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Trichocereus tarijensis
West flank, Sierra Aguilar

Photo. - K. Gilmer



WR914 ex Cieneguillas
Photos: K. Augustin

Weingartia neumanniana



Cerro Negro, Humahuaca
Photo: M. Winberg



Pampa Mochara
Photo: T. Marshall

When we stopped on the Pampa Mochara (to the north-east of Tupiza) in January of 1997, and found *Weingartia kargliana*, we were able to unearth one of these plants. The excavated plant was shown on slide at The Chileans' 1998 Weekend. The small head of the plant possessed a relatively substantial tap root, something like 20cm in length and about an inch in diameter - slightly less in diameter at the bottom than at the top. The head of the plant was carried on a narrow neck, the head and the neck together measuring only about 25 mm in height, the head being about 20mm across. The head itself was of an obconical shape, the flat top of the head having been more or less level with the top of the loose surface layer of stones, so that the spines which stood upright on the head were really all that was to be seen projecting above the surface of the ground.

The Pampa Mochara itself was a real pampa, more or less level with a general scattering of bushes together with quite a bit of low annual growth in the shape of herbs and grasses. But *Weingartia kargliana* was not found on the pampa proper, but off the flat area, on the hill slopes, or in saddles between hills, possibly only one or two hundred feet above the level of the pampa. Compared with the level pampa, the ground here was perhaps a little more stony, but with a lesser amount of low annual growth and no bushes. A lot of the *Weingartia* which we saw at this site were in flower, but the flowers were really quite small, barely 15 mm tall and broad. You had to be within a couple of yards of a flower before you saw it, despite the relative paucity of other vegetation.

When we came across *Weingartia neumanniana* near Berque, close to the border with Argentina, the plants were growing on fairly flat ground which lay on a very slight slope. The ground was composed of a sandstone-like rock with vertical bedding planes, which were pitched very close together, possibly about half an inch apart on average. The surface of the ground was more or less covered by small pieces of stone which had broken off the exposed strata, in the form of thin, rectangular flakes about the size of dominoes but about half an inch thick. Indeed it was very much like the nature of the ground where *Parodia occulta* was seen and photographed by K.Preston-Mafham along the road to Culpina. These *Weingartia* near Berque were growing in the cracks or bedding planes in the rock, so their rootstock finding its way down the crack was quite probably lengthy as well.

Apart from possibly a few bushes of *Larrea* (creosote bush) and some grasses, there was very little vegetation besides the other accompanying cacti at this location. A great deal less than at the site of *Weingartia kargliana* on the Pampa Mochara. At the Berque site, the paucity of vegetation in 1997/98 may have been accentuated due to the El Nino effect, as the rains were about 8 weeks late arriving at Tupiza. But even allowing for this, the vegetation at Berque was sparser than where we had found *W.kargliana* on the Pampa Mochara.

.....from T.Marshall

The plants of *Weingartia neumanniana* which we saw near Berque did look to me to be rather shrunken and dessicated. Some of them were almost level with the surface of the ground and all of them were shorter than they were wide. Most of the larger plants were 1.5 to 2 inches across, a few perhaps 2.5 inches across. I would not think that any of them were more than about one cm tall. There was one plant to be seen which had three heads but this was probably due to the original head having been damaged. Spination was jet black and fairly sparse.

The *Weingartia kargliana* which we saw on the Pampa Mochara were even smaller, perhaps up to only one inch across the body, with even fewer spines. Also growing on that hillside were *Trichocereus tacaquirensis* and *Oreocereus celsianus*. It was not only at Berque where the ground on which these plants were growing was composed of sandstone with close-bedded cleavage planes, but at the Pampa Mochara as well.

.....from W.Rausch, K.u.a.S 30.5.1979

Weingartia kargliana sp.nov. As I crossed over the almost bare, kilometres-long high plateau for the umpteenth time, I noted again and again some yellow flowers and initially assumed it was a form of *Lobivia pugionacantha*. Nevertheless, on closer inspection it transpired that it was a *Weingartia*. *Weingartia kargliana* Rausch sp. nov. is up until now the most northerly form of those closely related to *W.neumanniana* Bckbg.; it differs from that on account of the fewer ribs and fewer spines; the flowers are larger and more or less yellow. It grows above Tupiza, Bolivia, and it is almost impossible to find when not in flower. *Weingartia neumanniana* occurs more to the south (near Humahuaca in Argentina) and colonises more rocky areas. I name this plant for F.Kargl, under whose charge the Schonbrun Botanic Gardens in Vienna has risen in international esteem.

.....from H.Middleditch

A compact disc was received from K.Augustin which provided a fairly comprehensive review of the genus *Weingartia*, together with an abstract from that appreciation. In this review, where *W.neumanniana* is erroneously put into synonymy with *W.fidaiana*, there is a picture entitled "*Weingartia fidaiana* OI 1460" which has the appearance of a fairly typical *Weingartia neumanniana*. The open spination stands away from the body and does not obscure sight of the very blunt ribs. Whereabouts would this particular plant have been found?

.....from K.Augustin

The OI 1460 was identified as from " the road from Cotagaita to Tupiza, at 3km to the south of the junction with the road going to Impora, where the road begins to descend, on the left (east) side of the road."

.....from H.Middleditch

The road going north from Tupiza follows a valley, steadily gaining altitude until it eventually climbs out

of the east side of the valley, and then crosses over a saddle before it descends on to the extensive area of plateau which includes Pampa Mochara. It is in this vicinity, just to the east of the saddle, where OI 1460 was evidently found. To judge by the contours on the map, this would appear to place OI 1460 at about 3600m altitude. Some 15 km further west, across the plateau, *W.neumanniana* was again found, at 3460m altitude at BLMT 89. Over the almost level plateau between these two places, there is little change reported in the terrain and vegetation, so it would hardly be surprising if more specimens of *W.neumanniana* were to be found between these two places. This idea would seem to be supported by the foregoing comment from Rausch that they saw the yellow flowers “for the umpteenth time” along this stretch of road.

.....from K.Augustin

I have come into possession of a couple of specimens of *Weingartia* WR 914, which was found by W.Rausch near Cieneguillas, en route to Iscayache, when travelling in company with O.Ferrari and R.Kiesling. Fortunately this plant has now flowered and it cannot be distinguished from *W.neumanniana*, or, if you wish, *W.kargliana*. My two plants have not flowered together so that up to now I have not been able to set any seed.

Similar plants have been found in the valley of the Rio Paichu; although I do have two of these plants, up to now only one of them has flowered. And this one produced a fine brick red flower. I hear from H.Amerhauser that this is really an exception, as other available specimens from this population have flowers mainly of a yellow colour. The habitat location has been given as: between San Antonio and Cana Cruz, the second side valley, in slate, at 2600m altitude.

.....from J.Cooke

The flowers on my own *W.neumanniana* have a deep yellow throat and an orangish tinge to the ends of the petals like those on the picture of WR 914 in flower, But I would not describe these flowers as any larger than those on my other, more northerly, *Weingartias*. They may look larger on my on plant, for example, simply because it first flowered when it was only one inch across.

.....from H.Middleditch

As far as available records go, this observation from K.Augustin would appear to be the first report of a *Weingartia* of the *neumanniana* affinity being found in the area to the north of Iscayache. However, this location is roughly at the same latitude as the Pampa Mochara (the Type location for *W.kargliana*) and will have a comparable climate. However, the reported altitude of 2600m is a bit peculiar. San Antonio lies at about 3400m altitude and the road from there to Cana Cruz does not get below 3000m until it is only a short distance from Cana Cruz, itself lying at about 2850m. As these plants have been apparently been described as from “the valley of the Rio Paichu”, then the “second side valley” downstream from Can Cruz could well lie at 2600m. But that would be an unexpectedly low altitude for a *Weingartia* of *neumanniana* affinity.

Both the Culpina basin and the basin around Iscayache are bounded on their eastern side by a mountain range, which acts as a barrier to the rain-bearing clouds from the Atlantic, so that their rainfall regime will be fairly comparable. Much of the Iscayache basin lies above 3400m, whilst much of the Culpina and Inca Huasi basins lies below this same altitude, so that their temperature regimes may differ somewhat. It is *Weingartia westii* which is to be found in the Culpina basin, and now it is evident that *W.neumanniana* is to be found in the Iscayache basin.

.....from M.Winberg

From Humahuaca we climbed up the Cerro Negra and at 3200m altitude there were still *Trichocereus pasacana* to be seen. We also found *Weingartia neumanniana* which seemed to grow patchily in colonies. They grew on gentle slopes near the peaks of the mountains, in a rather restricted area, sometimes the plants were only a handspan apart. In some places there were as many as 20 to 30 small sized plants in one square metre. Mostly there were smaller plants, some 1 to 3 cm in diameter, but we did find a few bigger and presumably older plants. The small plants had fairly short and more or less appressed spines, whereas the older plants had typically outward pointing spines. They were all growing in a brownish-red slate, in cracks or bedding planes in the rock, with almost no humus. The plants are hard to find as the body also has a reddish-brown epidermis. Because the roots of these plants forced their way into the cracks of the rocks, it was very difficult to remove them. But we were very fortunate, as we found one small plant which evidently had been unable to force its root down a crack in the rocks. It was growing in the loose pieces of stone which had collected in a shallow cleft in the rock; the root, some 20 cm long, was growing sideways under this layer of loose stones. Apart from a few dwarf bushes nearby there was very little other vegetation growing on these rocks - some dwarf bushes, some grasses, as well as odd *Parodia*, *Lobivia*, and *Rebutia*..

In the course of our visit to Argentina in 1990, we made a stop at Iturbe. From Iturbe we had planned to go further on to Iruya. The bus only went twice a week, so in consequence we had some spare days to spend around this little village. At first glance, Iturbe and the surrounding mountains look rather boring, even to a cactus fan. We knew that there should be *Weingartia neumanniana v.aurantia* (Bckbg) FR 50 growing in this place. The first day was spent east of Iturbe, going up the mountains to 3600m. On the following day we climbed the hills to the south of Iturbe. These were hills of a rich brown slate and therefore also difficult to climb. We walked for a long time without finding interesting cacti. At last, at 3500m, we found our *Weingartia*. Beautiful brown bodies with short or long spines in brown or black. There were plants to be seen in abundance.

We know that Rausch had also found these plants near to the Bolivian border, near Berque. It does seem to me that *W.neumanniana* is a wide spread species and that *W.kargliana*, *pygmaea*, etc., could be classified as synonyms, or local forms, of *W.neumanniana*.

There were no signs of buds or flowers either at Iturbe in November or near Humahuaca in late January. In cultivation the MN 57 from Cerro Negro has a yellow flower, whereas the flower on MN 172 from Iturbe has reddish sepals. Both very similar to the flowers on the pictures from K.Augustin of the two WR 914



Weingartia neumanniana

Pucara, Humahuaca

Photo: L.v.d.Hoeven

Weingartia neumanniana found between Cieneguillas and Iscayache.

.....from C.R.Pugh

After our overnight stop in Humahuaca we decided to climb up the Cerro Negra on foot. The first part of the climb took us through sandy gorges at the base of the mountain, where *Austrocylindropuntia weingartiana* and *Opuntia sulphurea* grew under spiny bushes. As we climbed upwards into rockier parts, *Parodia maassii* became quite abundant together with a *Lobivia* which may be *L.marsoneri*. There were tall *Trichocereus pascana* growing at almost all stages of our ascent, with some *Oreocereus trollii* on the north facing slopes. There had been some very recent rainfall and in the higher parts there were various semi-alpine plants in good growth. Disturbing any of the ground cover, like gravel, revealed that the ground was quite moist. There was snow lying on the tops of the mountains to the east.

We were well up near the top of our climb when we came across *Weingartia neumanniana*. They were small plants, perhaps up to 2 cm in diameter, but remarkably abundant in the patches where they did grow. However they were very specific in regard to the nature of the ground and presumably the microclimate that suited them. It had to be the right kind of rock, formed of thin slabs coming to the surface in the form of mounds or ridges. The *Weingartia* mostly occupied the shallow, debris filled troughs between the projecting slabs, where their colour merged with their immediate surroundings. When we looked in the right places, it was easy to find them, once we knew what to look for, but before getting one's eye in it was quite easy to walk all over them without seeing them.

There were perhaps one or two open flowers to be seen, together with a few closed flowers. We did find one fruit but it did not seem to be quite ripe.

.....from G.Charles

After stopping overnight in Humahuaca we had a full day's outing climbing the Cerro Negra. First of all we walked up some sandy gorges at the base of the mountain where there were spiny bushes. As we climbed into more rocky parts, *Parodia maassii* started to appear and became very common, growing together with some *Lobivia ferox* and another *Lobivia*, possibly *L.marsoneri*. The tall *Trichocereus pascacana* were all the way up and we also saw *Oreocereus trollii*. At the highest point of our ascent we found *Weingartia neumanniana* which was growing in fissures and cracks in the rocky outcrops. We wanted to look at the root on one of these plants, but it was only with great difficulty that we managed to prise one of these plants out of the rock. It had a quite narrow neck joining the body to the thick root, which was much broader than it was thick, because this was the shape that it had to adopt in order to accommodate itself to the cleft in the rock.

.....from L.v.d.Hoeven

After meeting M.Lowry at the collection of O.Ferrari in early January, a field trip was undertaken in

company with R.Kiesling into the north-west of Argentina. After having made two previous attempts in the last 19 years to find *Weingartia neumanniana*, this time I was successful. These plants are very difficult to find because they are small and their natural colour camouflages them in the rocky mountain tops. They only occurred at a very restricted altitude, between 3250 and 3350 m and they seemed to be a very small population. There were no flowers to be seen and there were only very few seeds to be found.
.....from T.Marshall.

The picture of *Weingartia neumanniana* taken by L.v.d.Hoeven. is rather unusual in several respects. For practical purposes the whole of the body is growing above the surface of the ground and I do not recollect seeing any of this species of *Weingartia* either at Pampa Mochara or at Berque which were other than semi-subterranean. In addition, the tubercles are quite distinctively projecting whilst the spines are straight and robust, features which were conspicuous by their absence on the plants we saw at the two locations we visited.
.....from M.Wimberg

From my own recollection of the *Weingartia neumanniana* which I saw to the south of Iturbe, none of them had straight, strong spines like those on the plant photographed by Lv.d.Hoeven.
.....from G.Hole

After acquiring a habitat collected plant of *W.kargliana* from B.Bates, I had to find some suitable container to accommodate the rootstock, which was over 8 inches long. The problem was solved by taking two plastic long tom pots of slightly different sizes, cutting the bottom off the larger one, and grafting it on to the smaller of the two pots where it was secured by a coat of glue. This plant has been grown in a very gritty compost, given sufficient but not generous waterings, and no feed; up to the present, it has retained its compact shape and shows no sign of trying to adopt an elongated shape.
.....from J.Arnold

It must be all of twelve years ago or more that I raised a batch of *Weingartia neumanniana* from seed, which have continued to be grown on their own roots. They did indeed grow in an elongated manner for perhaps five or six years so that when they were between two and three inches tall they would have been about an inch in diameter or possibly slightly more. Then the upper portion started to adopt a club shape and at the same time the narrower lower portion would contract or shrink down into the compost to some extent during its period of winter rest. This has continued to occur each winter so that the lower, thinner, portion of the body now seems to have retracted completely into the ground and has left the more or less spherical body standing more or less on top of the level of the compost.

Shortly after the young seedlings became reasonably well established, two or three of them were transferred into my unheated greenhouse, where they have since remained. They not only grow equally as well as those in the heated greenhouse, they flower every year just as regularly and also at about the same time of year.
.....from H.Middleditch

Is there any possibility that the cylindrical growth occurred when the plants were still in seed trays, or somewhat shallow pots, and that when they went into longer pots the thickened rootstock could go down deeper into the compost and thus be able to draw the lower part of the body into the ground over the resting period?
.....from M.Lowry

It is many years ago that I acquired a small seedling of *W.neumanniana*. It was never given a great deal of encouragement to grow vigorously and before I parted with it, this plant was in a 2.5 inch square pot. It did tend to wobble somewhat if the pot was moved and the reason for this became clear when it was finally unpotted. The plant was like a dumb-bell, with the body about two inches broad and tall, together with a very substantial bulbous rootstock which occupied most of the pot, the two being joined by a short but very narrow neck.
.....from A.de Barmon

The *Weingartia neumanniana* that I had on grafts were growing elongated and as I dislike that form of growth I tried to root them down. The process has been repeated twice - each time the head was cut off in July and roots did not appear until two years later. Subsequent growth is very good and definitely globose.
.....from G.Charles

One or two of my *Weingartias* have had the thick rootstock cut off solely in order to get the plants to fit in a normal depth of pot. When they have become re-established they do not grow another thickened rootstock, but merely put down the more typical bunch of thin roots.
.....from P.Down

Over the course of the years I have had various *Weingartia neumanniana*, which have eventually been lost and then been replaced. They always grow for me in an elongated fashion, to a height roughly two or three times the diameter of the body. They are usually in square pots which are about as deep as they are wide.
.....from H.Till, G.O.K. Newsletter October 1968

Plants of *Weingartia* do not grow very large and thrive in an open window. It should be taken into consideration that they have a substantial rootstock and on that account require a deep pot. There are two groups of *Weingartia*. One, to which *W.cumingii* and *W.fidaiana* belong, remains more globular, whilst the second group with *W.neumanniana* grows more columnar.
.....from K.Augustin

Unfortunately the *Weingartia* such as *W.neumanniana* do not grow so well with us, for they always grow taller and taller in cultivation, becoming quite cylindrical. Perhaps they should be potted up in a coarse, nutrient-poor compost?
.....from J.Essers

.....from J.Essers

Normally all my Weingartia grow globular. But my *W.neumanniana* has long segments up to 25-30 cm long, so that they lie partly on the surface and some even hang over the edge of the pot.

.....from H.Middleditch

My own small *Weingartia neumanniana* is somewhat taller than broad and any ideas on how to persuade it not to become any more elongate would be very welcome.

.....from A.de Barmon

Of the southern *Weingartia*, I only have *W.neumanniana* in my collection. On these plants, the buds appear quite early - March here in France - and early watering can prevent the buds from developing. The critical stage is when the buds start elongating, no more than two weeks after first appearing. Once the buds have grown nearly to flowering size, I have not experienced any failure to open. When I was at The Chileans' Weekend we saw a slide taken in Bolivia by M.Lowry which was of *W.neumanniana* - the plants were in bud despite being quite dehydrated. Maybe this indicates that *W.neumanniana* sets its buds at the end of the dry season.

.....from M.Lowry

But we saw these *W.Neumanniana* near Berque on 17 December which would normally have been into the start of the rainy season, which was very late that year. Hence the plants would be far more shrivelled than was probably usual for this time of year.

.....from H.Middleditch

Which might suggest that budding up in habitat does commence at the onset of the normal start of the rainy season.

.....from A.de Barmon.

Flowering of *W.neumanniana* takes place here in April/May and the fruit ripens over June and July. My flowering clone is self-fertile, but germination rate of the seed is very poor. The seed harvested off my plant in 1997 was split into two halves, one half being sown fresh, the other half just over one year later. Both sowings yielded a germination of less than 10%. However the *W.neumanniana v.aurantiaca* seed from Mats Winberg sown in 1997 gave 70% germination. Could this be because my seeds came off a self-pollinated plant?

.....from A.Glen

My *Weingartia neumanniana* was grown from seed supplied by De Herdt in 1989, a packet of some ten seeds yielding a germination of some 6 or 8 seedlings. It is now in a 2.75 inch square by 3 inch deep pot. Growth is rather slow and there is a pretty hefty tap root. Buds have been formed each year since 1995, about June time, going all the way to full open flowers on two occasions. But almost always the flower reaches the stage when it seems that it will open in the next two or three days and instead it just stands still, getting stuck at the stage with the stigma protruding from the unopened bud. In due course it simply withers without opening at all. By mid-summer this plant will of course have been watered for some two months or more, along with all the rest of my collection. It probably needs sustained sunshine, or at least bright weather, at the critical time when the colour of the flower can be seen from the unopened bud. And as we know this is all too often in short supply.

.....later

This year my *W.neumanniana* did decide to open its flowers properly, but not only that, it also set a fruit, which produced 40 seeds. Of these, 15 were sown not long after harvesting and seven out of the 15 germinated.

.....later still

The remainder of the previous year's *Weingartia* seed was sown in Spring, with ten germinations, which is not significantly different from the autumn sowing results. This year the plants have flowered well and have set more seed, with a little help from a paintbrush. One plant produced only one fruit which contained 17 seeds. Another plant had three fruits with contents of 44, 45, and 110 seeds respectively. I have come to the conclusion that the flowers need good sun for full opening, and as far as my plants are concerned, they open in the morning and close in the afternoon.

[A set of notes on *Weingartia* FR50 appeared in Chileans No.43]

WE FIND THELOCEPHALA FANKHAUSERI From A.W.Craig

The original description for *Theलोcephala fankhauseri*, which appeared in Ritter's *Kakteen in Südamerika*, provided a habitat location "not far to the west of Domeyko". However, in *Englera* 16 we find that this habitat location is now given as "mountains NW of Domeyko" and in addition, that this find was made by Fankhauser, but numbered by Ritter as FR 1451.

Having travelled along the Pan-American highway as far as Domeyko, we set off from that place along the road going west in the direction of the coast, towards Sarco. After perhaps 6 or 8 km., we turned off that road, taking a faint trail heading northwards in the general direction of Algarrobo. After a few km we were fortunate enough to find *Theलोcephala fankhauseri*. At this spot we would be WNW of Domeyko, perhaps close enough to Ritter's "NW of Domeyko" to be at or near the Type locality for this species. The plants here were solitary, up to a maximum of 2 inches in diameter, the majority being smaller than this, all having a very grey epidermis, quite spineless. We were able to unearth one of these plants and found that it possessed the usual carrot-like rootstock but with a slight narrowing between the aerial head and the root. This was not a real neck but was more like the narrowing displayed by the *Theलोcephala* pictured in Ritter's Abb. 913.

For practical purposes there was no other vegetation to be seen in the vicinity of the spot where these plants were growing. Going northwards from there, further along the trail which had brought us to this spot,

we came closer to Algarrobo, where some bushes and even low-growing trees appeared. There were also occasional scattered clumps of a low growing *Tephrocactus*. Retracing our steps to the road heading west from Domeyko, we now turned towards the coast. The road shortly passes between numerous hills, by short and gentle undulations and it was in this area that we saw more of the scattered clumps of low growing *Tephrocactus*. They were in the sandy ground around the hills but we did not see any growing up on the hill slopes.

This road then divides into two, one track going north to the coast at Sarco, the other going south towards Carrizalillo. In his *Kakteen in Südamerika*, Ritter writes that the habitat location of *Thelocephala tenebrica* lies "to the west of FR 1451, at lower altitude" i.e. to the west of Domeyko, whilst in Englera 16 the herbarium specimen of this species is stated to have been collected 12 km to the southeast of Carrizalillo. So we took the road going to Carrizalillo. We then set off from Carrizalillo and drove in a southeasterly direction, finding our way across ground which not only lacked any real road, but showed no signs of a used track. We were not able to find any *Thelocephala* and becoming concerned about the rather difficult nature of the terrain we were encountering as well as the impending approach of evening, we were obliged to return to Carrizalillo empty handed.

However, we had more success when searching in the vicinity of Trapiche, both to the north and west of that place and not far away from it. The plants which we came across there would appear to be *Thelocephala tenebrica*, which were to be found both as solitary plants and as multiheaded clumps. The majority of these plants that we saw were multi-headed, with individual heads of 10 to 25 mm maximum diameter, the bodies being a grey-black colour. One population displayed a maximum head size of only 12mm, frequently only about 6 to 8 mm across an individual head.

We were able to unearth, or partially unearth, one or two of these clumps in order to examine the rootstock. We found that each of the separate heads in a clump were growing on their own individual rootstock, with a short but rather slender connection below ground level between the main head and each of the adjoining heads - almost a stoloniferous type of growth. The size of the taproot on each head was in keeping with the size of the head itself. Each of the aerial bodies displayed only a small narrowing at the neck. Hence both the *T.fankhauseri* and *T.tenebrica* had this but slight narrowing at the neck, unlike the *Thelocephala* which grow in the area around Vallenar, where the narrowing at the neck is very distinct.

.....from R.Ferryman

The original finding place for *Thelocephala fankhauseri* was Trapiche, where the plant can still be found in reasonable numbers. The main head (and sometimes the only head) has a thickened root system without any real neck, unlike the closely related *Thelocephala napina*. Clumping plants are frequent and these clumps can be either natural or a result of damage. The offsets produce a single taplike root at a very early age, usually when they are about 8mm across. The only other *Thelocephala* that I know does this at such an early stage is *T.krausii*.

.....from H.Middleditch

The Ritter description for *T.tenebrica* states that when offsetting occurs it takes the form of the formation of small complete plants. Presumably this refers to the stoloniferous type of offset described by A.W.Craig.

Fred Kattermann lists his FK 531 as *Thelocephala tenebrica* from "Domeyko, on hills to mine Algarrobo". This appears to be more or less the Ritter location for his *T.fankhauseri* "NW of Domeyko".

.....from W.Maechler.

We have found *Thelocephala fankhauseri* some km to the west of Domeyko (WM 164) in the hills there and it resembles the description given by A.W.Craig for the plants which he found NW of Domeyko.

.....from R.Ferryman

I have also been told by W.Krahn of a habitat location for *Thelocephala* to the west of Domeyko on the road leading to the coast. Despite three visits to this area I am not able to confirm a location there.

.....from W.Maechler

We have also found *T.tenebrica* somewhat to the NE of Carrizalillo, but only the one solitary plant. Some years ago we found some plants more or less east of Choros Bajos (WM 150) which in my opinion belong to *Thelocephala*. They are mostly small clumps of 2 to 3 heads, the size of each individual head ranging from 10 to 30 mm in diameter, with small tubercles and tiny black to brown spines. They have a long, hard, thickened rootstock with a somewhat narrowed neck. As far as my memory of *T. tenebrica* goes, these plants have a great similarity to *T.tenebrica*. The habitat location of these plants and of the *T.tenebrica* which we found somewhat to the NE of Carrizalillo are relatively close to one another. I do believe that these *Thelocephala* are at the southernmost limit of the area of distribution of *Thelocephala*.

.....from H.Middleditch

Three photographs of WM 150 were received from W.Maechler and at first sight these plants seem to be well-nigh indistinguishable from *Thelocephala* seen in habitat - the heads of the plants almost horizontal, barely a few mm above the level of the ground. However, a close scrutiny of these pictures might yield a different conclusion. On one photograph, the spines at several areoles extend right across the width of the flat-topped tubercle; at some areoles the spines are shorter, whilst on one or two areoles the spines even extend a little further, beyond the tubercle. On the second photograph, of a clump of three heads, some areoles carry spines which extend a short distance over an adjacent tubercle and a few even overlap spines from an adjacent tubercle. On the third picture, again of three heads (but clearly a different plant), there are a few areoles which display far longer and stronger spines, overlapping those from adjacent areoles.

.....from A.W.Craig

My own impression is that these WM 150 are plants of *Neochilenia hertrichiana*, which we have found in this general area.

.....from R.Ferryman

These plants of WM 150 do not appear to me to represent *Thelocephala*, but more *Neochilenia deherdtiana*. I remember F.Kattermann and I thought we had stumbled upon a *Thelocephala* at Sarco, but it was soon apparent that this was no more than *Neoporteria chaniarensis*.

.....from H.Middleditch

For practical purposes, *Neochilenia deherdtiana* and *N.hertrichiana* can be regarded as synonymous. There is also the record in the Kattermann field list of FK 402 *Thelocephala tenebrica* being found to the north of Trapiche among the FK 401 *Neochilenia hertrichiana*. This record also mentions *Opuntia miquellii* being found in that area.

.....from A.W.Craig

There were indeed *Opuntia miquellii* to be seen in the vicinity of the *Thelocephala* we came across near Trapiche, but not right next to each other. The *Opuntia* might have been two or three hundred yards away.

.....from H.Middleditch

The distribution of *Thelocephala* was reviewed by R.Ferryman in *Chileans* No.51 pp.131 to 135., from which the observation by W.Maechler that *T.fankhauseri* is the southernmost representative of this group seems to be quite correct.

.....from W.Maechler

In the course of over fifty visits which I have made to Chile, my son and I have travelled to a great many cactus habitats and we have found several new plants among the *Copiapoa*, *Thelocephala*, *Pyrrhocactus*, and so on. At the end of the 70's my son and I found a *Thelocephala* WM 016 in the vicinity of Trapiche which is neither *T.tenebrica* nor *T.fankhauseri*. In my view it is a new *Thelocephala*. From Trapiche to the locations of *T.fankhauseri* around Domeyko there lies a gap of some 100 to 120 km. Between the two there lies a range of mountains where the Pan-Am highway crosses a pass at all of 1260 m altitude, whilst the mountain ridge is higher still. It constitutes a natural barrier and I cannot imagine that the plants from around Trapiche could migrate over that mountain ridge. The *Thelocephala* WM 016 from near Trapiche has no great similarity to the *Thelocephala* from the area of Choros and Carizalillo.

.....from R.Ferryman

My own view is that the *Thelocephala* WM 016 from near Trapiche is *T.fankhauseri*, but then I am not able to see sufficient distinction between *T.tenebrica* and *T.fankhauseri* to justify two different names. Thus I was able to first visit a site near Trapiche in 1982 where *Thelocephala fankhauseri* grew (RMF 78), This location was given to me by P.Kraus in Santiago and confirmed by the late R.Wagenknecht. It was also confirmed by R.Kraus that the information was given to him by Fankhauser. This same species has also been found by me to the north of Trapiche, in the direction of Domeyko. I have explored the area around and to the north of Los Choros without finding any sign of this plant. But I did find this species to the southwest of Trapiche, following the Choros valley towards Carrizalillo.

I am also aware of a location for *T.fankhauseri* to the south of (but almost in view of) Domeyko. I was also told by W.Krahn of a location some 6 km or so to the north of Domeyko. We were travelling with the family and C.Pugh when we stopped at the supposed location but despite all of us being engaged in the search no sign of any *Thelocephala* was to be found. I was also given to understand that F.Kuhas had received the same information, stopped there, and had been equally unsuccessful with his search.

.....from A.W.Craig

We were also acquainted with this location not far to the north of Domeyko and likewise failed to find any *Thelocephala* there.

.....from H.Middleditch

From the descriptions of *Thelocephala tenebrica* and *T.fankhauseri*, provided by Ritter, there would not appear to be any significant feature which would distinguish clearly between these two species. Possibly the virtually spineless areoles of *T.fankhauseri*, compared with the short (up to 3 mm long) spines attributed to *T.tenebrica*, might be considered a distinguishing feature between the two species names. Suspicions might be harboured that the erection of the name *fankhauseri* perhaps had as much to do with Ritter acknowledging the assistance which he had received from Fankhauser as with any substantial distinction from *T.tenebrica*.

CULTIVATING AUSTRORHODIA from S.Radcliffe

The plants of *Austrocactus* which I have in my collection have been acquired over a period of several years. They are fairly slow in their rate of growth, but seldom seem to grow straight upright, preferring to lean or grow almost horizontal. A feature that all six of my plants exhibit is that the spines on the upper side of the stems are noticeably longer, thicker, and stronger than those on the underside.

The most robust growth is to be seen on my two plants of *A.patagonicus* which have very dense, strong, spines, which display the usual differentiation between the upper and lower sides of the stem. The thickest spines on one plant are minutely pubescent. This plant, obtained as a seedling from Southfield nursery, is now about six inches long and has recently turned upright during the course of the last winter, at a point about half way along the stem. It has also flowered for the last two years, but on both occasions I was away on holiday at the time so I was not able to note any details of the flowers. The plant is definitely self-fertile and produces seed.

A plant of *A.dusenii* was raised from Doug Rowland seed (ex-Neuquen, Argentina) in 1979. It is only in a 3 inch pot and is composed of about thirty small finger-like branching stems of about 10 mm in diameter and up to 30 mm long. This plant has an untidy, sprawling habit and the stems are semi-prostrate. The spines are

generally feeble, centrals ranging from straight to hooked up to 15 mm long and again the spines on the upper side of the stem are longer, thicker, and stronger than those on the underside. A second plant, which does not have a name, is almost certainly the same species, being of generally similar appearance though the stems are fewer and longer and where they overhang the pot, heavy unbranched aerial roots up to three inches long are produced.

.....from R.Ferryman

The conception of *Austrocactus patagonicus* as a single solitary plant, which possibly arises from the illustrations in Britton & Rose and elsewhere, is erroneous. These plants sprawl and offset just like other *Austrocactus*. Both of my plants which are offsets from an ex-habitat plant are growing horizontally, whilst two seedlings raised from seed off an ex-habitat plant are barely four inches long and have bent over right from soil level so that the growing point is facing sideways and the lower spines project down the side of the pot. From the appearance of the spination on my own plants, my first reaction is to question the idea that the spination is not the same length both on the top and the bottom of the horizontally growing part of the plants. Most of my *Austrocacti* are growing on a raised shelf close to the glass where there is not only good top light but there is reflected light from nearby pots, metal structure, and so forth. Taking a good look at one of my seedlings which does not receive reflected light on the underside, because it is growing horizontally over the top of another pot, I find that the central spines on the underside are about one inch long and somewhat bent at the end, whereas the central spines on the upper side are up to two inches long, thicker, and hooked at the end.

.....from A.Johnston

I have grown an ex-Piltz *A.dusenii* which he collected in the south of province Neuquen. The body is thin and creeps over the soil surface, rooting down as it does so. The spines are all white, thin, and hooked, up to 0.75" long. The longest plant of *Austrocactus* in my collection is a DVV2, which I have had for a long time and it is now 18 inches in length. This also roots down as it creeps along. In both the appearance of the plant and of the flowers it is very like the *A.gracilis* that I obtained as a cutting from R.Coulsting at a Chileans' Weekend, although they now look quite different to when I was given the cutting. All these plants are being grown in long, narrow, and shallow trays; they start off in 8" long trays and as the stem grows longer horizontally they have to be repotted into longer trays. When they start to put down aerial roots beyond the edge of the tray it is time to repot. One of the plants of DVV2 has put out a couple of aerial roots from the upper side of the stem, over the tray.

The only *Austrocactus* which is growing fairly upright for me is an *A.patagonicus*, obtained from T.Jenkins, which has never offset. I also have an offset from a plant bought from the same source by J.Arnold; this is leaning right over now and also putting out offsets itself. Also taking on a leaning attitude are *A.patagonicus* from Bulthuis and B.84 from Whitestones. There is quite a variation in spine colour, from light to dark brown. A small offset of *A.patagonicus* from Piltz which has almost black spines is being rather slow to put down roots, but I live in hopes.

I also have a plant grown from seed collected by R.Kiesling in the Sierra Grande; this produces a lot of arching stems and looks quite different from all my other *Austrocacti*. The plant from Lago Argentino which came from Prof. Schreier in Germany via K.Mortimer continues to prosper; in appearance it is rather like an *A.dusenii* which came from Bulthuis. I find that the plant I have labelled DVV1 is a bit of a misfit compared to the others; the stems are numerous, having tiny insignificant spines, and resemble a *Chamaecereus*. Unlike most of my other plants the spines do not change into more robust growth and I have never had a flower. On its own roots it is pathetic.

As far as I can see there is almost no sign of spines being any shorter on the underside of my plants, compared with those on the upper side. Perhaps on one plant which has lower spines projecting into a gap between pots, where direct sunlight is excluded, might possibly be slightly shorter. But I do find pubescent spines quite often on young plants grown from seed, but not on all of them though. My second plant of B.84 also produces some long, straight, tapering, pale coloured spines which look pubescent.

.....from R.Scheck

Have you noticed that there is a difference in the spination of *Austrocactus*? The spines of *A.patagonicus* do not reflect light, but the spines of *A.bertinii* do reflect light.

.....from H.Middleditch

Could this be accounted for by the presence or absence of the pubescence on the spines, whose existence is mentioned above?

.....from A.Johnston

There are quite a lot of questions I would like to find answers to on these plants. Do they adopt this creeping habit because of the conditions in habitat? I understand that the climate is pretty severe and very windy. How are the seeds dispersed? We know that the dried up fruits are rock hard and they do detach themselves from the plant. Do they get blown about and the seed dislodged in this way? The seeds do not just fall out, at least in cultivation. Or are the fruits removed by some sort of wildlife and passed through the system? I have no idea what sort of wildlife occurs in their habitat - what sort of rodents or birds are there? And what about insects for pollination? When do they flower in habitat? If we knew this we would have a rough idea when the seed was dispersed and what season it was. I suppose the creeping plants which put down new roots from their underside must do this in habitat as well; do they lose their early growth and die back from the original base as the plant progresses?

.....from P.Denis, The Argentine Republic, 1922

The climate determines the character of the soil in Patagonia. The rounded pebbles of granite and eruptive rock, sometimes free and sometimes embedded in red sand or limestone, are spread over the tableland and they are particularly abundant in the coast region. It is the wind that explains the concentration of the

gravel at the surface. It separates the pebbles from the more mobile material about them. Where-ever the outcrop strata contains pebbles, the wind eventually converts the place into a field of shingle.

.....from D.C.Money, South America

The stepped Patagonian plateau is formed of horizontal sedimentaries which cover a basement of crystalline rocks. In places the crystallines project to give resistant hilly areas. In other places relatively recent lava flows cover the surface. Over parts of the tablelands, layers of water-borne and glacial material have been deposited, and fine particles from the dry surface frequently fill the air with dust in this blustery part of the continent.

.....from Preston E.James, Latin America, 1959

Patagonia is a land of strong individuality. The roar of the wind seldom ceases, and in the winter men and beasts seek the shelter of canyons and cliffs. It is not a steady, strong breeze like the trade winds of the low latitudes, but a boisterous stormy wind that carries rolls of clouds with it and that frequently changes in direction as different air masses sweep by. The haze of dust makes objects in the typical Patagonian landscape indistinct even at short distances.

.....from J.Dorst, Patagonia 1967

The traveller crossing the pampas from the north sees a great change taking place in the landscape after the Rio Negro and the Rio Limay. On the approaches to the Rio Colorado the alluvium of the pampas is replaced by sheets of rounded pebbles and crumbling sandstones. These formations become preponderant at the Rio Negro. The steppe-like character of the Argentine pampas is confirmed by the presence of a bird peculiar to open habitats; the nandu (*Rhea americana*) found in Argentina as far as the Rio Negro, beyond which it is replaced by a smaller, darker brown species, the Darwin nandu. The pampas is also inhabited by the pampas deer; it has not penetrated Patagonia or beyond the Rio Negro, which here again acts as a biogeographical limit.

Ever since the colonisation of the plateau after 1880, Patagonia has been - except for a few old spanish settlements - a zone of sheep raising, thanks to colonists from the British Isles. Sheep runs on great estates now cover most of the land. Because of this, the number of wild animals, already few by comparison with more clement regions, has dwindled. The animals that remain are similar to those of the pampas. The most typical animal of the patagonian steppe, the guanaco (*Lama guanicoe*), a small member of the camel family, is found from the high plateau of southern Bolivia and the Argentine pampas to southern Patagonia. The guanaco's relative, the vicuna, standing nearly four feet high at the shoulder, is characteristic of the steppes.

Many birds show interesting adaptations; noteworthy is the group of south american sheldgeese, which are all, except for a species of the high Andes, native to Patagonia and the pampas. The sheldgeese hide their eggs in the tall grass, or among the rocks and bushes. They feed mainly upon the weeds and grasses, eating an enormous amount; for this reason they are hunted by the stockbreeders. The birds are still incredibly numerous, despite a systematic effort to eliminate them. In clearing land for pasture and in destroying the foxes that fed on both the eggs and the young, man has in a way been responsible for this almost uncontrollable proliferation of the birds.

.....from Mrs. M.Jones

A plant of *Austrocactus* was given to me by R.Coulstring in 1979. At that time I was not very struck by this somewhat unprepossessing specimen and eyed it with some misgivings. But as the donor seemed to think it was something precious I accepted it with dutiful thanks. It was grafted with trailing stems. It grew in fits and starts, thin bits with the new growth fatter, and became a pain to accommodate. In the end I dumped it on a high shelf where it received water only when I remembered to stretch up with a small can, which was not very often. Last summer the shelf collapsed. I rescued the plant from the debris and hovered between the bin and the cold greenhouse. My heart smote me and in to the cold greenhouse it went. Last winter was a cold one. All the geraniums, fuchsias, tubs of *crassula portulaca*, troughs of shrubby mesems, and stocks for Spring, all perished as the thermometer fell to 24°F on a few occasions. In March I went forth to clear out the corpses and empty the cold house. But - surprise - the *Austrocactus* had come through smiling, a tribute to the grafting stock I suppose. This may have been *T.spachianus*, but I am not sure. Then in April-May I noticed buds, so the plant then had my attention with a repot, a trim, and reasonably regular watering. Poor thing, perhaps it thrives on neglect! The flowers were yellow, the outer petals had a coppery-bronze tinge to the tips. The stigma was also yellow. It does not seem to conform to any description in Backeberg.

.....from H.Middleditch

Now at last we know how to grow *Austrocactus* properly! This plant may well be that mentioned in *The Chileans* No.39 pp.38-39, as *Austrocactus gracilis*.

.....from H.Sonnermo

My *Austrocactus* are not very easy to grow, as they grow very slowly and do not flower every year. When I take cuttings from my *Austrocactus* my preference is for stems which carry aerial roots, which I bury in the compost. If they do not have any aerial roots, then I always lay them on the ground and soon they start to put out their new roots. Some cuttings are extremely slow to put out new roots, some of them even expire before they root down. I do have a lot of these plants and although they do not look the same I think that there are not so many species.

.....from D.W.Whiteley

What I have noticed about my shrubby *Austrocactus* is that they want to grow like rather like strawberry plant suckers, in that they like to grow horizontally and layer themselves into the compost, This is often difficult if they are being grown in ordinary pots, or even in small pans, but persuading them to grow upright does seem to inhibit their vigour and flowering I find.

The *Austrocactus* which I have grown put out a very weedy initial growth on their original roots until the

stem bends over through its own weight and touches the compost, where it roots down again. It then gets an additional lease of life, often offsetting or branching at this point and the main stem increases greatly in diameter due to the extra feeding roots, usually also starting to flower.

Perhaps there is a case for growing these types of *Austrocactus* in wide pans, or boxes, or even seed trays, to allow for the rooting of the horizontal stem? I have even seen the "creeping devil" grown in plastic rainwater guttering to allow for this form of horizontal propagation.

How does one get cuttings of *Austrocactus* - unless layered whilst still on the plant - to root down? I have had a few cuttings of different sorts of *Austrocactus* from time to time, but I found great difficulty in rooting them. Some years ago several cuttings of *Austrocactus* came to me from A. Johnston, along with a single head of *Tephrocactus subterraneus*. The *Tephrocactus* rooted down straight away, but the *Austrocactus* sulked and put out only rudimentary roots from the cut surface, simply sitting there for a couple of years before finally shrivelling up! Plants which already possess aerial roots however seem to strike immediately if the aerial roots are placed into the compost!

Perhaps I should have placed the *Austrocactus* cuttings horizontally on the compost to encourage them to root down? Or could it be that *Austrocactus* do not really like the warmth of the greenhouse in summer and it was this that inhibited rooting down, whilst established plants are able to stand the stress?

.....from A. Johnston

My own cuttings of *Austrocactus* are always rooted down in a tray. The tray will be part-filled with compost, without any surface covering of added grit. A cutting will often be a branch taken from a main stem, which may be almost straight but is often curved. The curved ones especially will have the lower portion laid on the compost and the upper portion leaning against the inside of the tray, to provide suitable support. A small amount of compost will be placed over the cut surface. A tray of cuttings will be given a good spray to ensure that the compost is adequately wetted, and subsequently given a regular spray to ensure that the compost is never allowed to dry out completely. This method seems to give me good results.

.....from L.v.d.Hoeven

I am enclosing some seeds which I was able to collect about a month ago when I was in Patagonia. These were found on an *Austrocactus* growing near El Maiten which is in the northwest corner of province Chubut.

.....from A. Johnston

Some of the *Austrocactus* seed from L.v.d.Hoeven was sown early in 1998. The germination was very erratic, so much so that I thought I had only had a single seed germinated, but the others came up in dribs and drabs over a few weeks. At this moment there are six seedlings.

.....from H. Middleditch

Perhaps some of these seedlings did prosper and grow into mature plants?

.....from A. Johnston

After five years these *Austrocactus* are still only barely three inches long. They certainly seem to grow much more slowly than many of my other *Austrocactus*. They have started to lean over but are not yet growing horizontally. So far, there have been no flowers.

WE MEET WITH TRICHOCEREUS TARIJENSIS From K. Gilmer

Our journey through the northwest of Argentina finally brought us to the border with Bolivia at La Quiaca. We had taken the well travelled route going north along the Quebrada Humahuaca and then followed the road from Abra Pampa across the altiplano to La Quiaca. When we were travelling up the Quebrada Humahuaca, there was a mountain range bordering the full length of the valley to our left. We crossed this range by a pass just before we reached Abra Pampa. As we travelled over the altiplano up to La Quiaca, there were various ridges and mountains to be seen away to the west. We decided to take a different route on our way back south from La Quiaca and so we followed the roads which ran on the west side of both those mountain ranges.

From La Quiaca we travelled westwards via Tafna to Cieneguillas, along the route which runs more or less parallel with the border of Bolivia. From Cieneguillas we then drove due south over the altiplano, passing the Salar of Pozuelos well away on our right hand side. To our left rose the mountain range of Sierra Cochino and its northward extension. From Carahuasi we took the road to Abra Pampa; then, a few km to the south of Abra Pampa, we left the road which goes to Iturbe and down the Quebrada Humahuaca, directing our vehicle due south over the altiplano towards Tres Morros. Along this part of our route we passed the very extensive area of the Salar Guayalaloc on our right whilst having the Sierra Aguilar to our left. [See Chileans' Humahuaca map - H.M.]

Along the whole of this southward travel we drove over an almost flat plateau which seemed to stretch for many kms. with very little change in the scenery. The ground was a sandy, gritty surface which carried only very sparse signs of very low growing vegetation. The surroundings were very similar to those on the photograph taken by G. Charles from the top of a hill overlooking the south shore of the Salinas Grandes. From the foot of the hills, scattered low bushes extended out into the flat plateau, towards our road, for up to half a km from the bottom of the hill slope. On two separate occasions we made a stop along this route, firstly to walk over to the Sierra Cochino, and subsequently over to the slopes of the Sierra Aguilar, crossing very similar ground at both places. And when we reached the hill slopes, we too found some columnar *Trichocereus*. But those we saw were in flower, with bright pink flowers. They were all solitary, unbranched columns. On the slopes overlooking Laguna Guayalaloc they were present in very great numbers.

These plants were all to be found growing on the fairly steeply sloping hillsides. Walking up the slope

Trichocereus
tarijensis

Photos: K. Gilmer

South of
Iturbe,
Quebrada
Humahuaca



West flank,
Sierra Aguilar



behind a plant enabled a photograph to be taken of the flowers; very fortunately one plant was growing immediately next to a very steep piece of ground, so that by scrambling up there we were able to look directly at the flowers which were not so far away from the camera. My recollection is that we saw plants of this sort in flower at only 1.8 to 2 metres in height, although of course most of the plants in flower were taller than this.

.....from H.Middleditch

On these *Trichocereus* seen by K.Gilmer, the flowers are all grouped round the growing point, those nearest the apex being almost upright, those nearer the shoulder leaning outwards to some degree, perhaps due to some extent to the press of the number of flowers close to the growing point. From the vantage point above the top of the plant it is possible to see almost directly into the flower facing the camera, where it is quite evident that the stigma and style are leaning against the lower side of the flower. A few thoughts on this feature were expressed by F.Vandenbroeck in *Chileans No.57*, when discussing *Soehrensia*. It was suggested that the style and stigma might be disposed centrally in the flower when the flower first opened, subsequently leaning to one side.

.....from K.Gilmer

When we were travelling north from Humahuaca it would be about 10 km before reaching Tres Cruces when we came across *Trichocereus tarijensis* in flower. Where we could see into the open flower, they were all rotate with the stigma disposed centrally in the flower.

.....from M.Lowry

We came across *Trichocereus tarijensis* in flower at a number of places in the course of our travels in Bolivia and Argentina. They almost always have a number of flowers standing close together at the very crown of the stem and because they are usually above head height it is very difficult to be sure that every single flower in the bunch is open. But we did get a clear impression that most of the flowers all opened at the same time on any one plant, or at least within a day or two of each other. Within a group of these *Trichocereus* there would be a number of plants in flower, but certainly a larger number which were not in flower at that time. It was in mid November when we found these plants out in flower not far to the north of Humahuaca, and when travelling north out of Tupiza we saw plants in flower in mid December one year and in early January another year. This gives the impression that whilst individual plants have a flowering period which will hardly amount to one week, the population as a whole may well flower over a period of time which extends for possibly a month or more.

.....from H.Middleditch

One of the photographs taken by K.Gilmer opposite Laguna Guayalaloc takes in a wide sweep of the mountainside on which there are growing many *T.tarijensis*. All these plants appear to be solitary, not even branching from part way up the stem. In addition, one or two of these *T.tarijensis* photographed in close-up by K.Gilmer consist of a single tall stem with what appears to be a large globular offset at the base. Is it possible to say if these were indeed basal branches?

.....from K.Gilmer

All the plants we saw at this location were entirely unbranched. Where two stems are growing close together side by side, like the example in my picture, these would certainly be two plants growing side by side and not a branching plant. In this population there were few instances that we could see of plants growing so closely side by side, and these would be the exceptions.

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

On an excursion from Humahuaca we came towards El Aguilar, a mining town with 7,000 inhabitants. Lead and zinc are mined here. Here is to be found the second highest football field in the world at 4500m altitude. Here, too, we found *Trichocereus poco* as well as *Lobivia longispina* with flowers of white, yellow, and red.

.....from E.Geyger, Untersuchungen zum Wasserhaushalt der Vegetation im nordwestargentinischen Andenhochland. 1985

[Observations made mainly around the headwaters of the Rio Yacoraite, between the Rio Cajas and the Sierra Aguilar] On a steep north-facing slope above the valley of the Rio Despensas was found an open woodland of *Polylepis tomentella*, growing in the company of evergreen bushes and the columnar cactus *Trichocereus poco*, at about 4200m altitude.

.....from G.Charles

On an earlier visit to Argentina we did come across *T.tarijensis* on the climb above Purmamarca, at about 13,000 ft altitude [3750m], and on a subsequent visit we again found *T.tarijensis* on the hills near the abandoned railway line to the south of Iturbe, at about 3480m altitude.

.....from R.Hillmann

We left San Antonio de los Cobres travelling westwards along the road which leads to the border with Chile and then continues towards the shores of the Salar de Atacama. Before reaching the border, however, we took the Ruta 70 which goes to the north. This road lies at a very high altitude, mostly at or above 4000m, most of the time over a more or less level plateau. The ground is made up of more or less 100% gravel with no sign of humus, no sign of humidity, and virtually nothing in the way of vegetation. The first 30 km or so were in good condition, but later the road was very sandy and had been destroyed by the heavy vehicles carrying salt. Then we crossed the road going to Susques, coming from San Pedro de Atacama and Paso Jama, now a surfaced main road between Chile and Argentina. After a few more km we had three different roads to chose from and took the right hand one. After this, we had no idea where we were travelling. After some hours of driving and crossing many passes we reached Coranzuli. There were hummock forming *Tephrocactus* to be seen both to south and to the north of Coranzuli. To the north of this town we saw our first *Trichocereus* at 4050m. Then, about 20 or 30 km north-east of Coranzuli, we were in a mountainous area and it was here that

we saw *T. tarijensis* with red flowers. Further on, the road descends gradually down to the flat part of the altiplano and continues to Azul Pampa.

.....from H.Middleditch

This further report of *Trichocereus pocco* growing on the mountains rising out of the altiplano, is from a location even further to the west of Abra Pampa. Would those *Trichocereus pocco* have been growing on a steep hillside, or rocky promontery, rather than on fairly level or gently sloping ground?

.....from R.Hillmann

These plants were growing on a fairly steep, and rocky, mountainside. In fact, these *Trichocereus* were growing on steep and rocky mountainsides where-ever we saw them. But in addition they seemed to prefer a north-facing slope. On the way from Cieneguillas to Carreras, in south Bolivia, we could see the *Trichocereus tarijensis* grew on the sloping side of the valley only on the southern side of the road.

.....from M.Lowry

We took the road going north out of Tupiza, a road which has to negotiate some fairly mountainous terrain, so that after about ten miles going northwards, it is then obliged to go about ten miles in a generally eastwards direction, before turning north again. Consequently the mountain slopes at either side of the road face various points of the compass at different places on the road. At about 10km out of Tupiza, the *Trichocereus tarijensis* were to be seen growing on a west facing slope above the road; at about 21km out of Tarija we saw more of these plants on the east side of the road, but here on a NW facing slope. At some 33km out of Tupiza, these *Trichocereus* appeared on a south facing hillside over a length of about 2km. Then, on another E-to-W length of road near Rio Blanco, these *Trichocereus* grew on a north-facing slope on the south side of the road.

.....from H.Middleditch

It would appear that factors other than orientation of a slope may be of more significance when it comes to providing a suitable habitat for *Trichocereus tarijensis*. Perhaps the nature of the ground?

.....from G.Charles.

On our later visit to Argentina we made an overnight stop at La Quiaca, on the border with Bolivia, before setting off to pay a visit to Nazareno. From Yavi we drove first to the south until we came to the road leading eastwards to Nazareno, travelling over arid, bare, and uninhabited terrain, towards the mountain range of the Sierra Santa Victoria. When crossing this range we made a stop at both sides of the pass, where we did find various cacti, but there were no tall *Trichocereus* to be seen growing there. Returning from Nazareno we recrossed the Sierra Santa Victoria by the same pass and came to the junction where we had turned off for Nazareno. From here we now headed south again via Cangrejillos, to the east of the range of hills which run all the way up to the border, at which point they are crossed by the road between La Quiaca and Yavi. Amongst a maze of tracks, few of which were on our map, we sought without success for a way going through the hills to our right. We passed numerous individual mountain peaks, making one stop to climb a rocky slope where we saw great numbers of *Trichocereus tarijensis*, at an altitude of 3840m. Yet none of these plants were to be seen when we made one further stop again on a mountain slope, before we reached Abra Pampa.

.....from G.Hole

When we were travelling over Abra de Pives, near Purmamarca, we had the misfortune to suffer some tyre trouble, which delayed us for the better part of an hour or more. Whilst this was being attended to, I took the opportunity to walk round the vicinity where there were some *Lobivia ferox*, *Parodia tilcarensis*, *Trichocereus pocco* (or *tarijensis*) and *Trichocereus atacamensis* growing. Even if there had been only dead flower remains on the *Trichocereus*, there would have been no difficulty in telling which were which. On the *Trichocereus pocco* the flowers were all clustered round the very top of the plant. more or less pointing upwards, whereas on the *Trichocereus atacamensis* (or *pasacana*) the flowers stood out sideways, not just near the top but also for quite some length down the side of the stem. The *T. tarijensis* evidently start to flower when they are about five feet in height.

A JOURNEY TO BOLIVIA IN 1908 By R.Hauthal

Translated by H.Middleditch from Wissen. Veroffent. der Gesell. fur Erdkunde zu Leipzig. 1911

Travelling along the Quebrada del Toro on the road from Tastil we passed through Ojo de Agua. Our next overnight stop was near a place called Tres Cruces. Next day, after a march of about 7 hours, we came out on the high plain of Salinas Grandes, near a small place called Moreno. We had now reached a huge flat basin very typical of this part of the high plateau. On the following day we made a short 3 hour march to reach the borax establishment at Tres Morros.

This whole area of the Salinas Grandes presents a picture of solitude. A large part of this basin is covered with a layer of rock salt. The natives break this up into lumps of such a size that two blocks make a load for a mule. It takes a week to carry these to Salta. Other than the natives coming over the plain with a salt caravan, human life is absent, likewise animals are only sparsely represented. Ostriches and vicunas are characteristic representatives of the animal kingdom here, both zealously hunted for their flesh, feathers, and hides. After a fatiguing twelve hour ride over the sunbaked plain, north of Tres Morros, we came to our next stopping place, a side valley with a meagre water supply, Agua del Castillo. This water was fully utilised for some small fields of lucerne. The men were all away on a communal vicuna hunt, which is an essential activity here.

As monotonous as the fauna is the flora. In this huge salt pan the very interesting cactus plants are absent. Only the typical and widespread halophytic plants make up the monotonous, sparse, plant cover and by their slight variety of colour excellently match the monotonous character of the landscape. Everything here carries

the stamp of monotony, of silence, of absence of variety. Even the nature of the ground surface does not disturb this singular picture. Rainfall is extraordinarily sparse so that water, a principal factor in the formation of a landscape, is almost completely absent. The landscape displays only the featureless character of arid weathering, which in the main is brought about by the alternation of heat and cold. The temperature changes are often very considerable, fluctuating from day temperatures of 25°C to night time temperatures of -12° to -18°C. This severe temperature difference brings about a rapid shattering of the rock, and the mountain slopes are covered with expanses of scree. On this account the outlines of the mountains are very monotonous and their form has a more or less very smooth, stereotyped outline. These circumstances of typical monotony without the slightest variation to the eye, accompany the traveller not only for hours but for days and so become wearisome.

Going north from Agua del Castillo, the selfsame plain still stretched out to the left and to the right. A 6 hour march on the following day brought us to Abra Pampa, across a plain like that of the Salinas Grandes, but without any salt deposits.

The vegetation is sparse. Trees are completely absent; the cacti, which are very frequent in the upper parts of the valleys which rise from the lower ground, are here only in occasional examples. Low growing spiny bushes, which are almost leafless as a defence against the continuous year-long aridity, and some bunches of a tough yellowish grass offer some relief to the eye. Only at spots where the streamsides are fringed with flat strips of land, where the ground is impregnated by the water table which is also close to the surface, does there occur a short-stalked moist green carpet of turf, which is sprinkled with many short-stemmed flowers.

From whence the inhabitants obtain their livelihood remains a mystery to me. At these high altitudes I have seen only very isolated small fields cultivated for crops, but numerous herds of sheep. These do indeed provide the principal part of the subsistence for the natives.

Travelling north from Abra Pampa for some 30 km., the ground rises very gradually; it continues throughout as gravel of mostly walnut size, up to fist sized at the largest, whose origin is to be sought in the surrounding mountain chains. Spread over and dominating the mountain slopes are the loose masses of scree, which originate from the the base rock which only occasionally makes an appearance - the result of the effects of heat and cold. The layers of scree extend over wide expanses, displaying a homogeneity of content in regard to the sizes of the stones.

.....from H.Middleditch

In this part of the altiplano the level and almost vegetationless ground would not seem to offer a home to *Trichocereus tarijensis*, just as described by K.Gilmer, above. On the other hand, they do grow on the rocky slopes of the mountainsides. The broken stone on the mountain slopes which results from thermal fracture of the rock, will all be angular in shape as it has not been subjected to being rounded off when carried downstream in flowing water. Under the overhang of such pieces of rock lying on the ground, out of direct sunlight, there will be a microclimate which would support germination and growth of new seedlings. The overall effect being shown in the picture on the front cover, no doubt deliberately taken to show that not all the scree is of uniform size.

MEMOIRS OF A NATURALIST By M.Cardenas **Translated by H.Middleditch**

At the beginning of 1931 I gave up all my teaching activities and went to Chile in search of sea air and of new cultural relations. After three months' stay in Santiago I made an enlightening return journey to Bolivia by train from La Calera, near Valparaiso, as far as Antofagasta, passing through towns interesting from the point of view of the native flora, such as La Serena and Copiapo. After stopping for a day in Antofagasta, I re-entered Bolivia with a destination of Quechisla in the province of North Chichas, where I worked with my brother in the capacity of doctor to the Compania Aramayo de Minas. Quechisla was the centre of the administration of this large mining firm. It had a mild climate being situated at 3400m above sea level. From Quechisla I set out to survey the other sections of the company, such as Telamayu, Tasna, Animas, Chorolque, etc. I became most optimistic about collecting plants because the Flora of the south of Bolivia was unknown to me. I also made a very profitable trip to Cotagaita, capital of the province. I did not carry with me any special material for botanizing and I dried my specimens making use of the current newspapers. The plants were in the majority resinous and so would not rot. A first collection of some 50 specimens, were sent for identification to Dr.Hicken at Buenos Aires. A duplicate set of the same specimens were despatched to Dr.I.Johnston at Harvard. At the end of a month, more or less, I received the appropriate determinations.

I remember that among other plants, I harvested a giant columnar cactus with numerous ribs and dense acicular spines. At the top of the stem many magenta red flowers appeared forming a handsome crown. By the flowers and a section of the stem, Dr.Hicken classified this columnar cactus as *Cereus pasacana*. In truth, in the year 1931, this corpulent *Trichocereus* was yet a new species which was described as *Trichocereus poco* by C.Backeberg in *Kaktus A.B.C.* in the year 1935.

.....from K.Preston-Mafham, At The Chileans 1989 Weekend.

It took about 3 hours for the bus to travel from La Paz to Oruro where I looked around on the hill slopes behind the University. There I found a form of *Trichocereus tarijensis* - this one being called *T.antezenae*. The spination on each population is completely different but each population almost certainly grades into the next, which prohibits the use of different names. This plant has very yellow spination, quite hard; other plants have a

quite soft spination, white and interlacing. The slopes here at around 4000m altitude are dry in comparison with further south; here it is very windy and very cold - especially in the rain. *Trichocereus conacondaensis* comes from not much further away. I find it hard to believe that these are the same species as the plants to be found further to the south. There are probably none on the high mountains in between. They do not have the long form of *Trichocereus* flower, it is quite short, the so-called *Helianthocereus*. I would follow Rausch in his treatment of the *tarijensis-poco* group, with the major exception that I do NOT regard them as varieties of *Lobivia formosa*.

.....from M.Lowry

We have seen *Trichocereus tarijensis* at a great many places in northern Argentina and in Bolivia. The spination on these plants can be anything between thin and flexible to shorter, thicker, and fewer, which is not very evident when plants are viewed from a distance, but much more obvious when close to the plants. There can be as many as 20 to 30 spines to an areole on mature plants. To some extent they may have more hairy spines near the crown, but certainly not as pronounced as on *T.pasacana*. These fine spines at the top of the stem were seen at several places to the north of Tupiza and on to the Pampa Mochara.

.....from J.R.Kirtley

When I was in Bolivia in 1989 with B.Bates, we had travelled down the altiplano from La Paz and were some way to the north of Challapata, preparing to take the road to Potosi, when I saw through the binoculars at the base of a rocky outcrop, a red flowering *Trichocereus* - *T.tarijensis*. This was the first sighting of this sort on our way south, so we decided to stop and look round. This rocky hillside had very little soil, only in patches on the rock. An *Opuntia* sp. with white spines were everywhere - there were so many you could not walk without stepping on them. Growing in pockets of soil and humus in the rock crevices were *Lobivias*. Also here were yellowish-white flowering *Trichocereus* - *T.bertramianus*, well spaced out up the rising hillside.

.....from H.Middleditch

Were these red-flowering *Trichocereus* solitary, unbranched, columns, or did they branch from about ground level.

.....from J.R.Kirtley

The plants we saw did appear to be branching from about ground level.

.....from H.Middleditch

In that event they could possibly be described as *Trichocereus orurensis* Cardenas.

.....from M.Cardenas, Fuaux Herbarium bulletin, 1953

Trichocereus orurensis sp.nov. [full description provided]. This species grows like *T.poco*, on the sloping flanks of the Andean mountains, and bears flowers of a similar colour, but is easily distinguished from it by being basitonically branched, with fewer ribs on the branches, and smaller areoles that are further apart. The spines are fewer, acicular to subulate, but not bristle-like. While the flowers on *T.poco* are bright pinkish-red, on *T.orurensis* they are purple-lilac to light magenta. *Trichocereus orurensis* seems to be confined to an area extending from NW of Oruro to Lomitas, on the Oruro to La Paz railway and, so far as we know, is the northernmost extension of the red-flowering *Trichocereus*.

.....from G.Charles

But I almost sure that among the *Trichocereus tarijensis* which we saw on our day's outing from Humahuaca towards Aparzo, there were the odd plant or two which was putting out a branch right from ground level.

.....from H.Middleditch

But does that basal branching occur by exception so that *Trichocereus tarijensis* can be described as solitary or branching from above the base, only rarely branching at ground level? In *Lobivia* '85, Rausch describes *T.tarijensis* as solitary, but then Rausch has not been everywhere and nor has he seen everything. Which leaves us with the question, how far north do the normally solitary columns of *Trichocereus tarijensis* extend?

.....from K.Preston-Mafham. At The Chileans 1989 Weekend

After stopping overnight in Potosi we set off in the direction of Camargo. It was raining most of the time and we did not stop until we came down steeply into Cuchu Ingenio. This is almost the most northerly locality for *Oreocereus trollii*. Also growing here were *Lobivia*, *Rebutia*, *Parodia*, and *Helianthocereus*. Visiting the flowers of *Trichocereus tarijensis* were humming birds and a blackbird sized bird. They may be coming for the beetles that are eating the pollen or they may be going for the nectar. Bird visits are so frequent that it may be either nectar or pollen. The *Trichocereus tarijensis* with the pink flowers comes as far north as here, then further to the north the similar looking plants have yellow flowers. On *T.tarijensis* the spination does vary quite a bit even within this one population; some of them had stiff needle like spines and others had soft white interlacing spines, completely different.

.....from R.K.Hughes

On our way south through Bolivia we made a stop about 10 km to the north of Cuchu Ingenio, particularly to look at the *Oreocereus trollii* there. There was a *Trichocereus* growing right by the roadside with red flowers at the crown. By scrambling up the bank next to the road I was able to look slightly down at the flowers; this would make the main stem about nine or ten feet tall. It had two branches rising from the base, about four feet tall. Spination was fairly dense but I would put all the stems at about one foot in diameter. The main stem must have had a hard life, as it was bald except for the top 3 or 4 feet which was covered in silvery coloured spines. The two branches had the same coloured spines. On the main stem there was one fully open flower at the apex, standing nearly vertical, plus two half-open flowers and at least five buds or dead flowers. Both branches carried buds or dead flowers at the crown.

At BDH 21, north of Escayache, there was a much shorter and stouter columnar *Trichocereus* with a club

shaped stem. It was perhaps 4 ft. tall and 1ft 3 inches diameter at the base, and 1 ft. 6 inches diameter at the top. There were three growth restrictions to be clearly seen on the stem. Because it did not have a dense spine covering, the stem beneath the spines and the ribs were clearly visible. At the apex there was a mass of dead flowers, composed mainly of brown hair with only a hint of red petals. At the base of this plant there were four football like stems about a foot in diameter, three of which displayed the brown fur of undeveloped buds. Not far away was a single-stemmed plant of similar size where the ribs could be seen but the denser spination made it difficult to tell the diameter of the stem. Again there were a number of dead flowers in the crown, but two more flowers had probably wilted recently and clearly showed the purple-red colour. These two *Trichocereus* from BDH 6 and BDH 21 were both recorded as *Trichocereus* sp. since they were so different that it did not seem possible to name them both as *T.tarijensis*.

.....from H.Middleditch

When we were joined at our Chileans' Weekend by R.Kiesling when he was on detachment to Kew (in the 1970's) we were shown a slide of a *Trichocereus poco* seen in Jujuy. This plant had four stems, all rising from the base to slightly different heights to about waist or chest height, All four stems bore flowers. Taken together with the above comments from R.K.Hughes about seeing football size basal offsets bearing flowers, this would bring into question the traditional distinction between *T.poco/tarijensis* from south of Cuchu Ingenio and *T.orurensis* from north of Cuchu Ingenio, based upon the latter branching from the base, the former from above the base.

.....from R.Kiesling

There are various populations of *Trichocereus tarijensis* in Argentina, which tend to be isolated from one another. Some of these populations have tall plants, attaining between 2 and 4 m in height, mostly simple, but eventually branching. I know of two populations near Mina Aguilar, one of which is small comprising perhaps 20 specimens, which are not taller than 2m. The other, going some 5 km in the direction of Humahuaca, consists of dozens of specimens, the tallest plants near 4 m high. At a spot about 10 km to the west of Humahuaca there are some isolated plants growing to 3 m tall. Going east from Humahuaca, at Palca de Aparzo there are a large number of specimens, both tall and short.

The picture which I showed to you many years ago at your Chileans' Weekend was taken near Juella, a canyon a few km to the north of Tilcara but about three hours' climb to the west. All the specimens in that population are about 1.5 m tall and flower at that height. To the east of Tilcara, at about 3000 m altitude, there is again a population of plants which do not grow as tall as those seen elsewhere.

My recollection of specimens seen near Cuchu Ingenio is of their having pink flowers, as well as cream ones which were named *T.bertramianus* (and other names) by Cardenas. All these specimens were about 1.5 m tall. Apart from the flower colour they do not display any difference from the *T.tarijensis* to be seen in Argentina. There is also a population which I have seen near Iscayache, the Type locality, which have dark red flowers.

.....from M.Lowry

On our 1996/97 trip to Bolivia we came across *Trichocereus tarijensis* bearing red flowers at the apex of the stem, when we were travelling from Culpina back to San Pedro. Later on the same trip we came across more of these plants in flower to the north of Tupiza, along the road which leads to Cotagaita. I can remember one of these plants in particular which had put out branches from about head height and there were five or six branches each with a cluster of red flowers at the apex. On our 1997/98 trip to Bolivia we saw more of these plants to the east of Mal Paso, before the descent to Impora, and subsequently also near Curqui, en route from Iscayache to Cieneguillas. At Cieneguillas I am convinced that we saw a *T.tarijensis* with an offset near the base.

Travelling south from La Paz we also saw *Trichocereus* with red flowers not far to the south of Oruro, near Corviri, and also near Challapata. But these plants were branching from the base so we recorded them as *Trichocereus orurensis*. Similar looking *Trichocereus*, again branching from the base, were seen near Yocalla along the road out of Potosi leading in the direction of Challapata, as well as near La Joya, on the altiplano. At both latter locations they were recorded as *T.orurensis* but as they were not in flower it may perhaps be preferable to use the older name of *T.bertramianus* for them.

It does seem to be possible to draw a distinction between the more northerly growing forms of *T.bertramianus* and the more southerly growing forms of *T.tarijensis*. The two forms come together in the area between Potosi and Cuchu Ingenio. In this area however, the differences between the two groups is not quite so distinct and in consequence the forms seen near Cuchu Ingenio, near Huari-Huari, and near Otavi, were recorded as *Trichocereus* species. There would not appear to be a great deal of difference between the two groups in regard to stoutness of the stem as the diameter of the stems was comparable both in the northern and southern groups. At Cieneguillas, for example, we saw plants of the southern group which displayed stems of only some one foot in thickness. The plants of the southern group do tend to be taller than those in the north; the plants in the northern group almost invariably branch from the base whilst those in the southern group tend to be either solitary or branch from above the base. But generally there is a distinction in the spination. The southern forms are very rarely yellow spines, mostly the spines are a rich brownish-orange colour. The northern forms have a very pale coloured spination, commonly whitish or yellowish. However even here there are occasional exceptions. At BLMT 111 to the south of Oruro there were two or three dozen plants of *T.bertramianus* which were primarily pale spined, but there was one single plant which was brown spined.

.....from H.Middleditch

My own young plant of DJF 283 *T.tarijensis* certainly displays spines of a rich ginger brown colour, whilst RCB 308 *T.antazena* has pale cream spines and RCB 125 *T.orurensis* has pale golden brown spines.

CEREUS TARIJENSIS By F.Vaupel

Translated by H.Middleditch from *Monatsschrift für Kakteenkunde* 1916

Short columnar plant, 1.5m high, 25 cm in diameter, number and form of the ribs not known for certain. Areoles large, broad-elliptical to oval, up to 15mm long, over 5mm broad, furnished with thick yellowish-brown wool later going grey, barely 1 cm apart from each other. Spines 10-13, awl-like, stiff, pointed, yellow-to red- brown, spread over the entire areole; one particularly distinctive central spine is up to 7 cm long, the radial spines are shorter and thinner, but unequal among themselves. In the upper, flowering part of the plant, the areoles are almost mutually touching one another, the wool is longer, over 5mm long, the spines are more numerous, but thinner, to a degree almost bristle-like and bent.

Flowers only 10cm long, funneliform, pericarpell and tube with scales from whose axils arise dense bunches of brown wool; filaments numerous, inserted in two series stigma lobes numerous about 1cm long, barely projecting above the uppermost anthers. Flower colour pale wine red.

Habitat - southern Bolivia, where it grows near Iscayache around 3500m altitude on stony hills.

.....from H.Middleditch,

This description would appear to be comparable with the plants from BDH 21 as described above by R.K.Hughes.

This original description by Vaupel provides a Type locality of Escayache, a place name over which there would be little, if any, doubt or confusion, rather than using the name of the closest indian hamlet, or a nearby hill or other physical feature. Consequently it may be advisable to regard Fiebrig's Type locality of Escayache as referring not to the immediate vicinity of Escayache itself, but rather to the near and far surroundings of that place, between the Serrania Sama to the east and the Serrania San Roque to the west. But, oddly enough, it is difficult to find any field record of *Trichocereus tarijensis* here.

.....from M.Lowry

There are basically three roads in and out of Escayache - one to the east - to Tarija, one to the south - to Patancas and Villazon, and one to the north going via Cieneguillas to the Rio San Juan del Oro valley. Where these roads run in the Escayache basin, or valley, there is not a single *Trichocereus tarijensis* to be seen. Nor are any to be seen on the climb over the Abra de Sama, out of the Escayache valley, on the way to Tarija. Nor along the road going south and over the low pass to Patancas. Going north, the road leaves the Escayache valley and starts to wind into the mountains before any *Trichocereus tarijensis* are to be seen, near Cieneguillas. The nearest location to Escayache where we have seen these plants is in the Curqui valley, which is separated from the Escayache valley by a 4000m high ridge. Even further away than Cieneguillas, these plants were also seen near Cana Cruz.

However, it may be advisable to bear in mind that much of the lower-lying ground in the closer surroundings of Escayache is now devoted to cultivation, leaving very little in the way of original vegetation in the area now occupied by farm fields. In addition, there are no trees growing in the near and far surroundings of Escayache, and any tall *Trichocereus* there could have been a valuable source of firewood or building material.

The height of 1.5m quoted by Vaupel for this *Trichocereus* is quite surprising. At all three places - Curqui valley, Cieneguillas, Cana Cruz - where we saw these *Trichocereus*, specimens in excess of 1.5m in height were by no means exceptional. Not only there, but at most places elsewhere in Bolivia and northern Argentina where we came across *Trichocereus tarijensis*, they regularly grew to between 2 and 3 metres in height.

Whilst these *Trichocereus* were frequently to be seen growing on rocky slopes, it was not uncommon to come across them on rather modest slopes. For example, in northern Argentina, perhaps some 20km or so to the north of Humahuaca, where the road has effectively left the Humahuaca valley and is coming into the more level terrain of the altiplano, there were some *Trichocereus tarijensis* growing by the roadside on a very gentle slope indeed.

.....from R.Kiesling, *Darwiniana* 21, 2-4, 1978.

Trichocereus tarijensis. The holotype was deposited in the Berlin Dahlem herbarium and destroyed during the second world war. A photograph of this specimen was published by Werdermann in 1940. A duplicate was deposited in the Delessert herbarium in Switzerland and I have been able to see a photograph of that one. Another isotype exists in the Instituto Darwinion; the original label with the specimen reads "K.Fiebrig - Plant from south Bolivia 1903-1904, 2770 *Cereus tarijensis* Vpl. sp.nov, Escayache, near Tarija 3500m. 1.11.04"

.....from C.Backeberg, *Cactus France*, 22.88.1967

Trichocereus tarijensis var. *totorillanus*. Differs from the species *tarijensis* on account of the taller stem which attains a height of 3-4 m; the species *tarijensis* is 1 m in height. Type location Cieneguillas, prov. Mendez, Dept. Tarija. It is likewise to be found at Culpina in Sud Cinti province.

.....from H.Middleditch

In the intervening years since the publication of the above description by Backeberg, many more travellers have recorded the tall columnar and largely solitary *Trichocereus* with pinky red flowers; and doubtless observed plants much taller than the 1.5m height quoted by Vaupel. In order to provide an identification for the various forms to be seen at different locations in habitat, Backeberg erected the names *Trichocereus poco* with three varieties as well as *T.tarijensis* v. *totorillanus*. From the field observations contributed above, it appears that it may well be difficult to draw a clear distinction between these various names.

.....from K.Fiebrig, The Plant Geography of Bolivia, Engler's Botanischer Jahrbuch Vol.45 1911

[Vegetation of the Puna] In similar fashion to the grasses, we also find another group of plants, the succulent cacti, an equally widespread type whose habit displays the adaptation brought about by the climatic factors accelerating transpiration, which operate to a particularly intensive degree on the Puna. Despite this, the cacti do not display any significant additional modification. At these inhospitable heights, it would appear that the cacti provide evidence for the excellence of their patent defence system. One (or more?) *Cereus* spp. of very respectable growth is to be found at really significant altitudes; indeed the columnar cacti are actually the tallest growing plants of all in the arid heights over 3000m - they are even found up to 3600m. They stand on the mountain ridges, the spurs, and the slopes, usually directly exposed to the storms on the open heights. I have never come across them in the high plains proper.

Alongside dwarf bushes from the Compositae, Legume, and Loganiaceae Families they often constitute the only taller vegetation, reaching a stately height of 5 metres or more, with a stem diameter of 40cm or more. Despite all the gales, this most outstanding height of growth is always straight upright, but the candelabra-like form is also prevalent. In the angles formed by the arms, large birds' nests are often to be found; their stems - the only real trunk in this highland landscape - are the favourite spot for all sorts of dwarf epiphytes, lichen, mosses, and especially a tiny species of *Tillandsia* which I found only on this columnar plant.

.....from M.Cardenas [Ibid]

The *Trichocereus* poco occurs on the sloping flanks of the Andes in southern Bolivia, between Atocha and Quechisla, and between Tres Palcas and Escoriani [Atocha to Tupiza] at an average altitude of 3500m.

.....from H.Middleditch

The differences in this group of *Trichocereus* in respect of spination, body form, and branching habit, noted above by several travellers in the field, taken together with the comments from C.Norton in *Chileans* No.57 in regard to tall specimens in cultivation, would suggest that a range of variation exists in these features. It would appear that the southern form, whose oldest name is *Trichocereus tarijensis*, is usually solitary or branching from above the base, only by exception branching from the base. The northern form, *Trichocereus orurensis*, typically branches from the base. Taking both sorts together, in the south of the range of distribution, flowers appear to be usually pink; pink or reddish at mid-distribution; and darker pink to lilac at the north of the distribution area.

GETTING CARRIED AWAY BY THE ANTS - AGAIN From H.Vertongen

My first visit to Argentina was made in February 1992. During this part of the year I would have hoped to see plenty of plants in fruit. But in fact, with but one or two exceptions, I had arrived a little late. Secondly, in order to reach the ripe fruit before the insects - especially the ants - one must be very sharp off the mark. At maturity all the fruits are plundered by the ants. Consequently I ask myself how men like F.Ritter can arrive at the ripe fruit just at the right time to collect the seed. I have made precisely the same observation about the ants when travelling previously in Mexico.

A ROUND TRIP TO THE QUEBRADA DEL TORO. By F.Ritter Translated by H.Middleditch from Forty Years Adventuring.

On 19 February 1959 I planned to travel in my pick-up truck from Salta to the fine cactus habitat at Puerta Tastil. But in Quijano I had to turn back, since the road had been completely washed away by the river. On that account I made an attempt to get to Puerta Tastil by a circuitous route via Jujuy, Purmamarca, Tres Morros and San Antonio de los Cobres. Above Purmamarca I slept in the wagon overnight. Even the road from there is in rather poor condition and I had some difficult spots to negotiate above deep precipices. The road then goes over a 4000m high pass into a huge dry salt pan, where borax is extracted at Tres Morros - but at present, in the rainy season, there is only a watchman there. Fortunately for me the ground was still passable. I had to lose no time on the subsequent part of my journey since flooding can set in any day. The area then becomes transformed into an impassable lake for months, and there is no other way back. By nightfall I was in San Antonio de los Cobres on the high Puna, where it is difficult to find lodgings. On account of the cold I had no wish to sleep in the truck.

On the following day I then went to Puerta Tastil. Along this stretch it had rained heavily, so that here and there the road disappeared under sand and stones. On that account I had to come to a stop several times in order to clear myself a path with a spade or make it flat enough to get past. Finally I reached my appointed destination where I searched for cacti until the evening of the next day. It was 28 years previously that I travelled this way when I was 33 years old. On my return trip on 28 February I had considerable trouble with the starter. Only with difficulty did I get back to San Antonio de los Cobres at the end of the day, where I was able to get the starter repaired.

Then on 25 February I started off back to Jujuy, hoping to get back there that day, but that was not possible on account of a storm breaking out in the meantime. The salt basin was already partially overflowing with water and I became stuck at one spot in a sticky clay-like mud. The situation was extremely critical for me. If I did not succeed in getting through, it would no longer be possible at all this season, because the whole basin would shortly be covered with water, as it was every year. I had to stop with the truck, since even with the most suitable vehicle for this terrain, no truck would come this way and I would have to trek back along the margin of the basin to San Antonio de los Cobres, to stay there in all probability for four months, until the

basin had dried out again. In the meantime the truck would have been completely stripped, being clearly visible from a great distance in the salt plain.

I worked myself some meters forward making use of a bed of shrubs, but I soon realised that it was impossible to make headway here. It was just as bad going back - but that cost me unending labour. Standing in cold mud for hours on end with bare feet, I cleared myself a way back to some extent and finally, after five hours of strenuous labour, came out of the mudhole backwards. With the greatest of difficulty I then went along the outside of this place following the margin of the basin. I came across Tres Morros and then shortly after that, the track went up in the bed of a stream. A considerable amount of water had come down here and the track was quite impassable, with deep gulleys cut across by the water as well as being covered here and there with soft sand in which one would sink in deeply. With a great deal of labour I brought the truck on to higher ground here and let it stand at a spot which was outside the bed of the stream. By good fortune the stream is in flow only after a downpour of rain and at this particular time there was no flowing water. This is where I stopped overnight. So that I was not stuck here indefinitely, I set out the next morning working with the spade along the very awkward section of the track, looking at all times for places where I could clear a way forward. Finally I told myself that it would be too much work and I had better turn round to try the huge detour via Abra Pampa. I had almost got back to the truck when it struck me that progress could be made by using the stream bed as a track, since it was always firm ground, whereas the road was unusable being constantly worn away by bends in the stream, as well as being covered by soft sand where it had been overflowed by the water. So I set to work once again, clearing the stream bed where large stones stood in the way and widening it where it was too narrow - this along a stretch of 2 km to where the road finally left the track of the stream. Then I tried driving up it and actually came through with some difficulty without once colliding with the banks at either side. The rest of the drive to the mountain pass at over 4000 m altitude involved some awkward spots, but usually I was able to overcome them. I had suspicions that on the east side, where there was more plentiful rainfall, the road would perhaps become impassable, especially since the road showed no trace of any vehicle having travelled this way since my own trip five days earlier. That would be fatal for me since my fuel was insufficient to go back to the salt basin and from there to Abra Pampa. But fortunately the descent was better than the previous section, because the locals had kept it in good order.

.....from H.Middleditch

Following the above account we are then told by Ritter that he set off immediately from Jujuy to drive to Villa Montes, which he reached on 28 February 1959. It might be assumed that he travelled around in that locality, probably upstream and on foot, for just over a week. He then left his truck in Villa Montes and flew to Santa Cruz de la Sierra. "A fine highway, the best in Bolivia, runs between Santa Cruz and Cochabamba for over 500 km". Ritter left Santa Cruz by bus on 10 March, arriving at Cochabamba by about midnight the same day. There he went to the outskirts of the city to photograph a *Parodia* in bud which he had seen some eight months previously, then immediately returned to Santa Cruz. Since "the Brazilians do not allow tourists to bring their own vehicle" Ritter flew from Santa Cruz to Corumba. It will be quite evident from this account in his "Forty Years' Adventuring" that Ritter was quite prepared to travel about one thousand kilometers to be in the right place at the right time just to take one photograph. It might be reasonable to assume that he also planned his travelling to catch fruit when it was just ripe, since the seeds he collected in this way paid for his travel and keep. As observed by H.Vertongen, he would need to know precisely when to be where, in order to be just ahead of the ants.

The graphic account given by Ritter of his trip to Puerta Tastil provides an excellent impression of the effects of the summer downpour. It is hardly surprising that most cactus travellers will avoid the wet season and all the problems associated with earth roads as described by Ritter. Not all the water from the summer downpours runs off and erodes the slopes. Some proportion will seep into the ground, infiltrating loose debris and migrating downhill to where it will even feed roots of plants growing where it has not rained. Travellers in the dry season will see only parched terrain and blue skies with no indication of how the cacti survive. The manual labour described by Ritter is incidental if taken in isolation; it is the necessity for it which provides factual data on how the cacti survive there.

.....from F.Bozsing, G.O.K. Newsletter November 1979

Our trip to Argentina took us first of all to Alta Gracia. Some 40 kilometer from that town, *Gymnocalycium albispinum* was discovered, which had not been met with for a long time. Also found was *G.multiflorum*. A novel discovery was a strongly tubercled form of *G.quehlianum* which was difficult to distinguish, being embedded in stones and amongst moss. A large stream in the locality may be the cause of the appearance of the disjunct varieties of habitat. The *Gymnocalycium* are exposed to the harsh environment and are often badly damaged. One *Gymnocalycium mostii* had its habitat location right on the middle of an ant heap. It was often difficult to collect seeds of certain species since the ants carry off the seed with expedition.

.....from G.Charles

In the course of our very first trip to Argentina we came across *Gymnocalycium* in several places in La Rioja province. Among these was *G.castellanosii* and *G.bozgianum*, which were growing both on rocks and tucked half under rocks. Quite a number of these plants were in fruit and there were ants scurrying round, sometimes working away inside the fruit. A number of fruit looked as though they had freshly split open but the ants were busy cleaning out the seed, or the fruit had been completely emptied by the ants.

.....from B.Bates

In the course of our 1993 trip to Bolivia we had an overnight stop at Puna from where we set off for Sucre on the following morning. This took us through the village of Millares; just after passing through the village we stopped and scanned the surroundings with the field glasses. There are *Gymnos* growing on a wall

of rock behind the village, so we go back into the village and climb up the hill. These *Gymnocalycium* are in fruit and some of the fruit is ripe, but to collect any seed you have to be quick because the ants barely let the seed ripen before they take it. In fact, they remove about a quarter of the contents of one seed pod in the short time that I am there taking photographs.

.....from P.Down

During our visit to Bolivia we saw ants eating the petals of a flower on *Trichocereus tenuispinus* when we were at BDH 16, not far west of the Condor pass. Several of the pictures shown to us by R.Hillmann at our 1996 Chileans' Weekend were of flowers with tattered petals which gave the impression that they, too, had been eaten by the ants.

.....from K.Preston-Maffham (At The Chileans' 1989 Weekend)

On the way from Tarabuco to Zudanez we came across a population of *Lobivia cinnabarina*, hundreds of them alongside the road, all in an advanced stage of bud. There were big heads up to 9 inches across and some clumps with nine or ten heads, all with buds. It was mid-December and there were one or two flowers out in the drizzle. The flower interior looked "battered" - it could be beetles getting pollen and filaments which are nutritious. There was another flower with the petals partially eaten away.

Then after we had left Millares, we climbed higher and higher and at 13,000 ft we came across *Lobivia cinnabarina* v. *walterspielii* and *Tephrocactus rossianus* - in flower. There was what looked like a little beetle in some of the flowers and one flower looked all chewed up. Coming down to Cuchu Ingenio there were *Oreocereus*, *Lobivia*, *Parodia*, *Rebutia*, and *Helianthocereus* here. We saw humming birds and a blackbird-sized bird visiting the cactus flowers. These birds may be coming for beetles that are eating the pollen, or may be for the nectar. Further on, we climbed out of San Pedro on the road to Culpina where there was a population of red-flowering *Lobivia lateritia*. There was only one flower fully open and to my great chagrin the beetles had totally chewed the flower to pieces. There were just tatters.

.....from C.Sherrah

Whilst we were travelling in Chile, we also came across some ripe *Copiapoa* fruit with the seeds being removed by the ants. [Chileans No.58. pp41-43] On ripe, partially open pods, which looked as though they might contain black seeds, I would stick in my tweezers and 3 or 4 black ants would run out! But in addition the flowers get eaten down to stamen level, whilst in several ripe pods I found bluish or brown caterpillars of 1cm in length. All the old, dry, pods that we found on the *Copiapoa* had a hole in them and the contents had been turned to dust - so we assumed that this was the work of the caterpillars. There were old *Tephrocactus* fruit like this, as well.

.....from R.Ferryman

Yes, I have come across these small creatures inside *Copiapoa* fruit. But discussing this with K.Preston-Maffham it appears that they are more likely to be weevils. Certainly some of those I have seen were a bluish colour - and some of them were decidedly fat and robust. It is likely that the female will merely pierce the wall of the fruit to lay the eggs within, and any hole in the wall of the fruit will probably be where the inhabitants have eaten their way out. In northern Chile I have also found old fruit on *Oreocereus* with a similar hole through the wall.

The *Trichocereus* also has to contend with the ravaging of its fruits by these larvae, which hatch out within the fruit and then eat the entire contents of the fruit. [Chileans No.42. p.127]

(In Chileans No.52 there are more field observations on seed dispersal by ants together with extracts from various Natural History publications on those features of seed which appear to be attractive to ants.)

IN THE HIGHLANDS OF PERU From H.Sonnermo

On the occasion of my first visit to Peru I arrived in the capital city, Lima, from where I took a bus to Cajatambo, a village which lies in a deep valley at about 3700m altitude. After a three hour climb up the hillside out of Cajatambo there was a magnificent view over the snowcapped mountains of Cordillera Huayhuash and Cordillera Raura, with valley of the Rio Pumarini lying between them. In the lower part of the valley I found big cushions of *Austrocylindropuntia floccosa* with many more plants to be seen as I climbed out of the valley. There were floccosas with small heads or with big heads; some very hairy, others with almost no hair. I do not recollect seeing any flowers on these plants, but many plants carried green fruits. Because of the height and the thin air, I became very tired from the climbing and made the mistake of sitting on a green hairless cushion of *A.floccosa*. The higher I climbed out of the valley, the more hairy these plants became. At about 3900m I found some very beautiful specimens, some with yellow and some with white hair. At a slightly lower level I came across a plant of *A.floccosa* with stems perhaps 20-25cm tall, but the stems were very much stouter than the typical *A.floccosa* - possibly as stout as an *Oreocereus*. And then whilst going down to the Rio Pumarini I came across a big colony of *Austrocylindropuntia exaltata*. Some of these were in flower. This was the only locality where I saw any *A.exaltata*.

Going back to Lima, I then travelled south to Cuzco, where I stopped for a few days and then took a bus down to Lake Titicaca and the city of Puno. Making a visit to Sillustani, I found some *Tephrocactus*, some of these plants carrying spines and some being spineless. None of them were in flower when I was there in June. Another bus took me to the town of Macusani which lies to the northwest of Lake Titicaca at an altitude of about 3800m.

I spent a week in and around Macusani, taking long walks out of the town in various directions. One day I climbed up above Macusani and came across more yellow-haired *A.floccosa* at about 4500m altitude. From Macusani I could see the yellow-white cushions of *A.malyanus* on the hills all round in every direction. Only

15 minutes walk out of the town I found the first big cushion of *A.malyanus*, as well as big clumps of *A.floccosa*. Going down the valley for about 5 km along the road to Ollachea I came first to the village of Quenkosaya, at 4100m altitude. At one spot there was an *A.floccosa* (v.rauhii?) with heads only 2cm long but only some metres away there were plants with heads 10cm long. If these are one and the same species it must include an extremely wide range of variation!. Continuing down the valley, the cushions of *A.floccosa* were relatively flat, but fairly wide, extending to as much as about 5m. across. On the other hand the *A.malyanus* were like round humps - the big ones were certainly 1.5 high and 2m broad.

I saw flowers everywhere on *A.malyanus* - almost every cushion had flowers of yellow or orange. So it looks as though *malyanus* flowers at the end of the rainy season or at the start of the dry period. I came across a lot of *A.floccosa*, both in the Cordillera Huayhuash and around Macusani, but they were carrying almost no flowers at all at the time I was there. I saw only a few buds. Some of the plants of *A.malyanus* carried a lot of old seed capsules, but they were buried well down between the stems and it was a lot of work to collect them. These capsules were very dry and the seeds were loose inside. The shape of the seeds was similar to those of *A.floccosa*. The strange thing was that I saw no fresh fruit on any of these *A.malyanus*. On the other hand, on the clumps of *A.floccosa* I found a lot of green fruit with juice inside.

I was able to follow *A.malyanus* almost all the way down to the little village of Tantamaco. When I arrived at Tantamaco the *A.malyanus* had disappeared and now I found *A.floccosus* growing together with a *Lobivia*, probably *L.maximiliana*. Here I also saw an extremely big *A.floccosus* - by that I mean much taller than elsewhere, for here the stems were 40 cm. tall. Around this tall *A.floccosa* there were the ordinary sort that I saw elsewhere. There was nothing obviously different either in the nature of the ground or in the surrounding vegetation which might have accounted for this one plant growing in this manner.

In the opposite direction I could follow the *A.malyanus* along the road to Lago Chungora, but when I came close to Lago Chungora, the *A.malyanus* disappeared and only *A.floccosus* was to be seen.

Most of the nights I simply camped out in the open, when the skies were absolutely clear. My journey was undertaken in May-June, when the skies during the day were blue from horizon to horizon for most of the time and the sun was very strong. Only occasionally were there some clouds which tried to cover the sun. One evening I was erecting my tent high in the Cordillera Huahuash when some dark clouds appeared and some snowflakes fell. But this was the one and only occasion. If I forgot to empty any water any evening, it was frozen solid the next morning.

I have sown a proportion of the seed of both *A.floccosus* and *A.malyanus* which I collected. There has been no germination as yet but previously I have sometimes had to wait for five years for seed of this sort to germinate.

.....from H.Johnson, A collecting trip in Peru, K.u.a.S 3,1952

.....from Mejorada we journeyed onwards to Ayacucho. On the plateau near Ayacucho, *Tephrocactus floccosus* grows in many varieties. They vary in size and form, length of hair and in the colour of the hair from pure white to darker yellow. However, the flowers are similar overall.

.....from W.Rauh, Peruvian Cactus Vegetation, 1958

Whilst Britton & Rose knew only the two species *T.floccosus* and *T.lagopus* from this group, and Backeberg & Knuth produced two further names, *T.udonis* and *T.verticosus*, our new discoveries - especially those from the year 1954 - showed that in the Peruvian highlands there are species essentially more hairy than those already described, in particular in previously unknown colour tones of the woolly hair, which varies from clear white to golden brown. Since in many places, such as in the Cord. Raura, examples with hair of differing colour grow intermingled with one another, it is accepted that they will hybridize. These natural hybrids make a classification very difficult, since each species displays a very considerable variation in respect of body form and length, hairiness, and flower colour.

.....from R.Senior

Our trip to Peru took place in the middle of August, when we undertook a guided walking holiday, camping overnight, in the Machu Picchu National Park. From the Rio Urubamba we trekked up the valley of the Angascocha river and started to come across *T.floccosus* at about 14,000 feet altitude. At 15,000 feet an unseasonal and heavy fall of snow obliged us to turn back, but there were still *T.floccosus* to be seen almost at the edge of the snow cover. My recollection is of a fair number of flowers on these plants.

.....from G.Charles

Our first trip to Peru was made in the month of April 1998, when our route took us northwards from Lima. But we did come across some *Tephrocactus floccosus* at one place, overlooking Lake Conococha. At this place there were both fairly hairy plants as well as others with very little hair. But even on the almost hairless plants there were a few woolly tufts to be seen and when we looked closer we found that these were not segments, but fruits. We did not see any flowers at all in this population. But at this same spot in December 2002 we found these *T.floccosus* with red flowers, but without any fruit.

Our 1999 trip to Peru took us south from Lima so that we had more opportunities to come across *T.floccosus*, which we did find at a number of places. The first ones we saw were not a long way from Lima, just east of the summit of the pass on the way to Tarma. They were in flower, with yellow flowers and all the other flowers which we saw on these plants during this trip, were also yellow. Then further south, on the road from Pampas, we found both hairy and hairless clumps of *T.floccosus*, some of the hairy ones being more hairy and some less hairy, with no preponderance of any one sort, nor with any area of ground occupied exclusively by one sort, as there were plants with either more hair or with less hair to be seen where-ever we looked. About 20 km beyond Ayacucho, at 3300m we did find a population of these plants with a preponderance of hairy specimens, and then when we were approaching the pass at 3880m there were a greater

number of the less hairy plants to be seen.

On the road to Andahuaylas we came across a group of *T.floccosus* which had larger stems than those we saw elsewhere - they were both stouter and taller, possibly with one inch thick stems that were up to eight inches tall. Some of these plants were furnished with brown wool and some with white wool, but always the same colour wool on any one plant. There were flowers on some of these plants and because the individual stems were not packed tightly against one another, the flowers could be seen arising from part way up the side of the stems. Wherever we found populations of these *Tephrocactus* on this trip, there were many plants in flower, and wherever the stems were not closely packed, the flowers could be seen to grow out from the side of the stem, an inch or two below the top of the stem.

Just before reaching Andahuaylas, on Pampa Ajopucro, there were some *T.floccosus* which formed huge mats, up to as much as 5m across, but of course these might have been made up of more than one plant. On this extensive moorland slope there were more *T.floccosus* growing closer together here than on any other place where we found these plants - so many that the whole hillside seemed to be almost covered with them. Beyond Andahuaylas, on the road to Abancay, much of the ground was given over to fields, but in the rock between the fields were some *T.floccosus* with either white or brown spines projecting out of the white wool, looking like a small *Oreocereus*. One or two plants looked at first sight as though one part of the plant had stems with white spines and the other part with yellow spines, but we concluded that these were most likely to be two different plants growing up against one another.

The *Tephrocactus floccosus* seemed to grow by preference on gently sloping ground on a sort of heavy, loamy, moorland type of soil which always seemed to be wet underfoot. Once we were down on to the terrain surrounding the shore of Lake Titicaca, near Juliaca, the ground was very flat and the soil seemed to be of a much more gravelly or gritty nature, which we suspected probably dried out far more quickly than moorland soil on the slopes further up. Here, the vegetation was quite different and we no longer saw any *Tephrocactus floccosus*.

After making a further visit to Peru in 2002, this time visiting central and northern parts of that country, we were able to see more habitat locations for *Tephrocactus floccosus*, again with plants displaying possibly even wider degree of variation than we had seen on our earlier visit. There was no real difficulty in selecting a certain plant in any particular population that could match the description for one of the various names which have been published for these floccose *Austrocyllindropuntia*, but they can hardly be regarded as independent species.

.....from H.Middleditch

It is effectively being suggested that the extent of variation in *Tephrocactus floccosus* means that only this one name is to be used for these plants, in place of various published names including about a dozen names which appear in Rauh's "Peruvian Cactus Vegetation". Unfortunately the use of such a name to encompass such a wide variety of forms means that it fails to convey to a reader or listener, any real indication of e.g. hairiness or hairlessness, white or brown or yellowish hair, presence or absence of spines, etc. Since a name is merely a man-made device for conveying information, such an all-enveloping name would appear to fail in its prime purpose. However, as a convenience, the use of the various existing names associated with the diverse forms of *T.floccosus* would at least have the value that they would convey useful information to the reader or listener, as an alternative to saying e.g. "The yellow-haired version of *T.floccosus*", and so on.

.....from P.Hoxey

Our visit to Peru in company with A.Lau in early 2002 enabled us to visit a number of places where we found *Tephrocactus floccosus*. At some half a dozen of these places, the plants were all fairly similar to one another, with quite long white hair which completely obscured being able to see the stem of the plant - although some plants were more hairy than others. Typically they grew in a hummock which was wider than it was high. The larger hummocks would be perhaps some 80cm across and perhaps 40cm high. At two locations, these *T.floccosus* were fairly abundant - roughly a stone's throw apart, over a fairly wide area. But at other places, we only saw a few plants.

We were always at altitudes above 3000m when we came across *T.floccosus* and indeed we saw few of these plants below 3500m. They almost always grew on gentle slopes or flat ground. The accompanying vegetation was always quite low growing and alpine in nature - there were certainly no trees and no substantial bushes. Most obvious were the pyramid-like tussocks of grass that could be up to perhaps knee height, together with alpines and miniature shrubs of about ankle height. There were a great many alpine plants whose identity we did not know.

Our route took us to Oroya, and as one might expect to find Oroyas near there, we set out to try and find them. Not far from Oroya itself we started to climb a hill slope, where the general vegetation seemed to have been heavily grazed, either by domestic animals or by wild llamas. Some way up the hillside we started to meet with *T.floccosus* and the higher we climbed, the more of them we saw. However, unlike the other places where we found *T.floccosus* that varied to some extent in the amount of hair they carried, at this spot there was a tremendous variation in their appearance. The big, white hairy plants were still the most abundant, but then in addition there were plants with less hair, plants with not a lot of hair, as well as plants that were virtually hairless. On the less hairy plants it was possible to see that some of them were spineless, whilst others were spiny. In addition, some of them had long stems whilst others had short stems. We did have the impression that the big white hairy plants made larger clumps than those with little or no hair. We even found one plant which had some yellow hair as well as having yellow spines of about 1cm in length. We did not find any yellowish haired plants at any of the other spots where we came across *T.floccosus*. And we did not succeed in finding any plants of Oroya at this location, not far from Oroya itself.

Near Otuzco we came across another location for *T.floccosus*, although we were actually looking for

Matucana Ritteri which is only reported from Otuzco. We were indeed very surprised to find this particular species of *Matucana* at an altitude of over 3000m. But not only that, the habitat had been burnt off and a large part of it had been ploughed up. There were none of the large hairy clumps of *T.floccosus* here. Instead we found just a few clumps of a small headed form which was completely hairless. These clumps were also only small, being about 10cm across and nearly flat to the ground.

We saw only a few blooms on the *T.floccosus*, and they were at the site near Oroya. At all the other places where we found *T.floccosus* there were no flowers or buds to be seen, but we did find some fruits, which did not seem to project above the top of the stem which carried them. These fruits would be about three or four cms in diameter, still green and plump, with a very thick, fleshy wall. The seed was embedded in a very sticky mucus inside the fruit. We were able to collect a certain amount of old seed which we found just laying on the top of the plants.

Apart from the site near Otuzco, there were usually a great many tiny plants of *T.floccosus* to be seen in the company of the larger and older plants. At all the locations where we found *T.floccosus*, it was quite chilly and it gave a clear impression that it would not be the most pleasant of places for an overnight stay once the sun had set.

.....from H.Sonnermo

I was able to collect some seed off *T.floccosus*, but not very much. It was very difficult to collect any seed because the fruit were deeply buried in the cushions.

.....from H.Middleditch

Had it been possible to collect some seed from the various forms of *T.floccosus*, such as hairy and hairless, white haired and yellow haired, and so on, the resultant germinations may have shown appreciable variation, comparable to that seen in habitat. However, had the resultant germination yielded plants which reproduced the features of the plant from which the seed was collected, would this mean that the names used to identify these variations were botanically acceptable?

.....from K.Gilmer

Our visit to Peru in late 2002 took us to the Cordillera northwards from Lima. We came across *Austrocylindropuntia floccosa* at over two dozen different locations, seeing different flower colours and a great extent of variation in hairiness. Many of these plants were in flower, but the abundance of flowers varied enormously from plant to plant. Very often there would be two plants growing almost side by side, one of them carrying numerous buds and flowers, the other with very few buds and flowers, not infrequently with none at all. Where a hairy and almost hairless plant grew side by side, it could be the hairy plant with lots of flowers and the hairless plant with few flowers, or exactly the opposite.

.....from H.Middleditch

In regard to flowering times, it was in the month of October when flowers (but no fresh fruit) were seen on *T.floccosus* by G.Charles et al., whilst it was noted by K.Preston-Mafham that he found both flowers and fruit on *T.floccosus* in February (Chileans No.55). By comparison, it was the month of April when fresh fruit but no flowers were found on *T.floccosus* at one spot by G.Charles, whilst it was in the period May-June when only fresh green fruit was found on *T.floccosus* by H.Sonnermo (above) at several locations. In June-July-August, F.Vandenbroeck (Chileans No.55) found green fruit but no flowers on *T.floccosus*. Very basically, this is flowers in the wet season and fruit in the dry season. On *T.malyanus*, in May-June, abundant flowers but only dried-out fruit (and no fresh fruit) was found by H.Sonnermo. This might suggest the possibility that *floccosus* and *malyanus* have staggered flowering times in habitat, in which event cross-pollination between these two sorts becomes rather less likely.

.....from K.Gilmer

We paid a visit to southern Peru in September of 1988, when our travels started off from Arequipa. From here we took the main highway through the coastal desert to Tacna and then our route took us north towards Lake Titicaca. From Puno, we drove round the western end of Lake Titicaca and then took the road going north to the headwaters of the Rio Carabaya, where we were not far from the border with Bolivia. Turning west to follow the valley of the Rio Carabaya, we stopped both near Picotani and near Huacchane where we came across great mounds of *T.malyanus*. Apparently it was the start of the flowering season. At this time, however, we found no fresh fruit, but only dried up fruit which probably originated from the previous year. W.Rausch was at this habitat in the middle of December and had come across fresh fruit.

.....from H.Middleditch

It is observed by H.Sonnermo that *T.malyanus* was seen in flower in May-June, but K.Gilmer suggests that *T.malyanus* was just starting its flowering season in September - perhaps because of a relative paucity of flowers? Could it in fact have been the end of the flowering season?

.....from H.Sonnermo

It is very interesting to hear that *T.malyanus* was found near Picotani. I imagine it might even be found over the border in Bolivia. There is the Ritter name of *A.floccosus v. cardenasii*, collected near Achacachi, which is in Bolivia on the northeast shore of Lake Titicaca. The description says that it has less hair. This is very interesting for me - is there any possibility that this could be *T.malyanus*?

.....from B.Bates

The enclosed picture of *T.floccosus* was taken on the way back from Sorata, at Hualata Grande, near Achacachi. Here we were walking between the lines of piled-up stones that had been cleared off the fields. We continued on to Achacachi and the *T.floccosus* were still there, together with *Lobivia maximiliana* in fruit.

.....from P.Down

Near Achacachi, (at BDH 65) we were walking between the fields looking at the clumps of *T.floccosus* growing here and here between the stones which were piled in lines around the edges of the fields. There were

many small clumps of *T.floccosus* with up to possibly a dozen stems, with the individual stems of varying heights, probably up to about nine inches high. There were also some larger mats of these plants which were up to 18 inches wide and could have had some 50 or 60 heads, but similarly only about nine inches high. They had a coat of quite long white wool. We regarded them as a fairly typical *T.floccosus*.

.....from R.K.Hughes

The *T.floccosus* that we saw above Achacachi were very nice hairy specimens but no more distinctive than other beautifully hairy plants of this same sort which were to be seen above Huancayo [Chileans No.45 pp.133-135] or Cuzco.

.....from J.de Vries

Near Palca, to the east of La Paz, we came across *T.floccosus* at VZ 114 at 3923m altitude. [On Chileans map "La Paz River System"]

.....from H.Middleditch

There is also the BLMT 255 record for *T.floccosus* at 3923m some 36 km to the south of Achacachi. In addition, there is the TG 152 location for *T.floccosus* at 4040m near Moho, on the northern shore of Lake Titicaca in southernmost Peru. Together with BDH 65 at 3950m near Achacachi, these field locations for *T.floccosus* represent a zone in which no *T.malyanus* has been reported. It appears that *T.malyanus* is to be found in the altitude zone between about 4100 and 4600m, on the slopes of Cordillera Apolobamba. The altitude of Achacachi is only about 3850m, not far from the shore of Lake Titicaca, on the lower slopes of Cordillera Apolobamba, so that *T.malyanus* would hardly be expected to grow near Achacachi.

.....from H.Sonnermo

I have noticed that the *malyanus* grow in a different manner to the *floccosus*. On *floccosus* the new shoots can be seen on the stem, but they very seldom appear from near the top of the stem. On *malyanus* the new shoots originate from very close to the very top of the stem, near to the growing point, spreading in every direction.

.....from H.Middleditch

Which would explain why the *T.floccosus* give an impression of a set of individual stems growing upright parallel to each other, whereas the *T.malyanus* looks like the large hummocks of *Azorella* and *Aretiastrum* which also grow in the 4300 to 4600m altitude zone - and less abundantly down to about 4000m

TEPHROCACTUS MALYANUS By W.Rausch.

Translated by H.Middleditch from Succulenta 51, February 1972

We rode in a pick-up truck over the high plateau within the high mountains in the north of Bolivia. The altitude reads over 4300m. There were no roads here and the vehicle merely followed the track of a previous traveller. Frequently we made our own way over grassy flats and rocks. Suddenly we stopped before a ravine. We are obliged to turn round and look for another route. The vehicle drove jerkily and the passengers were thrown against each other. At each pothole we lurched sideways a meter or more. It was unfortunate that on this account the magnificent landscape could not be enjoyed, as we were constantly occupied in avoiding being thrown off the truck.

Some meters from the moving vehicle we repeatedly saw white patches of *Tephrocactus floccosus* together with large white hummocks which stood out like boulders. What could these possibly be? Our driver was not prepared to bring the vehicle to a halt; entreaties, threats, or abuse, were of no avail; even offers of money yielded no reaction. The whole affair concluded with great amusement and loud laughter from the indians, who could not understand why two gringos would wish to stop for these white hummocks.

Four years later I found the large white hummocks again in Peru, also at a very high altitude, between 4100 and 4600m. This time I stood with the live mass in front of me but yet again I could not grasp what these white bodies really were. With my hand I swept over the surface and felt spines - so it really was a cactus! The individual stems stood so close to one another that they could not be seen individually and formed such a compact mass that an offset could not be separated without damaging the plant. In addition, the seeds appear to be similar to those of *T.floccosus*, but differ markedly as far as habit, flowers, and fruit are concerned. The so-called hairiness is not hairs such as those on *Tephrocactus floccosus*, *lagopus*, etc. It is only a mass of dense felt. The flower is obliged to push its way out of the almost abutting stems and they are scarcely able to develop normally. The fruit also sits deeply concealed among the mass of felt so that on attempting to extricate it, part remains behind. With *T.floccosus* the flowers and fruit stand in their own space, as on a free-standing stem. This new species originates from an area of such extreme climate that they are unlikely to come into flower in Europe. At the self-same habitat location in Peru there also occurred *Lobivia maximiliana*, whose habitat location is to be found at the highest altitude of any of the *Lobivias*. During the night the plants are covered with frost and as day breaks some cms thick ice sits on the shady side of the plant whilst on the sunny side the flowers shine.

Then on the final day we leave our quarters at this location; it was icy cold and the llamas congregated in the lee of the valley against the sharp cold. In the morning everything was covered with snow.

.....from H.Middleditch.

As usual, this article by Rausch contains very little to indicate just whereabouts the first sighting of *T.malyanus* was made from a moving vehicle. It is never totally impossible, but rather unlikely, that it was made in the small patch of Bolivia which lies to the west of the Rio Suches - see Chileans Lake Titicaca map. More likely, this trip went from the shores of Lake Titicaca northwards across the very high areas of that part

of the Cordillera Apolobamba which lie to the east of the Rio Suches (as on the Southern Peru map, this issue), skirting the headwaters of the R.Palhuaya and Rio Llorca - see Consata basin map.

.....from I.Crook.

Our trip to Peru took us south through the central highlands, in the direction of Lake Titicaca. Going along the road from Cuzco to Sicuani, we crossed the pass at Abra La Roya and then started the descent towards Lake Titicaca, until we were at Ayaviri, with Pucara some 30km further along the same road. Here at Ayaviri we turned off to the north, taking a road leading to Macusani. Passing San Anton, we came to Rosario, where the Rio Carabaya comes from the east and turns to run south towards Lake Titicaca.

At about 1km before reaching Rosario we caught our first sight of *Tephrocactus malyanus*, at an altitude of 4112m. We continued to see these plants here and there, scattered over the surrounding slopes, on the gentle climb to the pass, and again after the pass, almost all the way until we reached Macusani. The exception was the 4km at either side of the pass, where they were absent. Once over the pass, the waters flow down the Atlantic facing slopes of the Cordillera.

Where the road crossed the stretch over the pass, where *T.malyanus* was absent, the ground carried almost a carpet of grassy green dwarf vegetation, which was quite damp underfoot. Where the *T.malyanus* was to be seen again at either side of the pass, the ground was still so damp as to be almost wet and boggy. One plant of *T.malyanus* in particular was growing next to a rivulet and the edge of the plant was actually touching the running water. By far the largest hummocks of *T.malyanus* we saw were those last to be seen before crossing the pass and the first to be seen on the descent after the pass. Accompanying these plants were various sorts of dwarf vegetation, none of it above ankle height, leaving very little bare ground exposed.

We stopped in Macusani overnight, during which it snowed on the nearby mountains, and on returning over the pass on the following day we saw the hummocks of *T.malyanus* covered by a coating of snow. As we went along the road down to Rosario, the green grassy looking vegetation accompanying the *T.malyanus* gradually changed to a much darker and drier looking appearance, although still scarcely more than ankle height. By Rosario, the vegetation accompanying the *T.malyanus* had become much more open, with bare ground now being quite obvious.

From Rosario we now set off eastwards, following the general line of the Rio Carabaya, travelling over altiplano-like terrain. From this road we continued to see plants of *T.malyanus* here and there on the gently sloping ground at either side of the road, over a distance of about 33km, after which we saw no more *T.malyanus* in the R.Carabaya valley. Wherever we looked at these *T.malyanus* they would be carrying a few flowers - possibly five or six flowers on the larger hummocks, three or four flowers on the smaller hummocks. We also found a few - very few - fruits, which had a thick, turgid, wall and contained few very pale creamy-white coloured seed.

At some 70km or so from Rosario, at Quisquipunco, we took the road leading to Sandia, via Cuyo-Cuyo. Very shortly after leaving Quisquipunco we crossed the pass and started on the descent of the Atlantic facing side of the Cordillera. This descent was initially very rapid indeed, whilst the river took an even steeper gradient, as we occasionally caught sight of it in the vertiginous depths below. There were no *T.malyanus* on the road out of Quisquipunco to - or beyond - the pass, but then a few were seen in the first 16km of the drive from Quisquipunco towards Putina.

.....from H.Middleditch

This very last sighting of *T.malyanus* i.e between Quisquipunco and Putina, is at no great distance from the Peru-Bolivia border. It appears to be quite probable that the original sighting of *T.malyanus* reported (above) by Rausch, from a moving vehicle, was at no great distance into Bolivia from that same part of the border.

Accompanying the original description of *T.malyanus* in Succulenta was a front cover illustration of this species, evidently taken by W.Rausch in habitat. Presumably in December, if the foregoing observation from K.Gilmer is accepted. In this picture there are a great number of the tips of new leaves projecting out of the woolly coat which covers this plant, suggesting that it was in full growth at that time, in the middle of the wet season. But there also two partially-open flowers on that same picture, which matches the field observations from I.Crook on this aspect. Does this mean that *T.malyanus* flowers well in the dry season, but with fewer flowers in the wet season?

.....from H.Sonnermo

Looking at the pictures of *T.malyanus* which I took in the month of May, there are no new leaves to be seen just protruding out of the wool which coats these plants. Indeed I am absolutely sure that I did not see any signs of new green growth on any of the many plants which I looked at. Perhaps the plants were not in growth at that time, even though they had plenty of flowers.

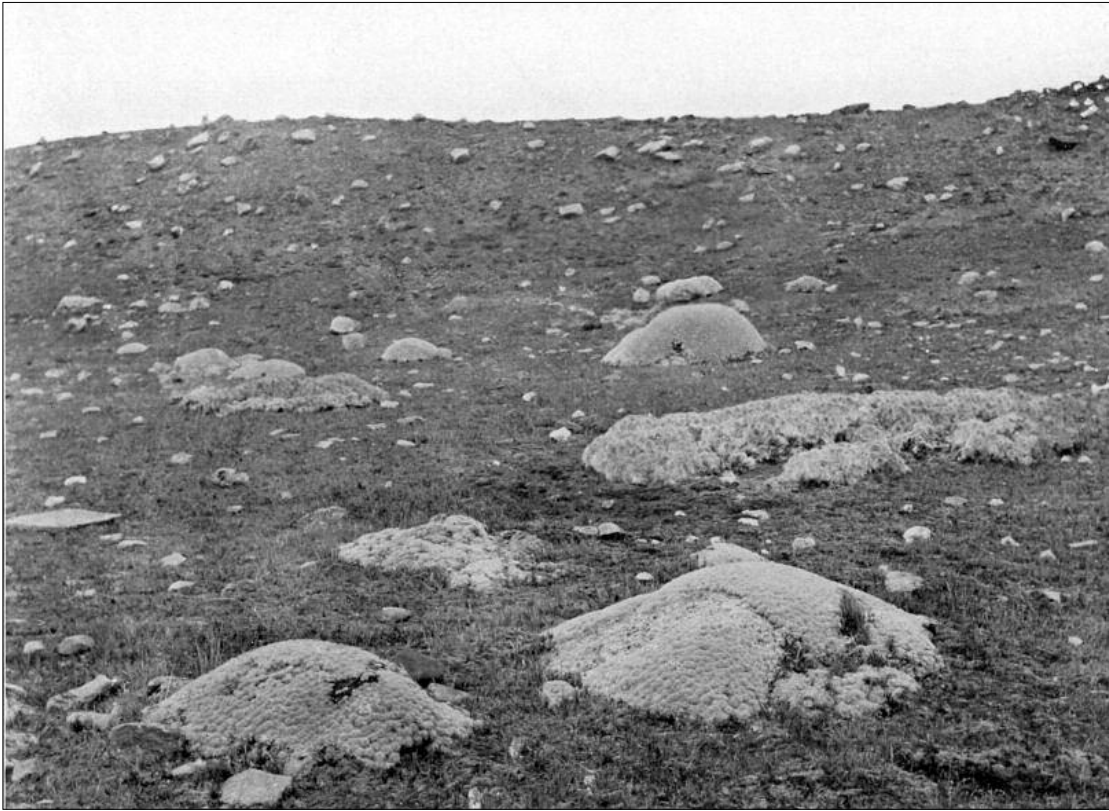
.....from F.Ritter. (Chileans No.49)

(En route from Achacachi to Ayata round the headwaters of the R.Llorca - see Chileans Consata basin map) Close to an almost 5000m high mountain pass, cacti are again to be seen. At a distance on the slopes to the south gleam huge cushions of the handsome *Austrocylindropuntia floccosa*, which is covered with a dense coat of white hairs.

.....from H.Middleditch

Huge cushions, not mats? Getting on for 5000m altitude? On the route skirting the Consata basin, a day and a half's march from Ayata? Any connection with the *T.malyanus* seen by Rausch & Zecher in this same general area??

During the course of looking round at the *T.malyanus*, as described above by I.Crook, was there any sign of regeneration?



N.E. margin of the Titicaca highlands, near Poto at 4,500m.
Opuntia floccosa S.D. - the mats; *Opuntia lagopus* K. Sch. - the hummocks.
 Photo: A. Weberbauer, Pflanzenwelt der peruanisches Anden



North of Macusani 4131m
 with *T. floccosus*



Lago Parinacocha

Tephrocactus lagopus
 (= *T. malyanus*)

Photos: H. Sonnermo

.....from I.Crook

Yes indeed, we did see a number of small plants of *T.malyanus*, suggesting that regeneration was taking place. In several places we did see at least one small plant quite close to a large hummock of *T.malyanus*, and we were suspicious that it might have been growing from a stolon thrown out below the surface level by the large plant. We did have in mind trying to dig down between the suspected offset and the main plant but unfortunately this never got done.

.....from K.Gilmer.

We were able to unearth some of the underground stolons produced by *T.malyanus*. These stolons are about 5 to 8 mm thick and lie about 4 to 8 cm below the surface of the ground. New plantlets would grow from these stolons, which we were able to trace for over one meter away from the main plant body.

I have been searching for information on the origin of the clone of *A.malyana* which is at present in cultivation in Europe. According to the information in my hands at the moment, it is not one of the specimens that W.Rausch brought back from the locality in Macusani, which he found there in December of 1969. But on the European market, one could buy cuttings of this species before that time. How could this happen?

NOT REALLY TEPHROCACTUS MALYANUS? From P.Hoxey

In the 1911 publication of "The plantworld of the Peruvian Andes" by A.Weberbauer, there is a section dealing with the plants of "The high andine or Puna zone". This includes a photograph of some cushion forming cacti taken near Poto, in "the northern margin of the Titicaca highlands" at 4500m altitude. These are stated to be *Opuntia floccosa*, in the form of flat cushions, and *Opuntia lagopus* K.Sch. in the form of arched cushions. These plants appear to be growing on a fairly gently sloping hillside, in the company of other ankle-high moor-like vegetation (see picture opposite). The description for *Opuntia lagopus* in Schumann's *Gesamtbeschreibung der Kakteen* does attribute the discovery of this species to Weberbauer.

What does particularly strike me about the plants in this picture is the evident difference between the mats, rather than hummocks, of *T.floccosus*, and the tall hummocks of the *T.lagopus*. Is there a possibility that these tall hummocks of *T.lagopus* are what was described a great many years later as *T.malyanus*?

.....from H.Middleditch

Weberbauer also observes in his book that "I only found the tall-arched, dense woolly cushions of *Opuntia lagopus* on the margin of the high plateaux of the Titicaca highlands. *Opuntia floccosa*, a somewhat more loosely haired, likewise cushion forming sort, is of frequent occurrence from the Titicaca highlands to the vicinity of 10°S from where it begins to peter out".

.....from P.Hoxey

There is a selection of names for the variations on *T.floccosus* that occur in Peru, which are indeed to be found over an area of considerable north to south extent. but it appears that *T.malyanus* is only to be found in the mountains to the north of Lake Titicaca.

.....from H.Middleditch

The original description by Schumann for *Opuntia lagopus* appears in his 1903 Supplement and runs as follows

..... Areoles furnished with yellowish white wool 1-1.5 cm long so thickly that neither leaves nor areoles are visible. In addition to the wool the areoles usually carry an almost 2 cm long, white, more or less glassy, very slender rough spine, basally thickened, which is painfully sharp and in addition equally long, slim, white bristles which take the place of glochids.

Obs. Each areole carries only one spine. ... It is covered extraordinarily densely with wool. An especially peculiar feature is that in correlation with the dense covering, the glochids, which remain only slim, extend up to 1.5 cm long.

The reference to the very dense yellowish white wool is certainly a good match for the appearance of *T.malyanus*, as it does form a woolly exterior cover so dense that details of the stem or spination are effectively obscured. The valley of the Rio Carabaya, where *T.malyanus* grows, as indicated above by K.Gilmer, does lie close to the margin of the Titicaca highlands, which is Weberbauer's location for his picture of *Opuntia lagopus*.

Taken together this would suggest that we may well have to regard *Tephrocactus malyanus* as a later synonym of *T.lagopus*. Which then explains why plants of the so-called *T.malyanus* were already in cultivation in Europe, as observed by K.Gilmer, before the collection made by W.Rausch in 1969, since there would have been various opportunities for specimens to be brought to Europe after they were found by Weberbauer. Presumably this original discovery would be prior to the publication of this name by Schumann in 1903.

.....from J.Iliff.

You will see that the first description of *Opuntia lagopus* appears in the Nachtrag (Appendix) to Schumann's *Gesamtbeschreibung der Kakteen*, where it is stated to have been found by Weberbauer at 4000m altitude in the Andes in the vicinity of Arequipa. To be quite sure that we know what is meant by the name *Opuntia lagopus*, the first step must be to search the area around Arequipa in order to find a specimen which can be compared with the original Schumann description.

.....from H.Middleditch

It really would amaze me if any sort of hairy *Austrocylindropuntia* were to be found in the near or far vicinity of Arequipa. This group of plants favour the Atlantic facing slopes of the Cordillera, being found as far north in Peru as the Cordillera Blanca. From here, the dry coastal zone and the arid Pacific slopes of the Cordillera occupy a progressively greater width as one goes steadily more to the south in Peru. At the same

time, the cactus vegetation of *Neoraimondia*, *Haageocereus*, *Trichocereus*, *Corryocactus*, etc., extend their distribution further and further inland from the coast. I am not aware that any floccosus type of *Austrocylindropuntia* has ever been reported from the Pacific side of the Cordillera in southern Peru, never mind near Arequipa.

.....from K.Gilmer

The area around Arequipa is far too arid to support any of the floccosus type of *Opuntia*.

.....from H.Middleditch

In addition, Schumann did state in the original description of *Opuntia lagopus*, that it came from "Arequipa, Bolivia" which is perhaps indicative of Schumann's knowledge of the geography of southern Peru (or lack of it). It is equally possible that his statement of Arequipa as the finding place is in error.

.....from J.Iliff

It is most unwise of you to suggest that Schumann would have made a mistake over this location of Arequipa. He was an eminent author who was not likely to make the sort of errors made by Haworth early in the 19th century over the locations for certain *Opuntia*. You would do better to concentrate on the question of the sort of plant matching Schumann's description to be found near Arequipa, than belittle Schumann's reporting of data which he could have received from Weberbauer himself.

.....from H.Middleditch

In "Vegetation der Erde" XII, 1911, which is the Volume written by Dr. Weberbauer, and devoted to the plant-world of the Peruvian Andes, it is noted that this author had previously been at the Royal Botanic Museum in Breslau, before setting off for Peru, where he arrived on 11 November 1901. From Lima he made a trip inland using the railway line via Oroya, to the silver mine at Arapa. Then on the 19 February 1902 he went by sea to the port of Mollendo in southern Peru, thence by the railway line running via Arequipa to the station at Pucara, at 3882m altitude, lying to the north of Lake Titicaca.

Fortunately both the map of Peru received from R.K.Hughes and the different map of southern Peru received from K.Gilmer, locate the place by the name of Pucara, at no great distance from Lake Titicaca on the time-honoured route to Cuzco. On the opposite side of the river (on both maps) is the Estacion Pucara, on the railway line. Evidently this will be where Weberbauer got off the train which he had joined at Mollendo on the coast and where the expedition was assembled for travelling into the highlands north of Lake Titicaca.

.....from A.Weberbauer. Translated by H.Middleditch from "Die Pflanzenwelt der Peruanischen Anden" 1911

Three days of imposed residence in Pucara offered me the opportunity of horseback rides to obtain a collection of characteristic plants of the Titicaca highlands. We then rode via the villages of Azangaro and Munani up to the northern edge of the mountains and from there down into the Sandia valley. In the month of March, at the time of the richest display of flowers, I set foot in the picturesque village of Sandia and marvelled for the first time at the charming subtropical flora of the eastern Andes. [There was] further exploration through pathless forests, but the transportation of representative scientific collections from each area, together with the necessary food and clothing, was simply not possible, so the expedition rode off without me.

For two months I studied the vegetation on the high mountain slopes which rose steeply on all sides around Sandia, from the bottom of the valley to the edge of the Titicaca mountains. There rose the snow covered peaks of the Andes of Carabaya and their exploration involved a particular trip in the month of May to the hamlet of Poto, lying at 4400/4500m altitude, whose inhabitants lived above the gold washery. The house of a hospitable Englishman, Mr.A.Gibson, the mine manager, was a comfortable base in the inhospitable heights, lashed by snow storms. A thorough study of the high andean flora of southern Peru was thus made possible.

After returning to Sandia I left on 5 June for a trip down the valley to the Inambani river and at the end of July I arrived back in Sandia. After a few days' rest, I set off back to the coast. I went via Munani, Azangaro, and Pucara, then stopped for half a week in Puno to look at the shores of Lake Titicaca and arrived back in Arequipa at the end of August. Making use of the railway, it was possible, within a short period, to undertake botanical excursions [from Arequipa] to places at many different altitudes, from the Hacienda La Chorunga in the Vitor valley at 1050m up to as far as Vincocaya at 4377m. At this time, in the middle of the dry season, the collecting really yielded only insignificant additions, but the zoning of the vegetation in accordance with altitude was splendidly displayed.

It was particularly instructive in the course of the ascent of the Vulcan Misti to follow the gradual disappearance of the vegetation and to recognise among the last outposts the curious hard cushions of *Azorella bryoides*.

At the end of September I went back to the harbour at Mollendo, from where I returned to Callao by sea.

.....from H.Middleditch

Presumably it would only be when Weberbauer returned to Callao in October 1902 that he would be able to convey data and possibly specimens back to Europe. He could hardly have wasted much time in doing so, since the first description of *T.lagopus* appeared in Schumann's 1903 Nachtrag. From the accompanying map of southern Peru it may be seen that Poto lies not far from the source of the Rio Carabaya, whilst immediately on the Atlantic facing side of that river source there arises the valley which leads down to Sandia. Hence it is unlikely that Weberbauer would have had an unduly difficult or unduly lengthy journey from Sandia to Poto. Thus it would appear to be reasonably certain that the original *T.lagopus* (syn. *T.malyanus*) came from the vicinity of that particular Poto.

The change in the nature of the vegetation when crossing the divide between the more arid western (Pacific) slopes of the Cordillera and the eastern slopes, was evidently not lost upon Weberbauer.



.....from A.Weberbauer (Ibid)

Whoever travels on the most important railway line in south Peru to Lake Titicaca will see, high above Arequipa, somewhat below the station at Pampa de Arreiros, a phytogeographic demarcation line which makes itself evident with rare clarity. The rigid columns of *Cereus* spp. vanish and with them a host of smaller desert shrubs; the vegetation now extends over the ground in closer compactness; the grasses which in the arid vegetation zone at best protect a short-lived rain flora under their frail outline, now everywhere raise their stiff thread-like leaves in thick clusters which remain seemingly unchanged through the sequence of the seasons of the year.

The landscape displays the most conspicuous and most pleasing characteristic however through the tremendously numerous dark bushes of an evergreen, compact bush of some half to one metre in height, of *Lepidophyllum quadrangulare*, called Tola by the natives. These are accompanied in lower-growing but nevertheless significant numbers of individuals of some other small leaved shrubs: *Senecio graveolens*, *Tetraglochin strictum*, etc. Between the grasses and the bushes mingle low-growing cacti, in particular the markedly domed hummocks of *Opuntia pentlandii*; sparser are the globular bodies of an *Echinopsis* sp. which are now solitary, now occurring assembled into groups.

From Crucero Alto at 4470m, the railway descends into the Titicaca basin. Here the plants grow more closely together than on the western slopes of the Cordillera, the grasses display a fresher green. Already at 4200m the *Lepidophyllum quadrangulare* reaches its lowest habitat, whilst on the western side it goes down to 3300m. This species stretches more eastwards still in Bolivia and even more to the south its distribution area extends even further east so that in Argentina it extends to the east side of the Andes.

.....from H.Middleditch

This distribution pattern is not confined to *Lepidophyllum quadrangulare*; a host of spp. forming a fairly cohesive phytogeographic zone, start at the west of centre of central Peru and occupy a distribution area which extends south from there, through Bolivia, a zone which gradually migrates eastwards to terminate in mid-west Argentina. *Lobivia* are to be found over a large extent of this phytogeographic zone.

.....from R.K.Hughes

I cannot see *Austrocyliodropuntia lagopus* or any other form of *A.floccosa* being found anywhere near Arequipa. The city of Arequipa lies at 2339m altitude in the SE corner of Department Arequipa. It is an oasis town on the inland edge of the coastal desert some 90km from the Pacific coast at Mollendo. Just 18 km to the NE of Arequipa is a line of three mountains - Nevado Cachani 6075m, Volcan Misti 5821m, and Nevado PichuPichu 5571m. They appear to ring the city as the first is due north and the last is due east. The Rio Chili which serves the town has a catchment area beyond these mountains, mainly above the 4000m contour. It has been dammed in two places below this altitude to store and control the water in lakes. The road to Chivay starts well above the town, soon surpassing 4000m, after which it skirts the catchment area of the Rio Chili, as far as Sumbay, still in Prov. Arequipa. Behind Nev. Cachani it crosses the Pampa de Canahuas which was covered in a grey volcanic dust that extended as far as Sumbay and possibly some way beyond. The road then goes N and W of N to make a long climb that to over 4900m altitude close to Nev. Huarancante. We did see some areas of *Yarita* [*Llaretia*] along here, but no *A.floccosa*.

.....from K.Gilmer

In the very south of Peru, we travelled north from Tarata on the Pacific side of the Andes, to Ilave in the Titicaca basin, our route running at no great distance from the Peruvian border, first the border with Chile and then with Bolivia. We saw *T.floccosus* only when we were over the highest pass and on the descent which eventually brought us to the shores of Lake Titicaca. Travelling south from Cuzco back to Arequipa, our last sighting of *T.floccosus* was at 4150m., not far before we reached the pass that took us from the eastern to the western side of the divide.

.....from H.Middleditch

It may be advisable to bear in mind that the above observation from J.Iliff regarding the finding of *Tephrocactus floccosus* near Arequipa, will have been made on the basis of a comprehensive appreciation of literature relating to the nomenclature of the Andean *Opuntiodiae*. However, J.Iliff would not appear to be aware of the innumerable errors that have appeared in the cactus literature during the lengthy period since the time of Haworth, a few of which have been reported in the pages of *The Chileans* when they have been relevant to the context. In addition, he may well not be very familiar with the basic phytogeography of the Andes, especially those aspects which affect the distribution area of *T.floccosus*, since this is outside his field of study.

The possibility of finding a floccose *Tephrocactus* near Arequipa, on the Pacific side of the cordillera, does seem to be unlikely. Most probably, the original *T.lagopus* (synonym *T.malyanus*) originated from no great distance from Weberbauer's base at Poto, as indicated in the legend to his picture in his book of both *T.lagopus* and *T.floccosus* growing "in the area of Poto". My own copy of *Pflanzenwelt der Peruanischen Anden* is a reprint so that in the original 1911 edition of this book this particular illustration (Plate XIV) may be of rather better quality.

.....Librarian, Royal Botanic Gardens, Kew

Yes, we do have a 1911 edition of Weberbauer's publication, but we would need to see your 1976 reprint before we could tell you if Weberbauer's Plate XIV in the 1911 edition was of better reproducible quality than in your 1976 reprint.

[The reprint went to Kew Library]

...I am sorry to advise you that our 1911 copy of the Plate you require is no better than your 1976 reprint and it is not worth proceeding with a photograph from our copy.

.....from H.Middleditch

Fortunately my out-dated copy of The Times Atlas does mark the location of Poto, even though this name is missing from the larger scale map received from K.Gilmer and the even larger scale PetroPeru map received from R.K.Hughes.

The accompanying map includes the area to the north of Lake Titicaca where the foregoing habitat observations have been recorded for *T.lagopus* (syn. *T.malyanus*).

**ECOLOGICAL RESEARCH ON THE BIRDS OF THE HIGH PERUVIAN PLATEAU. By J.Dorst.
Translated by H.Middleditch from Sciences Biologiques, Institut Francais d'Etudes Andines. Vol.V**

Of all the natural environments which Peru affords, that which one finds on the high Andean plateaux is, without doubt, one of the most interesting. This region - as well as Ecuador, Bolivia, and Chile, - is, for practical purposes, with Tibet the region of the world where life is established on a permanent basis at very elevated altitudes. Very extensive areas are to be found in Peru at about 4000m and above, on account of the extent of the complex ranges which form the Andes.

It is evident that these may be described very schematically as two mighty Cordilleras, one western one rising from close to the Pacific coast, desert-like on account of the very unusual oceanographic and meteorological conditions, the other eastern beyond which there begins the humid Amazon forest. Between the two Cordilleras there lies the extensive broken plateau whose altitude is most often in the order of 4000m; it is the altiplano of the Peruvians, to which the name puna is often applied. But a scheme as simple as that ignores the extraordinary complexity of the innumerable ranges of mountains, gashed by great gorges which have been carved out by rivers, of which the large majority flow towards the Amazon.

The relief of course has brought about a succession of biological environments, rising in tiers on the flanks of the Andes, in accordance with the considerable changes in the climate. From the very marked aridity of the Pacific coast, there is a zone of moderate altitude, a semi-desert where considerable stands of cacti are to be seen. This is followed at about 1600m altitude by a kind of bushy steppe. Then follows more humid areas between 2500 and 3200m. Above that, a dryer zone marks the transition to the environment of the high plateaux proper.

It was in this zone of the high plateaux that we stopped to study the avifauna and its ecological characteristics. In the course of our mission to Peru we have had occasion to study this habitat at two places: one spot in central Peru, in the region of Lake Junin, the other spot in southern Peru, to the north of and in the immediate vicinity of Lake Titicaca. This latter study extended from December 1954 to March 1955, during the rainy season. The observations which we report concern, to a large extent, the south of Peru.

The climate of the puna is extremely harsh. To the effects of altitude which involve a very marked rarification of the atmosphere, are added severe climatic factors: very low average temperatures, a great diurnal variation in temperature, and violent winds. Let us quickly examine these elements, so important in the ecology of the animals, by borrowing a few notes from the fine botanical work of Weberbauer (1945). Unfortunately data is very sparse with regard to the Andean region and the numerous local variations, as it is just these very micro-climates which play the most important role in ecology.

The average temperature is low on the whole. Thus at Puno, a town situated at 3822m on the edge of Lake Titicaca, the mean temperatures noted by Weberbauer are as follows:-

The warmest month, November 10.3° Annual mean 8.3°

The coldest month, July 5.8° Annual mean temperature range 4.5°

But the climate of Puno, and in general terms of the immediate surroundings of Lake Titicaca, is particularly mild on account of the nearness of the lake, whose temperature varies between 12° and 15° throughout the whole of the year and which on this account has a most important ameliorating effect. The stations further away from Lake Titicaca have, on the other hand, a much more severe climate, especially if they are more elevated. Thus, for example, again quoting Weberbauer, the mean temperatures at Vincocaya, a place situated at an altitude of 4300m and some 120 km as the crow flies to the west of Lake Titicaca, are as follows:-

The warmest month - November 4.8° Annual mean 1.9°

The coldest month - July -2.3° Annual mean temperature range 7.1°

These figures demonstrate that temperatures are in general terms low on the high plateaux.

But like anywhere else at such altitudes, the insolation is considerable in the Andes. It is notable that this brings about a rapid heating-up of the air by day, contrasting with an intense cooling down by night, which results in very wide ranging fluctuations in temperature. These reach their maximum amplitude during the dry season - the southern winter - in the course of which not a cloud occurs to screen the rays of the sun, and there is no precipitation to moderate the nightly minimum at that time. It is at this season that the most extreme maxima and minima are to be noted; a maximum in the order of +15°, often set against a minimum in the night of -15°, being a diurnal range in the order of 30°. The minima are never quite as low during the rainy season; thus at Checayani, at 3900m, from the 21 January to the end of February, the thermometer only dropped below zero on two occasions, the nightly minima usually varying between 2° and 5°. The daytime maxima were in the order of 20° - this temperature being taken in the shade.

It is moreover essential to observe that the ground and above all the rocks warm up much more quickly than the surrounding air during the day, as indicated by the following example (per Weberbauer), recorded at Pasto Bueno, Prov. Pallasaca, at 3950m:-

	6h	8h	12h	14h	16h	18h
Air	4.6	6.9	11.0	10.3	7.3	6.0
Ground	6.0	7.2	16.5	17.0	14.4	12.6
Rocks	5.3	8.3	21.0	23.6	16.4	14.2

Consequently the rocks play the role of a heat reservoir, or better a thermal flywheel. This point is worth remembering as the birds, and living things in general, have made the best of this phenomenon.

These climatic conditions [in the Puna] have brought about a very special flora, of which the most obvious feature is the almost complete absence of aborescent plants. Only the *Polylepis*, a member of the Rosaceae peculiar to the Andean environment, occupies a restricted number of locations at the bottom of sheltered valleys. Among the other plants, the majority do not rise very much above the surface of the ground. Many form very characteristic small cushions, consisting of components pressed closely one against the other. Such are in particular the *Azorella*, an umbelliferous plant endemic to the Altiplano. The number of plant species is relatively limited on account of the severe climatic conditions: the aridity, the frost, the diurnal variations in temperature and the wind prevent any major development of plant cover. The aridity is attested by the presence of cacti growing at a great altitude in the Puna. Certain cacti are of a "normal" appearance (*Echinocactus*), whilst others are furnished with a thick coating of woolly hairs (*Opuntia floccosa*, *O.lagopus*) The countryside of the Altiplano resembles that of the steppes, of which the most characteristic and the most widespread are the steppes of ichu, a rough grass growing in tufts widely separated one from another. Elsewhere, there extends forms of tundra, such as *Distichia* bogs.

But in sheltered places, the bottoms of valleys, rocky cliffs, or just well favoured slopes, there occurs the growth of more numerous plants, often forming a more or less dense undergrowth, sometimes reminiscent of the Maquis. These plant formations are clearly more favourable for birds, which show a marked preference for them.

But if one considers the more and more elevated areas, the quantity of vegetation decreases rapidly, and ere long the biotype becomes plainly desert-like. There are rocky slopes which allow the vegetation to climb to even more elevated altitudes on account of their more favourable steady thermal regime. As Weberbauer so correctly stated, at the limits of existence of vegetation, the stony ground and the rocks form oases of warmth in a cold desert. This image applies as much to the birds as to the vegetation.

.....from H.Middleditch

The author of this article states that he quotes from Weberbauer 1945 the mean temperature for July at Vincocaya as "2.3°". But if this figure is taken together with those for mean temperature for the warmest month and the annual mean, the arithmetic just does not add up. The 1911 review of the Peruvian vegetation by Weberbauer gives a mean Temperature for June at Vincocaya as "-2.4°"; consequently the relevant figure given by Dorst has been entered above as "-2.3°".

The *Tephrocactus lagopus* (syn. *T.malyanus*) must surely be a good example of one of the "characteristic cushions whose components are pressed closely one against the other" indicated by Weberbauer as occupying terrain around the 4000m mark. Clearly *T.floccosus* can still survive in conditions favourable to *T.lagopus*, but there appears to be a lower level below which *T.lagopus* can no longer survive.

The implications for the environment of the data originating from Weberbauer in respect of the daily temperature cycle in air, ground, and rocks, and its impact upon the vegetation, are reflected in the growth form of *Trichocereus tarijensis*. The tall columnar forms photographed by K.Gilmer on the steep rocky slopes are clearly taking advantage of the heat reservoir - or thermal flywheel as it described by Dorst - provided by the rocks lying on the surface of the slope. By comparison, the habitat picture of a *T.tarijensis* shown to our Chileans Weekend (circa 1978) by R.Kiesling, is of plants growing on substantially level ground, with no obvious signs of a stony surface - and growing only to about waist height. Probably two ecotypes of the same species?

In the inter-andean valleys of Peru there is a huge change of altitude involved in the descent from the puna to the floor of the valley. This is reflected, for example, in such significant changes in the form and external appearance of the *Espositoas* that they can be classified into separate species without undue difficulty. A decidedly lesser, but not insignificant, change of altitude from the floor of the valleys of the Rio Tumasla ("Cinti valley") and Rio San Juan del Oro, to that of the altiplano, is likewise reflected in differences in both *Lobivia* and *Parodia* which are to be found growing at lower altitudes in the valley, from those growing at higher altitudes on the altiplano, where different climatic regimes prevail. But in the area around Culpina, Inca Huasi, and La Cueva, altitude changes are moderate, whilst the general climatic regime is fairly comparable overall. In such circumstances, it is differences in the local nature of the ground, in orientation and hence degree of exposure to sun and the consequent calories per square metre received on the surface, etc., which causes the vegetation to vary its strategy for survival. The result is to be seen in the Culpina basin and adjacent basins in the surprising degree of variation in the overall appearance of the *Rebutia*, *Parodia*, and *Lobivia*, which pose not inconsiderable problems in deciding what name might most suitable be applied to this or that particular form.

PLODDING ROUND THE PILOSOCEREUS From M.Smith

In the last four years I have been travelling on three occasions in the Grenadines and Grenada, St.Lucia, and St.Vincent in the West Indies. These trips have been a mixture of holiday, cactus hunting, and visiting friends I have made on the islands. The documentation of this region is pretty patchy as far as the cacti are

concerned, despite being some of the first places in the Americas to be discovered. It makes it an interesting place to explore. My main interest, as far as cacti over there is concerned, are the Melocacti, collecting seed of them, and charting their variation and distribution. However, being a fan of all cactus, I collect other things, hence I have also collected seed of *Pilosocereus*.

By far and away the most common cactus in the Lesser Antilles is *Pilosocereus royenii*. Anywhere which is reasonably dry is likely to have them. It grows in quite dense shade in reasonably dry scrub forest, on any rocky hill or exposed outcrop, by the roadside, on the sheer face of lava sea cliffs, etc., etc.! It is obviously as tough and adaptable species. It does of course vary somewhat between the islands and its stature and growth form are greatly affected by its location. The finest specimens are usually on dry hills by the sea, or on peninsulas jutting out into the sea.

The usual way of collecting the fruit is to knock it off the plant with a stick. But sometimes they keep on flowering from old flowering zones for some years and then the fruit is within easy reach. Ripe fruit with seeds are quite difficult to find. Seemingly mature, but still green fruit, always contains immature seed, which dries to brown, rather than to the black mature seed. When properly red and ripened, the fruits are filled with seed and funicular material, with no air spaces or jelly like substance, although I suppose the decaying funicular material may turn into a slimy goo as time passes! Quite often, a fruit will turn out to have been completely emptied of seed by birds and ants, so one must catch fruit shortly after ripening if you are to find seed.

Because of this rapid dispersal, there is no such thing as an old fruit from the previous year. If you received some seed which failed to germinate then I would suspect that it was either not mature enough, or had been stored for some time after collection. However, I still get good results from four year old seed, so who can say?

.....from H.Middleditch

In the list of seed collections accompanying the foregoing letter, the only *Pilosocereus* recorded is *P.royenii*. However, in Britton & Rose *The Cactaceae*, *Cephalocereus nobilis* synonym *Pilocereus nobilis* Schumann is stated to occur in the West Indies with a distribution from St. Christopher to Grenada. This clearly includes St. Lucia, St. Vincent and Grenada. Hence it is somewhat surprising that there does not seem to any mention by M. Smith of *Pilosocereus nobilis* in his list of seed collections. Were any plants seen resembling the picture of this species in Britton & Rose Vol.2 Fig 64?

.....from M. Smith

Although I have not seen the illustration of *Pilocereus nobilis* in Britton & Rose, I would suspect that it may merely be *P.royenii* growing in a shady situation. *Pilosocereus nobilis* is reduced to a synonym of *P.royenii* by Howard, *Flora of the Lesser Antilles, Leeward and Windward Islands*, Vol.5, Harvard University. The description of *Pilocereus nobilis* in Backeberg's *Lexikon* would certainly fit plants of *P.royenii* growing in dry woodland. He describes the flowers as purplish pink, a colour that I have never seen, but Howard describes it as white, fading to pink or purple. All plants that I saw in flower were greenish white, despite the vegetative characteristics being very variable.

.....from H.Middleditch

In Britton & Rose [*Ibid*] *Pilosocereus royenii* is stated to have a distribution from Antigua to Puerto Rico, which effectively places its distribution area geographically adjacent to that given for *P.nobilis*, without any apparent overlap. Whilst *P.royenii* is stated to attain heights up to 8 metres or more, there does not appear to be any reference to the height attained by *P.nobilis* either in Forster-Rumpler (under the synonym *P.strictus*), in Schumann *Gesamtbeschreibung der Kakteen*, in Britton & Rose *The Cactaceae*, or in Backeberg *Die Cactaceae*. What sort of maximum height did these plants attain in St Lucia, St. Vincent, and Grenada? Since the original *Cereus nobilis* Haworth dates from 1812 and the original *Cactus royenii* Linnaeus dates from 1753, it is clear which name would have priority.

Additionally, what led to the conclusion that the fruit were stripped of seed by birds or ants? Did this apply only to fruit which had fallen off the plants and was lying on the ground?

.....from M. Smith

Fruits that had been visited by predators had a hole apparently pecked through the wall of the fruit, which would be 3 to 4mm thick. On a number of occasions ants were found inside the fruits, clearly collecting the seeds - some of the ants were seen holding seeds. However, I have never seen birds actually pecking the fruit. As far as predation of fallen fruits, all I can say is that the only fruits I ever found were all still attached to the plants, and were either unripe and green, ripened and untouched, or ripe and emptied of seed or in the process of being emptied by predators. The plants appeared to flower and fruit almost continuously, and fruit seems to survive being eaten for only a short while after ripening. In fact, ripe fruits are hard to find. Nowhere did I see any old or dried-up and leathery fruit at all, neither on the plants or on the ground. It merely appears eaten whilst still on the plant, a short period after ripening.

.....from B. Adams

The island of Monserrat is entirely volcanic in origin with mountains reaching 7000 feet in height. These peaks are almost permanently shrouded in clouds which create an annual rainfall of over 100 inches. This heavy and persistent rainfall, coupled with high temperatures, is reflected in the vegetation which consists largely of tropical forests, often of bamboo. On the middle reaches the land is heavily cultivated with, for example, yams, except where there are still areas of sulphurous activity.

At the north and south of the island, and along the coastline, the climate is much drier with the annual rainfall down to 40 inches. The vegetation here is much more xerophytic in character, being dominated by acacia thornbush and Cactaceous intrusions e.g. *Melocactus intortus*, *Pilosocereus* sp., *Agave* and *Bromeliads*. *Pilosocereus royenii* is very noticeable because of its height, up to 20 feet or more in sheltered locations, and

its cephalium growth. On more exposed locations, especially on the windward side of the island, the plants are considerably smaller, only up to 5 to 6 feet tall. Since Monserrat is situated in the Trade wind belt, the prevailing winds are constant in direction throughout the year. The flowers of this species smell of garlic, opening approximately half an hour before dusk. It is possible that the flowers are humming-bird pollinated, as one or two birds were seen in the vicinity of these plants. However, all the flowers examined were full of beetles. The cephalia, from which the white flowers emerge, tend to point to the SW, but this is not universal. Indeed, it is quite difficult to determine which way the cephalium may be pointing as it can easily extend a quarter of the way round the stem. The fruits were observed to be rapidly eaten by various agents, e.g. wasps. Although there are a number of names for the Pilosocerei which occur in this region, it is doubtful if there are plants to match.

.....from C.Norton

My plant of *Pilosocereus palmeri* came from Blackburns of Preston about 25-30 years ago. It has been kept in a greenhouse at a winter temperature of nominally 50°F although in a cold winter it drops occasionally to 46/47°F. During one bad winter, however, it marked terribly so it had to be chopped down. The base started to grow an offset which I cut off when it reached about four feet tall and then rooted it down. In the following year the long, thick wool was produced in the flowering zone and it subsequently flowered very well. Until the cephalium was formed, the ribs had very little wool. However, a few years ago when transporting it to a show, it was badly damaged and so I had to start all over again with another cutting.

To give it all possible encouragement, it was put into a free root run in a bed in the middle of the greenhouse, which was built up from floor level, so that the roots could go down to the concrete floor but no further. In order to obtain more height for the tall plants, this centre bed has been demolished and the floor dug out to roughly a couple of feet deep and lined with plastic before filling with compost. There is a ditch running behind the house which floods at times of heavy rainfall and I did not like the idea of the roots of the tall plants getting into ground which might well be sodden.

This *Pilosocereus* often has five or six flowers open together. They begin to open just before dusk and last for only one night. The flowers have a really foul smell. If no fruit is set, the flowers drop off within two or three days. The flowers must be self-fertile as fruits do set without any help from me. The fruit stays green and enlarges steadily until eventually the fruit will split. The walls of the fruit at either side of the split seem to pull backwards towards the plant. This exposes all the fleshy seed threads which are a bright beetroot colour and this smells just as bad as the flower. I suspect that often the night time temperature in the greenhouse, especially during the summer, is too high for the flowers to set fruit, but in habitat the nights are much cooler.

.....from J.Voase

Some time ago I received from C.Norton a cutting off his *P.palmeri*, which rooted down and thrived. Only a year or two after it settled in here it produced a cephalium, which extended almost all round the plant. Then over the next two or three years the areoles on the new growth produced some bristly hairs, which were absent from the lower part of the stem, but nothing resembling a thick woolly cephalium. In the next Spring it put on more of this same growth for a short length and then produced another circumferential cephalium extending over some two inches of stem, completing the season's growth with a further short length of hairy areoles similar to those between the two cephalia. It has done exactly the same thing this year, so that there are now three separate rings of cephalia along the stem. Flowers appear from the cephalium regularly each year whilst this year both lower cephalia have produced flowers. The middle cephalium had a second flush of flowers in August. When the flowers are open I usually stick my finger into the flower and stir it around a little and this seems to be quite effective in persuading the flowers to set fruit. The interior of the fruit is full of mush and it is very difficult to separate the seeds out of this mush. The only effective way I have found is to wash them out, and then let them dry straight away.

The seed harvested in one year is usually sown in the following Spring and germination is excellent. All my plants are grown in a mixture of four parts of grit to one part of mole-hill loam, to which is added a spot of J.I. base fertiliser, some bonemeal, and a touch of gypsum. The greenhouse has a twin-wall polycarbonate roof, all the fixed panes of glass on the sides and ends being secondary glazed. It is kept at a nominal 50°F in the winter.

A TRIP WITH RITTER ALONG THE COAST OF CHILE By A.F.H.Buining.

Translated by H.Middleditch from Succulenta 50.6.71 & 50.7.71.

On 19 January we took our lunch sitting in the midst of the rare *Copiapoa hypogaea*. These plants were very difficult to find - they were set half into the ground and concealed between stones, some even in flower. The rest of the day we trekked over apparently endless mountain ridges where we came across *Eulychnia St.Pieana*, *Neochilenia intermedia*, *Neochilenia scoparia*, *Copiapoa mollicula*, *Copiapoa bridgesii* and *Copiapoa serpentisulcata*. The botanising and photography took rather a lot of time. Just before the descent we found here *Opuntia tunicata*. It was already evening when we got down, dead tired.

The following day we trekked through wild gulleys to finally reach the habitat locations of *Neochilenia pulchella* which often grew inaccessibly in clefts against perpendicular cliffs. Further trekking this day enabled us to collect *Neochilenia pilispina* and *Copiapoa cinerascens v.intermedia*.

Leaving the main road going into the mountains and taking the way along the sea coast, Ritter relocated his *Neochilenia pygmaea*, *Copiapoa cinerascens* and - on an outlying mountain - *Copiapoa barquitenensis*. We also found *Copiapoa columna-alba* and *Thelocephala malleolata*. In the early evening we took a bath in the cool Humboldt current along the totally deserted beach

On 21 January we must either go back to the Pan-Am or risk one of the almost invisible tracks more or

less along the sea coast towards the north. The choice was difficult on account of this latter route being very hazardous. We preferred the doubtful route! With a great deal of difficulty plus good fortune, we got across dunes of deep loose sand, and after that there was no going back. After that we came into an area where the tracks sometimes came to a dead end at the sea coast and then we had to turn round and go further inland once again in order to take our bearings. Taking bearings came naturally to Ritter. He repeatedly ran up a hill to be better able to orientate himself.

For the umpteenth time we came out again on to the coast, in this instance apparently according to our measurement we had landed at roughly 1000m above the level of the sea. A magnificent view, but we were completely uncertain which way we should turn. The only way ahead went downwards into the sandy desert, only traversable with difficulty - and we could no longer go back.

Suddenly, at the same time, Ritter and I both pointed at a small cactus, some with and some without spines, which were almost entirely sunken into the stony ground. After scraping away the ground or blowing away the finer material, a closer examination could be made - they were both solitary and in fine clumps. They possessed a very long carrot-like root, so that at first we thought they were *Theloccephala*. But finally we concluded that it must be a hitherto unknown species of *Copiapoa*, which later it rightly proved to be.

Such an unexpected new discovery gave us fresh hope but then we must still move on in one direction or another. We went down a gentle descent, shaping a course towards the north. There was no longer any sort of track and to make matters worse at one point the vehicle became completely bogged down in deep loose sand. It was the middle of the day in blistering heat. All three of us began to dig out the vehicle and to fetch stones which were everywhere around us. After several hours of toil, Ritter finally succeeded in getting the vehicle out of the trap and on to more solid ground. I then had to go in front on foot to make sure we avoided any pitfalls in which we might get bogged down again.

Ritter drove the Ford to a better track which led us to a fine habitat location of *Copiapoa columna-alba* alongside which we also came across *Theloccephala malleolata*. Then ere long we finally came into a unique flat area where dozens of *Copiapoa columna-alba* stood like small penguins. It was a fantastic sight to see there all the solitary individual "menhir" figurines. They were magnificent snow-white plants with blackish areoles.

Further on, not far from the sea, there was an abandoned gold mine, where we could drive easily and collect *Copiapoa longistaminea* and *Copiapoa grandiflora*. After that, the method of reaching the sea by a fisherman's cottage was really not fit for a vehicle. We had to drive through a ravine in which the side walls were barely further apart than the width of the vehicle. The "road" goes in that manner over all sorts of boulders so that we were in mortal fear of getting hopelessly stuck fast.

At last we came through the defile and to the place, on the other side of which and within easy reach, Hutchison in his time collected *Pyrrhocactus taltalensis*. After undertaking some climbs on foot, Ritter brought back to me his *Eriosyce rodentiophylla* and *Copiapoa hornilloensis*, exceedingly rare plants. Further on we came near to the growing place of *Theloccephala esmeraldana*.

.....from H.Middleditch

This account of the journey along the coast of northern Chile made jointly by Ritter and Buining appears in both the Dutch and the German Cactus Journals. These two accounts do not duplicate each other but there does not appear to be any fundamental conflict between the two versions. The account in K.u.a.S. is somewhat abbreviated in places but at the same time it does include a few specific pieces of detail which are omitted from the Succulenta version. For convenience of reference, these additional details have been included chronologically within the above translation.

This account makes very few references to actual place names and it is not improbable that the author chose to be deliberately vague in order to conceal information regarding habitat locations. Nevertheless a careful study of the text does admit of a number of these locations being established with reasonable certainty, whilst others remain rather vague.

Immediately prior to 19 January there is a reference to the party being at Chanaral. In K.u.a.S. the record of plants which were seen on 20 January includes *Copiapoa columna-alba* and *Theloccephala malleolata*, both being omitted from the Succulenta account. In Englera 16 the collecting locations for FR 517 *Theloccephala malleolata* is given as both to the north and to the south of Chanaral, as well as near Pan de Azucar. All the other species noted as having been seen on 19 January are on record as growing in the general surroundings of Chanaral. From this, it would appear that Ritter & Buining were at Chanaral on 19 January.

It was on 20 January when the party went northwards from the Chanaral area and during that day Ritter "relocated his *Neochilenia pygmaea*". In Englera 16 it is recorded that *Neochilenia pygmaea* FR 519 was found by Ritter at three locations, respectively 20 km., 21 km., and 24 km. to the north of Chanaral, which is approximately half-way between Chanaral and Pan de Azucar, along the only available road, which closely follows the coastline. On this basis, it might be suggested that if the party continued to travel in a northward direction during the rest of that day, they would be at no great distance from Pan de Azucar by that evening.

From Pan de Azucar a decent road can be followed in an eastward direction, to the Pan-American highway. Alternatively, it is possible to travel north from Pan de Azucar and pass through the area which is now a National Park, which lies between the coast and the Pan-American highway. Between the coast at Pan de Azucar and Esmeralda, there is no route along the shoreline as the cliffs rise precipitously from a narrow beach or almost from the edge of the waves. Nowadays there is a route northwards along the cliff top - there are also occasional tracks here and there within the National Park area, going nowhere in particular precisely because there is nowhere particular to go to within this area. Roughly half way between Pan de Azucar and Esmeralda, near Las Lomitas, the ground reaches its highest point in this whole area, over 900m altitude

according to the contour lines. That part of the above account by Buining of their journey north towards Esmeralda is consistent with crossing the Pan de Azucar National Park. This would place the semi-subterranean Copiapoa found at "about 1000m above the sea" in the area of Las Lomitas.

This supposition may be supported by Ritter's later Type location for his *Copiapoa esmeraldana* sp. nov. of "steep coast south of Esmeralda; discovered 1969 by A.F.H. Buining and myself" as quoted in his *Kakteen in Südamerika*. In addition, it was not long after they left the site of their newly-discovered Copiapoa, whilst travelling in a roughly northerly direction, that they came across *Copiapoa columna-alba*. This might be regarded as rather unexpected since the ground level thereabouts could still be around 800m altitude which might be considered too high an altitude for these particular plants. However, in the Schulz and Kapitany Copiapoa book there is a recorded location for *Copiapoa columna-alba* at no great distance to the north of Las Lomitas, at over 700m altitude. This again confirms the probability of *Copiapoa esmeraldana* having been found at Las Lomitas.

The reproduction of the picture of *Copiapoa esmeraldana* in Ritter's *Kakteen in Südamerika* (Abb.978) is rather dark and in consequence details are rather obscure. It is, however, possible to see the distinct ribs which are almost vertically disposed and which appear to be divided into tubercles in accordance with the description of this species. The rib count of (11) 12-13 (-15) quoted in the description of *C.esmeraldana* accommodates the pictured plant, which is evidently one of the spiny specimens mentioned by Buining; but there is mention only of spines of 1 to 2 cm in length and no reference in the Ritter description to spiny and spineless specimens as seen jointly by Ritter and Buining in habitat. Together with the quoted body size of 3.5 to 7 cm diameter, the relative spine length to body size in Abb.978 would fit a 1 to 2 cm spine length.

....from A.W.Craig

The plants which Buining mentions that he and Ritter found on 19 & 20 January can be seen at various spots not only inland from Chanaral but also to the north and south of that place. Buining then refers to *Neochilenia pygmaea* that they found travelling north; we also found this plant when we were travelling along the coast road from Chanaral to Pan de Azucar. It was growing at no great distance from the roadside in ground that was a mixture of sandy, rocky, and stony places. This is the only locality from where this species has been reported so it seems that Buining and Ritter also took this same road from Chanaral to Pan de Azucar.

Just before reaching Pan de Azucar we came to a broad sweep of a bay with a good wide beach along most of its length, much of it being composed of white sand and not surprisingly this beach goes by the name of Playa Blanca. This beach is now a camping site, well-used for northern Chile, although it was probably used by far fewer travellers when Buining and Ritter were there. Roughly a km to the north of Playa Blanca, over a quite low ridge which juts out into the sea, there lies Pan de Azucar.

At Pan de Azucar, and at nowhere else between Chanaral and Esmeralda, there is indeed a choice between taking the road going inland to the Pan-Am highway, or going northwards into the Pan de Azucar National Park. There is no real road into this Park area. A few km inland from Pan de Azucar we could see faint tracks leading northwards into the hills, which could have been made by the Park Rangers going out on patrol. Like Buining & Ritter, we also found our way into those hills, where there were very few real tracks, but mostly they were non-existent. It was simply a matter of keeping clear of the rocks whilst trying to maintain a heading in the right direction.

We did reach the area of Las Lomitas where a short walk brought us to the edge of a very steep slope going uninterruptedly down to the beach, a considerable distance below. My first inclination would have been to regard an altitude of 1,000m as quoted by Buining for this coast, as a fantasy, but after consulting my maps and the plotted contour lines thereon it is evident that the highest point is not far short of that altitude. It was on the gradual ascent to this spot, along one of the numerous quebradas running south from the area of Las Lomitas, when we were so fortunate as to find *Copiapoa esmeraldana* in sandy ground on the east side of one of the smaller valleys. We also found what was probably this self-same species in the form of a small semi-subterranean plant near Las Lomitas [Chileans No.57 p.129]. Consequently I would accept that the original Buining & Ritter find of *C.esmeraldana* would be on the coast side of Las Lomitas.

At odd places in the general area of Las Lomitas we came across various stands of columnar cacti, probably *Eulychnia* and *Trichocereus*. Almost without exception these plants were hung with moss and lichen drooping from their stems and branches, with little droplets of water falling from the ragged strands on to the ground below. From Las Lomitas there is a gradual descent northwards over undulating and mostly bare ground to the sandy desert area in which the Quebrada Grande and its numerous side valleys are to be found. This area fully merits Buining's description of it as a sandy desert. Having seen fields of *Copiapoa columna-alba* at various places on several occasions when we were in this general area, we now tended to give these particular plants barely a passing glance, so I can imagine that we could have passed some of these plants on the descent to Quebrada Grande without actually taking notice of them. But fortunately we do have a photograph which was taken on the descent to Quebrada Grande in which there is not only a stand of *Eulychnia* - festooned only very sparsely with moss - but also some *Euphorbia* bushes as well as various lower growing plants - but growing apart from each other, not covering the ground. And on this same picture there are also a few *Copiapoa columna-alba*. Doubtless Buining also passed one such spot on his descent from Las Lomitas where he, too, saw some *Copiapoa columna-alba*.

The lower we descended into the Quebrada Grande, the wider the valley became and where it joined the Quebrada de la Cachina there was a very broad flat area, well over a km in each direction, dotted throughout with solitary, short, leaning columns of *Copiapoa columna-alba*, and very little else grew there. Our own picture of this population certainly reflects the Buining description of the plants standing there like penguins. Going seaward from there, along the Quebrada de la Cachina (a dry, flattish valley), one does indeed come to the abandoned Planta Esmeralda where *Copiapoa longistaminea* and *C.grandiflora* may be found in the

surroundings.

Despite there being an absence of any real guide to locations in the article written by Buining, it is nevertheless not too difficult to establish where he and Ritter travelled, as well as what they found where, from our own experiences of travelling in this area.

.....from P.Klaasen

Our trip to Chile in 2001 was undertaken in the months of May and early June, which is not the traditional season for such trips as it is outside the peak flowering season. However, at all the Copiapoa locations that we visited there were at least a few specimens in flower. Near Esmeralda we found a plant which we called Copiapoa esmeraldana, which was growing together with a population of C.lauí, C.grandiflora, and C.longistaminea. While we were there, it was observed by M.Machado that he had been able to follow a single black fly that visited flowers of all these four sorts of Copiapoa!

Following the cliff top southwards, we came to the Park Ranger station at Las Lomitas where they have a small garden in which various cacti are planted. These included some Copiapoa under the name of C.hypogaea so we enquired where we could see these plants. We were given directions to follow the cliff top track for a certain distance. So we took this track and stopped at about 750m altitude in the area where these plants were said to grow. There were a few scattered Eulychnias and Trichocereus to be seen around here, as well as some low shrubbery, together with lichen which was indicative of a high humidity.

We had a party of 16 people in five vehicles, so we agreed that each vehicle would stop one km beyond the previous vehicle. The occupants would then walk for one km at just over arms' length apart along one side of the track, and then return in the same manner along the other side of the track. We relied on at least one plant being in flower to give away a small population and we were lucky - without flowers, these plants would never have been found. The plants were completely covered in grit so that only a flower gave away its presence. After finding two plants in this way, brushing away the grit close by, revealed other plants that were not in flower. We found no fruits, so there was no seed to bring home.

It was the Kapitany and myself who found these plants - the others had no success. No plants were found during a brief search on the inland side of the track, so they seemed to be limited to the narrow strip some 10 metres wide between the track and the edge of the cliff. There were about a dozen plants that we found at this spot, including one just over the edge of the cliff, amongst the rocks, which was found by L.v.d.Hoeven. They did have spines which were whitish in colour, but predominantly on the lower areoles, as if those on the higher areoles had been worn away - perhaps by sand storms? These plants did have a likeness to Ritter's Abb.1019, but I suspect that the plant in his Abb.1020 is in cultivation. However, the plants we found did not have the deep brown colour and rugose epidermis that is to be seen on C.hypogaea in cultivation. One of our Chilean companions dug up one of these plants, some 4cm in diameter, to reveal a massive tap root and a distinct neck.

Travelling a few more km southwards, but still in the general elevated area of Las Lomitas, we made another stop. Here we were so fortunate as to find C.lauí - the first plant giving itself away by being in flower, after which a search on hands and knees found a few more. Here we also came across another Copiapoa which some members of the party felt could be called C.grandiflora. Certainly we had seen C.grandiflora growing alongside C.lauí earlier, near Esmeralda. Further south still, we did look for C.hypogaea on the slopes of the hills to the north of Chanaral airport, with the town of Chanaral opposite in the distance, but failed to find any.

.....from H.Middleditch

The description of both the semi-subterranean body and of the enlarged rootstock of the small Copiapoa unearthed near Las Lomitas by this party, seems to compare remarkably well to that found by A.W.Craig in the Quebrada de la Cachina at a spot some 10km from the shore [Chileans No.57 p.128].

.....from B.Burke

We saw quite a number of Copiapoa in the area of Esmeralda which were like the plants pictured in the Schulz & Kapitany book as C.esmeraldana. Wherever we saw C.esmeraldana around Esmeralda or Guanillos, it was always growing in company with Copiapoa laui. When we were in the area of Las Lomitas, I noticed some birds perched on the Eulychnia there and I was wondering how it might be possible to take a reasonably good photograph of them. At this point in time I was walking round very slowly looking at the ground in case there might have been a semi-subterranean cactus there, whilst at the same time I was eating a sandwich. Suddenly my eye caught sight of a tiny patch of white on the ground almost under my feet, which I immediately assumed was a small crumb off the sandwich. Thinking that this crumb might possibly be put to use to attract the birds to come nearer the camera, I bent down to pick it up - only to find that it was no crumb, but the white wool on top of a Copiapoa laui. Once having found this plant, it was a case of going down on hands and knees to search for any more. There were indeed a few more, but not many, none of them even one cm across, very probably only half that size. So evidently both Copiapoa esmeraldana and Copiapoa laui can be found growing at Las Lomitas,

.....from W.Maechler

Our expeditions on foot took us southwards from the Esmeralda mine, along the tops of the hills, parallel to the coast. In this way we came to the vicinity of Las Lomitas, at the summit of the Pan de Azucar National park. There is a thick mist every day around these hill tops, so that Eulychnias and bushes are to be seen hanging with lichen. Not far from here, on a steep slope (the Type location according to Ritter) I have seen Copiapoa esmeraldana. The plants here are similar to a small Copiapoa which I have found to the NW of Mina Esmeralda which grows in a very depressed fashion, with a diameter of about 5 cm., mostly solitary, rarely offsetting, with a brown body colour, almost spineless; the spines are about 2 to 3 mm long. From a distance it looks similar to C.hypogaea, but I have never seen it in flower.

.....from N.Rebmann

We have seen *Copiapoa esmeraldana* near Las Lomitas and to the north of Las Lomitas. We also found it on a ridge in the Guanillos valley, as well as near Mina Esmeralda. It is a small plant with one head or - if it is clumping - it has no more than three or four heads. Each head will be 2 or 3 cm across at a maximum; they may be with or without spines, as illustrated in the Schulz & Kapitany "Copiapoa" book. The ridge in Quebrada Guanillos on which we found these plants is shown in the Schulz & Kapitany picture 114, where the *C.esmeraldana* grow at the top or some two or three metres down from the top, on flat patches in small gravel, at 220m altitude. We found that *Copiapoa esmeraldana* were fairly common in the Guanillos valley, but only a few *C.esmeraldana* were seen near Mina Esmeralda, again growing in small gravel. Similarly at Las Lomitas the *C.esmeraldana* grow in small gravel on flat patches, at 800m altitude, close to the edge of the steep drop down to the shore. The plants we saw at Guanillos and Esmeralda were brown, but at Las Lomitas they were green or pale green.

.....from R.Ferryman

We also found *Copiapoa esmeraldana* growing on both the flat ground and on the slopes around Esmeralda. This species is quite widespread in that area and whilst it is almost always flat with the ground, it can have either a dark green or dark chocolate coloured body, depending upon the exposure of the plant. My recollection of the spines on *C.esmeraldana* is that they are small, generally radials only, and quite often missing entirely when it gives the impression of a spineless plant. Generally they are small plants, although they do sometimes offset, with individual heads rarely exceeding 50mm across, but they do offset to form "hard" small clumps. It could easily be mistaken for *C.grandiflora* in its juvenile state. These are the plants which are depicted in the Schultz and Kapitany *Copiapoa* book as *Copiapoa esmeraldana*.

.....from H.Middleditch.

The body colour perhaps reflecting the effect of more moisture and shade in the more persistent mist zone, and less moisture and shade below the persistent mist zone? The presence or absence of spines reflecting Buining's observation on first encountering this species?

The Schulz & Kapitany book on *Copiapoa* identifies as *C.esmeraldana* certain plants seen around Esmeralda, as well as to the north of that location, in the Guanillos valley. They quote having observed bodies of 3 to 5 cm in diameter with spines 5 to 15 mm long, which thereby fit within the Ritter description for *C.esmeraldana*. This body size can be checked against their Fig.117 p.98 using the 10 mm diameter heads of *C.lau* as a yardstick.

.....from C.Pugh

We have been in the area of Esmeralda on one or two occasions, when we were able to catch sight of the small *Copiapoa esmeraldana*. My recollection would be that these plants were some 2 inches in diameter at the most. At a quick glance they might have been taken for a *Thelocephala*, but the *Thelocephala* were very seldom to be seen with any part of their body above the level of the ground and in fact it was usually a slight depression in the surface of the gritty sand that gave away the existence of a *Thelocephala*. On the other hand the *Copiapoa esmeraldana* almost always grew on rocky places which were the typical locations for *Copiapoa grandiflora* and *Copiapoa laui*. The *Copiapoa laui* is a magnificent plant which fits very well into its habitat and was to be seen in quite staggering numbers, usually with dozens of small heads packed closely together. *Copiapoa grandiflora* is not a large plant but it is not as small as *C.esmeraldana*. If we had been like Buining and Ritter and come across our *C.esmeraldana* when we had stopped for a breather, we might have made a mental note about whether there were both spiny and spineless plants. But as we did not sit and contemplate the *Copiapoa esmeraldana* we saw, I could not comment on that feature. In addition, I do not recollect having seen any flowers on *C.esmeraldana*, whereas I can say quite positively that I have never yet seen *Copiapoa laui* in flower in habitat.

.....from A.W.Craig

On reflection I would also say that I have never seen a *Copiapoa laui* in flower in habitat, although we have seen them in the months of October, November, and December.

.....from F.Kattermann

At Las Lomitas we were able to find FK 794 *C.lau* as they were in flower. Later I made further collections, of *C.lau* FK 1053 and FK 1055, on top of the bluff.

.....from H.Middleditch

It appears that *C.lau* was also found by A.W.Craig near Las Lomitas.

.....from B.Burke

A plant of *C.lau* which was collected by A.W.Craig from the area of Las Lomitas is now in my own collection. The body has reached a size of about one cm across and it is now beginning to clump, having put out a few offsets.

..... H.Middleditch

In the account of the trip through northern Chile, undertaken jointly by Buining and Ritter, we are told about the then new small semi-subterranean *Copiapoa* found in the area of Las Lomitas, on the high ground between Pan de Azucar and Esmeralda. This can be confirmed by the "steep coast south of Esmeralda" given in Englera 16 as the Habitat location for FR 1457 *Copiapoa esmeraldana*; and even more positively by the note in Ritter's 4-Volume work that this species was first found there by himself and Buining in 1969. It was noted by A.W.Craig that plants of *C.esmeraldana* affinity were also sighted when ascending a valley to the south of Las Lomitas, coming from Pan de Azucar. In general terms it appears that *Copiapoa esmeraldana* can be found at the Type location near Las Lomitas, as well as in a valley to the south of that spot coming from Pan de Azucar; also in the lower part of the Quebrada de la Cachina, around Planta Esmeralda, and in Qu.Guanillos.

NOT FINDING QUEBRADA BOTIJA From B.Burke

On our first visit to Chile early in 2001 we travelled extensively from Santiago to just south of Iquique, and back, covering a total of 7,800km. When we were travelling northwards, we had a look around the Pan de Azucar National Park and then spent a day or two in the area around Esmeralda. After an overnight stop in Taltal, we took the road going north along the coast, with plenty of cacti to be seen at either side of the road, with plants of various sizes, many covered in a thick coating of dust. These were mainly *Copiapoa haseltoniana* in its various forms, together with much smaller numbers of *Eulychnia*. I do not recollect seeing much in the way of other vegetation, but there may also have been some scruffy looking low growing bushes.

Between Paposo and El Cobre this unpaved road continues to follow the coast and for the whole of the way there were steep hills rising up to over 2500m to the east side of the road. There was seldom much more than three quarters of a km between the shore line and the steeply rising foot of these hills. Both from Paposo and from El Cobre there is a road from the coast which goes inland to the Pan American Highway, but between Paposo and El Cobre there is no road running inland from the coastline. After passing through Paposo the cacti started to become less obvious, before finally almost disappearing after some 20 or 30km north of Paposo.

Having checked the map and also having a rough idea where the Botija valley should be, we expected to see an obvious opening into the Quebrada Botija. I was also expecting to see clumps of a *Copiapoa* known to me as RMF 53 on either side of the road some way before actually reaching the entrance to this Quebrada, thus alerting us to the fact that we were in the vicinity of the entrance.

During the course of our travels in Chile we had been warned not to make camp in any of the quite obvious water runs, which are caused by storms up in the high mountains. The Chileans refer to these storms as Bolivian winter, as they tend to start in the high Andes which form the natural border between Chile and Bolivia. The water run-off from these storms flows down the valley towards the coast in the form of a flash flood, carrying all before it. When it finally arrives at the coastal beaches it cuts a wide and deep trench in the ground, removing many tons of sand, earth, and boulders in the process, some of the boulders being the size of a small car. Any road lying in the path of one of these flash floods also tends to be carried away as well. On our way north from Paposo we were able to get across these obstacles as the highways department had bulldozed ramps down the trench sides. We had crossed one of these trenches at a point near where I felt the entrance to Quebrada Botija might be, but the entrance was not at all obvious from the moving car and we did not notice any *Copiapoa* RMF 53 at either side of the road here. So we carried on up the road, eventually reaching El Cobre without having seen any obvious way into the hills.

This was our first trip to Chile when we were unfamiliar with the habitat, which resulted in our missing the Quebrada Botija on our way going north. When we returned down the same road, this time going south, we were rather better prepared. We had consulted our maps, located Quebrada Botija, and worked out the GPS location for the entrance. In due course we came to where a trench cut by the flash floods had washed away the road, but now it had been properly repaired, despite it being so far away from civilisation. This trench matched up exactly with the GPS reading for the Quebrada Botija, so we stopped the car and began to walk towards the hillside which was all of 600 metres or more from the road. The hillside also appeared to contain no gaps and seemed to be a continuous rock formation, all a similar pale brown colour. At this point we had still not seen any of the *Copiapoa* RMF 53 which were supposed to be growing all over this plain, even between the road and the shore.

When we had almost reached the foot of the hills we finally saw the entrance to the valley which is some twenty to thirty metres wide and facing in a southerly direction. The entrance is obscured by the brownish hillsides apparently merging into one another when viewed from the road, the entrance only becoming obvious to our unfamiliar eyes when we were nearly on top of it. We had also now spotted what looked like plants of RMF 53 some distance away, around the entrance. Unfortunately we had come up the wrong side of the flash flood trench, here about 25ft. deep and some 30 yards wide, with sides that were too steep and deep to cross, so we had to walk back towards the road to be able to get across the trench at a more suitable point. We then headed back in to the entrance to the valley, encountering the RMF 53 up to and around the entrance. It is quite likely that the flash flood may have carried away many of these plants, even out to sea.

I feel that the RMF 53 has nothing to do with Ritter's *Copiapoa variispinata*. The RMF 53 certainly has nothing to do with the pictures of this plant on page 1201 of *Kakteen in Südamerika* book 3. One objective in stopping to visit this valley was to try and make my own comparisons. The other objective was to try and find the plant described by Schulz & Kapitany in their *Copiapoa* book as *Copiapoa* sp. Botija, and to see for myself if it had anything to do with the *variispinata* as described and illustrated by Ritter.

We walked some km into the Quebrada along the floor of the valley, which is obviously a well-worn waterway as in many places erosion has occurred due to the run of strong water currents. Eventually we came upon plants of *Copiapoa* sp. Botija, Again I feel that these have nothing to do with the plants described and illustrated by Ritter as *C. variispinata*. Along with the sp. Botija we also saw growing there single headed plants of *Copiapoa atacamensis*. These plants were in a wonderful condition and at first I did not realise what they were. Since my return to England I have met with other people who have been in this valley and have been assured that if we had climbed up the sides of the valley on to the hill tops, we would have seen many large clumps of *Copiapoa atacamensis* there.

Having now seen the RMF 53 at the entrance to Quebrada Botija and also the Schulz & Kapitany sp. Botija within the Quebrada, I am quite sure in my own mind that neither of these plants has a validly published name. Had Ritter made a stop at Caleta Botija and walked round there, then surely both the RMF 53 on the beach and the *C. sp. Botija* in the Quebrada would have been described in his book. I feel that Ritter

may well have simply passed by the entrance to Qu.Botija, just as we did when travelling north. But Ritter may have gone into one of the Quebradas further to the south. There seems to be a consensus of opinion that *C.variispina* may have been found by Ritter in the Quebrada de Izcuna. We hope to make this Quebrada a stopping point on our future visit to Chile.

.....from P.Hoxey

There is a surprising amount of vegetation to be seen when travelling along the coast road northwards from Taltal, and one seldom loses sight of large plants or mounds of Copiapoa. There are still big clumps of *C.haseltoniana* around Paposo as well as a number of fairly substantial *Eulychnia*. But beyond Paposo, this picture changes gradually the further we go, as the *Eulychnia* become fewer and less substantial, and the Copiapoa steadily get smaller and less healthy looking; the other vegetation becomes steadily more and more stunted and more open. Further on there are no more *Eulychnias*, whilst the Copiapoa are still smaller, looking more stressed, dryer and almost dehydrated, with very few scruffy dwarf shrubs. Finally there is no vegetation at all to be seen from the moving vehicle and then it will be some 20-30km to go before reaching Botija. Once at Botija, there is practically no vegetation visible from the vehicle, it is very barren - no real difference from the whole of the stretch of coast since we last saw any Copiapoa. We stopped here to have a look at the RMF 53, which really surprised A.Lau, as he had driven along this very same road without ever seeing these plants.

.....from F.Vandenbroeck

I well remember the Copiapoa which is to be found near Caleta Botija, as we found it both in 1983 and in 1990. In 1990 the plants were in full bloom and were a fine sight. I have never been able to understand why they have received so little attention and seem so ill known. It might perhaps be said that you stumble over them when travelling northwards from Paposo to El Cobre. They definitely cannot be identified as Ritter's Copiapoa *variispinata*. Of this latter, Ritter says that they are "weichfleischig" ie with a soft body texture, which the plants at Caleta Botija are certainly not. Furthermore, the spination does not vary.

.....from G.Charles

Travelling south along the coast from El Cobre, we intended to stop and have a look round at Botija. The approximate whereabouts of Quebrada Botija was known to R.Ferryman, so as we came closer to this place we were keeping a look-out for the entrance to the Quebrada. At this spot, the road continues to follow the shoreline about 200m from the edge of the sea, but the hills recede slightly from the coast at the entrance to the Quebrada, so that was another help in knowing where we were. Once having reached Botija, we drove the vehicle a few hundred metres over the rough ground towards the entrance to the Quebrada, leaving it there whilst we explored the locality. Whilst I had a look at the north side of the Quebrada, R.Ferryman climbed up the south side and C.Pugh went further up the Quebrada itself.

Less than 1km into the Quebrada I climbed up the steep slippery northern side, until I was up to the flat top at about 300m or so above the beach. On the climb, I passed a few *Eulychnias*, as well as a few scattered examples of *Neochilenia floccosa* and Copiapoa *atacamensis*, all solitary, as well as many bromeliads and a number of untidy looking multi-headed clumps of Copiapoa sp.Botija. But most of the ground was simply bare sand, or rocks. From this spot I was able to see that just before the Quebrada came out of the hills and on to the "beach", it made an enormous U-turn, turning first to the north and then to the south. Enclosed within this U-bend was a narrow ridge which rose to about half the height at which I was standing; looking across the braided channel in the valley, I was able to see across this ridge, and beyond it to the beach and the shoreline. Because the Quebrada is actually running south as it comes out of the hills, it does not make itself obvious from the road, particularly when driving south.

As we were approaching Botija we were fairly certain we were coming close, so we did expect to see clumps of RMF 53. And indeed we did, commencing a few hundred metres before we turned off the road towards the entrance to the Quebrada. They were plentiful and occasionally quite close to the road. I do recollect standing over one hummock which could hardly have been more than three metres off the side of the road. Which, of course, once again raises the question, why did Ritter not see these plants? Perhaps he did not see them because he went past them in the dark? Or was he using some transport - such as a lift on a lorry - which went past this location without stopping? There does now seem to be a general acceptance that Ritter's Copiapoa *variispinata* originated from Quebrada Izcuna, which is several km. to the south of Qu. Botija.

.....from N.Rebmann

We visited the Quebrada Botija in November of 2001 when we saw the Copiapoa sp.nov there in full flower, with great numbers of yellow flowers.

.....from B.Burke

Seeing the RMF 53 near the entrance to Quebrada Botija in early February, we found only one single flower on one individual plant.

.....from P.Hoxey

Two Copiapoa originating from KK, labelled *C.borealis* from El Cobre to Paposo, were acquired at the auction of the A.W.Craig collection. These seemed to me to differ from any other Copiapoa that I was familiar with. But subsequently I obtained from G.Charles two seedlings of "RMF 53" and I immediately realised that these were the same sort as the KK *C.borealis* plant. Earlier this year on a visit to Holland I picked up a cutting from an ex-De Herdt imported Copiapoa labelled *C.rarissima*, which I now recognised as really being an "RMF 53".

Note. A series of observations and comments about Botija and the cacti to be seen there, may be found in Chileans No.53 pp 88-91. There are also accounts of visits to Quebrada Botija made independently by A.W.Craig and by R.Ferryman in Chileans No.55 pp. 10 & 11.

FINDING WHAT SORT OF TEPHROCACTUS? From K.Wittmann

We have made quite a number of visits to Chile and on the occasion of a recent holiday there we took the opportunity to travel from La Serena up the Rio Toro, towards the border with Argentina. The Chile frontier control is at Juntas del Toro, a good half hour before one would reach the frontier at Paso Abra Negra. Turning left at Juntas, taking the road going in the direction of Banos del Toro and Mina el Indio, after about 2 or 3 kms there are some nice hummocks of *Tephrocactus*. These were in bloom, with over a dozen flowers on some hummocks.

.....from H.Middleditch

What time of year would it be when you saw these *Tephrocactus* carrying a good sprinkling of flowers?

.....from K.Wittmann

We made that particular trip in February.

.....from H.Middleditch

Observations made by those of our members who have travelled in Chile would suggest that it is not at all common to see any hummocks of *Tephrocactus* carrying a good show of flowers. Most of these trips have been made during the months of October to early January, so perhaps there are more flowers to be seen on the *Tephrocactus* a month or two after that.

.....from R.Ferryman

The road from Arrequentin on the Argentine side of the border leads up to the same Paso Abra Negra. Along this road we passed some small *Pyrrhocactus*, some *Denmoza*, and then incredible *Soehrensia* growing up to 9300 ft. altitude. Above Arrequentin there are hummocks of *Tephrocactus* which adopt an almost pyramid shape, with segments fairly well packed together. It is widely distributed throughout this area but it does display a range of variation in terms of segment size as well as spine colour. These hummocks will possibly be about 30 inches across and nearly as tall. I do not recollect seeing any of these plants as large as one metre across, but there were plenty of plants of various smaller sizes. They grow at a fairly high altitude, up to about 14,000 ft., but on the Chile side of the pass it is about 9000 ft altitude before the *Tephrocactus* re-appear. Then at 7000 ft there is *Neochilenia eriosyzoides*.

.....from H.Middleditch

The close-up picture of these plants seen above Arrequentin by R.Ferryman would suggest that they may be of *glomeratus* affinity. There are still plants in cultivation identified only as *Tephrocactus* species Arrequentin, which were brought here by Kiesling when he was on detachment to Kew. My own specimen of this sort has segments which display quite distinct elongated tubercles, typical of what would be regarded as *T.bolivianus*. They bear a resemblance to the *Tephrocactus* TG 41 which originates from Fiambala, at 2400m. Perhaps the ex-Kiesling *Tephrocactus* also comes from a similar altitude near Arrequentin?

.....from T.Gilmer

We also grow plants of the ex-Kiesling *Tephrocactus* sp.Arrequentin here in Germany and they are regarded as *T.bolivianus*.

.....from H.Middleditch

The road from Juntas del Toro going along the valley of the R.Toro towards Mina el Indio passes Banos del Toro. In the course of the 1971/72 Beckett, Cheese and Watson southern Andes expedition, a collection of *Tephrocactus* was made near Banos del Toro, at 3260m altitude, which is equal to about 10,750m altitude. The chances of finding any of this BCW 4645 still in cultivation must now be slim indeed. The obvious question arises - is it of *T.bolivianus* affinity, or like *T.glomeratus*?

.....from R.Ferryman

The area round Banos del Toro is readily accessible today as a good road serves the tourist facilities at this place. Up on the hillside not far from here, there are hummocks of *Tephrocactus* to be found, which form clumps that can grow to more than one metre across. These hummocks have a height approaching half their diameter. The individual segments are quite lengthy. This is the Type location for *Opuntia leoncito*.

.....from H.Middleditch

In his review of the Andean *Opuntias* in *Opuntioideae* 2002, J.Iliff opts to place *Opuntia leoncito* Werdermann into the "glomerata" group. The segment size of 4cm long by 2cm thick given by Ritter for his FR 497 from Banos del Toro, as well as the segments "almost smooth and lacking tubercles" of Hoffmann, would support this conclusion. The "spineless" fruit quoted by Ritter would suggest a *glomeratus* affinity rather than *T.camachoii*. Which would appear to offer an identification for the *Tephrocactus* from the Chile side of the Paso del Abra Negra, but still leave open a positive identification for the *Tephrocactus* from above Arrequentin, on the Argentina side of the same pass.

SELF POLLINATION IN REBUTIAS From M.O'Hara.

Rebutias have always been my favourites among the cacti. After having collected and studied many other genera over the years my main interest has once again come back to the *Rebutia*. Considering the complexity of this genus it is rather surprising that so very little has been written about this genus in more recent times, although it seems that many collections still boast a selection of *Rebutia*.

In comparison with many other genera, little work seems to have been done on *Rebutias* since the essays written by J.D.Donald in *Ashingtonia* and elsewhere in the 1970's. One of the perennial problems with *Rebutia* has been the shuffling of segregate genera - *Digitorebutia*, *Cylindrorebutia*, *Mediolobivia*, and so on.

Much criticism was heaped upon Backeberg for his raising of the genus *Mediolobivia* although such criticism seldom appeared to be accompanied by logical argument to the contrary. In his *Lobivia* '85, Rausch has transferred the *Mediolobivia* group to *Lobivia* but regrettably without any detailed explanation - or even without explanation - for the basis of the decision. Only rarely does any explanation seem to appear for or against one or other form of classification of the groups within *Rebutia*. This led me to decide to take a more detailed look at these groups.

Early in the 1994 season a start was made on an investigation of the group of *Rebutia* represented by the names *haagei*, *pygmaea*, *aureiflora*, *einsteinii*, *euanthema*. Initially it was the intention to look at the flowers and their structure, by making sections, sketches and photographs of the flowers of this group. However, this particular line of investigation soon extended to include any *Rebutia* which happened to be out in flower when an opportunity occurred to look at them.

Fortunately it was possible to allot one room in the house to this activity. This room has a large window that faces west but does not receive direct sun until about four o'clock in the afternoon. The room is centrally heated, with a daytime temperature of up to 20°C and a night time temperature of about 12°C, although on a bright sunny day the daytime temperature can rise even higher. The procedure was to take plants into this room just before their flowers opened. Not every flower section was a success and as some of these plants had more flowers that were just about to open, they were left in the room instead of being put back into the greenhouse. Being early summer, they would normally be fairly well watered but in addition they were often sprayed in the evening. Being able to look at my plants only on certain days of the week this meant that some of these plants opened and closed their flowers in the room in my absence.

No other plants were kept in this room and no windows were left open for ventilation in my absence, so that ingress by insects would be minimal. In any case there are not a great many insects about during May and June, when these plants are in flower, as compared with July or August. The door to the room would also remain closed in my absence, so not even houseflies would gain entry. Nevertheless it was noted that on many of the withered flowers the seed pods were starting to swell as though they were setting seed. This despite the fact that none of these flowers had been deliberately pollinated either with themselves or with others. This was not a planned experiment and occurred more or less by accident. Nevertheless it may well provide a reasonable indication of those species which are self-fertile and those which are not.

A note was made of the flowers on each plant which appeared to set seed. Each plant was then given an identifying label and eventually returned to the greenhouse where the pods matured. Once the seed pod appeared to be ripe it was carefully removed from the plant when a count was made of the seed it contained.

Scattered amongst the cactus literature are quite a few articles dealing with *Rebutia*. Most of those that it has been possible to consult state that *Aylostera* are self-fertile and the other *Rebutia* are (with some exceptions) self-sterile. The particular species which are self-sterile never seem to be named. The first season's experiments with my own plants suggest that all 23 species of *Rebutia* and 9 species of *Aylostera* which have been checked have shown themselves to be self-fertile.

.....from H.Middleditch

These experiments would appear to cast some doubts upon the use of the self-fertile or self-sterile feature of the flowers for the purpose of classifying *Rebutias* into e.g. *Aylostera*, *Mediolobivia*, etc. Various other features have been suggested for this purpose, but are they really reliable indicators for classifying *Rebutias* into groups?

.....from G.Laub

The grouping of *Rebutia* into *Aylostera*, *Digitorebutia*, or *Mediolobivia*, and so on, poses considerable difficulties. Even J.Donald seemingly resigned from this task at the end of his *Rebutia* saga in *Ashingtonia*. We now know that there is a wide geographical distribution of most of the *Rebutia* groups in Bolivia and Argentina and frequently representatives of more than one group are to be found growing not far from each other. Or, more significantly, they also exist in close relationships to one another, so much so that it becomes almost impossible to state where one group ends and another begins. The more plants we obtain from collectors in the field, the more evident it becomes that there are transitions from any one of these groups, into another.

In the meantime, Hunt has included these plants under the family of *Echinopsis*, but it is very doubtful to me if this helps in any way to get a better understanding of all the plants which are given this umbrella name.

.....from H.Middleditch

The genus *Aylostera* was established by Spegazzini in 1923 in his "Breves Notas Cactológicas" in the *Anal. de la Soc. Cient. Arg. Vol.XCVI*, with the emphasis on the "narrow elongated tube solidly united with the style" which had been seen in his *Echinopsis pseudominuscula* described in 1905. No doubt Spegazzini was perfectly correct in noting in 1923 that this particular feature had not been seen on any other sort of *Cactus*, but as more material came to hand with the passing years, this particular feature was found to occur to a lesser extent in some *Rebutia* than in others.

.....from M.Winberg

It is indeed quite possible to assemble a fairly simple table of the characters which could separate *Mediolobivia* from *Aylostera*, for example. But it seems that there are some intermediate forms of *Rebutia* which make it difficult to allocate them into one or other of these two groups. Frankly it is not easy to see any clear dividing lines between *Aylostera* and *Mediolobivia*, or between *Rebutia* and *Aylostera*.

One observation I made recently is on the flower of *Rebutia fabrisii*. I have some original clones of MN126 *fabrisii*, MN123 *fabrisii* v.*aureiflora*, and the tiny MN 135 *fabrisii* v.*nana* - all being forms of the same species, in my opinion. These do not have a distinct *Rebutia* flower with the style standing free all the way

down to the ovary, but seem to have a short length of adnate tube. The yellow flowering MN 123 seems to have a naked ovary, with no hairs or bristles, but the other forms from higher altitude all have bristles! The petal colour of *fabrisii* proper varies from purple through red to orange yellow.

The fruit of *Aylostera* could be anything from a tiny *heliosa*, *supthutiana*, or *schatzliana* fruit, to a rather large *fibrigii* or *spgazziniana* fruit. It can have bristles or hair, or both. The *Mediolobivia*, such as *pygmaea*, *steinmannii*, *atrovirens*, or *nigricans*, mostly have larger fruits with hair and bristles. The seeds of this latter group are mostly larger, too. But I doubt if any clear lines can be drawn between these various groups of plants.

.....from H.Middleditch

Is it possible that the size of the fruit may not really be a feature of a specific plant but more an indication of the effectiveness of the pollination?

.....from R.Martin

As for differences between *Aylostera* and *Mediolobivia*, I find it hard to draw firm conclusions. Even Rausch changed his mind about some plants, and swapped them from one group to the other. I would not always agree with the tap-root distinction for *Mediolobivia*. Has the possibility been considered that some species may form a tap root when grown from seed, but not if they are grown from cuttings? Although *Aylosteras* do tend to have longer flower tubes, some can be relatively short, and I do not think that there is a magic gap between the lengths of the flower tube on *Aylostera* compared with *Mediolobivia*. On the whole, *Aylosteras* do have thinner, less fleshy flowers, which probably accounts for the observation that their flowers stay open for less time. Also they do have paler fruit.

.....from M.Winberg

On our visit to northern Argentina in 1990 we took the bus from Iturbe to Iruya, and back. On our return visit in 1993 we had decided to take a closer look at the first part of this road, so we set off from Iturbe on foot. It took us two hours to walk to Chaupi Rodeo. A few kilometres further on towards Abra Condor we stopped to look round and found some nice plants, which we subsequently identified as *Rebutia pygmaea*. Of these, the *Rebutia pygmaea* MN 225 were small plants, only 10 to 15mm broad. We were able to unearth one of these plants without damaging the root, which was about 10cm long and tapered gradually from the body thickness at the top to a mere thread right at the bottom. A few km beyond Chaupi Rodeo we found a spot close to a stream where we could camp for the night, at about 3550m altitude

.....from H.Middleditch

A slide of some seedlings of *R.einsteinii* which came into my hands a number of years ago from P.Smart, also displays a rootstock whose upper portion is likewise the same thickness as the body. This rootstock had not been able to develop naturally to a good length, evidently due to the shallow depth of the container in which it had been grown.

.....from W.Phillips.

A year or two ago I grew some *Pterocactus kuntzei* from seed, sowing them in the usual sort of relatively shallow pot. When it came to pot up the resultant seedlings, I found that they had attempted to grow a long rootstock which had curled round in the bottom of the pot. So last year I sowed some more of the same seed, but this time in a 6 inch deep pot, to allow the root to develop naturally.

.....from H.Middleditch

One of these seedlings was received less than one year after being sown - the stem was about 6mm thick and some 3 to 4 inches in length, the tapering root of over four inches in length had an upper half of just the same thickness as the body. If *Rebutia* seed was given a comparable depth of compost, what species would produce a similarly thickened rootstock? Not just the "*Mediolobivia*"?

There is a good photograph in Rausch *Lobivia* 85 of half a dozen *Rebutia einsteinii*, all seemingly with thickened rootstocks which appear to be branching. Perhaps this root branching feature is not peculiar to just the one population?

.....from C.Pugh

When we were near Purmamarca we came across a number of *Rebutia* which may have been *R.einsteinii*. We were able to unearth a plant of moderate size and found that it had two thickened tap roots. One of these did look a bit older whilst the other looked as if it was fairly new.

.....from H.Middleditch

Is the thickened rootstock really only to be found on certain species of *Rebutia*, or is it a fairly widespread feature?

A BED OF THORNS?.....from F.Wakefield

For quite some time I have had problems with seed raising on account of the growth of moss on the top of the pots. This year I attempted to tackle this particular problem. First of all, I sterilised the compost (half peat, half grit, plus a small amount of lime and Q4) by raising the temperature to about 180°F and keeping it there for about twenty minutes. Thereafter the compost was kept under a closed cover as far as it was possible to do so. The seeds were sown on to the compost and watered with a solution of Filex in boiled rainwater. The pots were placed in a gravel tray and placed in a propagator under the staging with a pane of glass overall. Enough of the Filex solution wound up in the gravel tray to ensure that the compost remained moist.

Thereafter, the glass cover was never removed until some five months had elapsed, when most of the pots were removed and the plants pricked out. There was no sign of any moss on any of the pots and about half of them had a light film of blue-green algae on the surface of the compost, which had remained thoroughly moist over the whole period without any replenishment.

From this it seems to me that the way forward is to take a little more care in handling the compost so that it is exposed to the air (and airborne spores) for the absolute minimum of time. Finally, none of this treatment seems to have affected either germination or growth.

.....from J.Brickwood

From time to time I experiment with different compost mixes for my seed raising. I have had a love/hate relationship with perlite. Formerly I stopped using it because of its tendency to migrate upwards in the pot and because the pots seemed to dry out very quickly in warm weather. But I have now started using it again quite simply because it seems to do the job better than grit or coarse sand and plants seem to develop better root systems in it. Incidentally, I have found that the Cal-val sand is pretty useless for this purpose. I now stick basically to a mixture of John Innes/Arthur Bowers/ Perlite for virtually all of my cacti. More loamy or more peaty mixtures are used depending upon the genus. The key to long-term success, I believe, is a high content of mineral constituents, be it perlite or grit, or whatever. Nowadays I tend to use 50% or more in my compost and now rarely lose plants due to overwatering. I was tempted to stray last year by experimenting with Baby Bio houseplant compost, because a large sack of it seemed to be so light and airy. This was a mistake, because I found that it actually retains more moisture than the 'heavier' composts. But, worst of all, horrible white lumps of a creamy mouldy type of deposit form near the surface after a few waterings, which proved disastrous in my trials using it as a seed compost. But there again, I know others who swear by it!

I have had algal growths on my seed pots using both JI and peat-based composts, so I do not think that the JI is to blame. It is not really a major problem if it forms after germination - the seedlings grow on quite happily regardless. In the past I have used cling-film to cover a whole tray full of 2" seed pots and these do indeed remain moist until the film is removed. This method has been used with great success with such as *Lobivia* and *Gymnocalycium*. The only reason that I now prefer to seal the pots individually is partly through lack of space, but also to minimise the risk of algal or any other attacks affecting a whole lot of seed pots, rather than the odd one or two. Individually sealed pots do dry out quicker, but providing they are tightly sealed, they do not require too many rewaterings.

NOT SETTING FRUIT ON REBUTIA GONJIANII From A.de Barmon

When I moved my collection into my new greenhouse in 1997, the greenhouse was nearly empty. It is a common problem here on the continent to have plants nibbled by mice or some other form of animal life, so in order to avoid this problem I keep my greenhouse closed at all times, without any vents. This means that the air temperature inside the greenhouse can become rather high. This was not much of a problem whilst the greenhouse was nearly empty but by the following year it contained many more plants and during sunny days in summer the temperature rise at the level of the plants on the bench caused problems.

The *Rebutia* in particular seem to react to this condition by shrivelling, especially if they are due for a watering and are rather dry! After a few years of unsuccessful searching for plants of *Rebutia gonjjanii*, a plant of MN 211 was acquired in 1966 and in addition I received from W.Krahn four clones of WR 578 in the form of cuttings, which rooted down very promptly. All these flowered very well in 1998 and they were carefully hand pollinated between the clones. One of these plants had become about 50% shrivelled on account of the heat, so it was moved to a shady location whilst it was flowering. I was astonished by the end of the flowering season to find that this was the only *R.gonjjanii* that had developed a fruit.

The May of 1999 was very hot and the temperature inside the greenhouse usually gets to 40°C in full sun. As soon as the first flower opened the *Rebutia gonjjanii* were moved to a shaded area where the temperature always stays under 30°C. However, the lack of sun did not help further flower bud development. Indeed some of my friends who do not have enough light in their greenhouses do not succeed in flowering *R.gonjjanii* at all. The first lot of flowers to open on my *R.gonjjanii* were normal, but subsequent ones gradually began to lack pollen. Fruit was set by the normal flowers and the fruits contained between 10 and 50 seeds.

Now I have installed a new method of ventilating my greenhouse, by installing two 250 watt extraction fans which are controlled by a thermostat to bring them into operation when the outside temperature is 30°.

.....from H.Middleditch

In the summer months it is remarkable how warm a temperature can be retained within a greenhouse well after sundown. Especially a timber greenhouse with timber staging. In the higher parts of the Andes, away from the moist slopes which receive a rainfall that supports green woodland with green undergrowth, clear skies at night-time allow unimpeded radiation of the heat which was absorbed by the plants and by the ground during the daylight hours. As a result, the cacti which grow at high altitudes are commonly exposed to the consequent low overnight temperatures. Depending upon the altitude, this can even get down to freezing point. As the diurnal temperature measurements taken at higher altitudes by R.Kraus (published in K.u.a.S.) indicate clearly, the temperature of both the surface of the ground and of the air temperature next to the ground, can fall significantly, far more than the temperature of the body of the plant. Thus the natural environment for many of the high altitude cacti is a low night time air temperature.

Consequently I would have been inclined to look at venting the warm air out of the greenhouse on a summer evening as one possible approach to the foregoing problem outlined by A.de Barmon. The roof ventilators and external door on my own greenhouse are opened about Easter and closed roughly early October, never being touched in between. But that is still insufficient to clear out the warm air on a midsummer evening. And most of the plants in the greenhouse tend to give the impression that their growth slows down, as the night temperature inside the greenhouse becomes warmer.

REPORT & ACCOUNTS CHILEANS VOLUME 18, NOS. 58 to 60.

Income			
Balance brought forward		6,269.81	
Subscriptions		2,917.50	
Sales of Back Numbers		1,238.00	
Sales of other publications		387.20	
Sale of plants and seeds		72.00	
Sundry income		120.05	
Bank Interest (less charges)		81.60	
		<hr/>	
		11,086.16	11,086.16
Expenditure			
Printing		2,936.06	
Postage, stationery, telephone etc		2,791.68	
Nottingham Weekends, Cost	6,283.25		
Less Income	6,038.00		
		<hr/>	
		245.25	245.25
		<hr/>	
		5,972.99	5,972.99
Balance carried forward			5,113.17
			<hr/>
			11,086.16

The increase in the colour illustrations in recent issues of The Chileans is reflected in the increase in both the costs of printing and in the preparatory work which is also involved. The combined result has been a material reduction in the balance carried forward by comparison with the accounts for The Chileans No.55 to 57. A few years ago, incompletd building work intefered with the intended arrangements for a Chileans' Weekend at Nottingham University, for which a rebate was allowed against our invoice for the Event. By agreement with participants in that Event, the rebate was utilised for expenditure on e.g. visiting speakers, notifications, display material, hire of ancilliary equipment, and this outlay appears in the above (and previous) accounts as a nominal loss on the Weekend Events.

Shortly after going to press with the subscription renewal form for the next Volume of The Chileans, the Post Office announced a forthcoming increase in postal rates, which is unlikely to be covered by the small increase in subscription rates compared with the Volume 18 Nos.58-60.

It is a pleasure to be able to acknowledge all the many and various contributions which are made towards the publication of the Chileans. Providing copies of documents both vintage and more recent for reference; supplying pictures and also scanning pictures onto disk; providing seed for test sowings; formatting text from disk; as well as offering comments and observations. Without such support it would be quite impossible to continue with the publication of the Chileans

It will be some twenty years ago that the ancient typewriter used up to that time for the preparation of the text for The Chileans, became no longer repairable, It may be advisable to place on record that the word processor purchased as a replacement, and which has been used virtually exclusively since that time for preparing the text for The Chileans, has not yet been a charge on the accounts.

THE CHILEANS 2003 WEEKEND

Arrangements are currently under way for a Chileans' Weekend to be held over September 19th to 21st, 2003, at Loughborough University. Details have been despatched to participants in previous Weekend Events and can be provided to any other member on request.

CHILEANS PLANT AND SEED DISTRIBUTIONS

If you want to receive the occasional offers of plants and seeds, please send your name, your address and E-mail address to Graham Charles, Briars Bank, Fosters Bridge, Ketton, Stamford PE9 3UU, U.K. E-mail: graham.charles@btinternet.com

Offers are only made when sufficient documented material is available so is not every year. If you are already receiving lists then there is no need to re-apply, but members will only get the lists if they register to receive them. Offers of plants or seed for the distributions are very welcome.

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Slide Library Holders and Particular Interests

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Brazilian cacti	K.Stapleton, 62 Enfield Close, Erdington, Birmingham B23 5SE	joyandkarl@blueyonder.co.uk
Cereanae	G.J.Charles, Briars Bank, Fosters Bridge, Ketton, Stamford PE9 3UU	graham.charles@btinternet.com
\$ Cleistocactus	T.Lavender, Kalanchoe, Market Place, Tetney DN36 5NN	
\$ Copiapoa	B.Burke, 23 Jessica Way, Leigh WN7 4QG	brendanburke@blueyonder.co.uk
Echinopsis	M.Muse, 32 Fielding Road, Birstall, Leicester LE4 3AJ	
\$ Frailea	R.Gillman, Oddyns Farm, High Cross Lane, Little Canfield CM6 1TF	
\$ Gymnocalycium	S.G.Slack, 50 Sunnyside, Edenthorpe DN3 2PH	grahamandirene@slack2830.freemove.co.uk
Haageocereus	J.Arnold, Suffolk House, 2 Oak Hill, Washingbrough LN4 1BA	
\$ Islaya	M.Williams, 62 Bickerton Ave., Higher Bebington L63 5NB	maurice.williams@cwcom.net
Lobivia	J.R.Kirtley, 11 Fire Station Houses, Alnwick NE66 2PB	jim@kirtley7.fsnet.co.uk
\$ Matucana	P.Hoxey, 34 Stonehill Road, Great Shelford CB2 5JL	paul@hoxey.com
Neoporteriae	R.Moreton, 91 Umberslade Road, Selly Oak, Birmingham B29 7SB	
\$ Notocactus	P.Moor, 60 Milton Hall Road, Gravesend DA12 1QW	philip.moor@blueyonder.co.uk
Opuntia	R.Crook, 35 Cardinal Close, Worcester Park, KT4 7EH	
\$ Parodia	J.Brickwood, 48 Haselworth Drive, Gosport PO12 2UH	john@brickwood.freemove.co.uk
\$ Sulcorebutia	J.Cooke, Orchard End, Chipperfield Road, Bovingdon HP3 OJR	julian@cactusorchard.freemove.co.uk
Tephrocactus	R.K.Hughes, 16 Ashbourne Avenue, Bootle L30 3SF	
\$ Weingartia	A.Glen, 5 Hall Grove, Macclesfield SK10 2HQ	aglen@tinyworld.co.uk

\$ indicates that a list of slides of that genus is available on request by s.a.e. or E-mail. Numbers of slides per genus vary from a few to a considerable number. Slide quality and species coverage are also very variable. Also available are CD's for Notocactus, Parodia, Sulcorebutia, and Weingartia. Any additions to this library in the form of slides or a CD will always be very welcome

The Chileans

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