose propagation has succeeded with me, but the first one I found was allocated to my own collection, where it still stands today”.

Concerning *Lobivia ducis-pauli*, Werdermann wrote in Backeberg's book “New Cacti” as follows: “Of *Lobivia ducis-pauli* in *Kaktusar* 1931 can I still make no suitable picture, and that partially due to lack of knowledge of the language. The plant pictured by Fric can have scarcely anything to do with the little known *Echinopsis ducis-pauli* Forster (Handbook p.641). If the Fric species is new, it must be named by taking it into the genus *Echinopsis*. It really appears to me to stand very close to *Echinopsis longispina* Br. & R.”

In regard to these remarks the following is to be noted: ..... The plant of Fric was described as *Lobivia* and not as *Echinopsis*, since the author already at that time was still an adherent of the Schumann system of nomenclature. Consequently there is no reason why *Echinopsis ducis-pauli* Forster 1885 cannot exist alongside *Lobivia ducis-pauli* Fric 1931. In addition, Fric did not assert that his *L.ducis-pauli* is identical with *Echinopsis ducis-pauli* Forster, but with his new description and his name as author gave clearly to understand that it was matter of two entirely different species.

Curt Backeberg wrote in the periodical *K.u.a.S.* 1937 p.290 in his article about *Echinopsis longispina* Bckbg (= *Lobivia longispina* Br. & R. 1922) “Fric had sold this sp. as *Echinopsis ducis-pauli* Forster 1885, which was incorrect, since the latter name can very probably apply to a *Denmoza*”. This contention includes two errors, for in the first place Fric never sold any *Echinopsis ducis-pauli* but always *Lobivia ducis-pauli*, and secondly he never made use of Forster as the author's name but only of his own “Fric”. *Lobivia ducis-pauli* belongs in the form-group with *Lobivia longispina* and *L.potosina*.

The habit and flower typically belong to the genus *Pseudolobivia* and in Backeberg's system it is named *Pseudolobivia ducis-pauli* (Fric) Krainz. The new combination was made by Krainz in the *Swiss Cactus Society Newsletter* of 1946.

This plant is relatively rare in our collections. I myself have ten specimens with different spination. The plant pictured here is nearly white spined and the spines are up to 8 cm long. Fleischer, who has the largest cactus collection in Czechoslovakia, has a black spined *L.ducis-pauli* with spines of 15 cm in length. The largest plant of this species is to be found at Oelmutz, being 25 cm in diameter and having ca. 12 cm long spines. In addition there are plants raised from Fric's seed. Most of these are starting to be of flowering age and this affords us the possibility of harvesting seed from this prince of species fairly soon.

.....from A.V.Fric, *Lovec Kaktusu*.

Species such as *Lobivia ducis-pauli* are scattered across several hundreds of kilometres without in any way changing their habit, nor the colour and shape of their flowers. The *Lobivia ferox* Br. & Rose is very near to my *L.ducis-pauli*.

.....from K.Preston-Mafham

We came across *L.ferox* over a very wide area indeed. I have seen the same plant in northern Argentina and also in the south of Bolivia.

.....from R.Allcock.

The Czech publication *Azteкия* for 1991 includes what appears to be a reproduction of Fric's 1929 seed catalogue.

This extends to some 23 pages, which are not numbered, of which roughly half are occupied by illustrations. One of these illustrations is entitled "Number 80, with No.39 below, at 4400m altitude". In the numbered list of seed for sale, No.39 is entered as *Friesia umadeave* and no.80 is listed as *Lobivia* [*Echinopsis*] *ducis-pauli*.

.....from H.Middleditch

The foregoing illustration depicts a three-headed plant looking very much like *Pyrrhocactus umadeave*; to judge by the person kneeling alongside these plants, one of these heads will be about 6 inches in diameter and about 8 inches tall. Immediately behind the *P.umadeave* is a plant of *L.ducis-pauli* which (again on the basis of the figure in the picture) is well over a foot high and perhaps six inches in diameter.

It is interesting to note that in his article (above) Schutz states categorically that Fric "never sold any *Echinopsis ducis-pauli* but always *Lobivia ducis-pauli*" whereas the entry opposite No.80 in the *Aztekia* reproduction of the Fric 1929 catalogue reads "Lob. [Eps] *Ducis-pauli*". Evidently Schutz had either not consulted this Fric catalogue or had overlooked this particular entry. Fortunately we do have available to us the necessary original reference to check this specific point in the form of this photocopy reproduction in the 1991 *Aztekia*. When such a reference is not available, there can be real problems with the cactus literature in sorting out the facts which are right from those that are wrong.

It will be noted that Fric gives the maximum size of *L. ducis-pauli* at some one metre tall and 60 cm in diameter. This may be compared with the 25 cm tall by 10 cm thick given for *L.longispina* by Britton & Rose, and "30 cm diameter or more" for *L.ferox*. Backeberg gives 25 cm diameter for *L.longispina*, possibly utilising the observation made by Boedeker in *Kakteenkunde* 1934, relating to *L.potosina*. In his *Lobivia* 1,2,3, Rausch effectively repeats the Britton & Rose 30 cm diameter for *L.ferox* from Oruro, whilst in *Lobivia* '85 Rausch gives *L.ferox* as "globular to short cylindrical, 30-50 cm tall and 25 cm thick". Here Rausch also gives Cardenas' *Echinopsis lecoriensis* as a synonym of *L.ferox*; the original Cardenas description of *E.lecoriensis* gives a height of 30-60 cm tall by 25 cm diameter. This might lead to the suspicion that Fric has again allowed his penchant for exaggeration to get the better of him in quoting a maximum height of one metre for *L.ducis-pauli*.

In Chileans No.51 there was reproduced an extract from an account written by Fric of his trip to the Cordillera. Having reached Puerta Tastil by train he "went back on my tracks and hired a cart drawn by six mules and wandered upstream along the Tastil valley ... getting back to Puerta Tastil". From the extract quoted above by Schutz it appears that it was during this particular part of his travels that Fric came across *Lobivia ducis-pauli*. This must have been at slightly less than 2975 m, the altitude for Puerta Tastil. This location is probably the southernmost limit of *Lobivia ferox* and possibly the lowest altitude at which it has been reported.

.....from K.Gilmer

In the course of our travelling through the Quebrada del Toro we came across *Lobivia ferox* at three spots - TG 18 near Gobernador Manuel Sola, TG 19 near Puerta Tastil, and TG 20 just south-east of Santa Rosa de Tastil. We saw plants which were broader than tall as well as others which were taller than broad; they would be up to about 25 cm in diameter whilst the tallest ones would be in excess of 25 cm high. All the plants we found were growing on stony, gravelly ground which supported very few bushes; only exceptionally were any of these *L.ferox* growing close to grasses, herbs, or a bush. Several times we saw a plant growing quite close to the edge of the road we were following. These plants were heavily spined, with spines up to 20 cm long. All the flowers we saw were a pale pink colour, most evident in the outermost petals and bracts.

.....from G.Charles

On the occasion of our first visit to Quebrada del Toro we did not observe any *Lobivia ferox*, but on our second visit we did see this species at a location some 4 km to the north of Santa Rosa de Tastil where these plants were quite large. More of these plants were seen near La Cuevas, further up the valley. We continued to the head of the valley and then crossed the ridge in order to reach San Antonio de los Cobres. From there we headed northwards across the flat altiplano towards the Salinas Grandes and on a low ridge not far from the edge of the salt lake we again found *Lobivia ferox*.

.....from H.Middleditch

Britton & Rose were not able to quote a flower colour for either *L.ferox* or *L.longispina*. Backeberg gives white as the flower colour both for *L.ferox* from Oruro and for *L.longispina* from La Quiaca to Tilcara; but in his *Kakteenlexikon* he adds a note that plants recently imported by Uhlig were very variable in petal colour, "even reddish". In his *Lobivia* 1,2,3, Rausch includes various authors' names under *L.ferox* and also adds yellow, orange, pink, and red to the flower colours. Are these flower colours constant, or variable, in one population?

.....from E.Zecher, G.O.K. Newsletter June 1973

At El Aguilar we found *Lobivia longispina* with white, yellow, or red flowers.

.....from M.Nilsson

In the course of my trip to NW Argentina in 1990, a full day was spent in the vicinity of the village of Caspala, en route from Valle Grande to Humahuaca. To the west of the village, on dry and stony slopes, I collected some magnificent specimens of *L.ferox* v. *longispina* MN 154 with long and strong spines. The flower colours were quite variable at that site, white, orange, or yellow. Later on the same trip we were up at La Quiaca, where again we came across *L.ferox* v. *longispina*. From there we travelled west to Tafna, To the south of that village we found these plants again with a fantastic variation in flower colour from light yellow, orange, red, to purple-violet.

.....from K.Preston-Mafham

Near San Pedro we came across a population of *L.ferox* and from the picture in my book you will see that here there were a wide range of flower colours in the one population.

.....from G.Charles

There were a great many flowers to be seen on the population of *Lobivia ferox* which we found East of Yavi, in various colours. This was in strong contrast to the population which we had come across between La Quiaca and Yavi, where we only saw white flowers.

.....from J.Arnold

My own experience of *L.ferox* is that they can flower as quite small plants, even when only between one and two inches in diameter. These same plants are now 3 or 4 inches across and continue to flower well. The plants of KPM 184 produce orange or peach coloured flowers; they seem to have a somewhat slower rate of growth but have very long spines, three to four inches long, greater than the body diameter. Another KPM number *L.ferox* grows a little faster but the spines are not as long and produces only white flowers. These white flowers do tend to be slightly longer than the orange-peach coloured flowers. My Piltz P.71a *L.longispina* also produces white flowers which are, if anything, slightly longer still. All these plants are not difficult to grow, although I have lost one or two of them, which I suspect may have followed repotting. They do have thickish roots or a thick central root, which might have been damaged in the process of repotting.

.....from R.Purslow

I am currently growing a fair number of *Lobivia ferox* under DJF, WR, and KPM numbers, up to four or five of each collection number in some instances. All those that have so far flowered have been white, with the exception of PM 184, which produced a pinky magenta flower when the plant was only 3.5cm in diameter and growing in a two inch pot! My tallest *ferox/longispina* which reached a size of 20cm indiameter and 30cm tall, also produced a pinky magenta flower. Unfortunately, I lost this plant in the harsh winter of 1995/96.

The smallest growing forms with multicolored flowers which are associated with this group seem to be little studied or collected, compared to the generally white flowered and larger growing *ferox* forms which have a very wide distribution.

#### **PARODIA AUREICENTRA? OR PARODIA MAASSII?**

.....from F.Vandenbroeck

During our recent visit to Argentina we came across a population of *Parodia aureicentra* close to the Salinas Grandes, where we were so fortunate as to be able to collect some seed and a packet of this is enclosed.

.....from H.Middleditch

This seed was split into barely half a dozen packets which were passed on to a few members who regularly grow from seed. It will be interesting to see if anything materialises

.....from G.Charles.

The ex-Vandenbroeck seed of *Parodia aureicentra* has germinated quite well and seedlings will be included in the 1995 seedling offering. However, the plant looks to me like a typical *P.maassii*.

.....from H.Middleditch

By good fortune at the present time I happen to have three or four seedlings of various names associated with the *maassii* group. They all look to be of a similar age. By comparison they do not differ greatly from the seedling grown from the ex-Vandenbroeck seed of "*P.aureicentra*".

.....from F.Vandenbroeck

At the time we found these plants it was evident that these plants belonged to the *aureicentra* group because of their pronounced columnar mode of growth and their dense, dark brownish-yellow spination that does not fade with age. They are fantastic plants. It appeared to me that the population was untouched. Several populations of *P.aureicentra* in northern Argentina are well known and easily accessible so in consequence, sadly enough, the numbers of specimens decrease quickly. I have seen many populations of *P.aureicentra* from near La Poma to south of Molinos and they all have a habit which differs from *P.maassii*. The latter always remain flattish and its older spines tend to go greyish. It is in fact virtually impossible to confound the two species in the field. I am aware that the population near Salinas Grandes is very far away from the accepted distribution area of this species, according to Weskamp, but this is irrelevant.

.....from H.Middleditch

Could a count of the radial spines be used as a means of distinguishing *P.maassii* from *P.aureicentra*? According to the descriptions which appear in the Brandt *Parodia* monograph produced by Parodia Inter Kette, *P.maassii* has 8-10 radial spines and *P.aureicentra* has 30-40 radial spines. My own seedling plant of *P.carrerana* raised from Mesa Garden seed KK 1130 has a distinct single central spine, so that there is no difficulty in counting 10 radial spines, although I would not like to guarantee this for every areole on the plant. The small seedling of BDH 21 likewise displays one prominent single central spine and it has eight radials. The seedling ex-Vandenbroeck collected *Parodia "aureicentra"* has 8 to 10 radial spines per areole and a single central. Unfortunately I lack a *Parodia* of the *aureicentra* group for comparison.

.....from P.Down

On my plants of *P.maassii* the average number of radial spines is 10, some areoles having 8 and others 10 or 12, but a check on random areoles on several plants produced a count of ten on nearly all of them. On plants of the *P.aureicentra* group there are many more radial spines so that it is difficult to count them with any degree of accuracy; on *P.aureicentra v. omniaurea*, I would say it averaged 26, on *P.rauschii* 34-38 and on *P.varicolor* 30 to 36.

.....from J.Lambert

*Parodia maassii* and *P.aureicentra* may both become more or less columnar with age. The most obvious difference between them lies in the number of radial spines: 9-11 (-15) in *P.maassii* against 25 to 40 in *P.aureicentra*! In addition, the crown is more woolly in *P.maassii* and the flower of *P.aureicentra* is a deeper red, as compared with a coppery shade in *P.maassii*. For a location near the Salinas Grandes, not far from Tres Morros, I would be inclined to say that the plants were *P.maassii*.

.....from J.Brickwood

Although my seedlings raised from this ex-Vandenbroeck seed are still quite small, their appearance at present still leaves me with the impression that they are really *P.maassii*. As my *Parodia* collection has predominantly been built up from seed in recent years. as yet I do not have a representative selection of mature plants of the *Protoparodia* group. However, the *P.aureicentra* types do appear to start off as more or less globular becoming elongate and more densely spined with age. My several forms of *P.maassii* are nowhere near maturity and these vary from more or less globular to short cylindrical. The Vandenbroeck collected material may be a form of *maassii* which is relatively taller growing.

.....later

Looking at the so-called *P.aureicentra* from Salinas Grandes raised from the ex Vandenbroeck seed, now that they have got a bit bigger I am quite certain it is *P.maassii*.

.....from G.Charles

We shall be making a short trip to NW Argentina in December 1995, planning to travel up the Quebrada del Toro and go on to San Antonio de Los Cobres, returning over the Altiplano to Purmamarca. This takes us close to the edge of the Salinas Grandes, where we will keep an eye open for these plants.

.....from F.Vandenbroeck

We found this population purely by luck. Coming from San Antonio de Los Cobres and arriving at the Salinas Grandes we stopped the vehicle and took a walk over to some hills. We climbed these to have a good view over the salt lake and on some well hidden slopes we saw the plants, thousands of them. It would be difficult to find them again. The area near the salt lake is huge and dotted with countless hills.

.....from G.Charles

(Later) Yes, we did find the site at which F.Vandenbroeck probably found his *Parodia*. They do indeed grow short

columnar, all the mature plants. Having seen them and comparing them with the *Parodia aureicentra* we saw on our last visit to Argentina, in the Calchaquies valley, they do strike me as being *P.maassii*.

.....from M.Nilsson

On the enclosed 1:250,000 scale map which includes this locality you will see that there is a line of hills running north-to-south from the point at which the road from San Antonio de Los Cobres first approaches close to the Salinas Grandes.

.....from H.Middleditch

This site near the Salinas Grandes is quite some distance from the nearest reported location for *P.aureicentra*, which is at some 3000m altitude in the general vicinity of La Poma. The next nearest location for *Parodia aureicentra* is P.172 from the Cachipampa, recorded at 3300m altitude, which will not differ greatly from the altitude of the location near Salinas Grandes reported by F.Vandenbroeck and by G.Charles. Both these locations for *P.aureicentra* are separated by the Quebrada del Toro from the area of the Altiplano in which the Salinas Grandes is found. In the Quebrada del Toro there is to be found *Parodia steumeri*, which possesses a seed of similar size and appearance to that of *P.aureicentra*; seeds of both *P.aureicentra* and *P.steumeri* differ to a degree from the seed of *P.maassii*. On this account alone, it would be somewhat surprising if any *P.aureicentra* were to be found north of the Quebrada del Toro.

.....from G.Charles (at the 1996 Chileans' Weekend)

From J.Brickwood I have received a copy of his *Parodia* distribution map, which is produced to an excellent standard and provides a useful guidance to the extent of distribution of virtually all species of *Parodia*. These are displayed on the map here [ at the Weekend ] in a manner which makes for quick and easy reference. This map shows that *Parodia maassii* has a lengthy north-to-south distribution. In the north it extends to around Yocalla which lies some twenty to thirty kms north of Potosi; from there it extends southwards and it reaches as far as the slopes of the Nevada Chani. The distribution area for *Parodia aureicentra* lies to the south of the Abra de Acay and is confined to the valley of the Rio Calchaquies and its tributaries. The spot near the Salinas Grandes where we found *Parodia maassii* lies not far off the previously reported locations for this species and well away from those reported for *P.aureicentra*.

With the *Parodia maassii* near Salinas Grandes we also came across *Lobivia ferox*, *Tephrocactus bolivianus*, *Tephrocactus hypogaea*, an *Airampo* sp. and *Trichocereus pasacana*.

.....from J.Piltz

It does surprise me that there is a suggestion that *P.maassii* may be found to the west of the Abra de Pives, as the only places that I was aware of where *Parodia maassii* has been found previously, were on the Quebrada Humahuaca side of the Abra de Pives, and of course further north along the Quebrada Humahuaca. None of the *P. maassii* we saw there could be described as tall. Mostly we found these plants growing in the company of *Opuntia sulphurea*.

.....from H.Middleditch

In *Kakteen in Südamerika* by F.Ritter there is an illustration Abb.375 of his *P.maassii v.carminantha*; there are one or two plants in the picture with a body whose height is approximately twice its diameter. The location is given by Ritter as "south of Tres Morros". As the crow flies this site will be some 25 km (14 miles) away from the Salinas Grandes site visited by F.Vandenbroeck and by G.Charles et al. This Ritter site will very likely also lie on one of the ridges running north from the Sierra de Chani i.e. west of the Abra de Pives. At both the Ritter site and the Vandenbroeck site the altitude will be similar and the general environment is also likely to be rather similar.

.....from J.Lambert

Ritter's picture of his *P.maassii v. carminantha* does indeed give a good idea what older, elongated plants look like. I have a plant of *P.maassii* in cultivation with a body measuring 12 cm high and 5.5 cm in diameter.

.....from F.Kasinger

As we were approaching El Moreno we stopped the vehicle and climbed some way up the hills to the east. The rocks are very friable. Here we found *Parodia gigantea*. This was the biggest *Parodia* which I have seen in Argentina. These plants were 20-25 cm in height and 10-15 cm in diameter.

.....from H.Middleditch

This site reported by F.Kasinger is effectively "south of Tres Morros". Other than travelling on horseback or trekking on foot, it is the only part of the north slope of the Sierra Chani which is accessible by road. This makes it quite probable that these plants found by F.Kasinger are at, or very close to, the site of Ritter's *P.maassii v.carminantha*. It does appear to be quite probable that this is another sighting of columnar *P.maassii*.

.....from F.Kasinger

The plants of *P.maassii* which I saw both near Tafna (fairly close to the border with Bolivia) and near Uquia (in the Quebrada Humahuaca), all grew in a flattened or globular form, none of them were in any way columnar.

.....from K.Gilmer

We saw plants of *Parodia maassii* at TG 46, 18 km north of Humahuaca; at TG 48, 5 km south of Iturbe; and TG 54, 26 km west of La Quiaca. At each of these places there were some big plants with a height definitely greater than their body diameter.

.....from H.Middleditch

Tafna lies some 20 km due west of La Quiaca, whilst TG 54 lies a few kilometres further to the west along the same Ruta 5 and also immediately adjacent to the border with Bolivia. Uquia lies about 7 km to the south of Humahuaca. The observations by F.Kasinger and K.Gilmer would suggest that in certain populations of *P.maassii* there may be found plants growing globular at one spot and more elongated specimens elsewhere but at no great distance away.

.....from G.Charles

At the Salinas Grandes site GC 167.03 the *Parodia maassii* were almost twice as tall as their diameter. When we were some 12 km to the east of La Quiaca, close to the border between Argentina and Bolivia (GC 176.05) I photographed a *Parodia maassii* which was more than twice as tall as the body thickness.

.....from J.Kirtley

The plants of the *P.maassii* complex that were seen and photographed at the many locations visited in the course of our journey through Bolivia were for the most part globular. However, there were exceptions, and these appear to me to be consistent with the growing conditions in which the plants were found.

The first variation from globular to short columnar was observed at B/K 13, north of the Rio Pilcomayo on the road from Ventilla to Potosi. Here the plant was growing on the face of a vertical, south-facing cliff, together with a plant of *Lobivia ferox*. The situation in which the seed germinated left the plants growing there with no choice but to elongate to seek the available light. Should the plants survive, they would surely become pendulous. The second variation to columnar was observed on the descent to Impora at B/K 36. Among plants of the *P.maassii* complex growing here there

was one group, either seedlings, or a number of heads on a damaged plant, which were growing so close to one another as to obstruct each other's normal globular growth, so much so that those towards the centre were more elongated than those on the outside of the clump - which were nevertheless elongated, but to a lesser extent. However, none could be said to be anything more than short columnar, perhaps 1.5 times as long as wide.

.....from P.Down

We saw many *Parodia maassii* on our trip to Bolivia and of course they were huge compared to the plants we see in England. I do not recall seeing any much over 25 cm tall. Certainly none exceptionally tall like the *P. obtusa* which we saw near Cotagaita, which reached a height of 30 to 40 cm.

.....from K.Preston-Mafham. At the 1989 Chileans' Weekend

Between Lecori and Camargo we crossed the Quebrada Honda. Growing with *Cleistocactus tupizensis* near here were a very distinctive population of *Parodia maassii*. Distinctive for two reasons. Every other population of *P.maassii* we saw was in flower - but not this one. So they could not interbreed with any of the adjacent populations. Secondly, they were almost up to 2ft tall, great barrel cacti.

.....from J.Fahr

We made a trip to Bolivia in 1995 with the objective of searching for *Parodia*. We arrived in Bolivia at La Paz and from there we drove to Cochabamba and on to Sucre. From Sucre we went to Camargo and Las Carreras, taking the road from El Puente which leads towards Iscayache. We travelled along this road as far as the pass between Cieneguillas and San Antonio. From here we went over to Cana Cruz, and took another side road to the Rio Tomayapo near Obispo. Then we started our return journey. Most of our stops were made between there and Sucre.

From El Puente we travelled some 20 km in the direction of Iscayache and found some *Parodia* on a steep slope, at 2955m altitude. These plants were up to 40 cm tall and 20 cm in diameter, with 13 ribs. About four km further on, where we were not far from Cieneguillas, we again found similar looking plants. Just before we reached Cana Cruz, at 3055m altitude, we again found similar plants up to 40 cm tall and up to 23 cm in diameter, with central spines up to 9 cm long. Just before Obispo, close to the R.Tomayapo, we found a further population with plants in great numbers, growing up to a height of 55 cm and to a diameter of 23 cm. We would class all these as *P.maxima*.

.....from H.Middleditch

If this version of *P.maassii* clearly distinguishes itself by a consistent habit of growing up to nearly two feet in height, and displays an elongated fruit, then it may well be entitled to a separate identity.

.....from C & M. Sherrah (C & S Jnl U.S. 1996)

Uyuni is reached by bus from Potosi. The trip winds its way through fantastic mountain scenery covered in *Parodia* and *Oreocerei*.

.....from H.Middleditch

Taking into account the recorded field observations on *Parodias* found in the Potosi-Tupiza-Uyuni area, it is very probable that the plants seen by C & M Sherrah will be *P.maassii*. It would be very useful to know whether these plants were seen in the near vicinity of Uyuni.

.....from C.& M. Sherrah

Unfortunately we did use the phrase "around Uyuni", which is misleading. The *Parodia* which we photographed were at a village half-way between Potosi and Uyuni. By half-way I mean by travelling time, not by distance. My diary note tells me there were no *Parodias* in the vicinity of Uyuni. Near the village half-way between Uyuni and Potosi there were thousands of *Parodia* to be seen at either side of the road. My recollection is that they occurred for at least 5 to 10 km along the road we travelled by bus, out of the village. *Parodias* could be seen from the edge of the road for hundreds of metres away, singly and in large clumps. We did not get the name of the village.

### **ECHINOCACTUS MAASSII sp.nov. By E.Heese** **Translated from Gartenflora 1907**

Body solitary, half-globular to pear-shaped, rounded above, solitary [sic], hardly ever offsetting of its own free will, new growth fresh green, 8-10cm tall, later even still taller, 7-10cm in diameter. Ribs 13-21, separated by somewhat sinuous intercostal grooves and running into one another to some extent, faintly resolved into humped tubercles. not drawn out into chins. Older plants twisted spirally. Areoles in the crown oval to roundish, furnished with short, white wool, 3-4 mm in diameter, later becoming bare. Crown slightly sunken, completely covered with upright, glossy brown spines, between which the flowers project.

Radial spines usually 10, occasionally 11-15, 5-15 mm long, angled away from the body, honey-yellow when young, later whitish, round, many translucent, some bent in an undulating manner. Central spines 4, formed more or less into a sloping cross, with an onion-like thickening at the base, the lowermost the longest, often 3 cm long, goat-horn like, [hooked?], mostly downwards, often also curved to the right and left, when young a fine pale brown, later becoming grey and of the colour of the radial spines.

Flowers. On the basis of the flower remnants and seed found on the freshly imported specimens, the flowers are positioned at the newest areoles on the apex. The plant has still not flowered with us. Habitat: Bolivia. A plant well known for years. It came to the Berlin Botanical Garden since 1904 as *Echinocactus leucacanthus* Zucc., as a native of Mexico, with which it has neither Habitat nor anything else to do with.

This plant is named in honour of the Secretary of the D.K.G., Herr Maass in Zehlendorf.

.....from H.Middleditch

In Ritter's "Kakteen in Südamerika" this species is written as *Parodia maassii*; if we accept that Heese has correctly spelt the name of the DKG Secretary of the time, then the Ritter spelling is incorrect.

.....from June 1909 Meeting D.K.G., M.F.K. August 1909

...finally Heese told the meeting that *Echinocactus maassii* had brought forth some flowers, [ at the Dahlem Botanic Garden] and that these bore an undoubted similarity to those of *Echinocactus* [*Parodia*] *microspermus*, in particular in having a woolly pericarpel.

.....from Britton & Rose, The Cactaceae, Vol 3.

*Echinocactus maassii* Heese. We believe this is the plant collected by J.Shafer at 3450 m altitude at La Quiaca. Our description is drawn entirely from Dr. Shafer's plant: Globular to short-cylindric .....

.....from H.Middleditch

From the foregoing observations and references it may be seen that *Parodia maassii* is to be found at odd places in

the small corner of the altiplano which was visited by Fric in the course of his last trip to South America, in 1929. It appears that Fric did not journey from Toro to Tres Morros in company with the mule train, but travelled independently on horseback with a guide and a cook. In this way he could have found a location of *P.maassii* on the slopes of Nevada Chani, away from the well-trodden route used by the mule train. We also know that quite tall specimens of *P.steumeri* are to be found in the Quebrada del Toro. Thus it remains unclear which of these two sorts was most likely to have been Fric's *Parodia gigantea*.

## SOEHRENSIA - MORE THAN A PASSING ACQUAINTANCE From R.Allcock

My affection for *Soehrensias* goes back to the time when this strange and unfamiliar genus first appeared on a seed list of Denis Sargent and I felt, after finding that these are a hardy high altitude "Echinocactus analogue" that I must certainly try them. The plants were listed as sp.nov. de Oro and sp. nov. U 163 and were sown in the Spring of 1963. They have turned out to be principally *Soehrensia grandis* and *S.formosa*. I gave away some of these seedlings, which I now greatly regret, in view of their emerging polymorphism. Among the *S.formosa* there is an anomalous plant with very short spines. One of the *S.grandis* flowered when the plant was about nineteen or twenty years old, with a red flower.

I also have several *S.bruchii*, one of which is more columnar than the others, but none of these has flowered. In addition there is one plant which has a similar appearance to *bruchii*, which bears a two tone flower in orange and pink. A number of other *Soehrensias* have been purchased in a bid to cover the polymorphism more completely.

As with other cacti, the study of seedlings can be of enormous value in establishing relationships, which later become obscured as the plants assume adult spination. One thing is quite clear, that *S.korethroides* and *S.nivalis* are indistinguishable as 2 to 4 year old seedlings, showing a very close relationship indeed. On the other hand, *S.nivalis* and *S.bruchii* of this age group are altogether different from each other. To me, this makes a nonsense of the designation *S.bruchii v.nivalis*. Also *S.ingens* is distinguishable from *S.korethroides* even as small seedlings. Looking at my seedlings, I would assert a close relationship between *ingens*, *korethroides*, and *nivalis*. Also I have seedlings of *S.grandis v.aureiflora*.

The plants of the *Soehrensia* group are to my mind just as interesting as the smaller cacti, and surely the only reasons for their relative unpopularity are that for the most part they have to grow old and large before reaching flowering maturity. Against this must be reckoned their great hardiness, which permits cultivation under a spartan temperature regime, something which to me adds to their romantic appeal as denizens of high and wild places, as much as to their practical appeal as something that can be neglected from time to time and still do well.

.....from G.J.Swales

I have a number of plants of *Soehrensia*, most of which have been in my collection for quite a few years. What is possibly the oldest plant is called *S.shaferi*. It was purchased as a small seedling from a nursery to the south of Tunbridge Wells. The three plants of *S.korethroides* have now got to a size where they should really be in at least 8 inch pots. The length and attitude of the spination is very similar on each of these plants, but they look rather different because of the differences in the spine colour. One plant has spines which are dark brown and cream, another has spines which are ginger brown and cream, the third has pale yellow spines.

.....from C.Norton

My *Soehrensia formosa* was grown from seed by the late but very good friend Stan Atkinson of Beverley. I bought the plant from him 27 years ago when it measured 5 inches in diameter by 5 inches high. It is now 2 ft tall by 9 inches in diameter and may possibly be 40 years old. I also have a smaller plant of this species, both never having flowered. A small *Soehrensia* species that I picked up at Southfields nursery looks like a form of *S.bruchii*; this has flowered and the flowers would best be described as a marigold colour. It is now 6 inches high by 7 inches in diameter.

.....from J.Griffin

My *Soehrensias* have been in dire need of repotting for some time. Several of them have flowered fairly regularly, usually late in the summer, but after they were repotted not one of them put out a single flower! I have a double headed *S.formosa*, a *S.korethroides*, *S.bruchii*, *S.bruchii v.nivalis*, *S.rosarioana* - which resembles *S.formosa* and is quite free flowering, *S.grandis* which is growing elongated globular, and *S.grandis v.pinchasensis* which certainly do not look like *S.grandis* and flowered even as seedlings.

.....from R.Allcock

My own *Soehrensias* used to flower quite well but they have quite failed to produce any flowers for the last two or three years. I put this down to the fact that they have really outgrown their pots and are in need of repotting into a larger size container.

.....C.Holland

In my own collection I have small plants of both *S.ingens* and *S.grandis v.aureiflora* WR 129, together with three larger plants of *S.formosa*. These are 12" tall by 5" diameter, 10" tall by 8" diameter, and 7" tall by 5". This last, the smallest of the three, surprised me by flowering this year. Because of the length of the spination the buds had got quite large before I noticed them.

.....from R.Senior

It is quite a number of years since I regularly raised cacti from seed, but many of them are still with me now. On account of our relatively mild climate here in Cornwall several of these plants are grown out of doors all year round, mostly in free root run, whilst others in 12 or 14 inch pots are brought outside for the summer. However, I do have a problem deciding the exact origin of the plants which I keep outdoors as the seagulls pinch the labels. It would be about three years ago that my largest *Soehrensia bruchii* was planted out of doors, without any protective glass covering and it was after that move that it has flowered. The oldest part of the body next to the wall is corky and spineless, the next section of the body gives the appearance of having only dead spines, whilst the 'head' is growing nice and green and is now larger than the other two lower sections of the body. All the sections are lying on the ground so that the growth is almost *Machaerocereus*-like. The flowers appear fairly well away from the growing point and I would judge that they were on areoles two or three years old. The next largest *S.bruchii*, which is also grown outdoors all year round has also flowered; somewhat unusually, this plant is offsetting freely at ground level.

.....from H.Middleditch

In *Friciana Rada IV* for 1964, p.12 there is a list of habitat collected seed of certain species of *Gymnocalycium* under Uhlig catalogue numbers. These had been abstracted from the Uhlig catalogues for 1961 and 1962 and are all numbered below U 200. It would thus appear that the U 163 seed, mentioned by R.Allcock, originated from Uhlig at

about that same time.

.....from R.Allcock

This list in Friciana for 1964 shows clearly that the U 163 is purely a catalogue number and not a field number. The heading states that "Seeds were listed in the 1961 and 1962 catalogues of Uhlig coming from Cardenas, Fescher, Lembcke, and Hammerschmid, but it is not clear whether those seeds without any indication of origin came by importation"

.....from H.Middleditch

Whether the U 163 was imported seed or not might be made clearer by reference to the Uhlig 1961 and 1962 catalogues. Unfortunately, it is only recently that I disposed of a series of Uhlig catalogues and so am now unable to refer back to old issues.

.....from R.Mottram

My own stock of Uhlig catalogues does not go as far back as 1962-63.

.....from G.Charles

In an article by R.Kiesling in a recent US Cactus Journal there is a photograph of a *Soehrensia bruchii* with a dozen or more heads of globular shape and all about the same size. To judge by the three people who are sat beside it on the ground and apparently cheerfully leaning on the perimeter of this clump you might imagine that each head would be about 18" or even 20" tall. There is no indication of whereabouts this picture was taken, either in the text of the article or in the title of the picture.

.....from K.Preston-Mafham

The only area I know of where *Soehrensia bruchii* is to be found is in Tucuman province, between Tafi del Valle and the Abra del Infiernillo. Down in Tafi it is often single headed and is a smaller plant whereas up near the Abra del Infiernillo it is larger and multiheaded. The Kiesling picture was probably taken at this latter location. *Soehrensia korethroides* is more widespread than *S.bruchii* and is also found at higher altitudes.

.....from M.Nilsson

Is not the Kiesling photograph in the US Journal a *Soehrensia bruchii* from Tafi del Valle? The plants here are much broader than *bruchii v.nivalis*, and not as high. I found very few *bruchii v.nivalis* in habitat.

.....from I.Hoffmann, US C & S J, Vol56,1984

We took to the road again [from Tucuman city], this time towards Tafi del Valle. In the downpour, we had to pass up the many turnouts that said "viewpoint" as there was no view further than the next tree. But as we went up higher, the lighter the rain became and finally it stopped as if cut off by a knife and we came into a super-dry, totally scorched area. We could not believe this - here rain soggy trees and one km further, burned out grass! We not only found boulders but also our first *S.bruchii* wedged in with those boulders. Further up towards the pass the *Soehrensias* were simply huge. One meter or more in circumference, often many headed, they were an imposing sight.

.....from B.Schweitzer

On the way from Tafi del Valle to the Abra de Infiernillo we did not stop to look for plants. After crossing the highest point of the pass at 3045 m we did stop first at a point 2 km down on the west side at 2975 m, before two very striking sweeps in the road. We saw plants with golden yellow spines growing in grass on not so steep slopes on the left hand side of the road. On the right hand side there are very steep rocks and here we found the biggest plants of these *Soehrensias*. In comparison with the pictures in Backeberg's *Kakteenlexikon* Abb.389, we only saw solitary plants, not groups.

.....from R.Hillmann

Heading into the mountains from Trancas, in the northern part of Tucuman province, we followed the R.Tacanas towards Hualinchay. At an altitude of 2900m we came across a form of *Austrocylindropuntia verschaffeltii* with orange flowers, together with *Soehrensia bruchii*, in company with abundant *Begonias*.

.....from H.Middleditch

It may be recollected that the *A.verschaffeltii* from near Tafi del Valle, reported by J.Lambert and M.Nilsson (Chileans No.49), also occur in the same area as *Soehrensia bruchii*.

.....from R.Allcock

In his *Lobivia* III, I note that Rausch lists all the *Soehrensia* under *Lobivia formosa*, using the name *nivalis* if the flowers are red, and *formosa* if they are yellow. In his *Lobivia* 3, he illustrates a plant in this group with a beautiful orange flower. Where might this fit in, I wonder?

.....from G.Charles

On our trip to Argentina in November 1992 we drove north from Andalgalá, via the Cuesta Capillitas, to reach the valley of the Rio Santa Maria which runs along towards Cafayate. At Amaicha del Valle we turned off in order to follow the road which climbs out of the valley in the direction of Tucuman. We stopped at several places on this climb and before we reached the pass we came across plants of *Soehrensia* with orange flowers. Once over the pass we started the descent towards Tafi del Valle and we stopped again at a point some 20km before we reached Tafi, at about 3000m altitude. Among the tufts of grass we found *Soehrensia bruchii* in flower; the flower colour varies from orange to scarlet. There were plenty of bees here, masses of unripe fruits, and lots of seedling *Soehrensias*.

.....from H.Middleditch

In his *Lobivia* 85 it is stated by Rausch that the red-flowering *L.bruchii* comes from east of the Abra de Infiernillo whilst his *v.amaichensis* with the flowers of orange (occasionally yellow) colour comes from west of the Abra de Infiernillo. It appears from the habitat observations made by G. Charles that the division is not quite as clear-cut as Rausch has suggested.

Perhaps the red flowering *S.bruchii* may be related to the wetter conditions and the associated pollinating agents to be found on the ascent from Tafi del Valle, the yellow flowered plants on the Amaicha side of the pass being associated with the dryer conditions and the presumably different pollinating agents? The orange flowers being in the transition zone?

.....from G.Charles

The orange and the red flowering plants which we saw between Amaicha and Tafi del Valle are quite different from one another. The orange flowered plants had larger bodies and finer spines, looking more like *S.formosa* or *S.korethroides*, whereas the red flowering plants looked to me like typical *S.bruchii*. The orange flowered plants were nearer to Amaicha and in the valley bottom, the *S.bruchii* being nearer to Tafi and on the slopes.

.....from H.Middleditch

In his *Lobivia* 1,2,3, it is stated by Rausch (p.156) that "the northern limit of the yellow-flowered *Soehrensia*



formosa (Pfeiff) Bckbg is found near Andalgala, where they are also called *Soehrensia ingens* Bckbg." Thus we have a yellow flowered globular *Soehrensia* near Capillitas, which lies to the west of the high mountains bounding the Chaco. Some 70 km further north, on the same side of the same mountain range, at a similar altitude and in a similar phytogeographic zone, there are to be found globular *Soehrensias* with an occasional yellow flower, near the road from Tafi to Amaicha. There are no roads into the high Andes between these two locations, nor are there any reports to hand of any natural historians or cactus collectors trekking uphill to about 3300m altitude from the Santa Maria valley, between these two locations. What would they find if they did? Some yellow flowering *Soehrensias*? Or perhaps the yellow flowering *Soehrensias* only grow at the two spots where man has laid a highway through this particular area?

.....from W.Knoll, Austrian Cactus Society magazine, June 1974 (Translated by K.Wood-Allum)

Doing my best with my sparse Spanish, I asked in the bus station at Tucuman about a bus to get me to Cafayate. Unfortunately there was no connection that day but there was a bus to Tafi del Valle where my notes indicated there were some interesting cacti to be found. So I bought a ticket and climbed into the ancient bus. This was my first trip into the cacti habitats of north-west Argentina and I was looking forward to searching for some interesting cacti.

In Tafi del Valle I found a hotel room for the night. On the next morning, scarcely had the first rays of the sun shone into the room than I was up and dressed, on with the rucksack, and set off on foot, pickaxe in hand. As I did not know where the cacti were to be found, I simply tramped up the nearest slope and soon I saw the first *Soehrensia bruchii*. This species, WO9, reaches a diameter of half a meter, has golden-yellow spines and varies greatly in the flower. On this day all the plants were in flower - a magnificent sight. The flowers varied from yellow through to golden yellow, pink, light and dark red to violet. I collected flowers in all colours and placed them on one plant to photograph them to be able to show my fiends at home the real variability.

To start with I could hardly get my fill of this display of flowers, but then I reminded myself that I really ought to be doing some collecting. So finally I started to look for young plants of a suitable size, but it turned out that this was not altogether so simple. It took almost the whole day before I was able to collect a small number of nice plants, and take them back to the hotel. After the evening meal I was ready to retire to bed after somewhat strenuous exertions of the day at 2,500m altitude.

The next morning brought no sunshine, It was drizzling and the clouds hung over the mountain peaks. This time I would tackle the other side of the valley. A further patch of scree lay in front of me, which I imagined I would be able to cross in half an hour at the most. I greatly deceived myself. It took me a good hour and a half to reach the foot of the mountains. Again flowering *Soehrensias* were everywhere, which of course I paid scarce heed to on this day.

.....from H.Middleditch

It is to be hoped that a suitable ball and chain has been attached to that picture of the flowers in various colours, detached from the parent and perched on one plant of *S.bruchii*. Now to move further into the mountains.

.....K.Gilmer

During our trip to north-west Argentina, we came across *Soehrensia* at three locations. One site was on a steep slope on the south side of Encrucijada, in the Quebrada del Toro, a second was near the Abra de Pives, at 4,100 m altitude, en route from the Salinas Grande to Purmamarca. The third location was a few km south of Tintin on the road to the Quebrada Escoipe, at 3,100 m altitude; at this last spot we found only one plant, but it was the only occasion on which we found a plant in flower. The flower was red, but a somewhat pinkish red. The outer petals on the flowers were standing more or less upright and indeed gave the impression that the flower was almost closed. But it was just far enough open for a bumble bee to get into the flower - with a struggle - as I was able to observe. Having read the description for *S.korethroides*, I now think that the plants we saw could be this species.

.....from K.Preston-Mafham

We saw *S.korethroides* (which is the same thing as *S.bruchii v.nivalis*) at three places - above La Poma which is north of Cachi; above Purmamarca near the Abra de Pives; and also just past Las Cuevas in the Quebrada del Toro. Generally the spination on these plants was rather brownish, rather like that on the plant of which we were shown a slide by K.Gilmer. But I do not think that I ever saw a multi headed plant of *S.korethroides* - they were all solitary. The flowers on *S.korethroides* do not open as widely as on *S.bruchii* because the spines are too long and dense. The offsetting plant seen by K.Gilmer en route from Tintin to Cachipampa seems to me to be a one-off. He told us there was only the one plant at that location so it is probably out of its normal habitat and of a very great age. Where we ourselves saw *S.korethroides*, the plants were never growing close together, but well apart from each other, perhaps a stone's throw or even more apart from each other.

.....from C.Pugh

We followed the valley of the Rio Calchaqui from Cafayate, via Cachi, to La Poma. Beyond La Poma there was some farmland - not farmland as we would know it in this country, but the occasional dwelling and many signs of cultivation. There appeared to be a form of irrigation channel running from one farm to the next, all the way along this section of the valley. We made one stop roughly 20 km to the north of La Poma, then shortly afterwards we came to a decidedly steep bit of road. Up to that point the road had been climbing but at a steady and modest gradient; the condition of the road was passable but did not allow of travelling at a fast pace. The vehicle radiator had boiled once or twice prior to this spot but at the steep bit of road it boiled most vigorously. We stopped and surveyed the situation, walking over the immediate rise ahead. Here we found a further steep section and decided that we would not be able to proceed further. We also found here some plants of *Soehrensia*, but not very large ones.

.....from F.Vandenbroeck

In travelling from the Salinas Grandes to the Quebrada Humahuaca, we came across some *Soehrensia* of the var. *nivalis*. The population near to the pass was very densely and silvery spined, the lower populations showed a more open, coarse, and blackish-brown spination. As far as I remember most plants in the population grew solitary, although I did see smaller sprouting clumps as we descended towards Purmamarca.

.....from R.Ferryman

The *Soehrensias* we came across were always solitary. I recall meeting only one plant (not in the Quebrada del Toro) which was offsetting but this was without question a damaged plant.

.....from K.Gilmer

We did see several clumps of *Soehrensia* as we crossed the pass towards Purmamarca, but they did appear to be one older and larger plant with several smaller ones all growing side by side. Certainly they were not offsetting sideways from the main stem, like the plant we saw near Tin-Tin.

.....R.Kiesling

The road from Purmamarca to the Salinas Grandes climbs out of the Quebrada Humahuaca. Both the main road to

Tres Morros and the secondary road to El Moreno go through the mountains and near the top of the pass on each road there are *S.korethroides* to be found growing. They grow at the same site as *Lobivia glauca*. Approaching the top of the pass it is more humid than down in the Quebrada Humahuaca. Rainfall is mainly October to April, practically none in winter when it is cold.

.....from M.Nilsson

It will be six years ago when I came across about half a dozen plants of *Soehrensia* just north of Piedra de Molino, on the road from Escoipe to Cachi, after an hour of climbing from the house where the local bus stops. All these plants had reddish-brown, stiff spination. The body form was broad cylindrical, except that the small plants (ca. 10 cm high) looked like *P.maassii* at first sight. The older plants were more greyish downwards. The biggest plant was maybe ca. 20 cm broad and 30 cm high. There were no flowers to be seen. There were no other columnar plants in that vicinity. It was growing together with *Rebutia nigricans*, *Lobivia haematantha v.kuehnrchii* and an *Airampo* form of *Opuntia*.

.....from J.Piltz

The report from M.Nilsson of "*Lobivia bruchii v.nivalis*" from near Piedra de Molinos at the head of the Cuesta de Obispo is new to me. We travelled this road over the Cachipampa and saw no sign of these plants.

.....from J.Lambert

*Soehrensia korethroides* is found all along the Cachipampa, but never abundantly.

## **ECHINOPSIS KORETHROIDES** By E.Werdermann Translated by H.Middleditch from *Neue Kakteen* by C.Backeberg 1931

Body solitary, globular to short cylindrical, in its habitat becoming up to 30 cm in diameter; colour dull light green to a lustrous insipid green; crown somewhat depressed, in young plants surmounted by yellowish to blackish-brown spines; later the crown becomes exposed, usually spineless and only the newest areoles are white felted. Ribs 15-20 or more, quite evident, not divided up into tubercles, narrow and acute in the crown, 4-8 mm high; areoles elongate, ca. 1.5 to 2 cm apart, only the new ones with whitish to dirty yellowish woolfelt. Radial spines 12-20, unequal, whitish to yellowish horn coloured with darker tip, horizontally or diagonally spreading, needle-like, usually straight, up to 3 cm long; central spines typically 4, rarely less, often more, yellowish-red-brown, often somewhat flattened and banded, stiff, but brittle. Flowers from the side of the crown, about 6-7 cm long; pericarpel and tube with scales and long brown hairs, petals dark red. Habitat north Argentina, Prov. Los Andes.

In young plants in particular the spines over the crown look just like a sweeping broom; they are often broken off, looking as if they have been cut off by shears. Initially I took this plant to be an *Echinocactus* until the collector, Stuemmer, sent me some pressed flowers.

.....from R.Kiesling

Bearing in mind that *S.korethroides* sometimes grow globular and that sometimes they grow more elongated, up to 35 cm in diameter, it may be that the *Echinocactus* III of Fries could possibly be *S.korethroides*.

.....from R.E.,Fries, "Contribution to the knowledge of the Alpine Flora of Northern Argentina", *Nova Acta Regiae Societatis Scientiarum Upsalensis Ser.IV* 1905

**Echinocactus III** Globular cactus 20-30 cm tall, 10-20 cm in diameter, short cylindrical. Ribs ca. 30, clearly divided into tubercles. The areoles are covered with thick woolfelt. Spines about 17, directed outwards, up to 5 cm long, stiff, round as an axle, straight. The areoles at the crown of the body are without spines. The flowers are placed 5 to 10 cm from the growing point, are 4-5 cm long, covered externally with thick wool felt. Petals reddish brown. Habitat: Prov. Jujuy, Moreno, in stony places, at 3500m altitude. 25 Dec. 1901; Fr 955, in flower.

.....from A.V.Fric, *Kakteenjager* 1929

(accompanying a habitat photograph) *Lobivia bruchii nivalis* at over 4500 m altitude; varies between a robust dark red spination to yellow and snow-white hair-like spination according to the altitude of the finding place.

.....from H.Middleditch

*Soehrensia bruchii v.nivalis* appears to have been so named by Fric on account of it growing at a very elevated altitude, the snowy-white spines supposedly mimicing the snow. However, one cannot help harbouring doubts about the altitude quoted by Fric for the location of this plant. This is not the only occasion when doubts arise regarding the accuracy of an altitude quoted by Fric as a figure of perhaps 4000m might have been expected as the upper limit at which it might be found.

.....from K.Gilmer

When we came across the *Soehrensias* in the Quebrada del Toro, we found plants with silvery spines, plants with golden yellow to reddish spines, and plants with blackish-brown spines. At one spot we even found three plants growing almost side-by-side, one plant of each of these different spine colours!

.....from H.Middleditch

It was originally queried by K.Gilmer whether these *Soehrensia* might be *bruchii*.

.....from J.Lambert

None of the pictures of *Soehrensia* taken by K.Gilmer would be *S.bruchii*, which has a quite different type of spination to that displayed by the plants in the photographs. *S.bruchii* has a stronger, shorter, spination, not "brushy" at all (see Fig.229 in my book). When travelling from Purmamarca to Tres Morros (which is near the Salinas Grandes) you have first to cross the mountains which enclose the Quebrada Humahuaca. This is route 52. First of all you come to the Abra de Potrerillo at 4,200m and then after a fairly brief run over undulating ground you come to the Abra de Pives at about 3,900m. There is indeed a beautiful population of *S.korethroides* at the Abra de Potrerillo (see Fig.233 in my book). I would say that the plants seen by K.Gilmer at Abra de Pives are indeed *S.korethroides*. As for the photographs taken at Las Cuevas, I am much more doubtful. For one thing, the altitude here could well be too low for *T.korethroides*.

.....from H.Middleditch

From the map at my disposal the altitude of Las Cuevas in the Quebrada del Toro is 3430m; the *Soehrensia* were found by K.Preston-Mafham and R.Ferryman some distance upstream from Las Cuevas, towards Encruzhilda, possibly at about 3600m. The plants reported by K.Gilmer from near Las Cuevas may be from the same general locality. *Soehrensia* is also recorded by M.Nilsson from above Las Cuevas in the Quebrada del Toro at 3800m altitude. It is also reported by M.Nilsson that *S.korethroides* occurs at 3400m above Alfarcito, lower down the Quebrada del Toro. This would suggest a slight altitude overlap between these *Soehrensia* and *Gymnocalycium spegazzinii*, in the Quebrada del Toro. The

Soehrensia found by C.Pugh to the north of La Poma may also occur at around 3600/3700m altitude, shortly after the last *G.spegazzinii* were seen.

On the climb out of the Quebrada Humahuaca via Purmamarca, M.Nilsson observed that these plants were found below El Quemado, which lies at 3800 m altitude. On this same road, they were noted at 4000m at GC 169 near the summit of the Abra de Potrerillo. and above Las Cuevas at 4080m at GC 166 near the pass from the Quebrada del Toro on to the Altiplano. The group of plants seen by M.Nilsson to the north of Piedra Molinos are recorded at 3950m altitude.

The account by E.Vatter of his travels in the Quebrada del Toro [Chileans No.51 p.108] also mentions that he found plants of what he called *S.bruchii* near San Antonio de los Cobres. In all probability these would also be *S.korethroides*. To judge by the surroundings on the slides of *S.korethroides* from various locations which have been shown at Chileans' Weekends, these plants grow by preference on hillsides with occasional outcrops of rock and in company with tussocks of ichu grass. Hence the Vatter *Soehrensia* would probably be growing on the slopes of the adjacent mountainsides, rather than growing on the flat altiplano. San Antonio de los Cobres itself lies on the altiplano at an altitude of 3775 m. so that the *Soehrensia* seen by Vatter could have been growing at about 3800m altitude. If it is accepted that the Fries' *Echinocactus* III is also *S.korethroides*, from near El Moreno, then it would be rather strange if the only three spots on this south-east corner of the Altiplano where *Soehrensia* grows happen to be those accessible by roads and tracks. If an altitude range of (3400) 3500 to 4000m might be suggested for *S.korethroides*, then there could well be many hundreds of unvisited locations where these plants might occur over the slopes between the Nevado de Chani, the Quebrada del Toro. Cachipampa, and Abra Acay.

.....from R.Hillmann

According to my own observations, the *Soehrensias* which I saw when crossing the Abra Acay were at some 4250m altitude. They certainly displayed a variation in spine colour.

.....from K.Preston-Mafham

When we climbed up from Andalgala to Capillitas we saw great numbers of *Soehrensia formosa*, but again they were all growing solitary and again at some distance apart from each other. Some of them were 25 cm across and many of them were in flower, with yellow flowers.

.....from J.Lambert

Along the Cuesta de Capillitas I also observed and photographed these plants. I made a detailed description of the flower, fruit, and seeds. The photograph and description can be found in my book, under the heading of *Trichocereus (Soehrensia) ingens*.

.....from F.Kasinger

After making a stop at El Arenal on our journey south from the Santa Maria valley to Andalgala, we reached El Ingenio before halting to camp for the night. Next day we went on to Minas Capillitas and then stopped to search for *Acanthocalycium thionanthum v.aurantiacum*, but only found three or four examples. We then continued on our way, past an impressive example of *Soehrensia formosa* which was around 50 cm long and about as broad which we spotted hanging down from a rock face.

.....from L.Pfeiffer, Enumeratio Diagnostica Cactearum, 1837

***Echinocactus formosus*** Hort. Angl. Syn. *Melocactus gilliesii* Hort. Habitat: Mendoza. *Echinocactus* subglobose to oblong, pale green; 16 vertical, blunt, somewhat indented ribs; areoles not very close together, oval, grey, somewhat woolly; spines rigid, needle-like, centrals 2-4, long, brown, exterior spines 8-10, white below, dark-brown above.

Specimen 5 inches diameter, 4.5 inches tall. Areoles 4-5 lines apart. Central spines 1 to 1.5 inches long.

.....from R.Meyer, Monat. fur Kakteenkunde 1894

*Echinopsis formosa*. Plant globular at first, later elongated ..... The size of the plant in my collection, on which I base this diagnosis, is 24 cm tall and 16 cm in diameter. In the magnificent well-known collection of Bennecke in Birkenwerder is to be found a fine specimen of about 50 cm tall, which has not even yet flowered.

.....from H.Middleditch

Under the heading of *Echinopsis formosa* it is noted by Schumann in his *Gesamtbeschreibung der Kakteen* that this plant grows up to half a metre tall, quite a stretch from the original height of about 12 cm given by Pfeiffer. In their *Cactaceae*, Britton & Rose refer to a specimen of two feet in height reported from the Darrah collection in Manchester, the plant reputedly having been in England for some 60 years. Both Backeberg and Rausch indicate that it can be found growing up to 2 m tall, but apparently in more favourable places. When Kiesling was on detachment to Kew he came to The Chileans' Weekend and amongst the slides which he showed to us was one of *S.formosa*, found at 3500 m altitude "on the road from San Juan to Chile". This plant was on a north-facing slope i.e. an advantageous orientation for daily insolation, whilst patches of snow were found at a somewhat higher altitude but on a slope receiving less insolation. Bearing in mind that Kiesling collected a *Tephrocactus* at Arrequentin, north-west of San Juan near the border with Chile, there is the possibility that he found this *S.formosa* near that location. Arrequentin itself lies at over 3000m altitude. Schumann records *Soehrensia formosa* as solitary, Backeberg as usually solitary, Rausch as mostly solitary; Backeberg provides a *v.polycephala* for an offsetting form found by Dodds. The plant pictured by Kiesling gives a definite impression of an offsetting plant with several heads, possibly photographed because it was an unusual form rather than a typical example of this species.

.....from R.Hillmann

We found thousands of plants of *Soehrensia formosa* growing on the hillside to the west of Mina Salagasta, about 30 km to the north of Mendoza city. There were some big specimens with sweet-sour fruits the size of an apple. Some of these plants give the impression that they were offsetting, as in your description. Lower down on the same hillside, at about 1400m, there were growing *Denmoza rhodacantha*.

.....from H.Middleditch

A search of the available literature has revealed a paucity of factual data on whereabouts *Soehrensia formosa* grows in San Juan and Mendoza provinces, and at what sort of altitude. In his *Lobivia* 1,2,3, Rausch includes a picture of a population of decidedly columnar *Soehrensia formosa*, but does not quote their location any closer than "Mendoza". If the person in the picture can be used as a scale, some of these *Soehrensias* must be well over one metre high.

.....from K.Gilmer

We came across *S.formosa* in two places in Mendoza province. One was in the vicinity of Villavicencio which is located to the north of Mendoza city, the other near Manzano Historico. We found the first group of these plants to the west of Villavicencio at about 1500 m altitude; here they grew in company with *Denmoza rhodacantha*, *Cereus aethiops*, *Opuntia sulphurea*, *Trichocereus candicans*, and a species of *Pyrhocactus*. After travelling a further two kilometers along the road to the west, we stopped again at another group of *Soehrensia*, this time at 2000 m altitude. Here the only other

cactus to be seen was a hummock forming *Tephrocactus*, of *T. glomeratus* affinity.

Later on, we took the main road south from Mendoza city and then turned off towards Manzano Historico. At about 7 km beyond that place, at some 2000 m altitude, we stopped where there were again plants looking like *S. formosa*. Here they grew together with a hummock-forming *Tephrocactus*, a *Pyrrhocactus* species, and also some *Austrocactus* with yellow flowers. At the customs post at 2600 m we saw more *S. formosa*, growing here with an *Austrocactus*, a hummock forming *Tephrocactus*, and also what we took to be a species of *Gymnocalycium*. At each of these places the *Soehrensia formosa* always grew on the mountain slopes. The specimens we saw in Mendoza attained a greater height, up to 1.2 m tall, with a body diameter of 50 cm. Occasionally they formed clumps which could reach 2 metres across. Whether these huge clumps consisted of a single, offsetting plant or whether it was simply a large number of individual plants growing hard up against one another, it would not be possible to say with certainty. But to judge by how closely the heads grew together, making a very compact clump, it gave the impression that it could be a single, offsetting plant.

.....from U.Eggl

We encountered some plants which might be *S. formosa*, above Manzano Historico. Most of these plants were depressed globose to globose, but some were decidedly columnar. I would guess up to 40 cm tall. We did not make any measurements, and none of these plants were in flower.

.....from F.Vandenbroeck

On our way south from Tinogasta we made an overnight stop at Famatina. On the following day we decided to undertake an excursion up into the actual Sierra. It was drizzling somewhat, the sky overcast, and there were distant rumblings of thunder. However, in the mountains the weather conditions are very variable and therefore there were occasional sunny periods. We take the road towards the hamlet of Corrales. This led us on to a valley in which small hamlets succeed one another; in the drab landscape they appear as green spots with tall poplars, walnut trees, peach or apricot trees and also some pasture. In what was at the time a much too wide grey river bed, an amazing yellow-coloured river wound its way through the slimy sediment, which it had already laid down. When the road deteriorated, we left the vehicle behind and continued upstream on foot. All around were growing groups of *Trichocereus* displaying flowers of all possible colours - white, pink, yellow, orange, salmon, to magenta-red. White and red predominated. On the ascent of a slope we came across remarkable columnar plants of about one metre high, with short, thick, bristle-like spination. We stand here presumably looking at specimens of *Lobivia formosa* sensu Rausch. Nearly all the plants have an obliquely sloping crown and bore fruit. As we climbed higher we saw more of the self-same plants alongside numerous specimens of *Denmoza rhodacantha*.

.....from M.Nilsson

You will see on the enclosed map that Famatina lies at 1470m altitude. The village of Corrales is marked some 15 km to the north-west of Famatina, the road continuing a further 10 km or so up the valley of the Rio Achavil. There is a height of 2750m marked on the map next to the road, about four or five kms above Corrales. But whether this applies to the road at that point, or to some peak near the road, is not at all clear.

.....from J.Lambert

Even though I have travelled through the province of Mendoza and San Juan, I cannot tell you anything about *Soehrensia formosa*, as I have never met this species so far.

.....from H.Middleditch

Will the TG 59 and TG 60 locations near Villavicencio be anywhere near your proposed route for your planned trip to San Juan?

.....from J.Lambert (later)

During the course of my visit to San Juan in December 1995 I decided to make a one-day excursion to Villavicencio and Uspallata. The mountain road between both places crosses the Sierra de Uspallata and a fine population of *S. formosa* occurred there, above the level of 2000m. These plants, especially the adult specimens, are very difficult of approach as they only grow on steep flanks of the mountain. Columnar specimens of 50 cm in height are not in the least exceptional here. Fortunately we discovered another population of the same species along the road to Arrequeñin. Here the plants grew at between 3000 and 3300 meters altitude, on rather gentle slopes, together with *Denmoza rhodacantha*, a *Pyrrhocactus* and very few bushes. The soil consisted of schistose material with some blocks. I did manage to photograph a specimen of about 60 cm high and 40 cm diameter! This population may belong to *Soehrensia uebelmanniana*, a Chilean form very closely related to the type species, with only a slight difference in the spination, and keeping a somewhat more plumpish shape.

.....from F.Vandenbroeck

It was in November 1990 that we came across *Soehrensia* some km to the south-east of Caspana (east of Calama, Chile). The plants reached a maximum height of about one metre, but most of them were smaller than this. We saw only one yellow flower which, unfortunately, was not open, but they were covered with big red fruits. It is possible that this species flowers in the winter time, which would explain the many ripe fruits when we found it in Spring. I believe that it was Ritter's *Trichocereus uebelmanniana*, although Ritter mentions a height of about 1.5m. There must have been a population of about fifty plants scattered over a rather limited area, growing together with *Tephrocactus atacamensis*. We did get the impression that some of these plants may have dichotomous heads

.....from R.Moreton

The seed of *S. uebelmanniana* which was collected by F.Vandenbroeck has germinated fairly well. The MN 3 *Soehrensia bruchii* from seed are also coming along quite well.

.....from G.Charles

Some of the ex-Vandenbroeck seed of *S. uebelmanniana* also germinated for me and now I have four plants. They do look rather like young plants of *S. formosa*.

.....from H.Middleditch

Perhaps one of the more distinctive features of the flowers of *Echinopsis* and of *Trichocereus* is the very obvious stigma, well exposed in the mouth of the flower, carried on a style which leans against the wall of the flower tube. This characteristic feature also seems to be found on both *Lobivia grandiflora* and *L. andalgalensis*. In his *Lobivia* '85, Rausch has put all *Soehrensia* and some *Trichocereus* spp. into his expanded *Lobivia*, but he does not appear to concern himself with whether the flowers of these *Soehrensias* do display the upright style, more or less central in the flower, as expected in *Lobivia*. As usual, Rausch tends to make statements with a lack of supporting data. His photograph of *Lobivia rosarioana* (p.49, *Lobivia* '85) clearly displays a stigma on a style rising centrally in the flower tube. Of the two open flowers, that with the stigma lobes barely parted from each other, carried well clear of the surrounding anthers, is presumably "today's" flower; whilst that with the almost wide-open stigma lobes spreading out and touching the topmost

anthers, is presumably "yesterdays" flower. It is difficult to see any sign of stigma lobes on his pictures of the flowers of *Soehrensia grandis* or *S.bruchii*, whilst the stigma disposition is far from clear on his pictures of *Soehrensia formosa*. On both pictures of *Soehrensia walteri* the style and stigma are clearly leaning right against the side of the tube. However, there is no mention in any of the accompanying descriptions of the disposition of the stigma and style on these plants. In Fig. 1077 in Ritter's *Kakteen in Sudamerika*, an upright, centrally disposed stigma may be seen on *Soehrensia uebelmanniana* in habitat.

.....from C.Holland

On the flowers on my *S.formosa*, *S.ingens* and *S. grandis* WR 129, the style was carried more or less centrally in the flower.

.....from D.Aubrey-Jones

The interpretation of the age of the two flowers on the picture of *L.rosarioana* in Rausch *Lobivia '85* would seem to me to be reasonable. My own plant of *rosarioana*, raised from seed, has now flowered and I notice that the stigma lobes remain more or less in an upright disposition, closely parallel to each other, for the first three days on which the flower is open. On the last day of opening, the stigma lobes are spread out into something like a cup shape.

.....from H.Middleditch

For those who are fortunate enough to flower any *Soehrensia* there appears to be an opportunity to make valuable observations on the nature and disposition of the style and stigma in these flowers. There may be some consistency in these features but this could only be established on the basis of observations made on a number of plants, preferably in more than one collection. The distribution area for the *Soehrensias* discussed above is included in the Altiplano map; part of that area is shown in more detail on the map of Central Salta.

### **CEREUS (OREOCEREUS) TROLLII Sp.Nov. By W.Kupper.**

**Translated by J.Brickwood from Monats. Deutsche Kakt.-Gesellschaft No.5 1929.**

The *Cereus* which I now place before the reader in words and pictures is perhaps the most magnificent discovery of recent years. It is comparable with the most beautiful and popular columnar cacti, such as *Cephalocereus senilis* and *Pilosocereus lanatus*. However, I would maintain here that the justification exists to state that this plant even surpasses the latter two species in its beauty and my cactus friends who have also seen this plant are of the same opinion.

This plant was discovered in 1927 in the Cordillera of southern Bolivia, from Corolqui to Potosi at elevations between 3800m and 4700m, by Dr. C.Troll, a geographer and botanist from Munich, whilst on an extensive voyage of exploration which took him through several countries in South America. Even the factor of the habitat elevation alone makes for an extraordinary new publication since, amongst other things, this is the only *Cereus* known at present to occur at such high elevations in the mountains; only a few *Opuntias* occur at still higher places. But above all, what really completely distinguishes this plant from its relations, and which will surely test and satisfy all desires of cactus enthusiasts, is the incomparably beautiful, snow-white, woolly covering of the plant, which is so thick that it completely envelopes the robust plant body. Only the longest spines from each areole stand out from the thick woolly coat.

This new *Cereus* is undoubtedly very closely related to *Cereus (Pilocereus) celsianus* and at first I believed that it should be placed as a form of the latter. However, it differs in such essential features from that very variable species that it definitely deserves the rank of a new species. I have named it *Cereus trollii* in honour of its discoverer; according to Schumann's taxonomy it would be called *Pilocereus trollii*, or *Oreocereus trollii* according to the ideas of Britton & Rose. I give here a description as follows, a large part of which was supported by the statements by Dr.C.Troll:-

Body thick, low growing, short columnar, upcurving to erect, offsetting around the base and in this manner forming small groups up to 25 cm across, not exceeding 1 m in height and mostly shorter. Ribs 15-25, low and rounded, notably tuberculate as a result of transverse notches between the areoles. Areoles up to ca. 3 cm apart, elliptical, about 1 cm long. Radial spines 10-15, varying markedly in strength, some stiff, bristle-like, some subulate [awl-like]. Central spines 1-3 (-4?), much stronger. Areoles also with a dense tuft of long, fine, white woolly hair. The spines are initially a shiny red-brown colour, later becoming a paler, translucent golden-yellow. They are either straight or slightly curved. The strongest central spine becomes 5 cm long. The woolly hairs attain a length of 7 cm and are markedly curly or fuzzy.

The flowers appear in the vicinity of the crown, arranged in multiple rings, and are a deep pink, tubiform and slightly curved. The receptacle, including the 12 mm long perianth segments, measures 4 cm in length. The stamens and style project slightly out of the flower. The tube bears pointed, triangular scales of ca. 2mm in length, the axils of which bear long wool.

The arrangement of the stamens is interesting; at the base of the flower tube a spacious nectar chamber is partitioned off by a membranous diaphragm, an opening being left free only in the centre where the style arises. The inner margin of this thin diaphragm is resolved into a ring of stamens. Further, numerous stamens emerge in part from the diaphragm, partially from the lower section of the tube wall. The upper part of the tube wall does not bear any stamens, however a further ring of them once again emerges at its upper margin, within the perianth segments. The mouth of the flower tube is slightly oblique in shape.

According to C.Troll, the fruit is about 3 cm in diameter, globose, yellow, and dry inside when ripe. The epidermis of the fruit is half concealed by woolly felt.

In the habitat area, the birds collect the soft, woolly hairs of this *Cereus* to aid their nest-building. It is clear that at the high-lying habitat location this magnificent new species is frequently subjected to very sharp frost, and this may possibly indicate that the plant may also be winter hardy in our climate.

.....from H.Middleditch

An account of the observations made by Troll in the course of his extended travels through south-east Bolivia appeared in Petermann's *Geographische Mitteilungen* for 1927. This was followed in 1928 (in the same periodical) by a map of the area on which were plotted certain of the routes which were followed by Troll. One of these trips, undertaken with a troop of mules, took place between February and May of 1927. Starting from Potosi, the route went south to Vitichi and on to Cotagaita, thence west into the higher mountains, via Quechisla (near Cerro Chorolque) to Atocha; thence to Uyuni and on to the western Cordillera. It would appear that *O.trollii* was encountered at one or more places along this route, between Potosi and Chorolque.

.....from K.Preston-Mafham

During my visit to Bolivia, after we had spent a night in Potosi we set off in the direction of Cuchu Ingenio. The

road ran across mountains which might have passed for moorland in the Pennines, with not a sign of habitation or cultivation to be seen anywhere. What gave the appearance of being heather covered moor turned out on closer examination to be sparse tufts of grass and scattered ankle high twiggy shrubs, liberally interspersed with chunks of rock and stone. About half way between Potosi and Cuchu Ingenio, still on the high mountains but starting to descend, we stopped and climbed the hillside, finding a number of plants of *Oreocereus trollii*. As we continued along the same road, we started to follow a valley, gradually losing altitude and eventually met with signs of cultivation. After our stop to photograph the *O.trollii*, we must have travelled at least 10 km before we saw the first signs of *O.celsianus*. As we approached Cuchu Ingenio, they became quite abundant.

.....from R.K.Hughes

Setting off from Potosi we travelled to the south. About 30 km out from Potosi we were descending towards Cuchu Ingenio, where the road was snaking along the right-hand side of a vee-shaped valley. As we rounded a curve I spotted an *O.trollii* on the steep slope below the road. Here we stopped at BDH 6 against the steep bank right at the roadside, which was about the same height as the vehicle. Climbing up and over this bank we then saw in front of us a gentler slope on which there were scattered a great many *O.trollii*. We did not see any more *O.trollii* between there and Cotagaita.

.....from H.Middleditch

The convenient travelling routes over this mountainous area are determined by the lie of the land and will change but little from one century to another. It might reasonably be assumed that the same route was followed south from Potosi both by R.K.Hughes, by K.Preston-Mafham and by K.Troll. In the absence of any other reports of *O.trollii* along the route Potosi - Cotagaita - Quechisla, one possibility is that the original discovery of *O.trollii* was made between Potosi and Cuchu Ingenio.

.....from C.Backeberg, *Der Kakteenfreunde*, Vol.3 No.5 1934.

[Travelling south after leaving Lake Titicaca .... ] In general the impressions of the highlands in winter are not infrequently quite imposing. So I rode southwards for a few days over the high plateau. It was quite early in the morning and extremely cold. All around the flat landscape was covered with a light coating of hoar frost, the puddles were iced over and as far as the horizon no more Tola bushes were to be seen, which as a rule grew at still higher altitudes. Beyond the immediate horizon arose the white peaks of the western cordilleras and amidst the frost coated plateau the snow covered peaks looked to me like icebergs in a boundless polar sea.

For me it was more of a stroll through the wintery plateau since nothing was to be found in this area apart from some *Opuntias* which seemed to be quite exceptionally unchanging. But then, further to the south, it became interesting once again. Near Atocha there grew a *Cereus* [*Oreocereus*] *trollii* which was much whiter and larger, with less stems but at the same time stouter, than the Type. The groups are not so shiny as those from the Argentine border, which in addition have much more slender stems. So which are the plants found by Dr. Troll? There are, at all events, two distinctly different varieties. Then I came into the territory where the huge *celsianus* grow. There were specimens that could easily be taken for a *pasacana* and moreover are found with snow white wool. My pictures will show fantastically huge specimens, close to a larger Bolivian *Cereus*, which was also larger than a *pasacana*.

.....from H.Middleditch

From this account by Backeberg it appears that he approached Atocha from the altiplano; the only available route either by road or rail would be from Uyuni to Atocha. Leaving the altiplano at Uyuni, at about 3650 m altitude, the road to Atocha and Tupiza sets off into the mountains, climbing gradually. After a travel of perhaps thirty miles it has ascended only a few hundred metres when it reaches the watershed between the altiplano and the drainage to the tributaries of the R.Pilcomayo. Then it starts to descend, gradually, reaching Atocha at about 3650m again. Presumably the *O.trollii* seen by Backeberg would occur at about this altitude. It is unclear just how much later along this route Backeberg saw *O.celsianus*, but if he was two thirds of the way to Tupiza, he would be at some 3200m altitude. Thus along this route, the *O.trollii* appear to ascend to a higher altitude than the *O.celsianus*.

.....from F.Vandenbroeck

During our visit to Bolivia in 1992 we took the road from Potosi to Uyuni. This is a fairly good road and it offers marvellous landscapes and interesting cactus habitats. Leaving Potosi we soon met with hummock forming *Tephrocacti* and *Lobivia pentlandii*. Further on we found *T.rossianus* with a wide variety of flower colours. About 25 km out of Potosi we met with some tall specimens of *Trichocereus tarijensis* with red flowers. Climbing up to take a closer look at these plants we came across *Rebutia pygmaea*, *Lobivia pentlandii*, and more hummock-forming *Tephrocacti*. It was a beautiful habitat also because the cacti were surrounded by small gnarled trees with a red scaling papery bark, which I believe are a *Polylepis* species. These trees are quite typical for high altitudes, as we also saw them at several other places. They seem to be the only tree-like species that can survive at altitudes around 4000m. Further on both *Oreocereus trollii* and *O.celsianus* appear. Closer to Tica Tica we observed *Opuntia sulphurea* and large numbers of *Parodia maassii*. Past Tica Tica there are robust specimens of *Trichocereus werdermannianus* and a form of *Lobivia pentlandii* with yellow flowers (var. *hardeniana*?). Nearer to Uyuni the terrain gets sandier and more barren with a monotonous vegetation of Tola shrubs (compositae). Even the llamas are absent. Suddenly from the high plateau, the town of Uyuni becomes visible as a small whitish speck in an immense plain.

From Uyuni we set off in the direction of Atocha, with the intention of continuing eastwards to Cotagaita. Between Uyuni and Ayacocha there is little of interest as to cacti. It is an endless sandy high plateau sparsely covered with low Tola bushes, which may certainly be quite scenic in places. The road is dreadful and at certain places it was being repaired, but at other places it simply disappears and one has to find a track without losing the right direction. We met a truck which had broken down and we picked up one of the passengers. This was fortunate for us in a way, because without this man we would certainly have got lost. The whole area is completely deserted. Before reaching Cerdas, a small hamlet, we got stuck in a mud-hole and it took us several hours to extricate ourselves.

Our original plan was to travel from Atocha directly to Cotagaita. However, much of this road seems to be merely the bed of the river Quechisla and since there had recently been some rain the ground had become too soggy for safe travel. In consequence we turned to head for Tupiza. At the start this road, too, was pretty dreadful. It leads through the river bed where one has to try and find a passage clear of obstructions, but soon it goes up on to the plateau where it becomes fairly good. On the plateau we came across large populations of *Lobivia ferox*. Later on, in a small shallow valley, we saw *Oreocereus trollii*, together with *L. ferox*, *Neowerdermannia vorwerckii* and *Rebutia pygmaea*. Further on the plateau become mountainous and often the road follows the mountain crests offering superb views. There is no traffic in this area.

At about 60 km out of Uyuni we came across large numbers of *Parodia maassii* together with *L.ferox*, *Opuntia soehrensii*, and *Oreocereus trollii*. Lower down the slopes there were *O.celsianus* and *Trichocereus tarijensis*.

Tephrocactus bolivianus abounds here and Polylepis trees are very conspicuous. We also saw Tephrocactus pentlandii with remarkably dark spines. From far off it becomes possible to see the valley of the R.Tupiza, which is visible as a long deep cleft running across the plateau. Heading down towards this valley we passed through veritable forests of O.celsianus, where Cleistocactus tupizensis, Parodia maassii, Lobivia ferox, and Tephrocactus bolivianus may also be seen. The road descends to the village of Salo, which is situated in a valley. In this valley the road again follows the river bed, where large specimens of Trichocereus werdermannianus may be seen.

.....from H.Middleditch

The route followed by F.Vandenbroeck from the Rio Quechisla to Salo appears to run more or less parallel to the Atocha - Tupiza road. Here, too, the O.trollii appear to extend to a higher altitude than O. celsianus.

.....from C & M Sherrah

After arriving in Uyuni from Potosi by bus we took the opportunity to hire a local taxi. We went to the foothills about 3 or 4 km directly east of Uyuni along the main Uyuni-Potosi road. On quite steep slopes we found Oreocereus trollii growing in company with Trichocereus pasacana.

#### **FORTY YEARS ADVENTURING By F.Ritter Translated by H.Middleditch**

March 20th 1962. From Villazon I took a lorry to Tupiza and on the next day a lorry took me towards Las Carreras as far as Mal Paso, in order to collect the marketable seeds of Oreocereus trollii. It was already dark when we reached Mal Paso at 3500 m altitude but fortunately I found lodgings there. The next morning I walked further uphill and fortunately around 3700m I found abundant fruits of Oreocereus trollii, which I collected all day. Early in the afternoon there came a thunderstorm. It was not possible to shelter from the rain and hail; only a niche at the bottom of an overhanging rock kept one side of me dry. When it cleared up, I crept out with my clothes sopping wet, which dried in the cold wind, whilst to make use of available time I searched for more fruits; these were far apart. Then came a walk of about two hours in an icy wind with over half a hundredweight in my rucksack to return to my lodgings.

On the next day I had naturally made my cold worse, but despite that I climbed into the mountains once again and again collected a rucksack full of fruit. On the following day I was not able to climb into the mountains once again; only with an effort could I stand upright, my condition being worse for me at my age of 64. At least it was sunny weather so I collected fruit of Parodia maassii in the immediate surroundings of the hamlet. In the afternoon a lorry from Tupiza took me as far as Impora, over a pass above 4,000 m high. For two and a half days I cleaned seeds from my collected fruits from early morning to late at night.

On 21 November 1962 I had collected a few examples of cacti near Cotagaita and whilst I was making some notes, a sudden violent whirlwind came and lifted the sack, half full of cacti, high up into the air and dropped it to the ground again some 20 metres further away. It was just as well that this did not happen near some cliffs. A few days later I took a lorry out of Tupiza on the road to Mal Paso. Well on the way I disembarked at a narrow gully which appeared to me to be worth searching for cacti. To my surprise it turned out to be an excellent finding place for Rebutia; so I stopped there until the onset of darkness and found about six different species of Rebutia, almost all in bud. I took with me specimens of each of them in order to photograph them later in flower. In the dead of night I arrived at Mal Paso.

.....from H.Middleditch

The occurrence of O.celsianus to the north of Tupiza, on the Pampa Mochara, at about 3500m altitude, was reported by J.R.Kirtley in Chileans No.47 p.95. These plants were also seen at about 3800m altitude to the west of Mal Paso, whereas Mal Paso itself will lie at an altitude somewhat higher than 3800m. Ritter indicates that he came across O.trollii but makes no mention of O.celsianus at Mal Paso so that if this can be taken to indicate an absence of O.celsianus here, then it appears that O.trollii may grow up to a higher altitude than O.celsianus at this location.

.....from R.K.Hughes

Having seen O.trollii at 3950m not far to the north of Cuchu Ingenio, we would be at about 2750m altitude when we saw O.celsianus on gentle slopes a few km to the south of Cuchu Ingenio. At a similar altitude again we saw O.celsianus at BDH 8 near Vitichi, growing on more or less level ground, likewise at 2900m about 10 km south of Cotagaita at BDH 9. Just to the north of Cotagaita, near the turn-off to Camargo, at BDH 11, the O.celsianus grew on a gentle slope. It is quite possible that O.celsianus may grow more or less all the way from south of Cuchu Ingenio to Cotagaita, if seen from the air.

At about 10 km north of Iscayache at 3400m at BDH 19 and again at BDH 20 at 3475m at 16 km north of Iscayache we stopped where the O.trollii were growing on pretty level ground. These were both typical O.trollii sites. At BDH 20 the odd O.celsianus grew small and were of similar appearance to the O.trollii. At 19 km north of Iscayache at BDH 21 at 3470m we had descended in a left-hand curve to find a gully with cactus-covered slopes. On the medium to steep slopes O.celsianus formed plants with stems to head height. There were only one or two isolated plants of O.trollii that I saw, looking as if they were in the wrong place.

.....from F.Vandenbroeck

During the course of 1988 we were able to make a trip to Bolivia. The period we were in the country, during July and August, is not always the best for finding plants in flower or fruit. We found a fair number of cactus species but many plants had withdrawn into the ground, or looked shrivelled up, or were laden with dust. During the seven weeks we were there the sun was scorching in an absolutely speckless sky, every day except for two mornings when for a few hours there were some clouds. Our tour started and finished at Santa Cruz but we spent most of our time in the highland areas. From Tarija we climbed up to Escayachi, and there we saw a few Oreocereus trollii in flower, but these must have been very early flowers. It was certainly not the main flowering season yet, although the very first signs of spring were showing here and there in the landscape. From Camargo we drove up the valley of the R.Tumusla as far as Cotagaita and at this place we found Oreocereus celsianus, some carrying their pure yellow fruits. Near Chunchara we were able to collect some withered blackish fruits which contained ripe seeds. I suppose the fruits must dry up on the plant and wither and finally fall off on to the ground where the seeds must be spread by the rains and by animals.

**A BOTANICAL TRIP TO SANTA VICTORIA By T.Meyer**  
**Translated by H.Middleditch from Revista geografica Americana X,120;1943**

On 23 January we set off early from Yavi for Cajas. Beyond Yavi is a sharp rise of more or less 300m and then the road continues almost level. The vegetation in this section corresponds to the Campo Tola, described below. At some 15km from Yavi there is a small native hamlet called Suri Puji, where there is an extensive association of tree-like white cardons, prominent cacti completely covered in white woolly hairs. In this section goats, mules and sheep were only seen in the vicinity of Suri Puji, together with troops of llamas. In Cajas the local guide with the mules awaited me, all ready to set off once the luggage was stowed. The road went gently upwards and the vegetation gradually became impoverished until reaching Cuesta del Abra de Lizoite at 4400m altitude, where only yaretas (Azorella) was to be seen, plants which grow partially underground, in the shape of cushions. There was a very intense cold; since there had been rains the previous day all the hills were white, completely covered by hoarfrost. The landscape was truly picturesque but the cold was so intense that it hurt the face and made me shiver. From here we saw in the distance a troop of four vicunas, which fled away on seeing us, making great leaps over the craggy rocks.

From the top of the Lizoite pass there started a gentle descent to one of the finest valleys that I have seen in my life. The cold receded and the vegetation became gradually enriched. It was necessary to halt at intervals in order to adjust the luggage on the mules, which would otherwise move forward on the descent of the lower sections. These frequent stops were made use of for botanising. Amongst the more showy vegetation of this section there stood out the short "white cardons" which looked like bunny rabbits' tails and by the beauty of their flowers are worthy of equating with various spp. of *Begonia*.

On this route it was possible to distinguish three classes of vegetation - 1. The Tola campos which cover the major part of the route from La Quiaca to Cajas. 2. The stunted vegetation of the high hills on the section Cajas-Lizoite and Lizoite-Santa Victoria, and 3. The vegetation of the lower Quebradas.

The Tola campos. The plants which predominate in this formation are three: the Tola, which is a composite of the genus *Baccharis*; the Chigua, another composite of the genus *Lepidophyllum*; and the Tolilla, which is a solanaceae of the genus *Fabiana*. All three are woody or lignified, whose height varies between 30 cm and one metre and are utilised as firewood by the natives of the region. In addition to these plants, which are the dominant ones, there follows in order of importance: the Garbancillo which is a legume of the genus *Astragalus*; *Salvia gilliesii* with purple flowers which enjoys great fame as a medicinal plant; a tiny convolvulus *Ipomoea minuta* with mauve flowers; an oxalis of the genus *Hyseocharis* with orange-red flowers; the Frankeniaceae commonly called Yaretilla which forms cushions on patches of very dry ground; two species of spiny shrublike legumes of the genus *Adesmia* and commonly called Anagua; the principal grasses *Espuro* (*Pennisetum chilense*) and *Chillagua* (*Festuca stirpifolia*) which form an excellent pasturage and in places cover vast stretches - they grow on the hills to heights in excess of 3000m altitude. Finally a group of cactaceae, amongst which the only one standing out from its background is the tree-like white Cardon, *Oreocereus trollii*, handsome plants which attain several metres in height and are covered with long white hairs; these form compact associations in the vicinity of Suri Puji.

.....from H.Middleditch

The "tree-like white cardon ... several metres high" would probably be *O.celsianus* rather than *O.trollii*.

.....from R.Hillmann

To the east of Yavi, near Cajas, there is a habitat of *Oreocereus celsianus*. Here the fog and clouds come up against the mountains so that there is quite a lot of humidity in the air. There are plants of *O.trollii* growing together with these *O.celsianus* near Cajas but about two km further to the east I came across RH 1359a *O.trollii* growing on its own. It is very common in Bolivia to find these two species growing side by side. I even have slides showing that both sorts are out in flower at the same time, but there are no hybrid plants to be seen, even though the humming birds were seen visiting the flowers of both sorts.

.....from C.Pugh

During the short visit to Argentina in December 1995 we set off from La Quiaca to the east. After passing Yavi and before we reached the mountains fringing the plain, we came to a low ridge whose slope was covered with hundreds of *O.celsianus*. On the fairly flat ground there were none of these plants, then all of a sudden we were in the middle of them. Some of them could have been well over 2 m high, as I can distinctly remember G.Charles reaching up to try and get at a fruit and the top of the plant was still above his outstretched arm. They all seemed to be full of fruit. Also a single hairless *O.celsianus*. The flower colour was very variable on these plants - from red all the way to a peach colour. Many of the *O.celsianus* branched from above the base and in the crook of one of these branches a South American wren had built itself a nest. In addition there were one or two *Lobivia ferox* x *Oreocereus celsianus* hybrids to be seen, about 1 metre tall and very densely spined.

Once beyond this low ridge we crossed a stretch of more or less flat ground and then came to the foot of the mountains proper. Here the road followed a flat bottom valley where there grew some low bushes roughly knee high, together with a few shrubs and various herbs. The sides of the valley were very rocky but not very high. There were two species of *Rebutia* growing on the rocky hillside, under the dwarf bushes, quite close to the road. Amongst the bushes were a number of *Lobivia ferox*, although these were not abundant. Some of them were in flower, mainly white flowers but we saw other colours as well. In addition there were a number of *Neowerdermannia* and what we took to be *Tephrocactus subterraneus*. Also to be seen on the rocky hillside were *O.trollii*, whose flowers were all dark red in colour. There were no *O.celsianus* growing here.

.....from K.Preston-Mafham

Leaving La Quiaca en route for Santa Victoria, the first section of the journey was over the altiplano. Near Cajas the ground started to rise as the mountains came closer and it was here that a great many *Oreocereus celsianus* were to be seen. As far as it was possible to see, no *O.trollii* grew with them. About two kilometres further on, the gradient steepened abruptly as the ascent of the mountain started in earnest. This is where *O.trollii* was found, but they disappeared before the road reached the top of the pass. Once over the pass when the road was following a pretty steep descent, *O.trollii* again put in an appearance. But there were no *O.celsianus* to be seen on the east side of the pass. So the *O.trollii* grew on the steep slopes in roughly the same altitude band at both sides of the pass.

Further to the south a trip was made from Iturbe, crossing the mountains which line the eastern side of the Quebrada Humahuaca. Once over the pass, the descent to Iruya began. Just after the crown of the pass there were *O.trollii* to be seen growing on a modest slope, spread out along the mountainside. After the road had descended a short way further, there were no more of these *Oreocereus* to be seen, so they appear to be confined to a narrow altitude zone. Indeed, on



reflection I would be inclined to say that *O.trollii* was confined to a narrow altitude band wherever we saw it.

.....from R.Ferryman

We did see *O.trollii* at one or two places in the course of our visit to Argentina. Generally this plant was fairly low growing in comparison with *O.celsianus*. To me, the taller plants which branched from the base were *O.celsianus* and the short plants which occasionally offset from above the base were *O.trollii*. However, the *Oreocereus* we saw on the road east from Yavi seemed to me to be a rather taller version of *O.trollii* although a contrary view was taken by another member of our party. Much discussion over the identification of these particular plants took place at this spot.

.....from C.Backeberg, *Stachlige Wildnis*, 1951

We reach the border at La Quiaca-Villazon. Early next day we set off further on our journey. After the mountains of Bolivia, it is a peculiar experience to wander over this stony high plateau. At considerable distances from each other follow the stopping places Tres Cruces - Iturbe - Humahuaca. At the latter place I broke my journey for a few days to collect a number of specimens of the fine white-haired *Oreocereus trollii*.

.....from H.Blossfeld, *G.B. Cactus Journal* 1936

Here behind Humahuaca to the east of the Quebrada, in a wide valley, are thousands of *Oreocereus trollii*. In the village we get a peon who takes us some 8 km northwards, along the main road. We halt where a lateral quebrada branches off, leave the peon as guardian of the lorry, and set off westwards, further up the slope. We climb up the first stage and come out in a ravine. Up here are an enormous number of *Parodia maassii*. Under some wretched thorn bushes *Opuntia weingartiana* sticks up like fingers. And then, between the tola bushes, we discovered a snow-white head with close, brownish spines - the first *Oreocereus trollii*. It occurs sporadically up here between the last large *Trichocereus pasacana*.

Once more we go up to a higher terrace and at last we have arrived on the plateau. Thence onward the ground rises slowly, *Oreocereus trollii* becomes more plentiful, but no more *T.pasacana*, as far as we can see.

.....from R.Mottram

In April 1992 I received from J.Iliff a number of small plants of various *Opuntia*, together with some brief accompanying notes. One of these reads as follows: "Opuntia chichensis, Argentine, prov. Jujuy, E of Humahuaca, above Pucara, on level, apparently granitic pebbly ground with sub-shrub cover of *Baccharis* sp. and a compositae, also with *Opuntia soehrensii*, *Opuntia shaferi*, and *Oreocereus trollii*".

.....from G.Charles

During our visit to north-west Argentina in 1995, we took the road which runs east from Humahuaca, climbing out of the valley straight up towards the mountains, in the direction of Pucara. Here we came across *Opuntia weingartiana*, *Parodia maassii* and *Oreocereus trollii*. This was before we had reached the *Trichocereus pasacana* and small clumps of *Tephrocactus bolivianus*.

.....from K.Preston-Mafham

When travelling along the Quebrada Humahuaca, we came across a number of *Oreocereus* that were difficult to place either in *O.trollii* or *O.celsianus*.

.....from G.Charles

During our brief visit to Argentina in December 1995, we climbed out of the Quebrada Humahuaca on the road through Purmamarca. Approaching the pass we came across some *Oreocereus trollii*, which I was really amazed to see as I had not imagined that they grew as far south as this.

.....from H.Middleditch

The account of Fric's visit to the Quebrada del Toro and Tres Morros, which appeared in *Succulenta* for January 1936, included a photograph taken on the slopes of one of the mountain ranges running north from Vulcan Chani, whose peak is visible in the background. Bearing in mind the clarity of the atmosphere at these altitudes, it would be unwise to assume that the photographer was only a few miles to the north of the snow capped peak - it could just as easily be a couple of dozen miles away or even much more. From the photograph the impression is gained that the ground is falling away to the right, so that it may be assumed that the picture was taken on the western flank of the range which runs along the western side of the Quebrada Humahuaca. Possibly it may be no great distance from the Abra de Pives on the road which comes from Purmamarca. There are two people in the picture; the shorter and apparently younger one may well be the young lad hired by Fric as the cook and the taller may be the guide. They are standing over what is most probably a plant of *Oreocereus trollii*, although no other plants of this sort can be discerned on this photograph. This location is probably no great distance from the sighting of *O.trollii* noted immediately above by G.Charles.

.....from G.Charles

We saw no *O.celsianus* in the area above Purmamarca where we found *O.trollii*.

.....from H.Middleditch

This location, west of the Quebrada Humahuaca and east of the Salinas Grandes, appears to be the southernmost extent of the distribution area for *O.trollii*. It is quite remarkable that in such a brief trip into one relatively small corner of the altiplano, Fric had the good fortune to meet with *O.trollii* at what must be the southernmost limit of its distribution area. Not only that, he also came across a number of other cacti whilst travelling along and out of the Quebrada del Toro which were also close to the margin of their distribution. Several of these were not too well known at the time.

.....from R.Senior

My *Oreocereus trollii* was raised from Ritter's seed many years ago. It is now in a 7 inch pot and has reached about 12 inches in height. It is put out of doors in the summer and brought in under glass for the winter. It has some very smart looking golden brown spines. It flowered for the first time this year, the flower appearing from an areole fairly close to the crown.

.....from H.Middleditch

This particular plant is probably of some respectable age. My Winter seed catalogues were inherited from R.Ginns and the last issue in my possession is dated 1962. However, this may not necessarily be the last Winter seed catalogue, as the collection of *Copiapoa rarissima* is recorded by Ritter as March 1969. The last diary record in his "Forty Years Adventuring" is dated 1971, whilst on page 1089 of his *Kakteen in Sudamerika*, Ritter tells us that he moved house from Chile to Paraguay in 1972.

.....from R.Mottram

I think you will find that 1962 is the last issue of the Winter seed catalogues. Of course, seed with an FR number may have been available after that date from other commercial sources.

## A GOOD DAY'S CATCH. From F.Vandenbroeck

During the course of our visit to Bolivia in December 1993 we had a long journey from Potosi to reach the small town of Uyuni. This place lies eastwards of the salt lake of the same name (Salar de Uyuni) at an altitude of 3660m. From here we undertook an excursion to an island in the middle of the salar. Because it is so easy to get lost on this endless whiteness we looked for a guide who would take us to the "Isla Pescado" (Fish Island). First we had to go to Colchani, a small village which lives on salt extraction. On the way there we stopped to make enquiries of a young man riding by on a bicycle, who turned out to be a student at Uyuni. He was from Bella Vista on the Chilean border. He agreed to come along with us as a guide.

Then we drove onto the salar, with nothing but salt on all sides. It is completely barren for nothing can live here. We had to drive 117 km over the salt flat to reach the island. The scene is blindingly white and painful to the eyes. Getting further on to the white barrenness of the salt lake, one can see blackish "islands" looming up in the distance. One of the largest is the so-called Isla Pescado because its shape resembles a fish. I was especially interested to have a look at the vegetation on this "island", a lava covered chalk formation surrounded by salt. Getting on to "land" we were astonished to see marvellous stands of *Trichocereus atacamensis*. Most of the plants were a single column and only very seldom carried one or more branches. Many of these plants were in flower. I immediately recognised these marvellous *Trichocereus* which I knew from the mountains east of San Pedro de Atacama. In my view it is remarkable that this species should occur here without getting any further eastward on to Bolivian territory. On the other hand, together with this *Trichocereus* we found *Tephrocactus pentlandii* v. *dactilifera* which, of course, comes from the east but does not penetrate into Chilean territory. So two species, originally alien to each other, met here and find their limit.

Ritter, in part 2 of his *Kakteen in Sudamerika*, describes the species *Trichocereus eremophilus*, whose habitat he put in the border area between Bolivia and Chile at a height of around 4000m. The habitat and description of this species agrees with those on the Isla Pescada. Ritter refers to the close relationship of these plants with *T. atacamensis*, and justifies the new name - amongst other details - with the fact that *T. eremophilus* grows in a much more extreme climate than *T. atacamensis*. Whether *T. eremophilus* should be regarded as a separate species or as an ecotype of *T. atacamensis*, is probably only a matter of opinion.

After a light lunch we made an inspection tour of the rocky island. A few xerophytic bushes were to be found. There were birds here and we even startled a viscacha. The place was swarming with flies. Amazing that there is so much life here! Then it was time for the return trip to Uyuni, over the white surface that looks like snow and ice.

## ....from "THE ANDES" By Tony Morrison 1975

The Salar de Uyuni is not so much a salt flat as a sea of salt, 85 miles across at its widest and about 100 miles long. It is the largest expanse of salt in South America. After the drying out of Lake Minchin, which flooded this part of the Altiplano right across from the eastern cordilleras to the western (during the ice age), a giant expanse of flat lake bed was exposed to the sun and to the rarified air. For more than 10,000 years, intense evaporation sucked the surface dry, drew up more moisture from below, and siphoned that away too. In the process a strong concentration of minerals was brought to the surface; these dried out and crystallised and the salt, the last to crystallise, was left at the top.

After so many thousands of years, the salty crust is mostly between six and twenty-four feet thick. Beneath it lies gravel and mud. Near the shore, the salt crust becomes much thinner, forming a fragile covering over treacherous, oozy, mud. Our plan was to drive across the Salar de Uyuni from north to south - but first we had to find a suitable point at which to enter the lake. Judging from the map, the most direct route was through the small pueblo of Salinas de Garci Mendoza, but at this village there would be no way of crossing the mud zone. Instead we would have to find one of the causeways built at strategic points by the occasional lorry drivers who take short cuts across the salar. I had been told that there was a causeway near a tiny indian settlement directly south of Tunupa. Sure enough, as we breasted the last rise before the pueblito, we saw a line of stones running out on to the salt.

We drove down the causeway, and on to the salar where we maintained a steady 50 miles an hour. We had been travelling south-west for 45 minutes and the crests of the volcanic peaks along the Bolivian-Chile frontier were beginning to show as large black blobs above the horizon. Another twenty minutes, and one of these blobs appeared to solidify. It seemed to be much closer than the rest and I wondered whether it might be an island in the salt. Half a mile away, I could see that it was indeed an island, about 150 feet high and a mile or so long, with tall columnar cacti on its hump. As we drove nearer I could see cacti on every slope.

I walked part of the way round the island, prodding the salt with a crowbar to find a firm surface. We found that the salt was thickest near a rocky promontory and we were able to stop the Land Rover within a yard of the shore. The fine grey sand of the beach was scattered with a few plants and yellowing tufts of ichu grass. One small crimson flower peeped out from below the sandy surface. Above us the rocky slope was covered by scraggy tola bushes and cacti, which I recognised as the type known locally as cardon. I clambered up to investigate a ledge whose light colour had attracted my attention. The rock was covered with a greyish-white encrustation, which I struck with a large stone. A hard outer concretion about two inches thick fell away, exposing a dark grey inner core below. I concluded that the crust was the calcareous remains of a prolific growth of algae. Long ago, waves had splashed against the cliffs where I was standing. The algae had established themselves both in this splash zone and just below the surface where sunlight had penetrated, permanently marking the level of the vanished inland sea, Lake Minchin.

Looking around, I noticed that the calcareous encrustation stopped only a few feet above me, forming a band right along the side of the island. Beyond this line, the rock was bare. I scrambled up the rocky slopes - by the time I reached the top of the island I had found two more distinct calcareous bands. It seemed clear that each of these bands represented a period when the level of the ancient sea was stable and higher and the water was warm enough for algae to grow. Perhaps meltwater from the shrinking glaciers kept the level of the lake steady. Then came a severe drought lasting perhaps hundreds or even thousands of years, a period of constant evaporation when the algae had no chance to flourish at any one level. This might explain the wide stretches of bare rock between the white bands.

At the top of the island I was surrounded by the tall, sharp-spined cacti that I had seen from the Land Rover, and by a multitude of Tola bushes and tough spiny plants. Beyond lay the dazzling ocean of the salar, stretching flat in every direction except for the flecks of a few other islets.

.....from "MEMOIRS OF A NATURALIST" by M.Cardenas. Translated by H.Middleditch

On the 23 March 1952 we arrived at noon at Uyuni, and booked into an hotel. Our intention was to go across the salar and to reach Colcha K., the capital of the province of South Lipez. The Commandant of the regiment quartered at Uyuni, Colonel Siles, an ex-pupil of mine from the Military College, sent us a truck for travelling to that remote frontier town

On the following day we set out from Uyuni before noon and presently entered the salar in the direction of Colcha K. The day was clear and our lorry raced over this immense white surface of salt at more than 70 k.p.h. The drivers of the vehicles making the crossing must know the ways in and out which have been banked up because the ground at the edges of the salar is marshy. Our driver told us that he was guided on this crossing by certain peaks of the cordilleras which appeared on both borders. There was no permanent vehicle track for those which make these crossings because anything formed underfoot is immediately filled over by the wind which carries the grains of salt. The salt is sparkling white and in the middle of the salar it is so hard that it is difficult to break into it with a handpick. It must be dramatic to be left in the middle of the salar on account of some fault in a vehicle. The spectacle which is presented by this Grand Salar when contemplated from the centre is most impressive, especially when one tries to imagine the magnitude of the geological phenomena that could have taken part in its formation, in an age far removed from the present.

We arrived at Colcha K in the late afternoon and were given quarters by Colonel Siles who commanded a small garrison in this remote frontier region with Chile. When we went into the clubhouse to dine, we were only the Colonel Siles, a Lieutenant, a radiotelegraphist, a Medical Officer and the three of us. We stayed for the whole of the following day in Colcha K., observing its native vegetation and hunting for wild potatoes. The vegetation was confined to the rocky heights which maintained a certain humidity within its crevices. In this place we collected *Salvia gilliesii* with blue and white flowers, and *Verbena seriphioides*, with very small flowers which appear from between the minute leathery leaves and the spines which give to the cylindrical branches an uncommon serpentine appearance. We did not find many wild potatoes other than *Solanum acaule*, which grew in abundant colonies even between the cultivated flowering plants in the gardens of the small park in the town.

On the morning of the following day we started the return trip to Uyuni in a lorry which was sent by the Mayor because the old lorry from the garrison of Colcha K remained out of order. In full sunlight we crossed the arid pampa which lay between the town and the margin of the salar. There grew abundantly in this area the lampaya, *Lampaya medicinalis*, the *Solanaceae Fabiana denudata*, and the *Tola Lepidophyllum quadrangulare*. Even in these high rocky parts of Colcha K., we discovered a new variety of *Tephrocactus chichensis* which was naturally described as *T.chichensis v.colchanus*, distinguished from the type species by its thinner and more curved joints.

Before coming down to the margin of the salar and at the full slope of the mountains, we stopped near to a cluster of houses called Chuquini in order to get a look at some columnar cacti of 4 to 5 m in height which possessed parallel upper branches on the principal stem and white flowers with thin tubes. I identified these specimens as *Trichocereus pasacana*, a species described as *Pilocereus pasacana* by Rumpel in 1885 and as *Cereus pasacana* by Weber in 1893. According to Britton & Rose, this cactus characterises the Andean countryside of north-western Argentina and the south of Bolivia.

In so far as Bolivia is concerned, I believe that these American botanists who did not come to the mountainous boundaries of the Salar, took as *Trichocereus pasacana* the species which grows abundantly between Atocha and Tupiza. This is *Trichocereus poco*, which was described by Backeberg 15 years after the appearance of Volume II of the extensive work *The Cactaceae*, by Britton & Rose. Perhaps the only botanist who came to the Salar, before myself, was Dr. Asplund in 1921. The slopes of Chuquini where we came across these cacti, lies in the western cordillera of our Andes and hence is in a region of volcanic rock formations. The great explorer of the Chilean Flora, Rudolfo Amando Philippi, encountered a high columnar cactus at the San Bartolo mine near Calama and described it in 1860 as *Cereus atacamensis*. Since the orographic zone of Chuquini should be of the same character as that of San Bartolo, the cacti which we have come across for the first time in Bolivia and those which grow abundantly in Argentina, named *Trichocereus pasacana*, should be called *T.atacamensis*.

After once again crossing that immense desert plain of salt, we arrived at Uyuni and were quartered by Colonel Villarreal in the residence of the officers of the regiment. After dining at the Military Club, we went to bed at 9.00 p.m. for a few hours' sleep, arising again at 2.00 a.m. in order to pick up the international train which took us as far as Oruro. thence on to another local train to Cochabamba, which we reached on 26 March at 9.00 p.m.

So came to an end this memorable trip which was the last undertaken in Bolivia before the revolution of 9 April of this same year completely changed the political and social regime of the country. This political movement which destroyed at a blow the well organised army, including the Military College of La Paz, nationalised the mines and destroyed the small progressive private estates which had existed, with the consequent economic debacle, annulling also intellectual values. Since then, our botanical trips had every time a great deal of difficulty owing to the fiscal bankruptcy, the disdain of all cultural manifestations and the insurgence of the Indians, as we were to see from now on.

.....from H.Middleditch

The location of Colcha K and the Salar Uyuni will be found on the map of the Altiplano in Chileans No.44 p.108. Up to the present time, the island visited by Tony Morrison and by F.Vandenbroeck has not been located on any available map.

.....from M.Lowry

On the enclosed copy of part of the SF-19-4 map at 1:250,000 scale which covers Uyuni and the south-east corner of the Salar Uyuni, you will see Colchani lies some twelve miles or so to the north of Uyuni. But there is no sign of any island in the middle of the Salar, that I can see on this map.

.....from C. & M.Sherrah, "Isla de Pescadores" US C.&S.J. 1996

In July 1994 my wife and I visited this remote island by way of northern Argentina and Potosi. At Uyuni we found an acceptable hotel. The winds sweep down from the snow-capped mountains across the Salar Uyuni, picking up salt, sand, and dust. Night time temperatures are a brisk -20°C with day temperatures rising to 0°C. The salar of Uyuni covers an area of about 12,000 square kilometres at an altitude of 3650 meters and is the remnant of a prehistoric lake that stretched from Oruro in the north to past Uyuni in the south. The Isla de Pescadores is in the centre of the present vast salt-lake. It lies at about 50 km from both the eastern and southern shore lines.

Near Uyuni itself we saw *Trichocereus*, *Oreocereus*, *Opuntia* and *Lobivia*, but on this island we found only an *Opuntia* and dense stands of *T.pasacana*. The soil on the island appears to be limestone (judging by the coral imprints) from an old seabed, over a basalt base. This has been broken down to a coarse gravel. Whether the pH of this soil favoured only *Trichocereus* and *Opuntia*, or whether the large fleshy fruits of these species favoured their dispersal by

birds, we do not know. It may be that the first seeds were brought by viscachas (chinchilla-like rodents) trapped on the island.

.....from H.Middleditch

From the sketch map which accompanies this article it is evident that their trip across the Salar Uyuni to Isla Pescadora also started from Colchani, on the eastern shore of the Salar Uyuni. This is presumably the same place mentioned above by F.Vandenbroeck. It now appears that this island lies some 50 to 60 km due west of Colchani; in turn it lies some 60 km to the northeast of Colcha K.

It is observed by Cardenas that the plants which we have long described as *Trichocereus pasacana* should in reality be called *T.atacamensis*. This observation appears to be soundly founded on the basis of prior publication.

.....from I.Bowman, Desert Trails of Atacama, American Geographical Society, 1924

At the head of the Escoipe ravine we come to the eastern slopes of the Cuesta del Obispo and here the trail zigzags upward to a height of 3300m at the crest. West of the Cuesta Obispo one enters a broad, waste-strewn valley floor after descending a steep and in places rocky trail from the pass. After crossing this broad alluvium-filled depression and a second narrow range one comes out upon the plain of Tintin, where the trail forks. One branch goes west and southwest to Cachi, a town on the floor of the deep Calchaqui valley, the other branch turning abruptly north to Payogasta and Poma. It was the latter that we followed, traversing the dry waste-strewn plain in the middle of a hot afternoon when clouds hung over the Sierra Tintin to our left hand as well as on the distant Cordillera. The plain of Tintin is covered with cactus and desert shrubs of many varieties. The chief columnar cactus, the so-called cardon, is valuable for rafters and in making doors and door frames, window frames and parts of buildings. We are here far above the forest and in a zone of low winter temperatures; but the cactus continues its scattered growth all the way up the valley and on the lower slopes of the main mountain wall to surprisingly high elevations.

Travelling westward from Poma, up the valley of Penas Blancas to San Pedro, west of the great Cordillera, one leaves the last outpost of settled life at 11,000 feet, at the border of the mile-deep Calchaqui valley. Even by the time one has reached Poma the forest and scrub of the eastern foothills and front ranges have been passed, and the only extensive growth besides grass and shrubs is columnar cactus, that extends mountainwards far into the zone of frost to an elevation of 13,500 feet. Here it grows chiefly upon the southern (warmer) wall of the valley, partly on lava flows, partly on the coarse debris washed or rolled down from these flows on the intermediate slopes of the valley. It is here subject to almost nightly frosts for a part of the year. The rim of the Puna de Atacama begins nearly a day's journey west of Poma, where the trail climbs rapidly to a height of over 16,200 feet (4950 m) at the Abra de Penas Blancas. The last few hundred feet of the trail is over rough volcanic debris and above the upper limit of plant life.

I found similar forms of the columnar cactus at elevations exceeding 13,000 feet in the high mountain country east of Iquique beyond the Cordillera Sillilica, where there are nearly six months of cold weather with severe frosts at night and often violent hailstorms by day, with some snow occasionally.

For the pack-train journey across Atacama, the desert of northern Chile, I obtained mules and guides at the nitrate plant of Central Lagunas east of Iquique. We set out early in May for the pass at the southern end of the Cordillera Sillilica. The first day's journey took us to Matilla, then we rode on to Pica where we spent the day. Almost before we had time to note the first spears of grass at about 8000 feet we also noted the first bird calls we had heard since we left the coast. This belt of grass lies like a band across the western face of the mountains. At its upper edge the short and nutritious grasses give way to the bunchgrass, or ichu grass as it is called, and ground mosses and resinous shrubs such as the tola bush. High upon the plateau summits at 13,000 feet we were surprised to find the large and straight-stemmed cardon cactus.

The last part of the ascent to the summit of the western-most plateau-like block of the Andes steepens, and the trail now follows the rocky interfluvium, now a steep walled ravine with a bouldery floor. After crossing the summit of the Altos de Pica, we dropped down a steep trail toward Lake Huasco and made camp besides the spring at the western edge of the basin. The so-called "lake" that now occupies but a portion of the salt-encrusted floor is but a shrunken remnant of a once large and deep lake that filled the whole depression. I crossed over to the other side of the basin where the old shore lines were clearly visible. The trail from Huasco eastward climbs the long piedmont slope that stretches forward from the Cordillera Sillilica, crossing over the pass at the southern end. After three uneventful days of journeying across the high mountain belt in which we passed only a few tiny settlements of a few huts each, (one called Cueva Negra), we arrived at Llica on the eastern edge of the mountains in Bolivia, at 12,000 feet. The next day we rode out of Llica southward along the edge of the mountains. A bold wall of lava rock here overlooks the salt basins. The floors of the little valleys that have been cut in the border of the mountain country are sites of tiny settlements. On the first day we passed Canquilla. We camped for the night at Suisigua. Fifteen or twenty alluvial fans at the base of the surrounding hills are covered with little farms. The next night we reached Laqueca, then travelled south and camped near the margin of the Salar de Empexa ..... and returned via Lake Huasco.

.....from H.Middleditch

In this publication, Bowman provides an appreciation of the nature of the landscape and terrain on the high Puna and in the Chileans desert; it also looks at how the indians survive in these inhospitable conditions and at what trade takes place between settlements. There are some descriptions of the journeys undertaken in the course of making this study, but the account is not set out in the form of a day-by-day diary.

It is in the section dealing with his trip from the Calchaqui valley to San Pedro de Atacama that Bowman refers to having also seen the columnar cacti "east of Iquique beyond the Cordillera Sillilica". The ex-Brandt map of Bolivia marks an Ap. de Sillilica which lies very close to a line from the Salar Huasco to Cueva Negra, i.e. the route followed by Bowman. Did Bowman mean that he found *T.atacamensis* on the approach to Cueva Negra? In his account of this trip into the mountains from Iquique, his reference to the cardon cactus appears to occur chronologically between Pica and Salar Huasco, on the ascent of the Altos de Pica. But this reference relates to the cardon cactus occurring at altitudes where the grass starts to grow above the desert region, and is not specifically tied to the ascent of the Altos de Pica. If Bowman did mean that he saw the cardon on the ascent of the Altos de Pica, it is 50 km away from where he crossed the Bolivian border near Ap. de Sillilica. When Bowman was writing p.274 of his book, did he rely on his memory for the location of the columnar cacti he saw on his p.22 when travelling east from Iquique, rather than checking his field notes? Or did he see the cardon at two different places on this trip?

In Chileans No.38 p.151 there is an abstract from the account written by Phillipi of his journey to the province of Atacama. From their overnight stop at the meadow of Empexa, his troop set off westwards and after less than two hours travel they saw some *T.atacamensis* on the south side of a small salar. Then they travelled over "almost level terrain" to reach an arm of the Salar Empexa - a patch which the compiler of the ex-Brandt map has taken the trouble to identify as

“Pampa” i.e. almost level terrain. Phillipi then passed the Napa spring, followed another arm of the Salar Empexa to the Isma spring, then went west to Lake Huasco. Here his route joined that subsequently followed by Bowman who travelled in a northeasterly direction from Lake Huasco. Wherever Bowman saw his *T.atacamensis*, it was at a different spot to those seen by Phillipi. Both of these locations lie some 25 to 50 miles to the north-west of Cardenas’ site at Colcha K.  
.....from R.Wagenknecht, *Some Chilean Cacti*, Revista Universitaria Santiago 40;1956.

*Trichocereus atacamensis* (Phil) = *Trichocereus pasacana* (Web) Br. & R. In the mountainous region of Chusmiza, in the vicinity of the hamlet of Mocha, at an altitude of 2,500m, in company with *Browningia candelaris*, there was found a plant of a height of 1.5 m with a vertically upright stem, with long and fine whitish spines, whose appearance presented a robust enlargement in the extreme.

Some time later, in the Esso review of year 15, no.83, of March-April 1951, there was carried a splendid photograph of a columnar cactus which was of course similar to the specimen observed at Mocha. The photograph carried the following legend: “On the road to Toconce, in the valley of the Rio Salado. In the foreground, a columnar cactus, at the foot of the Cerro Los Leones.”

On the map of the province of Antofagasta, to the NE of Calama is plotted the Rio Salado and the locality of Toconce at 68° 10’ longitude and 22° 10’ latitude. In the same area is plotted the cerros Los Leones at 5780 m and Toconce with 5440 m. The first of those named is the ridge or peak which served as background as noted at the foot of the photograph in the Esso review

In addition we have the following observation by Dr. Karl Reiche: “To the east of Peine grow huge specimens of *Cereus atacamensis*. This “quisco” has not yet been well studied, its common name is also “cardon”. The trunk is either solitary or branched like a candelabra, with 30 or 40 ribs on the stems, attaining up to 6 m in height. It is affirmed that it has pink flowers and eatable fruit”.

The locality of Peine is situated at the extreme south of the Salar of Antofagasta and in the latitude of Antofagasta.  
.....from F.Phillipi, *A Journey to the province Tarapaca*. 1885

On 2 February we followed the watercourse along the Socaire valley to the 6 or 8 houses which formed Socaire itself. Here we saw some colossal cacti, whose timber is so solid, that it serves for building work. It is *Cereus atacamensis*, which reaches a height of 10 m. At many places on the Puna it is the only material that can serve the inhabitants for rafters, door frames, and beams. These plants grow from Peine to a short way to the north of Cana, but only in a few places, usually on steep slopes.

.....from H.Middleditch

Following his trip through the Atacama during 1853-1854, Phillipi published the results of his collections in his *Flora Atacamensis* 1860. This included his *Cereus atacamensis* from the “San Bartolo mines near Atacama”. From the map which accompanied this publication and on which is marked the routes taken by Phillipi, it is clear that he travelled a few miles to the north of San Pedro de Atacama where San Bartolo is located. At the southeastern corner of the Salar de Atacama lies Piene, at the outlet of the Socaire valley.

Somewhat further to the north of San Bartolo, there do seem to be reports of *Trichocereus*, for example by Krahn.  
.....from R.Ferryman

It is without doubt the *Trichocereus* that Krahn mentions “going to Puritama and El Tatio” are the very same as I witnessed in 1978. There are indeed very few roads in this part of Chile - in fact there are no others that lead anywhere significant. The route to San Pedro from Calama is well used by the standards of this area and it is from San Pedro that one would undertake the journey to the geysers at El Tatio. There is only one road with a few short intersections that lead to small hamlets like Puritama and Rio Grande, which are in very difficult terrain even for four wheel drive vehicles. Upon reaching El Tatio one has left the *Trichocereus* behind. To return to Calama there are two possible routes, one very difficult and high (over 5000 m) via Toconce, and one just as difficult via Caspana. The latter we took, when we came upon *Soehrensia* just before the *Trichocereus* re-appeared. I feel certain that increasing altitude restricts the development of *Trichocereus* eastwards from the road and on reflection I recall all the *Trichocereus* habitats encountered travelling from San Pedro to El Tatio were west of the road.

.....from H.Middleditch

The road leaving El Tatio in the direction of Caspana goes forward to the Rio Salado, leaving Toconce a few miles upstream; this sighting reported by R.Ferryman is therefore fairly close to that reported by Wagenknecht from the 1951 Esso review. This location lies about 250 km (140 miles) from the sites near Colcha K, Salar Empexa, and Cerro Lillilica, where *T.atacamensis* has also been reported (above). It is stated by Ritter that his *T.eremophilus* is also found at Chiguana, which lies some 65 miles (115 km) to the southwest of Colcha K. There would appear to be every probability that *T.atacamensis* may occur at places between Chiguana and Toconce, but it is an area seldom if ever visited by cactus enthusiasts and very rarely even by any natural historian. With no clear distinctive features, and without any gap in distribution there would appear to be little justification for separating the form seen by Ritter near Colcha K. under a separate name.

The location of La Poma, Escoipe, and Cachi will be found on the map of Central Salta; Cusmisa, Mocha, Suisagua, Colcha K, Pica, Laqueca, and Salar Huasco will be found on the map of Northern Chile. The Cordillera Sillilica lies directly on the Chile-Bolivia border between Mamina and Suisagua, whilst Cueva Negra lies half way between that feature and Suisagua. Empexa lies at the south west corner of the Salar Empexa. The Altos de Pica lie between Pica and Salar Huasco. The map of Antofagasta includes the location of San Pedro de Atacama and Caspana. The area covered by each of these three maps falls within the map of the Altiplano.

## **A TALL STOREY FROM ARGENTINA From J.Lambert**

My very first visit to Argentina in 1981 started off from Cordoba, from where I travelled to the west, passing through the Sierra Cordoba to La Rioja, San Juan, and Catamarca. It was on this trip when, having left Villa Union to travel east we come to Puerto Alegre, the spot where we meet our first big *Cereus*. The species is known by the local people under the name “achuma” and may reach a height of 6 metres and more. According to Backeberg, this is *Trichocereus terscheckii* but Ritter, based upon a certain number of differences from the Bolivian cereiform types, created the species *T.terscheckioides* for this southern type. The name of “achuma” is far from specific and applies to several forms of this cactus, which is adorned with lenticular cavities of a pretty decorative effect, is used for the manufacture of tables and wall panels. From here we climb the Cuesta Miranda.

My second visit to Argentina in 1983, also started at Cordoba, from where we again set off via Cruz del Eje towards

La Rioja. Leaving Patquia, we push on on our way to Los Colorados where fine red rocks justify the name of the place. Here we once more meet with the tall *T.terscheckii*. After spending the night at Chamental, on the next morning we take the road to Olta. Near El Mollar we meet another cereiform cactus, namely *Stetsonia coryne*, growing amongst bushes, then once more at Cortaderos on the foot of the lower slopes of the Sierra de los Quinteros. Further on our journey we follow the road from Marajes to St. Augustin de Valle Fertil. At first there were no columnar cacti to be seen, but at Chucuma the *T.terscheckii* became quite abundant all at once, just as they do at Puerto Alegre.

Progressing to the north-east, we find the "achuma" well represented around the Serra Copacabana. Then we travel via the Quebrada de Belen where we notice flowering *Trichocereus* at the top of the slope. As we find ourselves here at an altitude of less than 1500 m this again has to be *T.terscheckii*. Finally we arrive at Hualfin, where the contrast between the barren hills and the fresh and green valley is really startling. Here we find a very nice *Cereus* which is different from the "achuma". This species was named *Helianthocereus pasacana* by Backeberg, but according to Ritter it should be a variety of *T.atacamensis* viz: *T.atacamensis* v. *pasacana*.

Similarly, on leaving Andalgala to the north, there are again *T.terscheckii* to be found at the foot of the mountains but on the climb itself the columnar cacti were now *T.pasacana*. On the road from Andalgala to Concepcion, however, there are again *T.terscheckii* at the foot of the climb, but as soon as one climbs the Cuesta de Chilca they disappear altogether and are not replaced by *T.pasacana*, either. Crossing the Sierra de Ambato by the Cuesta de Cebila, we again saw *T.terscheckii* on the ascent from the west. The vegetation remains fairly low so that the *Trichocereus* can be seen projecting above the tops of the trees and bushes. As far as I can remember, they were also to be seen at the top of the Cuesta.

In the mountains to the south-east of Salta, *T.terscheckii* is once again well represented, for example in the Cuesta de Quesera, which is on the road from La Cruz to La Troja, in the direction of Lumbreras. When you travel from Salta to General Guemes, there is a line of hills to the right of the road (i.e. to the south) which are covered with trees and bushes, but where one can see regularly some *T.terscheckii* sticking out through the canopy of leaves. To the south of Salta they again appear here and there at various places along the valley of the R.Guachipas, on the way to Alemania. I have noticed them particularly at Osma (near Colonel Moldes.) Turning off this road, through Rosario de Lerma, we enter the Quebrada del Toro. Here we find *T.terscheckii* in the lowermost reaches of this valley but at El Mollar we find *T.pasacana* on rocky cliffs, and then for quite some distance along this valley.

*Trichocereus terscheckii* is indeed encountered again in southern Salta and in northern Tucuman, for example along the Rio Rearte, which is a tributary of the Rio Sali. These parts are mostly covered by open woodland, a biotype in which the larger cerioids manage to occupy a niche. I did not observe any *T.terscheckii* further north, between Rosario de la Frontiera and the Rio Juramento, nor between the Rio Juramento and Pinchinal on the road to the east of the Sierra Santa Barbara. I think the altitude of these places was too low, and *Trichocereus* is replaced by *Cereus forbesii* and/or *Stetsonia coryne*. The same applies to Antilla and Rio Urena.

We had noted on a previous occasion that both on the ascent from Belen to Hualfin, as well as from Andalgala to Capillitas, *T.terscheckii* was to be seen in the lower part of each climb and *T.pasacana* at a higher altitude. Both these routes bring us to the Rio Santa Maria. Travelling north along the valley of the Rio Santa Maria, we see a nice isolated specimen of *T.pasacana* near to Santa Maria. We stop for the night at Amaicha del Valle. From there we follow the road up towards the pass and find more specimens of *T.pasacana* on the ascent between Amaicha del Valle and Abra del Infiernillo. En route to Cafayate we make a short detour to the Ruinas de Quilmes where again we see *T.pasacana*, as well as at Rincon de Quilmes.

Much further to the north we pass through Cafayate from where we follow the road to Cachi. We occasionally see *T.pasacana*, for example along the road from Molinos to Seclantes where it is scarce, also near Rumahuasi, and on the road to Potrero. At Cachi we photograph the confessionnal of the old church, this is made entirely from the wood of *T.pasacana*. In these treeless regions this same wood is used for many purposes, such as for ceilings or for furniture, and also for making some fancy goods such as lampshades or small statuettes. Driving to the north from Cachi along the valley of the Rio de La Poma, we reach Buena Vista where the landscape indicates that we have once more reached the upper limit of *T.pasacana*. On the way from Cachi to the Quebrada Escoipe we once again see many *T.pasacana* especially on the plain of Tintin. After descending the Cuesta de Obispo we see more *T.pasacana* in the Quebrada Escoipe itself.

It was with great pleasure that, in 1986, I found myself once again back in Salta which I had already visited in 1981. On this occasion we go further to the north to San Salvador de Jujuy, then via Volcan to the Quebrada de Tumbaya. Here we find a nice young specimen of *T.pasacana*. We spend the night at Tilcara and next morning we go back a short distance to take the branch road to Purmamarca. From here we take the road which leads westwards to the mountain pass. A stop here around Patacal allows us to observe *T.pasacana* in rather more detail. Adult plants reach a height of from 6 to 8 metres. The fine, large, white to slightly yellowish flower is a typical *Trichocereus* flower, with primary stamens in a compact bunch close to the style and the secondary stamens in a thin ring on the outside. Here there is a veritable woodland of *T.pasacana*. We climb further and drive along a superb mountain road towards Abra de Pives. We are now at 3250 m altitude, which about marks the upper limit of *Trichocereus*.

Travelling along the Quebrada de Humahuaca, this species is noticeable at Huajra, Tumbaya, Tilcara, and Huacalera - that is, roughly from 2000 to 2650m altitude. It does not appear further up the Quebrada de Humahuaca i.e. in the Quebrada de Sapagua or at Cuesta Azul Pampa.

In addition, I do not recollect seeing any *T.pasacana* on the mountain slopes behind Tres Morros or El Moreno, whilst there were certainly no columnar *Trichocerei* to be seen on the western slopes of the Sierra de Aguilar, when viewed from along the road which runs from Tres Morros to Abra Pampa.

.....from F.Kasinger.

To go to El Moreno from Purmamarca over Abra Potrerillo and Abra de Pives via Saladillo and Tres Morros will be about 100 km and take about three hours. The shorter route, turning off on route 78 after the Abra Potrerillo and going direct to El Moreno, is about 70 km and takes about two hours. I do not recollect seeing any *Trichocereus* anywhere there on the hillsides.

.....from G.Charles

On the road across the altiplano between San Antonio de Los Cobres and Purmamarca, we stopped where the road came to the edge of the Salinas Grandes at GC 167. We got out and walked over the sandy plain to a ridge of low hills, the first we had seen along this stretch. On the slope of this slaty ground we found quite a few *T.pasacana*.

.....from H.Middleditch

At present this appears to be the only reported observation of *T.pasacana* on the margin of the altiplano proper.

.....from G.Charles

When travelling up the Quebrada Humahuaca, north of Huacalera we certainly saw great numbers of *T.pasacana* well up on the valley sides. They even extended to the north of Humahuaca which lies at 2939 m altitude. In places they can only be described as forests. We did take the road west out of Humahuaca which leads to El Aguilar, but the state of the road in the aftermath of the heavy rainstorm and the odd loose boulder which had tumbled on to the road, deterred us from going far. We passed through a stand of numerous *T.pasacana* on this route.

We also took the road leading east out of Humahuaca, which leads to Aparzo. We did get as far as the crossing of the Sierra de Aparzo. On this road, again we saw great numbers of *T.pasacana* as well as *T.tarijensis*. They grew together but were easy to tell apart. The former bore white flowers whilst there were red flowers on the latter. But even without the flowers the two sorts displayed a quite different appearance; the *T.tarijensis* displayed more slender stems as well as having a finer spination of a different colour. We would have been at about 3300 m altitude here. However, about 40 km further to the north, there were neither of these tall columnar cacti to be seen, either in the Humahuaca valley or on the climb up to the Condor pass on the way from Iturbe to Iruya.

.....from K.Gilmer

Our first visit to Argentina started at Salta, from where we headed southwards along the valley of the Rio de las Conchas. Our first stop was made about 85 km south of Salta, and then the next stop was not far from Alemania, close to a dry river bed and the adjacent mountainsides. Amongst other plants which we found here, we also saw a tall columnar plant which we initially recorded as ?*Helianthocereus* sp.

.....from N.Wilbraham

On the occasion of the I.o.S Convention at Salta, we made a number of coach trips from Salta through the valleys of the Andes. One of these trips took us south from Salta, during the course of which we made a stop about two miles to the south of Alemania. Here we were quite close to the mountainside which rose quite abruptly from the edge of the road; it was covered with bushes and trees to such an extent that it could be quite difficult to pick a way through them and climb uphill. From the road we could see several tall columnar, branching cacti, standing out above the surrounding bushes. The name *Trichocereus werdermannianus* was suggested for them.

.....from H.Middleditch

*Trichocereus werdermannianus* is normally regarded as indigenous to Bolivia rather than to north-west Argentina. There do not appear to be any other reported sightings of this sort in Argentina. Turning to *Helianthocereus*, the nearest location from Alemania appears to be in the Quebrada Humahuaca; in his Lobivia '85 Rausch places the southern boundary for *T.tarijensis* near Tumbaya, Quebrada Humahuaca. Consequently neither *Helianthocereus* sp. nor *T.werdermannianus* appear to be suitable names for a location in the Lerma valley. For the columnar *Trichocereus* seen on the tree-and-bush covered slope near Alemania, the name *T.terscheckii* is indicated by J.Lambert, above. The area around Alemania is in the rain shadow of the moisture-bearing winds coming from the south-east; it is here that *Echinopsis silvestrii*, a *Parodia* of the microsperma group, *Lobivia aurea*, and *Gymnocalycium schickendantzii* var., are to be found. On the other side of the Cumbres Calchaquies, to the north of Vipos, prov. Tucuman, again in the rain shadow of the moisture-bearing winds from the south-east, there is to be found an *Echinopsis* of *silvestrii* affinity, a *Parodia* of the microsperma group, *Lobivia aurea*, a *Gymnocalycium* possibly of marsoneri affinity, as well as abundant *T.terscheckii*, all in fairly dense woodland on the lower slopes of the hills. The phytogeography of the Rio Conchas valley near Alemania and of the Rio Vipos valley north of Tucuman city, appear to be quite similar; in consequence it may be reasonable to suggest the name *T.terscheckii* for the columnar *Trichocereus* seen near Alemania by K.Gilmer and, separately, by N.Wilbraham.

In K.u.a.S 29;4.1978 there is a photograph taken by J.Piltz of a very tall, many-branched *T.terscheckii* seen near Alemania. As far as may be judged from the photograph this plant lacks any woolly hairs in the upper part of the stems and the rib count could be about 16 to 18. This would be roughly in accordance with the expected characteristics for *T.terscheckii*.

The Quebrada Escoipe is no great distance from Alemania and is of almost similar altitude; it may well have a similar climatic regime to that at Alemania. The lower section has trees and bushes on the steep sides of the valley. It is suggested by J.Lambert that there were *T.pasacana* here, although this appears to be a low altitude for that sort.

.....from G.Charles

I do not recollect seeing any tall columnar *Trichocereus* whilst we were driving along the Quebrada Escoipe.

.....from M.Nilsson

My journey along the Quebrada Escoipe was made by bus and it was difficult to see much of the valley sides from the bus windows. Certainly I do not recollect seeing anything resembling *T.terscheckii* in the lower section. Near El Maray I did see some tall columnar *Trichocerei*, to which I would not like to put a name as I am not sufficiently familiar with these plants. But I was told by D.Neumann that they were a *T.terscheckii* x *pasacana* hybrid.

On the photograph from F.Kasinger of the upper part of the stems on a *T.pasacana* seen on the road to Tucuman out of Amaicha del Valle, the spines are thin, feeble, and pale coloured. Looking at the photograph of my MN7 at Amaicha del Valle, that plant will be about 2 to 3 m high and has long, strong, brown spines - perhaps 5-8 cm long. It is probably *T.terscheckii*, but I did not pay close attention to these large plants.

.....from G.Charles

The spines on the lower portion of the main stem on *T.pasacana* can often be remarkably different to those on the older parts of the plant. Even on the young flowering plants the spines can be as much as ten inches long, but these long spines are entirely absent in the upper part of the plants where the hair-like spines appear

.....from F.Kasinger

Up to the present time I have made four visits to NW Argentina. My first visit started at San Miguel de Tucuman from where we drove via Tafi del Valle, over to Amaicha del Valle. As we descended from Abra del Infiernillo to Amaicha del Valle we met with a stand of *T.pasacana* where the valley might have been a km wide. This is the National Park Los Cardones. There was only an occasional bush or tree to be seen, standing about as high as the younger *Trichocerei* that were starting to branch. There were a great many low shrubs, all about knee-height, whilst the open ground was almost covered by low piles of stones and rocks. so that it was very difficult indeed to walk in a straight line. The growing point of these *Trichocereus* was almost obscured by a mass of hair-like bristly spines which gave the impression of having been discarded below the shoulder of the plant. Many of these plants were in bud or flower, the taller plants bearing dozens of buds on the ribs at least half-way round the stems. There appeared to be only one or two open flowers on a stem, the flowers being open to a funnel shape even though they were in the morning's full sun under a cloudless sky.

.....from H.Middleditch

An excellent photograph from F.Kasinger taken on the descent to Amaicha del Valle, shows the upper part of a stem of a *Trichocereus pasacana*. Buds and flowers seem to have been produced on almost all the ribs that may be seen, without any apparent preference for orientation. One is left to wonder if buds and flowers appear from all or most of the way round the stem.

.....from G.Charles

During our short visit to Argentina in December 1965, I did look at *T.pasacana* at various places to see if the buds and flowers were all round the stems. Generally this did seem to be the case, as I saw no evidence of buds preferring one side of the plant or another. There is clearly a long succession of flowers but sometimes many flowers are open on one plant at the same time.

.....from F.Kasinger

The further north we went the more the *T.pasacana* was protected by long white hairs, so much so that in the northern-most part of Argentina even the upper parts of the stem were so well protected by long white hairs that I could not see the epidermis. For example, at the beginning of the Quebrada del Toro, near Campo Quijano, the *Trichocereus* have no hair. whilst at Santa Rosa de Tastil they have a great many hairs.

.....from A.E.Hohnberg, Journey to the Puna de Atacama, 1900

Leaving Molinos, we travelled along the valley of the Rio Livracatao. The dominant vegetation still retains the appearance of the vallies. The cardones, *Cereus pasacana*, give the landscape a characteristic aspect, as in all the places where it grows. After passing San Lucas and Aguadito, the cardones have disappeared from the slopes at either side of the road, reappearing elsewhere.

After an overnight stop at Cuchiyaco we continued along the same valley; near Pata Pampa the valley is joined by an affluent from the west, the Arroyo del Cabrero. On its banks the cardones are abundant. Beyond Luracatao the cardones reappeared, although of the other species (*Cereus terscheckii*). Their height and stoutness is greater than *Cereus pasacana*, the one with horn coloured spines, the other with white spines which resemble down, growing much more slender at the top; the ribs seem not to be so straight as those which were seen on other occasions. At 80cm to 1 metre below the crown, the spines increase in number and length.

Passing La Toma, we came to Encrucijada where the bushes did not exceed 40cm in height and there were few cardones. After leaving Encrucijada we came to the foot of the Abra del Potrero where the barometer read 3600m altitude. [The party went on towards Santa Rosa de Pastos Grandes, as far as Pastos Grandes; from there they turned south, travelling to the east of Salar del Hombre Muerto, crossing the divide by Abra del Cerro Gordo, then commenced the descent of the Rio Amaicha valley towards Molinos] At 3550m we see the first cardon.

.....from H.Middleditch

It is my recollection that Buining wrote an article many years ago describing his visit to Argentina, in which he mentioned that *T.pasacana* was less hairy at lower altitudes and more hairy at higher altitudes. As yet, this particular reference has not yet been located so that my memory could well be faulty on this point. This recollection is at variance with the observation by Kasinger that *T.pasacana* becomes hairier the further north they are found.

.....from C.Pugh

We saw a great many plants of *T.pasacana* in the course of two visits to Argentina. My own impressions of the hairiness of the stems would be similar to that attributed to Buining, that they became hairier as altitude increased. A typical example would be on the ascent of the Quebrada del Toro, where the mature plants in the lowermost part of this valley had virtually no hair and that the higher one travels up the valley the hairier they become. However, even at the higher altitudes, not all the plants were hairy as the young plants were almost entirely lacking in hair. It would be from about two metre tall and upwards that they started showing signs of hair - and then only on the new growth above that height. The taller the plant becomes the more white and hairy the upper part of the stem. This very hairy portion of the stem appears to be less spiny than the lower, hairless, portion, but that may be due to some extent to some of the spines being hidden by the hair. Of course when I say "hair" this may be long, slender white spines which twist and curl around, rather than hair.

.....from H.Middleditch

If the *T.pasacana* which occur at the lower altitude end of its distribution is lacking in hair, and *T.terscheckii* does not display hairs, how does one decide where *T.terscheckii* finishes on an ascent and *T.pasacana* begins?

.....from C.Pugh

It was on the ascent of the Cuesta Capillitas that we noted the *T.terscheckii* round about the start of the climb, and also the quite hairy *T.pasacana* much higher up the ascent. During the climb, we were keeping our eyes open for signs of cacti - but we had no need to keep a look out for the tall, columnar, *Trichocereus*, they made themselves very obvious. In consequence we did not deliberately look at them in order to say which were *terscheckii* and which were *pasacana*. It was only when we were well up the climb that we realised the tall columnar *Trichocereus* was not the same as those we had seen much lower down. However, it is my impression that flowers looked bigger on *T.terscheckii*.

.....from J.Lambert

In my experience the characters distinguishing between *T.pasacana* and *T.terscheckii* are as follows. Firstly, the heads of the adult plants of *T.pasacana* always look whitish, due to some wool on the areoles (and hence justifying the name of the species), whilst this is not the case with *T.terscheckii*. Then there are the flowers, which are slightly bigger, opening more widely, and generally a bit more elongated in *T.terscheckii*. (The floral tube of *T.pasacana* is a bit more plumpish.) The colour of the outer petals is also different; the inner row of these are white with a green stripe in *T.pasacana*, but with a pink stripe in *T.terscheckii*, a feature which is never displayed by *T.pasacana*.

Incidentally, branching and forming a candelabra is not a distinctive feature to separate *T.pasacana* and *T.terscheckii*. In both species, older plants may develop this peculiar aspect, although it seems to be restricted to specimens thriving under favourable conditions. If there are few, or no, branching specimens to be seen at localities like Tintin or Amaicha, it is either because these places are getting close to the upper altitude limit for this species, and hence conditions are becoming more severe. Or there may be factors other than altitude which are not evident.

.....from R.Ferryman

The young plants of *T.pasacana* are very strongly spined with a thin but long spination. The "woolly" appearance of the older *pasacana* is clearly an ageing phase, which does not occur in *terscheckii*. In his review of "The pasacanoid *Trichocerei*" in the Fuaux herbarium bulletin, M. Cardenas suggests that *terscheckii* branches basitonically, has fewer ribs, is taller, and has larger flowers. But I do have a number of slides illustrating *terscheckii* branching from 3 m up from the ground and also of *pasacana* over 10 m tall! Incidentally I did suggest to our party on our Argentinian trip that the



only difference between *terscheckii* and *pasacana* appeared to be the size of flower, *terscheckii* having the larger flower.  
.....from H.Middleditch

In his *Nuevas Notas Cactologicas* of 1925, Spegazzini gives a flower length of 20 to 22cm for *T.terscheckii* and "not exceeding 10cm total length" for *T.pasacana*, whilst Backeberg gives a flower length of 12 cm for *pasacana* and of 15-20 cm for *terscheckii*. These proportionate sizes are reflected in the observation made by C.Pugh, by R.Ferryman, and by J.Lambert. On the other hand, in his review of *Trichocereus* in *Darwiniana* 21. 2-4, 1978, Kiesling gives a flower length of 15-20cm for *T.terscheckii* and 15cm for *T.pasacana*. This latter flower size is taken from the text and not from the sketch; the scaled lengths off his Figure 5 for the flower, the central spine, and the stigma lobes are all incorrect by a similar proportion, suggesting that the complete Figure has been reduced by 33% prior to publication without correcting the scales given in the legend to the Figure,  
.....from G.Charles

On the ascent of the Cuesta Capillitas it is also my recollection that the *T.pasacana* displayed a much more hair-like spination at higher altitudes. However, I do believe that at one or two of our stopping places there were both tall plants with hair-like spines as well as some tall plants without hair-like spines to be seen. Certainly this was the case at places in the Quebrada del Toro. What rather surprised me was how young these plants could be when the first flowered; near Santa Rosa de Tastil I was stood next to a plant in flower and I was looking down at the crown of the plant and the flowers. This plant was probably not much more than one metre high. They would obviously flower well before they reached the height at which the hair-like spines start to appear.  
.....from J.Lambert

I would not have thought that either *T.pasacana* or *T.terscheckii* was likely to flower at less than head height; perhaps as an exception, but I have never observed this. The shortest flowering specimens which I encountered were about 2 metres high.  
.....from H.Middleditch

It is observed (above) by J.Lambert that *T.terscheckii* were to be seen in the lower part of the Quebrada del Toro whilst *T.pasacana* occurred further up the valley. Perhaps there was some clear distinction between these two sorts here?  
.....from R.Ferryman

We were aware that two species of *Trichocereus* had been reported from the Quebrada del Toro, but I found it impossible to distinguish between them. In consequence there is only reference in our field list to *T.pasacana* as it was felt arbitrary to split them. We had related the southern form, in the lower part of the valley, to *T.terscheckii* at the time of our first visit there, as this is what the literature would have us believe. They are indeed clearly different from the more northern form from further up the valley, but on reflection and with the advantage of further field experience it was concluded that there was insufficient basis for distinguishing two species. The forms from lower down the valley had more obvious ribs, but in reality I could not say whether they had significantly less ribs. There was no gap in the distribution as one travelled up the valley and any variation that was to be seen appeared to be linked to localised habitat conditions. Throughout the length of the Toro valley one could say that there is a variation in form, but that is all there is - and typically what one would expect from a successful plant.  
.....from H.Middleditch

Two photographs taken by R.Ferryman in the lower reaches of the Quebrada del Toro of the tall columnar *Trichocereus* seen there, are extremely valuable. One of these photographs is a close up of a fairly new offset on one of these plants, an offset having a length not greatly in excess of its diameter. This offset fills a large part of the frame so that detail is excellent. There are eight ribs clearly visible on this picture, those at the extreme left and extreme right sides of the offset very probably being diametrically opposite. The rib count is therefore very likely to be 14.  
.....from J.Lambert

The picture of the young offset on the *Trichocereus* species from the Quebrada del Toro is not really suitable for determining the species, as it shows a still young offset having reached neither the rib count nor the aspect of the adult plant.  
.....from R.Ferryman

At the same stopping place where this young offset was photographed we also took pictures of some mature plants.  
.....from H.Middleditch

One of the further photographs from R.Ferryman is of two mature plants, possibly 6 to 8 metres high (or more), each with two or three branches. On one of the main stems there are three ribs which may be seen clearly, those nearer the sides being rather indistinct; on one of the branches there are four ribs which may be seen clearly; due to the distance from the plant to the photographer, the detail at the left and right hand sides of the stem is not entirely clear so that there could be between 7 and 9 ribs on the side facing the camera. Allowing for two of these ribs being diametrically opposite, this would suggest 16 ribs all told, at most. If these figures are compared with what the literature tells us, we have the following:-

	<i>T.pasacana</i>	<i>T.terscheckii</i>
Foster-Rumpler, Handbuch Kakteenkunde	-	9 to 11
Schumann, Gesamt. der Kakteen	15-20	-
Backeberg, Die Cactaceae	Over 20	8 to 14
Britton & Rose The Cactaceae	20-38	8 to 14
Cardenas, Pasacanoid <i>Trichocereus</i>	20	18
Kiesling, Darwiniana	40, main stem 20-30, branches	8 to 18
Ritter, Kakt. in Sud-amerika	-	8 to 12

Taking this data into account, what name should be put on the plants seen in the lower part of the Quebrada del Toro which display 14-16 ribs?

From the photograph taken on the Isla Pescadores by C. & M.Sherrah one may assess that there are 9 to 10 ribs facing the camera, making perhaps 19 ribs for the stem. This figure may be compared with the 26-37 ribs quoted by Ritter for his *T.eremophilus* from Colcha K.

In the review of "The Phytogeographic Province of the Monte" 1958, Morello provides an illustration of a *T.pasacana* seen near Agua de Dionisio, Catamarca. At the base of this solitary columnar plant it is just possible to count eight ribs facing the camera, suggesting a rib count of 14 or 15. Not far from the apex, some eleven ribs may be distinguished, indicating a rib count of over twenty for the upper part of the same stem. In the same publication is a photograph taken near Carapunco of two mature, branching *Trichocereus* entitled *T.terscheckii*. with stems quite close to

the camera. There is little difficulty in seeing seven ribs facing the camera on the lowermost part of the stem with at least ten ribs on the upper part of the stem. The same can be said for yet a third photograph, taken at the foot of the Cerro Munoz and again entitled *T. terscheckii*. On a basis of rib count, we have here three almost identical plants with two different names.

The elevation of the "foot of Cerro Munoz" will be uncertain, but Carapunco is on the road from Tafi del Valle to Abra Infiernillo, 18 km from Tafi at 1960m and 9 km from the pass at 3040m. Carapunco may lie at an altitude of about 2600m. Would the factor of altitude have any relevance to the question of a dividing line between *T. terscheckii* and *T. pasacana*?

.....from F.Kasinger

From Cafayate we drove in the direction of Salta, as far as La Punilla; there are no *Trichocereus* to be seen on this stretch of road. We then turned east off the highway on the track to Alamo where we went through three corrals and then we stopped the car. From there we walked for three hours towards the Calchaquies mountains. At our turning point we came to a large number of *T. pasacana*. Another day we again stopped near La Punilla and this time climbed up the Cerro Zorrito where once again we came across scattered plants of *T. pasacana*, this time widespread on fairly steep slopes, well above the level of the highway. A further short trip about 3 km to the south of Cafayate brought us to a small quebrada. Part way up, our way was blocked by large fallen boulders, but we could see the *T. pasacana* up ahead.

.....from G.Charles

Whilst going along the road from Escoipe to Cachi we turned off to the south near Cachipampa. Near Isonza the road started to descend into the valley of the Rio Amblayo. When we were in sight of Amblayo itself there were fairly large numbers of *T. pasacana* to be seen on the hillsides.

.....from J.Lambert

When we visited Amblayo we certainly came across plenty of *T. pasacana* there.

.....from H.Middleditch

Amblayo itself lies at about 2400 m altitude, in the valley of the Rio Amblayo, which is separated by the mountain ridge of the Sierra del Leon Muerto from the valley of the Rio de las Conchas. The Cerro Zorrito lies at the southern tip of this mountain ridge, above the junction of the Rio Calchaquies and Rio de las Conchas. The flanks of this mountain ridge are gulleied by numerous quebradas where there may well be other occurrences of *T. pasacana* between the sighting reported by J.Lambert at Amblayo and that reported by F.Kasinger on Cerro Zorrito, where they occur at similar altitudes.

Cafayate lies at 1660m altitude. On all three day trips made by F.Kasinger from Cafayate, the inference is that *T. pasacana* did not appear on the valley floor or the lower slopes, but only after climbing some way up the sides of the valley. Southwards from Cafayate, the valley of the Rio Santa Maria is mostly quite wide with fairly moderate slopes to the mountain ranges to both the east and west sides. From a viewpoint near the river itself, it may be considered possible to look up the mountainside and distinguish areas of bare ground from broad patches of vegetation, but even with binoculars it may not be easy to pick out columnar cacti several kilometres away. This might suggest that *T. pasacana* could be quite widely distributed along the mountainsides both at the east and west side of this valley, where it will only be reported from those points which are accessed from passable roads. Or after a long trek.

.....from G.Charles

From the road running north-south along the valley of the Rio Santa Maria, we took a side road, and after 5kms of steady but moderate gradient we arrived at the Ruinas Quilmes. Here there were *T. pasacana* dotted about in fair numbers. From here one could look down the moderate slope, into and across the wide valley. Going further north along the valley, we saw a low ridge approaching the road at about 20km south of Cafayate, at about 1820m altitude. We walked no great distance across to the ridge on which there were more *T. pasacana* growing. Whilst we were driving along the valley of the R. Santa Maria there were no *T. pasacana* growing on the valley floor proper.

.....from K.Gilmer

As we were driving up the Calchaquies valley, north of Cafayate, we may have seen *T. pasacana* growing up on the hillsides before we reached TG9 at 5 km north of Molinos. But at this spot they were growing in company with the *Tephrocactus* we were looking for. Further up the valley, they were well down the valley sides at TG 11 between Seclantes and San Jose de Escalchi.

.....from H.Middleditch

From the foregoing observations it appears that *T. pasacana* may grow on the slopes of the valley sides, along the Rio Santa Maria and the Rio Calchaquie, in preference to growing on the valley floor. The TG 19 site lies at about 2000m altitude, so that the lower level at which *T. pasacana* has been recorded appears to lie around 1850-2000m altitude.

.....from K.Gilmer

After consulting H-P.Thomas, who accompanied me on my trip through the Rio Santa Maria valley, it transpires that we did see a tall, columnar, branching *Trichocereus* not far from the road at TG5 - which was omitted from our field list! This was a few km east of Cafayate when we were travelling along the road to Salta

.....from H.Middleditch

This site lies at 1600m altitude, which is rather low for the reputed lower altitude limit for *T. pasacana*. However, the plant in the picture taken by H-P.Thomas gives the impression that it is *T. pasacana*, rather than *T. terscheckii*. It is possible it has grown from a seed carried down from the upper slopes by a rain storm and is an untypical representative of this particular ecological niche. In Frenguelli, *Phytogeografia Argentina* (Rev. Mus. La Plata, Botanica, No13, 1940), Plate 43 (1) is stated to be *T. terscheckii*, on the Sierra Cajon between Cafayate and Lorohuasi. No location for Sierra Cajon has been found, although Lorohuasi lies only 5km due south of Cafayate and thus will again be situated at approximately 1600m altitude. On the photograph in question, there are seven or eight ribs facing the camera on the lower part of one or two stems, and about ten ribs facing the camera on the upper parts of several stems. This is similar to the impression given by the plants illustrated by Morello 1958, mentioned above.

.....from L.Hauman, "Province of the Monte", *Geograf. Rep. Argent.* 1947 No.8

One district of the Monte occurs in the north of La Rioja and Catamarca, the area around Colalao in Tucuman, and the adjacent parts of Salta. In the valleys and on the slopes in the southern part of this district, where the altitude does not exceed 2000m, the typical elements of the Monte are to be met with ..... But their aspect is completely transformed by the presence and abundance of the Cardones, huge cacti, real trees, whose columns with occasional branches form a candelabra, frequently attaining a height of 3 to 5m, and sometimes 8m, with a diameter of 30 to 40 cm. There are two closely related species, *Trichocereus terscheckii* on the lower slopes and *T. pasacana* above 2000m.

.....from H.Middleditch

Based upon this altitude limit given by Hauman and taking into account other views quoted here in regard to the

upper altitude for *T. terscheckii* and the lower altitude for *T. pasacana*, it seems probable that the *Trichocereus* seen by F. Kasinger near Campo Quijano would be *T. terscheckii*. It may be surmised that the columnar *Trichocereus* reported by Kasinger from “the stretch between Antilla and Lumberas” could be *T. terscheckii*, as this altitude is reputedly too low for *T. pasacana*. However, the possibility of their being *Stetsonia coryne* should not be excluded, as suggested above by J. Lambert.

On the other hand, in his review of *Trichocereus* in *Darwiniana* 21.1978, Kiesling provides a map on which the distribution of *T. terscheckii* is indicated. This species is plotted at the north end of the Sierra Guasayan, Santiago del Estero; to the east of Antilla, at Neuvo Esperanza, again in Santiago del Estero; at Joaquin V. Gonzales in Salta province, nearly 100 km downstream along the R. Juramento from Lumberas; and on the Salta-Jujuy border on the eastern declivity of the Sierra Maiz Gordo which lies parallel and to the east of the Sierra Santa Barbara.

.....from L. van d. Hoeven

In November 1992 I started off from General San Martin [Ledesma] and spent a week travelling up to Valle Grande and back. This was followed by a week in and around the Sierra Santa Barbara. Between Santa Barbara and Santa Clara as well as on the road to Palma Sola there were a great many *T. terscheckii* and also plenty of *Opuntia schickendantzii*. Finally I went to Sierra Maiz Gordo, reaching nearly 2000 m at El Sausal. Again on this road there were plenty of *T. terscheckii*.

.....from H. Middleditch

In his review of *Trichocereus* it is noted by Kiesling that *T. terscheckii* extends “into the south of Bolivia”.

.....from F. Ritter, *Kakteen in Sud-Amerika*

*Trichocereus terscheckii* has a typical representative in southern Bolivia, at Tacuarandi and Palos Blancos.

.....from G. Charles

Our first acquaintance with *T. terscheckii* was just to the south of Patquia, where we saw two plants. Here the bushes were quite dense and rose to above head height so that if there were any more columnar cacti at some distance from the road, we may not have seen them. Where we stopped to the southeast of Los Colorados, the bushes were more sparse and we could get a good view of the surrounding landscape. *Trichocereus* of all sizes could easily be seen all over the hill, on the east side of the road. Further on, to the north of Chilecito, the *T. terscheckii* were very plentiful and the bushes were quite low, so that it was easy to see all the way up the hill. These columnar cacti were even outlined against the sky along the crest of the hill. We saw some more *T. terscheckii* quite some way to the north of Famatina, not long before we reached Schaquí. Here it was very dry and the bushes had no leaves.

In order to reach Catamarca we travelled across the Cuesta Cebila, making a stop near the summit. On the ascent the bushes were green but not very dense and it was easy to see the columnar *Trichocereus* even into the distance. Near Catamarca there were columns of *T. terscheckii* to be seen projecting above the dry woodland on the hills to the east of Catamarca city. We also saw more of these plants at the bottom of the Cuesta de Portezuelo.

.....from L. Bercht, at The Chileans 1995 Weekend

All along the valley between La Merced and the foot of the Cuesta de Portezuelo, there are great numbers of *T. terscheckii*.

.....from A. V. Fric, *Lovec Kaktusu*

[ on day trips from Catamarca city, 1928 ] ... On the second day I resolved that we should obtain the white forms of the cardon, *Trichocereus pasacana* f. *picta* and f. *aurea*. I bought the rail tickets as far as the terminal station at Mercedes, since I was not certain where I should disembark. On the train I spoke with the native travellers and I found that the pale cardon was known by all. I alighted from the train at the halt Cervina. [Here they used a lasso and a wooden fork to pull down two heads of *T. pasacana*]. They also went into the nearby highlands and collected there some fruit of *T. pasacana*. During the next two days we undertook a search on the high ranges on both sides of the river. Young plants of *Trichocereus pasacana* were more plentiful here than elsewhere, but it befell me to come upon scarcely twenty fine specimens capable of transportation. Only when I finally return to Prague shall I be able to compare them with young cardons from Tucuman (*T. terscheckii*).

.....from H. Middleditch

Or would these particular plants from the flanks of the Catamarca river valley really have been *T. terscheckii* after all?

.....from L. Bercht.

During my travels across the eastern slopes of the Sierra Ancasti, I did meet with *T. terscheckii* near Ramblones.

.....from J. Lambert

I have never been to Ramblones so cannot report on any *T. terscheckii* round there. More to the north, that is between Los Altos and El Alto, still on the eastern slopes of the Sierra Ancasti, there were none of these plants to be seen.

.....from H. Middleditch

This is a very interesting observation from L. Bercht as there does not appear to any previous record of *T. terscheckii* from the eastern slopes of the Sierra Ancasti. However, in view of the data available in respect of reported localities, it may be advisable not to disregard the possibility that this sighting may actually be *Cereus forbesii* or *Stetsonia coryne*.

Taking the foregoing observations in conjunction with the review (above) from J. Lambert, it would appear that *T. terscheckii* is widespread from Catamarca to La Rioja and around the margins of the Pípanaco basin from Andalgalá, Belén, Famatina, Patquia, to Chamental, as well as further west to near Marayes and Villa Unión. More to the east, on the margins of the Chaco, it is reported from the vicinity of Ramblones, in the Sierra Guasaysan, and in northern Tucuman. It also occurs in the valley of the Río de las Conchas, as well as to the north of Salta city, and possibly in Quebrada Escoipe. It has been observed to the east of the Sierra Santa Barbara, whilst Kiesling reports it from places between there and Antilla. Bearing in mind that *T. terscheckii* was first described (as *Cereus terscheckii* Parmentier) in 1837, travel was relatively commonplace at that time between Buenos Aires, San Luis, and Mendoza (and on to Valparaíso), as instanced by the account of Heads 1828, and Gillies 1830. In 1835 Tweedie did not travel any further north than Tucuman, typifying the lack of interest from European travellers of the time in the more north-westerly parts of Argentina. Taking this into account, together with the distribution of *T. terscheckii* reported above, it would appear to be possible that the original description of *T. terscheckii* was based upon a plant or plants seen in the area between San Luis, Catamarca, La Rioja, and Famatina.

In his *Kakteen in Sudamerika*, Ritter regards the original description of *Cereus terscheckii* as of uncertain attribution. At the same time Ritter equates the Britton & Rose *T. terscheckii* to the plants found in “the lower lying and moister parts of the province Salta and Jujuy and in dept. Tarija in Bolivia, an area searched for cacti at a much later date”. Ritter then describes as *T. terscheckioides* the plants from the drier area extending from Famatina to province Salta.

However, if it is accepted that the original *Cereus terscheckii* originated from this same latter area, then his name *T. terscheckioides* becomes redundant. Ritter provides a rib count of 13-19 for *T. terscheckioides*; evidence suggests that certain plants from his quoted distribution area for this species change from the lower number to the higher number with increasing age. In addition, the original *T. pasacana* (Weber) Britton & Rose was quoted by Schumann as having 15-20 ribs, which on that basis makes it a reasonable match for Ritter's *T. terscheckioides*. The travels undertaken by Ritter in this particular area of Argentina were of much more limited extent than those in Chile, Peru, Bolivia and northernmost Argentina. Taking all these factors into account, the existence of any real distinction between *T. terscheckioides* Ritter and *T. terscheckii* (Parm) Br. & R. remains open to question.

.....from *Monatsschrift für Kakteenkunde* 1893

From our highly respected friend Weber, who has an excellent knowledge of Cacti, the Berlin Botanic Garden has received a quite extraordinarily valuable collection of cacti, the larger part being the original specimens to which he himself has given a name. In the accompanying letter to us are included a great number of interesting and important observations, which we should not withhold from our friends. Here we report on *Cereus pasacana* Web. It is the giant in its family in the high valleys of the Cordilleras from Catamarca and Salta. It reaches 6-8-10 m in height, occasionally even attaining 15-20 m high. The plants distributed throughout our collections originate from seed which was collected near Yacutala (District Belen).

.....from H. Middleditch

It appears that Weber received one or more consignments of cacti from Schickendantz, who was at that time resident in Catamarca, but owned a ranch at Yacutala. The location of this place does not appear on any map at my disposal but probably lies between Belen and Hualfin. It may be surmised that the 15-20 rib description was either conveyed to Weber by Schickendantz on the basis of plants seen near Yacutala, or observed by Weber on his own Type plant. If this rib count was observed on the upper part of a mature plant near Yacutala, it might have been a *terscheckii*. In that event the name *T. pasacana* ceases to exist as the Type was an existing species, leaving the field clear for the name *T. atacamensis*. Belen lies at 1210m altitude, Hualfin at 1870m. Where precisely is Yacutala? At what altitude? And where does *T. terscheckii* change into *T. pasacana* along this road?

Although we are provided with a rib count by various authors to distinguish between *pasacana* and *terscheckii*, we appear to have examples of plants which change from *terscheckii* rib count at the base to *pasacana* rib count in more recent growth. There also appears to be a range of variation in the number and length of spines, as well as their robustness or hairiness, with both *pasacana* and *terscheckii*. There do not appear to be any reports of correlation between these features and flower length. Clearly there is ample scope for field work here.

.....from R. Allcock

In the account of Fric's life and work in *Lovec Kaktusu*, there is a passage in the section entitled "Journey to Tucuman and further north" where Fric remarks on the huge *Trichocereus terscheckii* "which gives a unique character to the whole of this region. The locals call it Cardon and its fruits are called *pasacana*. It is not possible however to confuse it with *Trichocereus pasacana*."

.....from H. Middleditch

It was on his very last trip to South America in 1928/29 that Fric became familiar with *T. pasacana*, in the Quebrada del Toro. At the lowermost end of this Quebrada there are some specimens, as reported above, which do not quite seem to match the accepted features of *T. pasacana*, but with this exception, the general impression conveyed by all visitors to this valley is one of great numbers of typical *T. pasacana*. In northern Tucuman the observations made by Fric in regard to the typical *T. terscheckii* seen there are matched by comments from J. Lambert. The impression we have from Fric of two distinct sorts has also been conveyed by many other travellers, but the review of these two species which was presented at the 1996 Chileans' Weekend demonstrated that the separation was far from as clear-cut as the literature might have us believe.

In *Aztekia* 14 1991 where the Fric 1929 seed catalogue is reproduced, with un-numbered pages, there is a most interesting illustration. This picture half a dozen columnar *Trichocereus* with a precipitous mountainside immediately behind. It is entitled "Collecting *pasacana* seed in the Cordillera valley. Nos. 144 and 152". In the body of the catalogue is to be found an entry for 144 as *T. cephalopasacana* and 152 as *T. pasacana nigra*. The same picture appears in *Moellers Deutsche Gartner-Zeitung* 3. 1930 p.35 entitled "*Trichocereus cephalopasacana* v. *albispina* grows in the mountains from 3000m high to the region of permanent snows". Allowing for the usual Fric poetic licence regarding altitude, the available data on Fric's travels would suggest that this picture was taken in the Quebrada del Toro. To judge by the headgear, it is Fric who is reaching up to collect seed from a single columnar *Trichocereus* with possibly eleven to twelve ribs facing the camera, perhaps 22 to 24 ribs on the stem. Literally four or five paces away is a further columnar *Trichocereus*, possibly two meters tall, which presents five or six ribs to the camera, perhaps eleven ribs for the stem. Might this be the *T. pasacana nigra*? It certainly does not fit the accepted character of *T. pasacana*. It is a passable match for the offsetting plant photographed by R. Ferryman at the lower end of *T. pasacana* distribution in the Quebrada del Toro. What do we call this plant - and a similar one a stone's throw away on the same picture?

An altitude range of 800 to 1400m for *T. terscheckii* is quoted by Kiesling and "up to 2000m" by Hauman. This does not appear to have been confirmed by any field work on the Belen-Hualfin road, or on the Andalgala-Capillitas road, or from the east to west slopes of the Cumbres Calchaquies in Tucuman province, in all of which areas *T. terscheckii* may intergrade with *T. pasacana*. Doubts also remain as to whether those plants in the lower part of the Quebrada del Toro may be attributed to *T. terscheckii*. Questions appear to arise as to the intergrading, separation, or transition from one species to another at all these locations, and possibly others as yet unexplored. It is likely that a few pertinent observations in the field could shed some very useful light on all these questions.

The distribution area of *T. pasacana* is covered by the map of the Altiplano. Most of the distribution area of *T. terscheckii* is covered by the maps of Central Salta, Pipanaco, and The Western Desert.

## FINDING WHICH SORT OF COPIAPOA? From A.W. Craig

It was in October of 1994 that I first made a visit to Chile, as one of a party of five. On that occasion the objective was to visit as large a number of known cactus sites as possible within the time we had available, without spending a great deal of time at any one stopping place. This was very valuable experience in gaining insight into travelling in that country. and in getting to know the few highways and rather more of the byways in the more northern parts of Chile.

Following on from this, a further trip was made with my wife Gwyn, in October-November of 1995, of longer

duration, with the intention of spending rather more time at various stopping places in order to look round and search for cacti. On the 1994 trip we went as far north as Paposo but in 1995 we were able to continue northwards from Paposo, past Caleta Botija as far as Blanco Encalada and El Cobre. This particular road follows the coastline, sometimes fairly close to the sea, occasionally perhaps as much as half a mile away. Nowhere along this section does it rise any great distance above sea level, perhaps thirty or forty metres at most in order to avoid a rocky promontory or a steep slope falling directly into the sea. Apart from the rocks, the surface of the ground here will be the sandy-brown colour to be seen almost everywhere in this part of Chile, but because of the bright sunlight and the brightness of the light reflected off the ground, the surface looks white.

During our drive north from Santiago to Paposo we experienced at first hand the dense cloud which can bank up against the coastal hills. Not far to the north of La Serena, the road leaves the immediate vicinity of the coast and climbs up into the coastal range. Before we got to the pass, the road ran into the cloud which was so thick that it was difficult to see the road and be sure that we were not losing our way. Once over the pass and down the short descent to the level ground beyond, we were under a clear sky with wisps of cloud trickling over the coastal hills from the west. When further to the north, close to Esmeralda, we had a similar experience as we drove back up to the main road, passing through a chilly, damp cloud with very limited visibility. When we were alongside the coast, the sky almost always appeared to be overcast with cloud so there was seldom any bright sunlight. It was like this at Paposo. As we continued travelling north from Paposo the sky remained overcast but by the time we reached Caleta Botija it was more of a haze than cloud. In consequence the sunlight did seem to be rather brighter here than at Paposo. A short distance to the north of Caleta Botija, where we drove inland and crossed the coastal hills we did not pass through a chilly, damp, layer of cloud with poor visibility, as we had done when crossing the coastal hills further to the south.

Most of northern Chile is decidedly desert like. Over the stretch between Taltal and Paposo the vegetation is rather less sparse than it is further to the north, but it would be stretching the imagination to describe it as verdant. Here the road skirts the coast along more or less level ground, which runs out to the beach. On the landward side the ground rises gently at first, then becomes much steeper, rising to the hills which run parallel with the coast. The tall *Trichocereus* and *Eulychnia* may occasionally be glimpsed on these hills where they are in the cloud zone. Near the road, the *Trichocereus* and *Eulychnia* are often in sight but seldom above head height. Also to be seen are clumps of *Copiapoa cinerea* vvs. including *haseltoniana*, *gigantea*, etc., often quite abundant. Smaller plants such as *Neochilenia paucicostata* become more obvious when walking round. In places there are even a few bushes, shrubs, and herbs. This panorama continues for perhaps twenty or thirty kms north from Paposo. Then over the following ten or fifteen kms the desert gradually regains the upper hand, the cacti and the bushes becoming ever sparser until they have virtually disappeared. Well before Caleta Botija there is little else but rock and sand to be seen, perhaps a very occasional *Eulychnia* or dwarf shrub.

As we approach Caleta Botija we start to see a different sort of *Copiapoa*, not a clump with several parallel upright heads like *haseltoniana*, but a real hummock, up to 400 mm in diameter, made up of perhaps as many as fifty individual heads, each up to 50 mm diameter. The topmost head faces upright, but the heads near the ground almost face outwards, so the complete hummock is nearly hemispherical. Almost all the plants we saw had an epidermis covered with rime. Some plants have short, insignificant, spines, of barely 5mm in length. Other plants have much longer - but still fairly slender - spines which are certainly over one inch in length, perhaps even 1.5 inches long. And all stages between but with a consistent spine length on an individual plant. Some plants have golden spines, some black. It would certainly merit the name *C. variispinata* which Ritter in his *Kakteen in Sud-Amerika* says are found 30 km south of El Cobre and 40 km north of Paposo. Nestling up against the base of one large boulder there were a line of about a dozen heads, only a few inches separating one from the next. They could have been three separate plants - one with quite short black spines, another with slightly longer and less dark coloured spines having an orange hue, and the third with even longer spines of a golden orange colour. If these plants are not *C. variispinata*, then what are they?

We would be about one or two km south of Caleta Botija when we first saw these plants. There were two or three separate populations to be seen from there to just north of Caleta Botija. The vast majority of these plants grew on the almost flat or gently sloping ground within rifle shot of the sea, but they also grew on the more sloping ground close to the foot of the hills. They even encroached on to the steeper slopes right at the foot of the steep hillsides, but only in small numbers. On many of these clumping plants the individual heads were hard up against one another, but quite a significant number of plants had fairly wide gaps between the healthy heads, with what looked like the remnants of dead growth at the bottom of the gaps. Occasionally a plant would have a ring of healthy heads, one, two or three heads wide, around a centre pocket bottomed by a residue of defunct heads.

When we were about half way between Caleta Botija and Blanco Encalada we saw the first plants of *Copiapoa solaris*. These are quite unmistakable with their deep cut ribs, wild spination, and large clusters. Still within easy reach of the sea, we stopped the vehicle and walked up the hillside and looked at these plants in order to pick one or two to photograph. It was then, whilst walking round the clumps of *solaris*, that some much smaller plants were seen growing only a short way above the surface of the ground. The first thought was that it was regeneration of the *C. solaris*, but then it became obvious that there was nothing in between these small sunken heads and the large clumps of *solaris*.

These smaller plants projected above the ground only as a low hump or hemisphere, about three inches (75 mm) maximum in diameter, with about six spines per areole. There were two spines directed sideways at each side, one below pointing downwards, and the topmost spine stood upright. This made the plants look rather like the picture of *Echinocactus echinoides* which appears in Britton & Rose, particularly as they were barely standing as far above the ground level as the depth of the body in that picture. At present we do not have a name to put to these plants.

The *Copiapoa solaris* continued to appear here and there as we went northwards from this spot, and although we had expected to see specimens of *C. atacamensis* in the vicinity of Blanco Encalada, we did not do so, although we did not make a thorough search for them. From here we took the road going inland which passes through the coastal mountains so that we quickly lost sight of the ocean. The road then came out on to what was virtually level terrain, cut at intervals by dry valleys running seawards. Near the spot where the roads from El Cobre and Blanco Encalada come together, we stopped again to look around at the *C. solaris*. There were some open flowers, but even on the clumps of two or three dozen heads there were rarely more than one or two heads with a solitary open flower. There were some dried flower remains, but these were probably remnants from the previous season's flowers. We had the impression that the flowering season had just started. Like the places where these plants grew close to the sea, there were seldom two plants growing close to each other, most being roughly a short stone's throw apart. Not infrequently there was a larger plant which looked dead, without any heads at the centre of the clump; the remaining heads, which might well amount to a hundred or more, being dead in all but name. At other spots there was only a blackened ashen hump on the ground with the relics of three or four heads on the periphery.

Here we found the small *C.tenuissima* sunken in the ground, usually under the shade of small rocks, with only a few plants out on the open ground. Most plants were solitary, those growing side-by-side may equally have been separate plants. Individual heads were usually not much in excess of 30 mm diameter, occasionally up to or slightly over 40 mm across, almost always flattened and nearly flush with the ground. The tubercles were pointed like a broad arrowhead, the areoles a tiny slit with minute spination. Body colour was pale grey, or dark grey on plants out in the open, or reddish brown where they enjoyed more protection from the rocks.

At this same spot we also found a third sort, again growing globular or somewhat elongated globular, above ground level. These heads would be up to about four inches across. There were solitary plants and others with up to four or five heads. The spination was fairly robust, with about 6 to 8 spines per areole. We are still uncertain what name should be attached to these plants.

We then drove further inland until we reached what passes for the main road running north to south; from that point we turned south, seeing nothing in the way of vegetation of any sort until we began to approach the coast again not far from Paposo.

.....from H.Middleditch

In his *Kakteen in Sudamerika*, Ritter gives for the Type location of *C.tenuissima* "Coastal mountains in the south of Antofagasta, a habitat of limited area where they are exposed to danger; the specimens to be seen there seldom flower or set fruit as they are eaten by the Guanaco. This species is related to *C.variispinata* and *C.humilis*. The illustration in Backeberg *Die Cactaceae* Vol.6 p. 3840 is significant in showing a somewhat hairy fruit. This is a primitive characteristic."

There is no indication provided by Ritter of any distribution area for *C.tenuissima*. There are a number of *Copiapoa* species named by Ritter which apparently occupy a very restricted distribution area. However, there is a field record in *Piate Grasse* Vol11, No4, 1991 of collections by I.&C.Doni of *C.tenuissima* at D65 at 5km E. of El Cobre and D66 at a further 8km to the east. This will be in the same general area as the sighting reported by A.W.Craig.

.....from R.Ferryman

During my first visit to Chile back in 1982, F. Kattermann, Adriana Hoffmann and myself found these clumping plants when travelling from Blanco Encalada towards Paposo, RMF 53. As there is no real location of Blanco Encalada we could only estimate the distance to Paposo and it was concluded that we were near to a map reference of Caleta Botija. The *Copiapoa* population was very healthy in terms of numbers and spread along the low coastal plain almost to the sea shore. It clearly had even grown on what was now the road. The road is the only direct link between El Cobre or Blanco Encalada and Paposo and is relatively well used. It was my conclusion that whilst I did not recognise this plant it would have been seen by anyone making this journey, a fact confirmed by subsequent travellers.

A review of the available literature indicated that the only known plant from this location was Ritter's *Copiapoa variispinata*. However, the plants we found did not match the description very well. They were grey bodied, small low clumping plants and I have to say, very impressive looking. It was a small location but such an obvious one - the only road passes through its habitat and twists immediately the plants come into view. so that it is impossible not to see them. It was our view at the time that Ritter could not have missed such an obvious location. As he clearly travelled this route, it was felt that perhaps his description was inaccurate or based upon cultivated plants. When I showed slides of this location at The Chileans' Weekend, this particular plant was discussed; some of the plants were almost covered with sand and others were growing close enough to the sea to be covered with sea spray. I remain unsure what the plant is that many of us have found south of El Cobre, but some time ago I concluded that this clumping plant was not *Copiapoa variispinata*.

Ritter describes a number of *Copiapoa* species from the area of Taltal to Paposo and further north, which were not known to me from reliable material, viz: *C.variispinata*, *rarissima*, and *paposoensis*. The stated location for *C.variispinata* was in the general area of the RMF 53 population and so I provisionally attached this name to my collection, although I was concerned that the description provided by Ritter did not in fact relate to the plants as found. Consequently I changed the identification of RMF 53 to *Copiapoa* species!

Regarding the observation that certain of the *Copiapoa* gave the impression that the flowering season had just started, it does seem to be very probable that *Copiapoa* will flower all year round.

.....from F.Vandenbroeck

During the course of our visit to Chile in 1985, and then again on my last travel there in 1990, we came across a *Copiapoa* species growing only a few kilometres to the south of Blanco Encalada, close to the ocean. The separate heads measure no more than 5 to 6 cm across. These plants are all quite characteristic and must assumedly represent a separate species. It was most interesting to have a look at the slides taken by R.M.Ferryman in Chile. Some of them show rare or remarkable specimens. However, I doubt whether the plants which are named *Copiapoa variispinata* are really this species. I know these plants very well and recognised them on these slides, but was never sure about their identity.

.....from H.Middleditch

The slide taken by F.Vandenbroeck of these plants in habitat near Caleta Botija showed clearly that they were precisely the same clumping plants reported by A.W.Craig and R.Ferryman. The same plant appears on Plate 15 in *Pianre Grasse* Vol11, No4, 1991 where it is simply titled "sp. 30km Blanco Encalada". It is also listed under D70 in the I.&C.Doni field list in the same publication.

In the F.Kattermann field number list there is an FK 376 from El Cobre and an FK 377 from Blanco Encalada, both *Copiapoa atacamensis*. Would this name be applicable to the "third sort" of *Copiapoa* seen by A.W.Craig inland from Blanco Encalada, near the junction with the road from El Cobre, in the company of *C.solaris* and *C.tenuissima*? Some of these "third sort" seen and photographed there had the spines on each rib arranged in a pallsade, similar to those on Pfeiffer's illustration of *Copiapoa marginata* (*Chileans* No.37 p.19) and on the Curtis' Botanical magazine illustration of *Copiapoa streptocaulon* (*Chileans* No.38 p.168). Other plants photographed at the same place had spines from one rib overlapping those from the adjacent rib, rather like those on the *C.atacamensis* on the frontispiece of *Chileans* No.48. The overall appearance of these plants was similar to those shown on the inside front cover of *Chileans* no.48. It was observed by R.Ferryman (*Chileans* No.48 p.111) that *C.atacamensis* extended from the vicinity of Antofagasta to the area round Blanco Encalada. In consequence it would be only the southern representatives of this species which may have been seen by A.W.Craig. It is always possible that the semi-sunken plants seen near Caleta Botija were the southernmost outlyers of this same species, at the limit of their existence and driven half underground.

.....from A.W.Craig

In regard to the plants seen near Caleta Botija, my understanding of *C.atacamensis* is that it is somewhat like a smaller version of *C.solaris* in that it grows above the ground and not partially submerged into the ground. It also offsets sparingly, whereas all these unidentified plants were solitary, with but one or two exceptions. It also appears that

*C. atacamensis* carries more than six spines per areole, which all tend to point away from the body to some degree, again quite different to the spination on this unidentified plant.

.....from F. Ritter, Kakteen in Sud-Amerika 1980

**Copiapoa variispinata** Body green, often offsetting below. Heads 4 to 7 cm thick, globular, elongating in old age, crown surmounted by dense spination, without any woolly cap. Ribs 14-22, slightly to deeply crenated, with mammillate tubercles. Areoles with prolific white wool-felt, round, 1.5 to 4.5 mm diameter on the tubercles with 3-8 mm gap between them. Spines mostly dark brown, less often pale yellowish brown, rapidly going grey, straight. Radial spines slim needle-like, directed sideways around the areole, 10-15, usually 3 to 8 mm long, in longer spined examples up to 15 or 20 mm long. Central spines somewhat stronger, 5-10, pointing in all directions, usually 5 to 10 mm long; in specimens with larger areoles spaced further apart and having relatively few ribs, 10 to over 30 mm long. [Flower detailed]. Type location: 50 km north of Paposo and 30 km south of Blanco Encalada. Found by me 1968.

This species displays an extraordinary range of variation specifically in respect of its spination. Indeed each of the specimens shown in the two photographs [Figs 981 & 982] could be taken to be two different species. However they are the two extremes of a steady transition, unless this species is combined with another species of *Copiapoa*, with which it can hybridise. This becomes understandable if one considers that in the graceful form it is essentially a matter of the persistence of the characteristics of youth being retained in age; the ribs remain low, the tubercles small, the areoles small, the spines slender and short as in young plants. In the other form there occurs more or less the much greater development of the characteristics of age.

.....from H. Middleditch

On reading the Ritter description there does seem to be quite a discrepancy between the data in this description and the plants on the habitat photographs of A.W. Craig, I.&C. Doni, R. Ferryman and F. Vandenbroeck. Ritter provides two photographs (his Figs 981 and 982) of this species, which certainly bear out his contention that they display a wide range of variation. However, both these plants are growing in pots and so presumably are in cultivation, although we are not told this in the text. The appearance of each plant, as far as one can see from the rather poor reproduction of the photographs, is more or less uniform from the base to the crown. This would lead to the supposition that they are seed grown, or alternatively offsets produced in cultivation from collected plants which have been removed from the parent and rooted down; they may even be the top growth produced in cultivation on a habitat collected plant which has been removed and set away on its own roots. My own experience with growing collected plants of *Copiapoa* is that the new growth in the greenhouse can not infrequently be so different from the habitat growth that if the cultivated portion is removed and put on its own roots, it would be hard to convince a visitor that the decapitated base and the rerooted top were one and the same species, never mind one and the same plant.

Consequently I would be prepared to accept that Ritter's Figs 981 and 982 are indeed *C. variispinata*, despite their total lack of similarity to the plants on the habitat slides. This brings us to Ritter's description for this species, which does seem to apply quite respectably to the particular cultivated plants in his illustrations. But it fails to relate to the habitat appearance of these plants. Thus it is hardly surprising that both R. Ferryman and F. Vandenbroeck express reservations about applying this name to the plants seen in habitat near Caleta Botija.

.....from R. Ferryman

The description of *C. variispinata* provided by Ritter certainly does not fit the plant I found near the coast which I designated RMF 53. Those plants are mound forming, with hard bodies, grey pruinose, with small diameter heads perhaps up to 100mm, ribs 10 to 12. Comparing the Ritter description to RMF 53 one will find glaring differences in rib count, as well as hard bodies for RMF 53 and soft body for *variispinata*. The population of RMF 53 as I saw it is very consistent and cannot be deemed variably spined. Certainly I do not support the view that the Ritter description is of cultivated seedlings.

It was the uncertainty about designating RMF 53 as *C. variispinata* that led A. Hoffmann to exclude this plant from her book on the Cactus of Chile, with which I fully acquiesced. In order to try and clear up this uncertainty we again travelled in company to this same area. This time we headed inland from the RMF 53 location following two quebradas. It is a long walk to the coastal range and even further ascending. Our efforts were rewarded when we found what I believe to be *C. variispinata* growing in the Quebrada Izcuna; the coastal end of this valley runs down into the RMF 53 location near Caleta Botija. Higher into the Quebrada Izcuna, *C. variispinata* can be found with an unidentified species of *Copiapoa* that appears to be unrelated to either *C. humilis*, or to *C. tenuissima*, or to the clumping species RMF 53 seen at the coast. Yet another *Copiapoa* can be found in the Quebrada Izcuna, hard grey-bodied, thin columnar, clumping. This area is known as Miguel Diaz although there is no obvious reference to the name when you are there!

It was the following year when A. Hoffmann led a small party of I.o.S. members to this same location and half a dozen of these plants were collected. The intention had been to pay a flying visit to the Chileans' Weekend with these plants and then go on to the I.o.S. Congress where they would be a subject of discussion. Most regrettably the necessary paperwork did not accompany the collected plants and they were seized by U.K. customs before they had served their purpose. They are reputedly now at Kew.

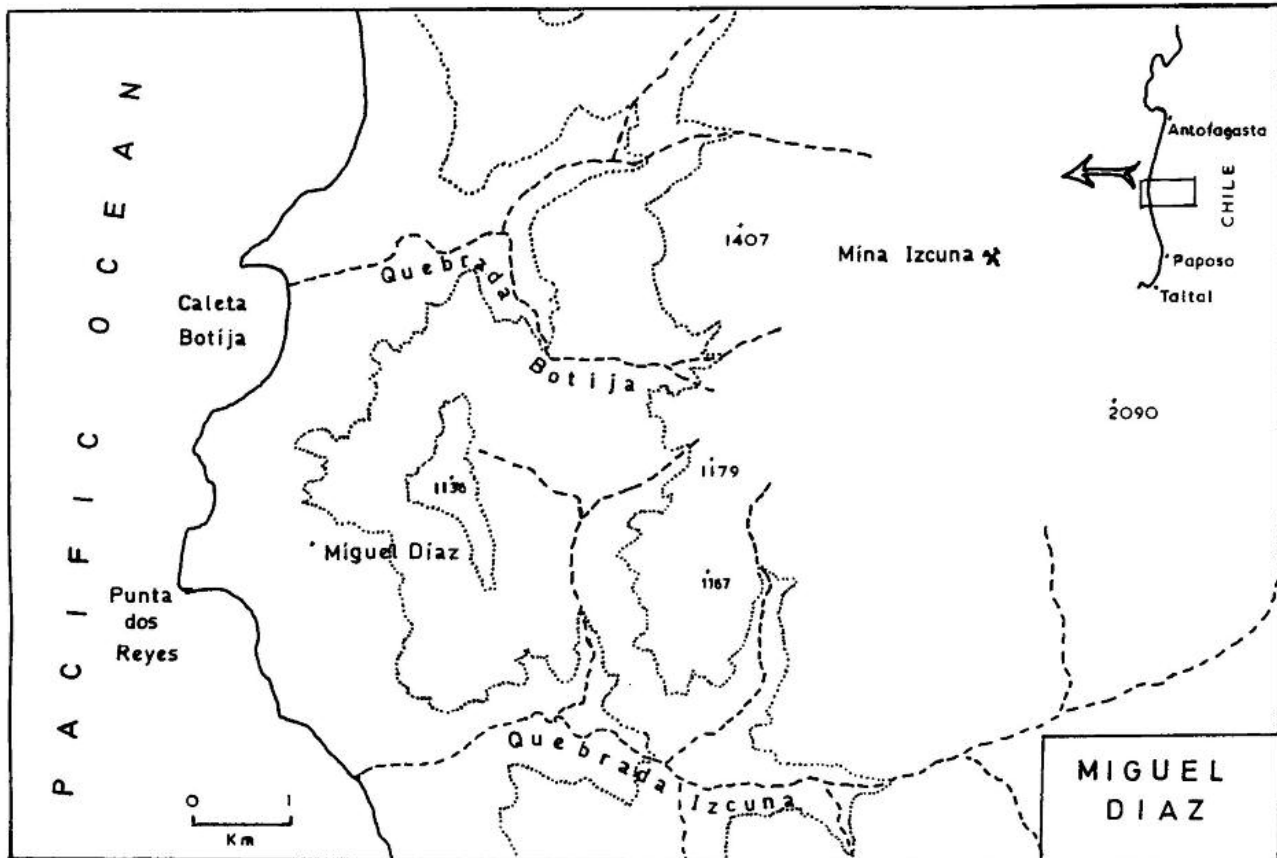
In his Kakteen in Südamerika, Ritter divides into sections all the species of *Copiapoa* which he describes there. His *C. variispinata* is included in his group with the likes of *humilis* and *tenuissima* which matches my own conception of *C. variispinata*. On the other hand, RMF 53 belongs with *C. atacamensis* (*C. boliviana* sensu Ritter). Most fortunately I have been able to obtain a cutting of FR 1447 from the source who acquired the original Ritter collection which had been kept at Olmue, in Chile. This is definitely a clustering plant of the *humilis* type and clearly the sort of plant that was found by A. Hoffmann and myself in the Quebrada Izcuna.

.....from H. Middleditch

After consulting the map accompanying Philippi's account of his trip to Atacama in 1853, it came as something of a surprise to find that Miguel Diaz, as marked on that map, was situated virtually at the same distances from Paposo and from Blanco Encalada respectively as quoted by Ritter. The same applies to the map accompanying the account by A. Johnston of his 1925 visit to northern Chile. In turn, Miguel Diaz is shown on both maps lying only two or three km south of Caleta Botija. Thus it does appear to be fairly certain that the observations made separately by A.W. Craig, by R. Ferryman, and by F. Vandenbroeck relate to a site close to Miguel Diaz, which is the same location as the that given by Ritter for his *Copiapoa variispinata*.

.....from F. Katterman

It will be approximately 30km to the south of Blanco Encalada that the road passes close to a fairly large number of clumps of *Copiapoa*, my FK382. These will be the same plants that other travellers have reported from here as they are the only obvious *Copiapoa* at this spot. We stopped there and went up the Quebrada Botija until we were at about 500m



altitude, where we found more Copiapo. They are not of exactly the same appearance as those close to the road, but being a lump I put them both down as *variispinata*! An Australian party were at this location in early 1996 and they also went up that Quebrada, reaching the upper fog belt at about 1000m altitude. They came across forms of *C.humilis* and *tenuissima* as well as *Neochilena floccosa*.

.....from A.W.Craig

My first reaction to this report was to question the altitude of 1000m as it gave me the impression of being in excess of the height of the coastal hills in this area. However, when I refer to the large scale detailed map of this area I find that the contours do show that the coastal hills are higher than I had imagined. In fact, it would probably need a trek of only some 3km or so up the Quebrada Botija in order to reach an altitude of 1000m.

.....from R.Shulz

We were able to spend two full days at the Quebrada Botija, which is my favourite site in Chile! We walked up this Quebrada and found a veritable botanical oasis, even *Tillandsia geissei*! This was most unexpected compared with the surroundings close to the coast where the *C.variispinata* were growing. The coast road roughly follows the 100m contour from Punta dos Reyes to Quebrada Botija. At one time the road must have made a loop on the contour line for about a kilometer up and down the valley but now it takes a direct line across the mouth of the valley. Below the road, the shoreline forms a bay, the Caleta Botija.

We camped about a kilometer off the road, in the mouth of the valley, at the entrance to the Quebrada Botija. There were plants of *C.variispinata* around the campsite and also for another kilometer or so into the Quebrada. We were rather too tired to walk up the hills to look for *C.variispinata* and walked up the valley instead. Roughly two kilometers further up the valley the *C.variispinata* gave way to a different sort of Copiapo to which we were not able to give a name. As we trekked up the valley we saw here and there a Copiapo which grew next to rocks and seemed to have an affinity with *C.atacamensis*. Some of these plants were starting to look like *C.haseltoniana*! Further still up the valley we came across *C.solaris* and in fact these were the healthiest specimens of this species which we have seen in Chile. There were tens of thousands of *C.solaris* to be seen with the aid of binoculars on the hill slopes above us. We also found a few plants of a *humilis* type, with a soft body, growing among the dead *Eulychnia* on the hill tops. The furthest spot we reached up the valley was probably about five kilometers from our camp site.

There is no valley as such at Miguel Diaz. We looked up to the hills but could not spot any green to indicate seepage so perhaps the spring is now dry. The Izuma valley is promising but we did not have time to explore it. It has the same topography as the Botija valley and is connected by an 800m high saddle to the Botija valley to the north. The Izcuna valley does not seem to have a track leading from the coastal road up over the alluvial rubble and as we did not have a four wheel drive vehicle we did not attempt to bounce our way over this and get closer to the hills.

When we climbed away from the coast, above El Cobre, we experienced our heaviest fog at between 800 and 900m altitude, where visibility was only about 50m! Otherwise on the coast there were the usual overcast mornings.

.....from H.Middleditch

It is interesting that A.W.Craig did not encounter any fog belt when climbing away from the coast above El Cobre and yet the Australian party did so. Would this be due to the time of year (December and May), or even the time of day?

In Chileans No.48 p.113 there is an account by R.A.Philippi of his trip along the coast from Paposo to El Cobre with observations on the surroundings. Where the quebrada from Agua Miguel Diaz met the coast "there was almost



nothing else to be seen except *Echinocactus*, with *Chuquiraga acicularis* and *Scytanthus* here and there". Only closer to the spring of Miguel Diaz itself was "the vegetation similar to that at Paposo, but much sparser", with 37 different species noted, compared with about 120 near Paposo. It might be presumed that the "Echinocactus" seen by Philippi where the quebrada met the coast, were the same RMF 53 as reported above.

### **COPIAPOA PAPOSOENSIS By F.Ritter Kakteen in Sudamerika Vol.3**

Body in the field flat to hemispherical, solitary, rarely offsetting of its own free will,, 6-12 cm diameter, grass-green, bluish-green, or somewhat grey-green. Body harder than *C.humilis*; crown somewhat depressed, with white woolly felt. Massive thickened rootstock going well down into the ground with long narrow neck. Body not discoloured red or brown by the sun, unlike *C.humilis*. Ribs 9-16 ..... Type location; at considerable altitude about 20 km north of Paposo, in the mist zone lying at a lower level in the same place there grows *C.humilis*. At about 1100 m altitude the mist zone is only very tenuous. Here the tender-bodied *C.humilis* becomes burnt to a red colour by the sun in the dryness. Just there is where *C.paposoensis* starts with a hard, green, succulent body. From there it extends up to 1300m where the mist zone does not usually reach and the complete desert begins. No hybrids were to be found between the two sorts, although the distribution area for both sorts overlap slightly. In a similar manner, *Copiapoa humilis* is restricted to the most zone further to the north near Blanco Encalada, likewise the somewhat harder *C.boliviana*. In comparison to that, the still harder *C.solaris* is to be found there and the harder *C.paposoensis* not until beyond the mist zone at this place, where almost constant sunny weather prevails in company with the greater aridity.

This species is probably more closely related to *C.humilis* than to *C.taltalensis*.

.....from H.Middleditch

We have here a clear statement by Ritter that plants which he attributes to *C.humilis* are found not only near Paposo but also further to the north near Blanco Encalada. Under the heading of *C.humilis* he states categorically that this species extends from Paposo to Blanco Encalada. He also states that *C.paposoensis* are to be found above the mist zone not only near Paposo but also near Blanco Encalada. Thus it appears that both these names need to be taken into account when considering the smaller plants reported by A.W.Craig which accompanied *C.solaris* at both the location between Caleta Botija and Blanco Encalada, as well as near the junction of the roads from Blanco Encalada and El Cobre.

.....from A.W.Craig

My best recollection of *Copiapoa humilis* is from the first trip to Chile with the K.Preston-Mafham party, walking up into the hills not far from Paposo. We went along a green valley which had the advantage of being in the mist zone and it was there that we saw *C.humilis*. Fortunately I also have in cultivation a propagation from the Huchison material collected at the Type habitat as well as quite a few other plants of *C.humilis*, many of good provenance. On this basis I feel that I can say that the small plants seen growing near the *Copiapoa solaris* were not in any way related to *C.humilis* as they bore no resemblance to the plants I have under this name; the unidentified plants lack distinct tubercles and were hard bodied, whereas *C.humilis* has distinct tubercles and is soft bodied.

.....from G.Charles

On the 1:250,000 scale map of this section of the coast of northern Chile, it can be seen that from where the coast road leaves the Pan-American highway, north of Paposo, there is only a narrow low-lying strip along the coast between the ocean and the foot of the coastal mountains.

.....from H.Middleditch

This map also shows that there are few, if any, quebradas of any real significance along the coastal road between the point where it leaves the Pan-Am and Punta dos Reyes. There seems to be little likelihood of finding any further locations along this stretch, with vegetation similar to that in the Quebrada Izcuna and Quebrada Botija.

.....from R.Ferryman

In trying to envisage the scenery as we drove along that stretch of road, I do not recall seeing the entrance to any quebrada where it would be worth stopping to investigate. Shortly after El Cobre the coast road climbs up into the hills and away from the shore, because from that point northward the coastal hills drop straight down into the sea with no shelf at their foot.

.....from H.Middleditch

The apparent absence of any potentially interesting cactus sites to the north of El Cobre or over the stretch south of Punta dos Reyes might explain why Ritter quotes only Blanco Encalada or Coleta Botija, out of the whole stretch, for locations for *Copiapoa humilis*, *C.paposoensis*, and *C.variispinata*.

Which leaves the question posed by A.W.Craig, what are the smaller plants growing in company with *Copiapoa solaris*? And the question of the clumping plants seen near Caleta Botija - "If these plants are not *C.variispinata*, then what are they?" still remains unanswered. And what would be the identity of the other unidentified *Copiapoa* seen by R.Ferryman and R.Shultz?

### **OPUNTIA HETEROMORPHA By F.Philippi**

**From Catalogus preavius plantarum in itinere ad Tarapaca a Frederico lectarum. Anales del Museo Nacional de Chile Second Section Botanica 1891**

*Opuntia cylindrica*, haud articulata, prostrata, ramis adscendentibus; vestioribus setus longissimus rectis albidus, aculeisque paucis, 1-2 e quavis areola ortis, 2cm longis armata, hornotinus autem diu folia parvula servantibus inermibusque, et pilis paucis brevibus in quavis areola munitis.

In province Tarapaca l.d. Chicuito reperta; colitur in horto botanico.

Ramus anni praeteriti 4cm crassus, bene a hornotino separatus; dense pilis rectis, tenuibus albis, 40 cm longis tectus, ita ut costae vel tubercula discerni non possint; pili jam dependent, forte anno sequenti delapsuri. Pars novella, dum hoc scribo, 18cm longa, apice modo 14 mm crassa. Pulvilli ejus 12mm longi, areolae parvae, lana brevi albida tectae, a quibus pili tenues nascuntur jam in areolis inferioribus 1 cm longi, pauci areolarum jam aculeos emittunt. Folia erecta, 7mm longa 2-2.5mm lata, cylindrica, acutuscula, laete viridia - Postea, et quidem novembri 1885, caules ultra pedem longi solo decumbentes, dein adscendentes et 1 m alti observati, apice tantum pilos servant, areolae vestitiores aculeis luteis

armatae. Apex corona florum rubrorum ornatus, quos casu infelici examinare mihi non licuit.

Opuntia - cylindrical, not at all jointed, procumbent, branches ascending; older plants with very long, straight, whitish bristles, armed with few spines, 1-2 arising from each areole, 2cm long, but on the current year's growth very small leaves are retained for a long time, there are no spines, and at each areole there are a few short hairs. Found in province Tarapaca l.d. Chucuito; in cultivation in the Botanical Garden.

Branch of the previous years' growth 4cm thick, clearly distinguishable from this year's growth; bearing dense straight hair, fine and white, 40cm long, so that it is not possible to discern ribs or tubercles; hairs currently hanging down, possibly falling off the following year. At the time of writing, young parts 18cm long with tip only 14cm broad. Tubercles each 12mm long, with small areoles, covered with short white wool, from which arise fine hairs now 1 cm long in lower areoles, a few areoles at present putting out spines. Leaves erect, 7mm long, 2-2.5mm wide, cylindrical, slightly acute, bright green - Later, and at least in November 1885, stems more than a foot long only decumbent, thereafter ascending and observed to be one meter high, apex sparsely furnished with hairs, older areoles armed with deep yellow spines. Apex embellished with a garland of red flowers which, because of an unfortunate mischance, I was unable to examine.

.....from G.J.Swales

From the description I would imagine that this plant was a cylindropuntia, since the plant was "cylindrical with no joints". It occurs to me that it may be *Opuntia vestita*, a thought suggested by the fact that I have one of these plants. Certainly it does not strike me as being a *Tephrocactus*. But does *O.vestita* possess "deep yellow spines"? Does it have red flowers? Whereabouts does it grow, somewhere along the route which Philippi followed through Tarapaca?

The first half of the description seems to have been written shortly after the plant had started to grow in cultivation and had put out 7 or 8 inches of new growth. The latter part of the description appears to have been written at a later date when the new growth had reached a length of one metre. This pretty well matches the sort of etiolated growth which I have seen on *O.vestita* both in size and in general appearance. Come to think of it, this form of growth is possibly more common in cultivation than the compact form of growth where it is difficult to see the stem for the white woolly hairs.

.....from H.Middleditch

I have searched those of my maps which cover the area traversed by Philippi in the course of his journey through Tarapaca and nowhere can I find a place name of Chucuito along his route. The description certainly suggests a rather hairy plant so that one tends to think of *O.vestita* as a possibility and this species is reputed to have "violet-red flowers". According to Backeberg's Lexikon the habitat of this species is only known as Bolivia, with no more precise location. So whereabouts does it grow, and where is (or was) the place that Philippi called Chucuito?

.....from H.A.Weddell, Voyage dans le Nord de la Bolivie, 1853

The object of our voyage to Bolivia being fulfilled, we proposed to return to Europe. Prior to embarkation I wished to pay a visit to Arequipa. Having taken leave of my companions, I was eager to leave La Paz. From La Paz I set off in the direction of the great Lake Titicaca. After passing the small village of Laja, we came to a chain of hills, at the end of which were the famous ruins of Tiguanao ..... we crossed the R.Desaguadero by ferry and so entered Peru. The district we now traversed was part of the department of Puno. Previously Juli was the capital of the department, and is also that of the most populous province, that of Chucuito.

.....from H.Middleditch

In his account of the ascent of the Andes from the port of Arica on the Pacific coast, F.J.F.Meyen (Reise um die Erde 1834) describes his first sight of the basin of Lake Titicaca. This was seen from a point on the trail between Pisacoma and the mission station of San Francisco de Anquac, after the party had surmounted the western chain of the Andes, From here the travellers could see Lake Titicaca and also the snow-covered peaks of the eastern range of the Andes in the background. As Meyen described it, "the whole basin of Chuquito with its boundless lake lay before us". Thus it appears that the Bolivian altiplano was regarded by Meyen at that date as the basin of Chuquito. Nowadays there is only one town on the shore of Lake Titicaca which goes by the name of Chucuito.

Now Philippi emigrated to Chile in 1851, which was 17 years after the publication of Meyen's book about his travels in South America. Before he emigrated from Germany, Philippi already had a brother out in Chile so he would have some interest in that part of the world and he had probably read Meyen's book. Both Meyen and Philippi were German so that it is quite probable that Philippi would tend to rely more on Meyen than, say, on D'Orbigny (who was French) when it came to names of areas outside Chile.

From another source I find the plant which Philippi subsequently named *O.heteromorpha* was received from a German engineer who was engaged on the construction of the railway line running south from La Paz towards Oruro i.e. over the basin of Chucuito, sensu Meyen. As noted in Chileans' No.52, under the discussion of *Austrocylindropuntia*, *O.vestita* does occur to the north of the city of La Paz, in the La Paz river valley. In order to be able to climb out of the La Paz valley on to the Altiplano, the railway from La Paz first of all runs further up the valley of the Rio La Paz, before turning round to make its way along and up the side of the valley. In the process it hairpins back and forward at several places. The construction engineers probably spent more time and effort on this section of the line than where it ran, mostly dead straight, over the more or less level Altiplano. It would be rather remarkable if they had failed to see *Opuntia vestita* growing there, in the process. It thus appears to be most probable that the original plant of *O.heteromorpha* is simply *O.vestita*, sent to Philippi from the La Paz valley,

## SOME SPECIALIST CONTINENTAL GROUPS

In this country it is usual to find most cactus collections will include a variety of plants with representatives from a wide range of genera, although of course there are some very interesting collections which specialise in particular groups of plants or even on a specific genus. On the continent it is much more common to find that cactus collections contain only plants of one specific genus. A consequence of this specialisation is that those with similar collections are likely to be in close contact with each other. In turn this has led to meetings of collectors with similar special interests, some of which are on a more or less informal basis, others now having a rather more formal meeting. A few of these groups have produced their own specialist publications, in which appear in-depth articles covering a particular species or group of that genus, as well as the results of field trips to study plants of the genus on the ground in habitat.

The *Sulcorebutia* group hold informal meetings once each year in the autumn, when discussions will usually include the proposed itinerary that one or other of the participants will follow when visiting Bolivia shortly after their meeting.

They take turns to host this meeting at home - "last time we had 22 here". Circulation of field trip results is confined to a privileged few outside those at the meeting.

The Discoclub is interested in Discocactus and has produced a set of coloured prints with accompanying text for a range of Discocactus species. These tend to be fairly expensive - round about ú60 for the set as it currently stands.

The Notocactus group operate under the banner of "Internoto" and publish a quarterly magazine of A5 size. Several of their members have made and continue to make fairly regular field trips to Rio Grande do Sul where personal contacts have been established. Other members have paid occasional visits to Uruguay and further afield, but the main concentration is on Rio Grande do Sul. In addition to accounts of field collecting trips there are articles specifically relating to Notocactus, as well as others on Frailea and Gymnocalycium from this state, and even one on Echinopsis. A lengthy and very comprehensive series of articles by S.Theunissen entitled "Back to the roots" reproduced the original descriptions of all known species of Notocactus. Without an entry-by-entry comparison it is not clear if this replicates or adds to the compilation of Notocactus species names by G.Shafer, which appeared as the 1979 issue of the then east german "Kakteen-Sukkulenten".

The Tephrocactus group hold occasional informal meetings and circulate observations, documentation, and photographs between each other. The Lobivia group holds a meeting each year and there is also a Rebutia group.

The Gymnocalycium group in Austria includes several members who have travelled quite widely in Argentina and Bolivia. A leading member is H.Till, whose interesting collection of Gymnocalycium was viewed on our 1964 continental cactus trip. "We have applied ourselves to the question of individual species in habitat, not just at odd places as has generally been done, but also the investigation of their whole distribution. So we arrange for each trip, which area will be explored for preference. The produce of each journey comes to me and all are evaluated by me according to a predetermined scheme. So my friends fly to Argentina each year in two or three groups, in accordance with the route we have planned". An annual meeting is held on a formal basis, open to anyone interested, at which field reports, other observations, and seed studies, are presented.

Fanciers of Parodia are catered for by "Inter Parodia Kette" which holds formal meetings, usually once a year, and produces an A4 size magazine which includes colour as well as black and white illustrations. This has been well supported with accounts of field trips made by members, but in the March 1966 issue the editor writes "This issue unfortunately has only three articles owing to only very few articles arriving here".

The german Gymnocalycium group holds a formal lecture meeting, usually in autumn, and also publishes a quarterly journal, which has in the past contained much useful data based on field work or subsequent studies of collected material. In August 1966 the co-chairman writes to subscribers " Unfortunately the first issue of GYMNOS for 1996 has not yet appeared since too few articles have come to hand"

.....from G.Charles

The Austrian "Gymnocalycium" costs one hundred Austrian schillings per annum and usually appears four times a year. It consists of a number of loose sheets which vary in number per issue from two to ten. The standard of production is excellent, being on good quality paper with well reproduced photographs.

.....from J.Arnold.

My experience of subscribing to the German Gymno journal did not get off to a happy start. Having sent off my subscription, nothing materialised for two or three months; my letter enquiring whether my subscription had arrived similarly received no response, as did yet a further enquiry. Eventually the publication did appear but with no explanation for the intervening silence. The journal itself is quite well presented, full of interesting articles providing valuable information. It is also well illustrated with both coloured as well as black and white photographs. It costs DM 20.00 for the annual subscription. It appears that most of the back numbers are still available.

.....from H.Middleditch

My own experience of subscribing to the german Gymno journal was equally unsatisfactory. Having paid the subscription at the start of the year, nothing was heard for some four or five months. A letter to the treasurer elicited no response; a subsequent telephone enquiry received a very courteous response from a female voice saying that a written reply would certainly be sent. But it was not. Apparently another of the Gymno group has now undertaken the task of keeping subscribers informed of their situation.

.....from R.Gooch

It will be some years now since I subscribed to the Internoto journal. As I do not read german easily, the illustrations were the most valuable part for me. Unfortunately each issue seemed to have one or two new species names, based upon some minor difference in spine count or colour, as far as I could see.

.....from H.Middleditch

The interchange of data between continental collectors specialising in one or other of these genera has been reflected in a radical change in the content of the mass-circulation journals "Succulenta" and "Kakteen und andere Sukkulenten", where there is now almost a sparsity of articles relating to South American cacti.

.....from S.Theunissen

It is quite correct to suggest that we now find only a few articles on Notocactus in either Succulenta or KuaS, since most authors on this subject are members of Internoto and therefore publish in the first place in our periodical. The same problem is there with Mammillaria and now the Gymno-friends have their own publication we also find fewer articles on that genus.

.....from H.Middleditch

Other influences have been at work which add to this same effect. The effect of Cites controls has really been to produce a bureaucratic nightmare. South american officialdom has never been renowned for clear-cut handling of documentation and a request to the appropriate section of the Department of the Environment for a CITES import licence was met by the rejoinder that they first required sight of the export licence from the country of origin. For practical purposes it is impossible to obtain any such licence until one visits the office involved in the country concerned. One might be excused for supposing that these DoE tactics are merely an excuse to avoid issuing any import licence, whilst at the same time academics have a free hand to obtain field material for Botanic Gardens. Any such material is usually only studied when the academics get round to it; only by rare exception is such data conveyed promptly to interested cactophiles who are outside the clique of academics. Cactophiles who travel in cactus habitats who desire to bring back the odd voucher specimen or two into Europe thus find themselves forced into the situation where they have no alternative but to smuggle them in to the country. In its laudable aim of cutting out wholesale plundering of habitat plants the Cites bureaucracy makes no attempt to take heed of the small-time collector who will put the professional Botanic Gardens to shame by propagating his material and circulating his information. This means that any habitat material can

now only be circulated on a person-to-person basis, whilst even habitat observations and records tend to become confined to a closed circle.

.....from N.Gerloff

In south Germany and in Austria several collections have been visited by the customs authorities in the last months. They were always collections whose owners had travelled in Mexico or South America. All the plants were confiscated which appeared to be imports and for which no proper documents could be produced. Two such actions were stated to me by the Austrians to arise from the appearance of field number lists in an English speaking publication. The Austrians are not prepared to have any of their field list given a broad publicity where they might become accessible to anyone connected with CITES regulations. Other Austrians have for many months requested me to ensure that no information about habitats is given to anyone in the U.K. - "Only trouble comes from there". If anything was published in The Chileans, it could reach the ears of CITES officials there and would be passed on to the customs officials here.

.....from H.Middleditch

This sort of climate has an inevitable result - cactophiles who take pains to cultivate, propagate, and study imported material are strongly inclined not to publish their data, observations and comments. Not only has this resulted in a very bland Succulenta and KuaS, even the specialist groups appear to be suffering from members unwilling to put into print anything that might possibly lead to loss of interesting material in their collection. The dedicated cactophile who shares his hobby is penalised on the altar of the few greedy collectors, whilst the privileged academics browse along within their own closed walls, keeping their findings secret until (and if) they eventually publish a paper.

### **GETTING THE MEASURE OF pH From R.Allcock A follow-up from Chileans No.51 p.150-152**

In taking steps to counter the adverse effects from a compost of high pH value, use was made of a solution of ferrous hydroxide. The initial pH of the ferrous hydroxide, freshly prepared, is perhaps about pH 4, as far as my test papers can be relied upon. Which brings me to the question of measuring pH. I did borrow a cheap pH meter, but it was virtually useless. Another one, borrowed from a friend, also gave erratic and erroneous readings. Test papers ought to be relatively reliable, but even there I doubt their accuracy. Placed in tap water, which is required by law to have a pH of at least 8, and which registers at 8 using my BDH testing liquid, I find that test papers register at about 7, and that the meter registers at about 6.9, dropping in the course of half an hour down to 6, and staying there!

Thus the meter is inaccurate by up to 2 units, and the test paper by 1 unit. This inaccuracy in the test papers is rather disturbing to me. The inaccuracy with the meters is to be somewhat expected, although I had no idea that it would be so bad! Meters such as those I tried would cost about £14, whereas I have seen pH meters for sale at £90. Enough said!

.....from D.Angus

It will be about ten years ago that I got hold of some litmus paper and decided to try using it to find out the value of the pH of my compost mix. The compost has to be not just damp, but really thoroughly soaked with moisture to be able to get a good reaction from the litmus paper, so pressing the litmus paper down on to the compost can be a bit messy. Added to that, the litmus paper only gives a rough idea of acidity or alkalinity, so it was not really very satisfactory. So I forgot about pH until I ran into serious problems with losing plants.

When I rehoused my collection about three years ago I built a raised bed so that I could give quite a number of my plants a free root run. Filling the raised bed needed something like four or five cubic yards of material so I used coarse gravel for this purpose, which also meant that I got good drainage. The gravel was topped off with a few inches of compost and then a good selection of my cacti were planted out into it. Having given them a free root run I expected to see some really good growth on these plants, but they did not seem to want to get moving. Worse still, after several months quite a few of them started to look rather sickly. There was no apparent reason for this. They were well watered with rain water, which I had always used and there was nothing novel in my compost mix. The condition of the plants just went from bad to worse.

Calling in at a garden centre one day I came across some tablets which could be used for measuring the pH of compost, so I decided to give them a try. It needed some compost shaking up thoroughly in distilled water, letting it stand for a while to let the compost particles settle out, then pouring off the water into which a tablet was dropped, where it would dissolve. The idea was to compare the resultant colour with a pH colour chart. Even after letting it settle, the water was still rather discoloured so that when a tablet had dissolved the resultant colour was rather murky. To get a decent colour the water had to left to settle for a day or two, which was a bit of a bind because what was really wanted was a result, not a long wait.

However these tablets were fine for checking plain water. The trouble was that they were rather expensive, round about £3 for only six or eight tablets, and so not many checks had been made before I ran out of tablets. So I decided to buy a BDH soil test kit. The first thing I found was that the BDH gave much clearer results than I had obtained with using litmus paper. From using the BDH kit, I found out that the tap water varies in its pH, but is almost always alkaline. It usually produces a strong blue colour with the BDH liquid. so it had been just as well that I had been using rain water on my plants for many years. But I was a bit surprised to find that the rainwater was about neutral. Obviously it would be better to be on the acid side. So I started to add sulphuric acid to my rainwater butt, to bring it down to around pH 6. It is a twelve gallon water butt and to this I add 5 mls of dilute sulphuric acid. I check every batch of water with a drop of BDH fluid and the 500 ml bottle is still better than half full after three years.

I also checked each component of my compost mix separately. Mixing some of the gravel I had used with distilled water, shaking it up well, and letting it stand a few hours, produced a strong alkaline reaction. So I was faced with no alternative but to remove the plants and clear out all the filling from the raised bed and replace it - after I had checked the new filling with the BDH test kit! This still left me with a messy and tedious procedure for testing the pH of my compost. So I decided to buy myself a direct-reading pH meter, which cost about £12. This only required the probe to be pushed down into well moistened compost and the needle allowed to settle, which gave me a direct reading of pH. The problem was, that if the probe was disturbed the reading started to change. If the probe was left in the compost, the reading would gradually drift, say from 7 to 6, over the course of perhaps less than half an hour. If it was left longer, it would drift further, but more slowly. In addition, the instrument was "not to be used in water" according to the manufacturers' literature. If it was placed in water, the needle would fly down to 4, gradually creep up to 5.5 and then after a period it would have crept up to 6.5! So I decided to buy a more expensive direct reading pH meter, only to find that the reading it gave on the same compost or water did not agree with that given by my other meter. It was even

suggested that I might have to pay well over £50 for a good reliable direct-reading meter. However, I was fortunate enough to find a direct-reading meter with a digital read-out, produced by ATP. It cost under £40 and is actually intended for use in the food industry where any drift away from the required pH of processed food can have serious effects on the keeping quality of the product. The manufacturers state that it is accurate to 0.1 of pH. The instrument has to be recalibrated at intervals, using test tablets. One test tablet is dissolved in distilled water to give a fluid of pH 7. The probe is dipped into this fluid and the calibration knob adjusted to give a reading of 7.0 on the meter. Every time I have checked it so far there has been only a very slight adjustment required. I have also cross-checked it with my BDH fluid and the two give virtually the same pH value.

Now that I am satisfied that I can get an accurate measurement of pH of a compost, I have tried it out on one or two ready-mixed composts. Manufacturers of ready mixed compost produce grades to a specific pH value for supply to commercial nurseries and I have found, for example that Levington low pH is 4.8, whilst their standard compost is 5.2. A bag of Richmond multi-purpose compost proved to have a pH of 4.2. At last I can get a quick and accurate check not only the pH of each component of my compost mix, but also the finished mix, as well as the contents of any individual plant pot. Most important of all, the plants are now growing well.

.....from R.Allcock

I found the contribution from D.Angus made very interesting reading and I am impressed by the accuracy of the meter which he has acquired. Using only paper strips, or BDH fluid, one is limited in accuracy, especially when the colours thrown up do not match anything on the charts provided, and when the various methods mutually disagree. On the other hand, meters can easily also give misleading information, and the materials we use are themselves by no means constant nor uniform in their properties. I would also like to mention that when using the BDH method to assess rain water and tap water (and also very diluted strong acids), it is advisable to use as small an amount of the indicator fluid as possible. The BDH indicator fluid, as supplied, is a blue green colour. There are only very tiny amounts of reactive agents in the solution being tested and these can be insufficient to change the blue-green colour of the BDH indicator fluid if too much is used. Also it is important to allow a time lapse of several minutes to allow the colour change to develop. In assessing the colours it is helpful to perform measurements of tap water and rain water simultaneously, and with the same amounts of indicator and water in each case.

.....from M.Lowry

The sort of price I can recollect having seen quoted for a good quality pH meter makes me very suspicious of the real value of the meter mentioned by D.Angus, taking into account the cost which he indicates.

.....from H.Middleditch

You may care to bear in mind the sort of price we had to pay for electronic calculators when they first became available, as well as the sort of size they were and their weight. Nowadays you pay even less for a calculator, of less weight, and with so many functions that you almost need a Ph.D. to operate it. It appears that we may now have available solid-state pH meters, which of course lend themselves far more readily to current techniques of production-line manufacture than traditional instruments. The growth (or explosion) in the market for processed foodstuffs has greatly increased demand for such instruments, which have to operate to a surprisingly fine degree of accuracy, as apparently a change in pH of only a few digits after the decimal point can make the difference between a successfully processed foodstuff and one which will fail to meet the specified shelf life. It is the rise in demand for this retail product and in turn for the necessary process monitoring instruments, together with the design and production changes in the manufacture of those self-same instruments, which, as with calculators before them, has led to a better product at a lower price. The particular instrument mentioned by D.Angus is one of several advertised by a supplier of this equipment to the food processing industry. Those Inspectors of the Health and Safety Executive whose responsibility covers the food processing industry might be expected to have a vested interest in the accuracy and reliability of instruments of this nature, so perhaps we should not be misled by the relative cheapness of the product.

.....from W.Christie

As a professional chemist it causes me no little concern to read about the idea of using acid for cultivation purposes. I am quite sure that the various contributors are perfectly well-meaning in their intentions, but nitric and sulphuric acids are not really suitable for use by amateur growers. Added to which, they are virtually unobtainable by amateurs. The alternative, that of using salts for acidification purposes will cause other difficulties in the long term. In particular, they will build up in concentration in the compost and will inhibit the uptake of other mineral nutrients. Especially should aluminium salts (as in as hydrangea colorants) be avoided, as they have inhibitory effects on many plant enzymes. We probably get more than is necessary for our plants, as many water authorities add aluminium phosphate to the water supply to clarify the water. The answer to this problem is very simple. Acetic acid, as in vinegar, can be added to the water supply to give the correct pH. It does not build up in the soil, as the excess evaporates. The exact amount required will vary in accordance with the nature of the water supply.

.....from H.Middleditch

When this subject was discussed at the 1994 Chileans' Weekend, one of our members (also a chemist by training) expressed his considerable concern at the idea of bringing concentrated acids into a domestic environment. His considered advice on safe handling of such material appeared in Chileans 51 p.151. It is my impression that one or two Chileans' members do use acids to counteract high pH of their water; if a sufficiently wide net of enquiries was to be cast, we may find that others do so, too.

In regard to the suggestion that there might be an ample amount of aluminium sulphate already present in our domestic water supplies because of its liberal use in water treatment plants, two considerations appear to make this unlikely. Firstly, the use of aluminium sulphate in this context was mentioned by R.Allcock in Chileans' 51, when he referred to the hydrolysis of the aluminium sulphate which is added to water, thus forming a somewhat gelatinous substance which tends to settle out gradually. The really important function of the hydrolysed aluminium sulphate for bulk water treatment is that in this process of settling out, it tends to carry down with it the greater amount of suspended solids in the water - in other words, it "cleans" the water. For this to be done effectively requires still water conditions, and appreciable time. Which is precisely why water treatment plants commonly involve quite large areas of settling ponds, where this operation may proceed undisturbed. The clarified water will then pass out into the mains, whilst the deposit will remain at the base of the settling pond. This residual deposit will consist of virtually all the added aluminium sulphate plus the entrapped foreign matter. Every so often these accumulated deposits will need to be cleaned out in order to maintain the effectiveness of the settling pond. Which is why it would appear to be unlikely that other than traces of aluminium sulphate will remain in the mains water supply.

However, there is an even more cogent consideration. It is some years ago that much blame was laid at the door of

lead piping in domestic water systems for contributing to no small extent to the cause of gradual and insidious lead poisoning in water consumers, most especially where water supplies were on the acidic side of neutral. The impracticability of changing all in-house domestic water systems from lead pipe to copper or plastic pipe within a reasonable span of time, meant that either this problem was permitted to continue, or else some alternative remedial action was sought. The latter approach was adopted, the government requiring all domestic water suppliers to provide water to the customer at a pH above 7.5 i.e. non acidic, on the simple but effective basis that an alkaline water supply cannot be the cause of acid attack on domestic lead piping. The pH of domestic water supplies being on the alkaline side of neutral is mentioned in Chileans 51 both by D.Angus and R.Allcock. If water was supplied to the public with any free aluminium sulphate content, it would be acidic, be it ever so slightly, and so defeat the whole objective of this legislative requirement. Apparently it is not uncommon for the water suppliers to introduce a suitable additive into the water in order to ensure that it is supplied at about pH 8. If there was any residual aluminium sulphate in the water, it would react with whatever constituent of the water conveyed the alkaline characteristic and so become neutralised. Hence it is difficult to see how it is possible for any free aluminium sulphate to be present in domestic water supplies. It also means that anyone using domestic water for cacti would be well advised to consider the use of a suitable method of lowering the pH.

When we come to the question of the cumulative effect of the addition of aluminium sulphate to water used in the greenhouse it may well be advisable to consider any possible adverse effects this may present. There have been a number of aspects of cultivation discussed in these pages and from time to time it has been possible to include abstracts from various publications providing reasonably reliable data on controlled tests and observations. Clearly it would be helpful to be able to refer to whatever data has prompted the above remarks regarding the disadvantage of the long-term effects of using aluminium sulphate to control pH of the water used in the greenhouse.

.....from W.Christie

You may find the following extract relevant to the question of how an increasing concentration of residual aluminium salts in a compost can adversely affect growth.

.....from E.W.Russell, Soil Conditions and Plant Growth, 1977

Natural soils differ considerably in their acidity or pH, and these differences are reflected in the vegetation or crops they carry. For a long time it was not clear how far these differences were due to the sensitivity of the plant roots to the hydrogen-ion concentration of the soil or soil solution in which they were growing, and how far to secondary effects brought about by the reaction. Water-culture experiments have now proved conclusively that the harmful effects of acidity are due to secondary causes, except in extreme cases. It has been shown by D.I.Arnon that plant roots are definitely injured in solutions as acid as pH 3, and were unable to absorb phosphates at pH 9.

The reason why plants are sensitive to soil pH is that the pH of the soil affects the concentration of different ions in the soil solution, and so their availability to the plant. Thus, an acid soil is likely to have a higher concentration of aluminium and magnesium ions, and a lower concentration of calcium, bicarbonate, and molybdate ions than a calcareous soil. A high aluminium ion concentration is the most common cause of failure of agricultural crops in acid soils. It probably has two quite distinct effects. A high aluminium ion concentration in the free space in the root surface may prevent the root taking up phosphate, and aluminium inside the living cell may interfere with sugar phosphorylations. Aluminium tolerant plants differ from non-tolerant plants in their greater ability to take up phosphate from solutions containing aluminium. Lowering the pH of a soil nearly always increases the amount of manganese a crop will take up, and crops differ very considerably in their ability to deal with a high manganese supply.

.....from H.Middleditch

As noted above, aluminium sulphate "cleans" water in a treatment plant by its gelatinous nature, entrapping solid matter and bacteria as it settles out. The base of the settling pond in a water treatment plant is commonly covered by a bed of sand, which filters out this precipitate and so this sand bed must eventually need to be removed and replaced, or otherwise it would become clogged with precipitate in the course of time. Is it being suggested that the compost will likewise eventually become clogged by a similar precipitate where aluminium sulphate is used to acidify greenhouse water? Or is it being suggested that this residual aluminium sulphate with its attendant aluminium ions will adversely affect the take-up of certain nutrients?

.....from W.Christie.

All my own plants are grown in trays, which restricts the movement of pests and makes it easier to move groups of plants for cleaning, etc. Plants are watered both from above and below, thus enabling fertiliser and pesticides to make better contact with the compost. If an excess of water is found in the trays an hour or so after watering, it is syphoned off using a strip of capillary matting or similar material. However, I usually find that most of the water is absorbed. In these circumstances, any surplus salts or excess acid would accumulate, because it would simply be redissolved on the next watering. It is quite possible, however, that the "filtering" effect of the compost could equally bring about similar accumulation and attendant problems.

.....from H.Middleditch

Many collectors may be quite interested to find out what was the pH of their usual compost mix and also of the water they use. But if a regular compost mix is used together with one form of water supply, it might be assumed that the pH of either should not alter to an undue degree. Once the pH of both has been tested, that might well suffice, and this hardly justifies the purchase of a relatively expensive pH meter. But some simple and relatively inexpensive form of check might be quite useful.

.....from A.Johnston

A form of litmus paper can be purchased from outlets selling home-brewing equipment. It is what I call wine-making paper. It changes colour when dipped into a solution which is slightly acid. It is not dead accurate but probably better than nothing at all.

.....from H.Middleditch

In Chileans' No.51 there was a brief reference to problems with coir compost and a question was raised as to the pH of this material. At the moment I do have a little coir compost on hand.

.....from D.Angus

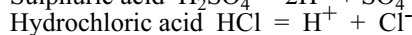
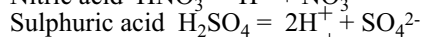
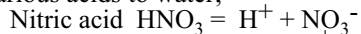
Your coir compost was put into solution, and it came up as a very strong yellow with the BDH test fluid, not a clear yellow but with a hint of orange. This would make it about pH 5.7 or 6.0. However the nature of your coir compost is quite different to my own - from a different manufacturer - as it consists largely of very small flakes; indeed it is almost dust-like. My own coir compost is much coarser with shreds and lumps. This is no different to peat, which can vary in just the same way - and coir may well suffer from exactly the same problem as peat. A pot full of certain types of peat can be watered and the water will eventually run out at the bottom, but it has simply found a route down the pot - probably

down the insides of the pot - leaving the body of the peat dry. The problems mentioned in Chileans' 51 could be nothing to do with pH, simply the mechanical structure of the coir which did not take up water readily. To ensure that peat (or coir for that matter) does take up water, it is best to add a wetting agent; peat will actually hold 25% more water when a wetting agent is used. Murphy do a wetting agent, so do Chempak; the blurb on the package says that 200 ml "does six or seven 200 litre bales of peat".

The important thing is not to water plants overhead when using a wetting agent. Another thing I attribute to the use of a wetting agent is the effect on mealy bugs. Since I have been using a wetting agent I have found that mealy bug has virtually disappeared from my collection. It still breaks out here and there, but only occasionally and to a limited extent. I still apply a solution of malathion twice a year, but then I always did - and the mealy bug was still rather a nuisance, whereas now it is insignificant.

## WHAT IS pH? From J.Cooke

The numerical value of pH is a direct measure of the concentration of hydrogen ions in water. What is a hydrogen ion? When acid is diluted by adding it to water, the bond which holds together each molecule of the acid is weakened, and the acid acts as if the molecule consisted of two separate parts, or ions. One of these parts carries a positive electrolytic charge, the other part carries a negative electrolytic charge. Let us take, for example, what happens when we add various acids to water;

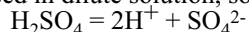


In each example it is the hydrogen component which is electrolytically positive and it is this  $\text{H}^+$  component which is described as a hydrogen ion. In each case the  $\text{H}^+$  ions are the basis upon which pH is measured. A solution with a value of pH 6.0 contains ten times the number of hydrogen ions as one with a pH value of 7.0; a solution of pH 5.0 contains one hundred times the number of hydrogen ions as one of pH 7.0; and one of pH 4.0 contains a thousand times the number of hydrogen ions as one of pH 7.0; and so on.

In order to calculate the pH of a solution we need to have a measure of the concentration of hydrogen ions in the solution, and this concentration is measured in moles. What is a mole?

Let us start by taking Nitric acid as an example. The component atoms of nitric acid  $\text{HNO}_3$  consist of hydrogen with an atomic weight of one, nitrogen with an atomic weight of 14, and oxygen with an atomic weight of 16. The sum of the atomic weights of the constituent elements is thus  $1 + 14 + (16 \times 3) = 63$ , so that 63 is the molecular weight of nitric acid. A one molar nitric acid would therefore contain 63 gm of acid per litre of fluid. Concentrated nitric acid is supplied as a solution in water of approx. 67% by weight. The acid content of 67% concentrated acid is 680 gm per litre, so that diluting this acid with water by a factor of ten will reduce the acid component to  $680 / 10$ , i.e. to 68 gm of acid per litre of fluid. This concentration is roughly one mole per litre, which is "one molar acid". As nitric acid is almost completely ionised in dilute solutions, there will be  $\text{H}^+$  ions and  $\text{NO}_3^-$  ions in solution in almost equal numbers. The concentration of each will be roughly one mole per litre, so that the concentration of  $\text{H}^+$  hydrogen ions will likewise approximate to 1 mole per litre, i.e. one gm of  $\text{H}^+$  per litre of fluid.

Similarly for sulphuric acid. The components of sulphuric acid  $\text{H}_2\text{SO}_4$  consist of hydrogen with a molecular weight of 1, sulphur with a molecular weight of 32, and oxygen with a molecular weight of 16; the sum of the atomic weights of the constituent elements is thus  $(1 \times 2) + 32 + (16 \times 4) = 98$  which is the molecular weight of sulphuric acid. A one molar sulphuric acid will therefore contain 98 gm of acid per litre of fluid. Concentrated sulphuric acid is supplied in a solution in water at approximately 97% purity. The acid content of 97% concentrated sulphuric acid is 1860 gm per litre, so that diluting the concentrated sulphuric acid by a factor of eighteen will reduce the acid component to  $1860 / 19$ , about 98 gm per litre. This concentration is roughly one mole per litre, which is "one molar acid". Again the acid is almost completely ionised in dilute solution, so there will be  $\text{H}^+$  ions and  $\text{SO}_4^{2-}$  ions in solution in approximately equal numbers. Since



then the dilute solution will be one molar acid, but a two molar solution with respect to the  $\text{H}^+$  ions. The concentration of hydrogen ions is thus 2 moles per litre, i.e. 2 gm of  $\text{H}^+$  per litre of fluid.

For hydrochloric acid, the components of  $\text{HCl}$  consist of hydrogen with an atomic weight of 1, and chlorine with an atomic weight of 35.5. The sum of the atomic weights of the constituent elements is  $1 + 35.5 = 36.5$ , which is the molecular weight of hydrochloric acid. A one molar hydrochloric acid will therefore contain 36.5 gm of acid per litre of fluid. Concentrated hydrochloric acid is supplied as a solution in water of approximately 31% by weight. The acid content of 31% concentrated hydrochloric acid is about 320 gm per litre. Diluting the concentrated hydrochloric acid by a factor of eight will reduce the acid component to  $320 / 9$ , about 36 gm per litre. This concentration is roughly one mole per litre, which is roughly "one molar acid". Again the acid is almost completely ionised in solution, so there will be  $\text{H}^+$  ions and  $\text{Cl}^-$  ions in solution in approximately equal numbers. The concentration of each will be roughly one mole per litre, so that the concentration of  $\text{H}^+$  hydrogen ions will similarly approximate to 1 mole per litre.

The pH is mathematically defined as follows:

$\text{pH} = -(\log_{10} \text{H}^+)$  where  $\text{H}^+$  is the concentration of  $\text{H}^+$  ions measured in moles, which in this case is also measured in gm per litre, since the relevant atomic weight is one..

So a solution of one molar hydrogen ions will have a pH of  $-(\log_{10} 1) = 0$ . Therefore one molar nitric acid  $\text{HNO}_3$  and one molar hydrochloric acid  $\text{HCl}$  will have a pH of 0, whilst one molar sulphuric acid  $\text{H}_2\text{SO}_4$  will have a pH of  $-(\log_{10} 2) = -0.3$

Soil with a pH of 8 would have a concentration of  $\text{H}^+$  hydrogen ions of  $1 \times 10^{-8} = 0.00000001$  moles per litre - not very high! Soil with a pH of 5 would have a concentration of  $\text{H}^+$  hydrogen ions of 0.00001 moles per litre. So in order to reduce the pH from 8 to 5 there must be added 0.00001 - 0.00000001 moles i.e. about 0.00001 moles per litre of compost. This is equivalent to adding  $0.00001 \times 1000$  i.e. 0.01 cc of one molar acid to a litre of soil.

In regard to the admixture of two dessert-spoonfuls of ferrous sulphate to a gallon of water, the molecular weight of  $\text{Fe}_2\text{SO}_4 \cdot 7\text{H}_2\text{O}$  is  $56 + 32 + (16 \times 4) + (16 + 2) \times 7 = 278$ . Assuming this quantity of ferrous sulphate has a weight of 10 gm, this would equal  $10/278 = 0.036$  moles which would release  $2 \times 0.036 = 0.072$  moles of  $\text{H}^+$  hydrogen ions per gallon. Since one gallon is roughly 4.5 litre, there would be  $0.072/4.5 = 0.016$  moles per litre with respect to the  $\text{H}^+$  hydrogen ions or 0.008 moles per litre with respect to the sulphuric acid. This would, in theory, have a pH of about 2, once the ferrous sulphate had completely oxidised.

.....from H.Middleditch

It is my impression that dry compost does not have a pH, strictly speaking; it is only those components of the compost which dissolve in water to produce a solution which does possess a pH. So that when we measure the pH of a thoroughly wetted compost it is really the pH of the water content of that compost which is involved. It may be as well to make this distinction, as measuring the pH of a compost involves not just adding water to it, but adding sufficient water and agitating it thoroughly in order to ensure that any and all soluble constituents of the compost are effectively dissolved. In this way any measurement of the pH of the resultant solution does give a clear indication of the pH of the compost, and not a misleading one.

.....from J.Cooke

Certainly the pH of a dry compost is meaningless until water is added and it is really the solution of components leached from the soil particles that is of interest - roots, after all, cannot take up dry particles of soil!

If water of a certain pH value is used to soak the compost in which plants are potted, it does not necessarily follow that the compost then takes on the same pH as the water. There are many sorts of buffering constituents in soil which attach themselves to the H<sup>+</sup> ions in the added water and this means that the compost need not necessarily be acidic even after a thorough soaking with water of low pH value.

.....from R.Allcock

The final equilibrium figure which I obtained by mixing two dessert-spoonfuls of ferrous sulphate to a gallon of water was a very low pH value. In a non-buffering medium e.g. pure sand, it is possible that this pH may be low enough to do serious damage to the plants.

.....from H.Middleditch

Presumably the same can be said for applying a similar dosage to a growing medium consisting solely of stone chippings?

### MELOCACTUS FRUITS *New Scientist* July 1993

In the sandy deserts on the coast of Brazil, a lizard and a cactus have evolved an unusual arrangement that benefits both. The cactus provides the lizard with food and water, and has its seeds dispersed in return. In fact, they cannot germinate unless they have passed through the lizard. Joao Vasconcellos-Neto and his colleagues at the State University of Campinas observed the lizard, *Tropidurus torquatus*, in the Linhares Nature Reserve to the north of Rio de Janeiro, where the temperature can top 50°C by midday on sunny days. The lizard feeds on ants, while keeping a watchful eye on *Melocactus violaceus*, a cactus that grows in open, sandy, areas.

Each day this cactus produces between one and four small, pink, fruits. They mature within the cactus's spine-covered crown, and are pushed up and out at the top. "The exposure of the fruit is synchronised with the lizard's period of greatest activity in the morning", says Vasconcellos-Neto. "As the temperature goes up, the velocity with which the fruits rise increases, and they are left most accessible to the lizards". When a lizard sees a fruit, it climbs up the side of the cactus and grabs it. Although the fruits contain little sugar, they have a high water content, and Vasconcellos-Neto believes this is why they are important to *T.torquatus*.

As for the cactus, it provides the fruit during the day, when few other herbivores apart from these lizards are active. In return, the seeds are dispersed to other sandy areas where the lizard defecates. Each fruit contains 22 seeds on average. "The seeds we collected from lizard faeces germinate in our lab" says Vasconcellos-Neto, "while seeds taken directly from ripe fruit will not sprout. This suggests that passing through the lizard's digestive tract breaks the seed's dormancy through some chemical changes."

Vasconcellos-Neto believes that the high temperatures and the spines of *M.violaceus* - which do not inconvenience the lizard - prevent the small mammals of the area from eating the fruit, "leaving *Tropidurus torquatus* as apparently the exclusive disperser of its seeds".

.....from F.Vandenbroeck

Although we must have seen thousands of (often very colourful) lizards during our travels in Brazil and Venezuela, I do not remember seeing any one of them eating cactus fruits. On the Galapagos Islands some iguanas readily eat the cactus pads!

### AUSTROCYLINDROPUNTIA VERSCHAFFELTII *By. R.Hillmann*

In the course of my travels in Bolivia and Argentina I have come across *Austrocyllindropuntia verschaffeltii* in the following places:

RH 454 Tafi del Valle	RH 607 Iruya	RH 1194 Hualinchay
RH 474 Cachipampa	RH 633 N. of Andalgalá	
RH 582 Nazareno	RH 905 Inca Huasi	

The plants we found at Iruya bore orange coloured flowers.

.....from H.Middleditch

In Chileans No.50 the then known locations reported for *A.verschaffeltii* were summarised. The RH 633 on the road from Andalgalá to Capillitas, north of Choya, would probably be the same location as that reported by D.J.Ferguson and by K.Preston-Mafham & party, at the most southern point of its distribution area. This species has not previously been reported from Hualinchay, in the north of Tucuman province (located on map on page 122 Chileans No.48). However, as was observed in that issue in the review of *Parodia microsperma*, the bedrock, climate, and vegetation would be somewhat similar at Hualinchay and at Tafi de Valle, from where *A.verschaffeltii* has already been reported by several collectors. There would appear to be no previous report of this species being found either at Iruya or at Nazareno, both of which lie on the western or "wet" side of the mountain ridge which interrupts the rain bearing winds before they reach the Quebrada Humahuaca. It is also rather remarkable that only one other report appears to exist of this species from the basin in which Culpina, Salitre, and Inca Huasi are situated.

.....from F.Vandenbroeck

Crossing the Culpina plateau in the direction of Salitre our attention was caught by conspicuously red flowering



groups of cacti. On closer inspection these turned out to be *Austrocylindropuntia verschaaffeltii*.  
.....from K.Preston-Mafham

In addition to the site near the Abra del Infiernillo in Tucuman province, where our party came across this particular plant bearing orange flowers, I also found another plant of this species with orange flowers when I was going up the Quebrada Escoipe on my own.

.....from J.R.Kirtley

Bear in mind that Ritter gives two flower colours for *A.verschaaffeltii*, brownish yellow, and red, in the proportion of 4 to 8.

.....from J.Lambert.

At the places where I found this plant, near Tafi del Valle and near the top of the Cuesta del Obispo, it grew fully exposed, with no bushes to hide it from the direct sunlight.

.....from K.Gilmer

In a dry river bed on the edge of the Cachi Pampa there were some bushes growing and it was only under the big bushes that we found *A.verschaaffeltii* growing. We never found one of these plants growing under the small bushes. Some of the plants had stronger spines than others. The typical method of propagation is for the plant to form small segments at the top of the stems, which fall down to the ground. Being more or less globular, the wind will be able to roll them away until they come to rest under a bush and that is where the next plant will grow.

.....from K.Preston-Mafham

Certainly the plants that we saw in the Quebrada Escoipe were all growing out in the open. There is a long and fairly steady climb all the way along the Quebrada Escoipe until finally you come to the really steep ascent with all the zig-zags. It was prior to this steep twisting ascent that I found *A.verschaaffeltii*. There were still plenty of bushes around, so it was really not far above the forest zone here. In fact there were still plants of *Echinopsis ancistrophora* to be seen at the same place, as well as *Rebutia deminuta*. We did not go to Tafi del Valle, in Tucuman province, on this trip, but that place is also just above the edge of the forest zone and *A.verschaaffeltii* is to be seen there as well.

.....from M.Nilsson

The *A.verschaaffeltii* which we found on the eastern side of the Quebrada del Toro above Chorrillos was growing together with *L.chorrillosensis* MN 114 and close to *Rebutia aureiflora*. The higher you climb the drier it gets. This area is still rather moist but is intermediate between the really damp lower part of the Quebrada del Toro and the much more arid part which extends a long way up the valley. *Austrocylindropuntia* is found on flatter ground among the grass, whereas the *Lobivia* and *Rebutia* seem to grow more in cracks in the rock, on slopes, around stones, and so on. I think that we only found one or two plants of the *Austrocylindropuntia*.

#### **CUTTING AN UN-PRETTY CAPER? From J.Brickwood**

I have recently been having trouble with from leaf-cutter bees trying to head-butt their way into my greenhouse. My goodness, they are persistent beasts! Seriously though, they have chewed their way through the roots of four or five of my larger plants. They are incredibly single-minded and very bad tempered but I have had no choice but to catch the individuals concerned and dispose of them. They have also been troubling other local collectors. Have you ever heard of any deterrent for this pest?

.....from R.Purves

This year some leaf-cutter bees have decided to make their home in my collection, again. They take no notice of me if I happen to be in the greenhouse when they come and go - they head straight for the pot they are using and disappear down the hole they have made, re-appearing a short while later. If I unpot the plant I am sure to find that they have made a branching tunnel lined with leaves. They put a stopper at the bottom of each tunnel then lay an egg there, adding some pollen or other nutritious feed for the emergent grub, before sealing the top of the tunnel. When I remove the construction from the pot it is just like a miniature cigar. To judge by the small circular holes cut in the leaves of some of my rose bushes, this is what they seem to use for lining their tunnels. So far I do not seem to have suffered any damage to the roots of the plants in whose pots they have tunnelled.

.....from R.Purslow

My problem has been not with bees, but with wasps, which make a habit of rifling the seed out of the fruit on my plants. Over the years I have been able to acquire a fairly large number of *Lobivias* with a good lineage, such as offshoots from old imports, so that for quite a number of species I have up to half a dozen plants. This year I went to the trouble of carefully cross-pollinating many of the flowers and was pleased to see the numbers of fruits which resulted. Unfortunately the wasps have been busier than ever in the greenhouse this year, taking seeds from these plants, and now I have scarcely any of this seed left at all. What I need is some simple but effective means of keeping them out of the greenhouse altogether.

#### **The Chileans Field Number Compendium - Third Supplement**

This supplement includes the additional Field Number Lists BDH, GC, ME, TG, K, FK, GN, JK, WCB, and P&W, together with a revised DH list, as well as additions to the RMF and Gf lists. It runs to 35 pages and costs £4.90 in the UK, £5.60 or \$14 overseas, all inclusive of postage and packing. Copies are expected to be available shortly from the Membership Secretary.

#### **The Chileans 1997 Weekend**

A booking has been made for the 19th to 21st September at Cavendish Hall, Nottingham University. The scale of charges applicable to 1997 are not yet to hand from the University Conference Office. From R.Ferryman we hear that he will talk about the higher Andes of Chile, from A.Craig we anticipate hearing what was seen on his 1996 visit to Chile, from G.Charles and C.Pugh we hope to hear about their recent trip to Western Argentina, and from M.Lowry we hope to hear about his recent visit to Bolivia in company with B.Bates.

Approaches have been made to one or two possible visiting speakers from the Continent but as we go to press, no positive commitment to participate has been received. It is expected that, as usual, facilities will be provided for sale/exchange of members' surplus seedlings or plants. Details, including costs, will be sent to those who attended the 1996 weekend and to any other member interested in participating.

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