

# *THE CHILEANS 2014*

VOLUME 23 NUMBER 73



*Pterocactus auracanus*

JL 101

Photo:- J. Lambert



*Pterocactus megliolii*



*Pterocactus reticulatus*



*Pterocactus gonjani*



*Pterocactus kuntzei*

Photos: K. Gilman



My own collection of Pterocactus is kept all the year round in the greenhouse. In some winters the temperature hardly falls below 0°C, whilst in other winters it may go down a few degrees below zero; not uncommonly it can even be as low as -5 to -8°C. On rare occasions it might even sink to -12°C, which the Pterocactus might well survive, but that would be dangerous for the other cacti in the greenhouse, such as the Lobivias. So the heater is set to come on at about -5°C.

Watering of these plants ceases by about the middle of September or early October, as the soil in which they are growing must be completely dry when the first frost occurs, which here is about the end of October or the beginning of November. Here, near Chartres in France, I am on the 48th parallel, so that the growing season will start about one or two weeks before it does in Britain. It will be about the middle of March that my plants will be sprayed for the first time, on a nice sunny day. Through the rest of March and then April they will be sprayed at irregular intervals, when it is a nice sunny day and the greenhouse is fairly warm – it can even get up to 15 or even 20°C on a good warm day inside the greenhouse at this time of year. Then, in May, watering will begin, very carefully at first. Fertilisers of 6-6-6 composition are added to the water at least twice a month from May to July.

Most of my Pterocactus are planted in the ground, but there is not sufficient space available to be able to grow them all in this manner. Some plants are being grown in pots of about 8-10 cm in diameter and they adapt to these quite well, although they do seem to prefer deep and large pots of 12 to 15 cm depth. They certainly need bigger pots than globular cacti of similar size, such as *Gymnocalycium* or *Frailea*.

All my Pterocactus that are in the greenhouse are in a good sunny position close to the plastic or glass, as they like to have as much sun as possible all year long. In June and July they have as much as 16 hours of sunshine in one day, which I think is good for them. They are quite happy with a temperature of 35 to 40°C inside the greenhouse on a nice sunny day. But of course from April to September the doors at each end of the greenhouse are left open all night and all day, in order to provide good ventilation. I imagine that Pterocactus would not be at all happy in a closed greenhouse in summer.

For Pterocactus the compost must have good drainage so I include a good proportion of gravel in my compost. I have tried many compost mixtures for my Pterocactus and they seem to be equally happy in many of them, provided the drainage is good. It is quite normal for my Pterocactus to lose some branches in the winter, due to the effect of the frost. But many fallen branches can often be used as cuttings to root down, or to exchange with other Pterocactus enthusiasts.

In some years, one or two of my Pterocactus do not seem to want to flower. I find that the main cause of this problem is that the compost in which they are growing is old and they need to be repotted at least every three years, although it is better to re-pot every two years.

It is possible to grow Pterocactus out in the open, exposed to any wind, but with a plastic covering to keep the heavy rain off the plants and to keep them dry in winter. Having tried this, I find that it does not give as good results as I achieve from growing them in my cold greenhouse. Pterocactus are to be found over a widespread area in Patagonia in southern Argentina. Snow is not rare there in the winter months when the temperature can be several degrees below freezing. This may explain why these plants are cold hardy and – not being tropical – why they adapt well to our own wide differences between the amount of sunshine they receive between winter and summer.

.....from A.Johnston

My Pterocactus are grown in the same compost that I use for almost all my cacti, which is one part grit to two parts of John Innes No.2. When I root down a cutting, the new growth is almost always elongated and only when the plant has had two or three more years will it produce a less elongated growth. At the same time, the tuber is growing steadily larger to a mature size. When the tuber has formed satisfactorily and the new growth is more nearly globular than elongated, only then can a Pterocactus be expected to flower. For example, a cutting of *P.auracanus* which came from the Zurich I.o.S collection needed three or four years of growth before I could expect to see a flower on it.

.....from R.Gillman

My Pterocactus grow in full sun but their branches seem to become detached very easily, especially at the end of the growing season. One of these detached branches had evidently fallen down into a large pot holding an Agave which was on the floor below the bench, where it did not receive quite as much sunlight. It would have been there for no more than two years, I would think, when I discovered one day that it had not only rooted down and produced a tuber, but it was also carrying an open flower.

.....from K.Gilmer

After hearing about the comment from one of your UK members who had a plant of *Pterocactus* which was very reluctant to flower, which was put out of doors for a week or two right in the middle of winter, I tried this idea with one or two of my own *Pterocactus*. However, they did not survive the experiment. Here in winter the night time temperature can fall to as low as minus 12°C and then during the following day the temperature will remain below freezing point, even for a few days. Of course there are night time frosts in Patagonia, but I believe that rarely, if ever, does the temperature drop below -8°C at night, whilst during the following day the sun will be shining and the plants warm up again, so that the tubers are not exposed to severe frosts which they are not able to withstand.

.....from W.Phillips

Reading in Chileans No.63 the comment from J.Arnold about encouraging his *Pterocactus* to flower by starting to water them as early as January, I decided to try an experiment with one of my own *Pterocactus*. I chose a *P.kuntzei* which had shed all of its branches, leaving just a stump of a stem, or neck, on the tuber. I reckoned that if this specimen rotted off as a result of early watering it would be no great loss, as it is one of several that I have of this species. The first watering was early in January, followed by two more in early February and early March, prior to starting the general watering of my collection on 20 March. It did not respond to this early watering treatment in any visible manner until the start of the growing season, when it put out two new growths from the stump of the old stem, shortly followed by a third new stem. Then it started to produce a flower bud on one of the new stems.

.....from A.Johnston

For some years I have been growing various species of *Pterocactus* and several of these do flower fairly regularly each year, for example *P.valentinii*, *P. megliolii*, *P.australis*, and *P.sp.Valdez*. These all produce terminal flowers and so far have never produced a flower from any other point on the stem. Quite often in the past I have tried to pollinate one of these flowers but have never succeeded in getting a fruit to set. Last year, a terminal flower appeared on both of the plants of *P.kuntzei* which came from Scheck in Austria; one of them was a cutting from a Papsch field-collection and the other was a cutting from an ex-Hoffmann plant. This time I tried cross-pollinating them; usually the end of the stem carrying the flower will start to shrink a little shortly after the flower withers, but on these two plants that did not happen. Within a week the end of the stem did expand a little which made me fairly sure that it had set fruit.

From first noticing the fruits, or swelling at the top of the stems, the fruit took three weeks to open. There was no recess on the top of the fruit, representing the base of the flower remains, as would normally be expected, instead the top of the fruit was crowned. After a while the top half of the fruit swung open like a lid and stayed there as it was held up by the interlacing spines - the spines on the separated upper half of the lid and those on the lower part of the fruit. Standing in the lower part of the fruit were seven seeds which were piled up like plates, standing up above the walls of the fruit. These seeds must have exerted quite a pressure on the lid as there did not appear to be enough room inside the fruit to accommodate the seed. The seeds were dry and there was no debris to be seen within the cavity of the fruit. As I took the plant down off the shelf to photograph it, two of the seeds just floated away off the top of the fruit. I think that I was fortunate to have my plant where there was no wind or draught, otherwise I might have just found an empty fruit and never known there had been seed in it. The slightest breeze would blow the seed away, which suggests a quick seed dispersal in habitat. The fruit on the second plant took another week to open and contained four seeds. Each seed was surrounded by a very thin wing, roughly circular in outline, typical of the *Pterocactus* seed I have seen before. The seeds from the first fruit measured approximately 12 mm over the wing and from the second fruit 10 mm over the wing. The wing is not quite flat but has an undulated surface with small black specks. On each seed the wing has a split from the outer edge to the seed in the centre. There was a slight overlap between the two edges of the split, not a gap.

.....from H.Middleditch

What sort of size would the fruit be on *Pterocactus*? Would it be similar on each species or would it be different between one species and another?

.....from M.Kurka

The size of the fruit on *Pterocactus* will depend upon the quantity of seed that it contains, which means how well it has been pollinated. For some years the flowers on my *P.tuberosus* were pollinated just by chance by insects, as I only had one flowering clone of a plant from an origin in Mendoza. The number of seeds in any fruit was twenty or less, arranged in a regular column, the fruit being just a bit thicker than the stem. Later I had flowered several clones of *P.tuberosa* from the same locality in Mendoza and pollinated them deliberately, using a paintbrush. The resultant fruits were about 20 mm in diameter on stems 8-10 mm thick. They contained fifty and more seeds in each fruit, and the seeds were arranged rather irregularly filling the fruit so tightly that when released from the fruit, the seeds were often bent.

.....from J.Chvastek, Cactaceae etc., 2008

On the last day of our visit to western Argentina, in December of 2000, we made a stop at Caucete, not far from San Juan city, which was occupied by low hills. There were plenty of *Tephrocactus aoracantha* and *Echinopsis leucantha* there. Our next stop on the way to Mendoza city was on a flat expanse of loamy alluvium with bushes growing on low hillocks, Here we found a population of *P.tuberosus* under a low overgrowth of bushes, which were not easy to see among the similarly coloured branches of the bushes. These *Pterocactus* were carrying fruit, from which seeds were beginning to fall.

It is typical of the genus *Pterocactus* that in early Spring, mature segments develop a terminal flower and after fertilisation develop seeds in the apical part of the stem. When they are ripe, the fruit splits and releases flat winged seeds of a diameter of about 12 mm across the wing. In each fruit there are usually about fifty seeds, which in the wild are scattered by the wind and rain. After the ripening of the fruit, the whole segment withers away. In the next vegetative season, new segments grow from the tuberous base.

.....from K.Gilmer

Last year I was also successful in being able to set fruit on some of my *Pterocactus*. My own experience is that self-pollination is not possible with *Pterocactus*; fruit can only be set by cross-pollination. Flowers were cross pollinated on two different clones of *Pterocactus kuntzei* and fruit was set in both of them. There were also flowers on *Pt.megliolii*, *Pt.reticulatus* and *Pt.gonjianii* of which I have only one clone. So I made a cross between *P.gonjianii* x *P.reticulatus*, and also *P.kuntzei* x *P.megliolii*, which set fruit. The time it takes for the fruit to ripen depends very much upon the influence of the weather. When it is hot with plenty of sunshine, the fruit will ripen in three or four weeks, but if it is cool and overcast it can take 6 or 7 weeks for the fruit to ripen. If a fruit is opened before it is fully ripe, the seeds will stop in situ and they are not quite dry. When the fruit is ripe, the fruit splits equatorially and the lid opens. This mode of opening is similar on each species and allows the seed to escape.

It is very easy to spread the seed with only a little wind, but in those places in Argentina where we saw *Pterocactus* growing there is quite a strong wind which blows every day, so it will be quite effective in dispersing the seed. In habitat most *Pterocactus* flower very early in the spring, before the rainy season and about three or four weeks after they have flowered the rainy season starts. This means that the seed will probably germinate fairly quickly, that is, in the same season that the plants flower.

.....from H.Midleditch

Were any fruits ever found in habitat on *Pterocactus* which had split, or opened, so exposing the seeds?

.....from J.Lambert

Seeds of *Pterocactus* are of course built to be scattered by the wind. The only chance of collecting them in habitat is to find a fruit still unopened. I do not think that the fruits will last from one summer to the next, and indeed the flowering seemed to be over on the plants which were bearing fruits. Flowering time for *Pterocactus* in habitat is indeed from the end of November to the beginning of December, a little later in Patagonia than further to the north. Flowers were seen on *Pterocactus* at Llanos de Chita on 23 November, at Rio Malargue on 28 November, and on Sierra de Portezuelo on 2 December. From what I observed in cultivation, plants may produce a limited number of flowers within a short period; they do not seem to spread their flowering period over any considerable length of time.

.....from C.Pugh

On the very first day of our visit to western Argentina, we made a stop roughly half way between Mendoza and Villavicencio. This was an arid, sandy area, with very little in the way of vegetation to be seen other than waist-high bushes. It was here that we found a scattering of *Pterocactus*, mostly out in the open but also growing under the bushes. Many of them had a swelling at the top of the stem, although this was not often very obvious. We took this to be sign that the plants had set fruit. None of these fruits had split (late November) and we took them to be unripe. We decided to bring some of this unripe fruit back with us. Back home, on opening the bag containing this fruit, it gave me the impression that a cap had come off the first fruit I looked at. And then I thought that there must be quite a few more fruit caps inside the bag, but in fact it was the seed. We saw *Pterocactus* at four other stopping places on this trip, but only at this first stop did we find any *Pterocactus* in fruit.

About half of this seed was sown, laid flat on a peaty compost with a covering of eighth inch grit, and germination has been quite good.

.....from G.Charles

From our stop to the south of Villavicencio I was able to bring back with me one fruit off a *Pterocactus* which was still unopened when it was collected. It was still unopened when we returned home on 13 December but early in January the top of the fruit split open, to reveal the seeds stacked neatly inside the pod.

.....from A.Johnston

The photographs taken by K.Gilmer show the fruit on his *Pterocactus* splitting to expose the seeds but without the lid, or top half of the fruit, breaking away. It looks as if the fruit on *Pt.gonjianii* is a reddish colour whilst that on *Pt.megliolii* is a yellowish colour.

.....from H.Middleditch

On the photograph received from A.Johnston of the ripe fruit on *Pt.kuntzei*, with the lid detached from the fruit but prevented from falling away by the entangling spines, the stack of seed is standing above the bottom part of the fruit. It is quite astonishing that the diameter over the wing of the seed is greater than the diameter over the body of the fruit. Perhaps the wing of the seed spreads out as the fruit splits, or the body of the fruit shrinks a little.

.....from K.Gilmer

Although the photograph taken by A.Johnston certainly shows the diameter over the wing of the seeds to be greater than the size of the fruit, this was not the case on the fruit which set on my own *Pterocactus*. In particular the diameter of the fruit on *Pt.megliolii*, *Pt.reticulatus*, and *Pt.gonjianii* is larger than the diameter over the wing of the seed.

.....from U.Eggli.

Fruiting has occurred sporadically amongst the *Pterocactus* cultivated here at Zurich. These are mostly *Pt.kuntzei*. I have never tested whether the plants are self-sterile or self-fertile; pollination must have been fortuitous, possibly the work of bees or other insects. The time taken by the fruit to ripen may depend upon the species in question; also it might well be influenced by the weather and growing conditions. But 6-8 weeks I would imagine to be a reasonable time for the fruit to ripen. The fruits are indeed usually circumscissile, but often not completely, or do split lengthways in part as well. This might depend upon the water status of the plant, and I have also observed that fruits of the same plant can be thick and turgid i.e. much wider than the stem, or meagre and flaccid i.e. about the same diameter as the stem. Although I have not observed seed lying on an open fruit with the diameter of the seed greater than that of the fruit, as in the photograph taken by A.Johnston, I find it very difficult to believe that the seed diameter can exceed the diameter of the unopened fruit. The walls of the opened fruits shrivel quickly and might be responsible for this observation.

As far as I have seen, flowering in the lowland populations in San Juan must be November or early December, but material from higher elevations and from the far south of Mendoza could be later. The fruits which I observed near Mendoza in mid-January 1995 were still closed, but the seeds were ripe and fertile. In this same area I also observed an interesting plant with bright yellow fruits, whose identity has not yet been resolved. Fruit colour does indeed appear to be variable. In this connection, I do have difficulties in separating some of the taxa of the genus on the basis of the material I have seen so far and consequently my observations on fruit colour are not yet easy to interpret.

.....from K.Preston-Mafham

A trip was made to parts of Patagonia in the month of December. The peaks of the Andes were covered with snow and at their foot we found a great many *Maihuea*; there were hundreds of ripe fruit on these plants but only one of them was in flower. There were black swans to be seen on Laguna Blanca, between Neuquen and Zapala. There were lots of *Pterocactus* to be seen, but only growing in sand - it may have been *P.hickenii*. Evidently the fruits would root down and form new plants, although the fruit does look rather similar to pieces of the stem. Quite a lot of fruit was found and cut open, but in every case there was some mushy pulp between and around the seeds, so the fruit cannot have dried out. It had typical *Pterocactus* winged seed. It was very windy indeed out there. Every afternoon the wind would get up and quickly become quite forceful. It would blow dust up off the ground into the air and whip it into ones eyes, making things really unpleasant.

.....from J.Lambert

The idea that a fruit from *Pterocactus* would root down does not seem to be very likely.

.....from U.Eggli

Regarding the mention of pulp between and around the seeds of *Pterocactus*, I am not able to confirm such a characteristic of *Pterocactus* fruits. The interior tissue of all parts of *Pterocacti* is extremely mucilaginous and slimy, so it may be possible that the material from the fruit wall was mistaken for pulp filling the fruit.

.....from H.Middleditch

If the seeds are fairly tightly packed within the *Pterocactus* fruit and the walls of the unripe fruit are inherently mushy, cutting into an unripe fruit must inevitably result in some of the fractured internal wall cells getting spread over the seed. If the wall of the unripe fruit is indeed very mucilaginous and slimy, is quite probable that this mushy material will have a fairly high water content which will start to sublime or evaporate once the ripened fruit does split. The consequence would inevitably be shrinkage of the body of the fruit. This

sequence of events would explain the observation made by K.Preston-Mafham on unripe fruit and that by A.Johnson on the seed diameter exceeding the breadth of the split, ripe, fruit.

Has any of the seed from the fruit which was set in cultivation, been sown to establish whether indeed it does germinate readily when very fresh?

.....from K.Gilmer

I have only sown seed from my *Pterocactus* in two different ways - by pushing it down vertically into the seed compost for the full depth of the wing, and by laying it horizontally and then covering it with about 5 mm of seed compost.

.....from A.Johnston

Some of my own seed has been sown, by pushing it vertically into the soil, with a little less than half the wing left showing above the soil. These have germinated quite well. Now I have three lots of seedlings, one from seed off my own plant, one from seed received from Nyfeller, and the third from seed received from K.Gilmer. These were sown in May and now (December) already have nice tubers under them. Some of those that did not germinate in May have been re-sown in plastic bags and germinated early in September. This shows that you should not give up too easily when seeds of *Pterocactus*, *Tephrocactus*, or *Maihuenia* have not germinated. *Maihuenia* will even germinate a year after sowing.

.....from W.Phillips.

It is more years ago than I care to remember that I read somewhere that *Pterocactus* seed should be sown by pushing it down edgewise into the compost, not laying it flat, so that is my usual practice. On the first occasion when I grew some *Pterocactus* from seed, I used a container which would possibly be two or three inches deep, which had proved quite satisfactory for raising a great many other sorts of seed. But when I came to remove these *Pterocactus* seedlings from their pot, I found that they had grown a long, thickish root which had curled up round the inside of the bottom of the pot. So I resolved to use a much deeper pot if I tried any more *Pterocactus* from seed.

Seed of both *Pt.gonjani* and *Pt.kuntzei* were sown in late March 2000 in 6 inch deep pots. These were repotted one year later, when the seedlings had grown a rootstock of which the top half was just the same diameter as the aerial stems - about pencil thickness. The lower part of the root was not much thinner. On average, the *Pt.kuntzei* had a stem about 3 inches long and a root about 4 inches long, whilst the *Pt.gonjani* had a 2 inch long stem and a 3 inch long root. The *Pt.gonjani* had not yet developed its tuberculate epidermis. The bristly spination could be felt on *Pt.kuntzei*, but not on *Pt.gonjani*.

.....from R.Moreton

The biggest problem in growing *Pterocactus* from seed is being able to obtain any seed in the first place! But if the seed is O.K. then they germinate well in only three or four days and grow on quite easily. The seedlings have cotyledons which are like those on very young seedlings of *Cereus*. I have kept the few that I have grown in normal depth pots, in a greenhouse which is just frost-free in winter, but I do find certain species such as *P.valentini* to be rather tricky. Several of them have flowered.

.....from P.Femenia

Growing *Pterocactus* from seed, in my experience, yields only about 20 to 25% germination. Over the first winter the seedlings are too small to keep them for safety in the cold greenhouse, exposed to some frost, but 4 to 5°C is enough. But they do not like a sunny position over their first winter.

.....from A.Johnston

After setting fruit for the first time on my own *Pterocactus kuntzei*, I have tried setting fruit on various other species of *Pterocactus*. But I have never had any success in trying to set fruit by crossing flowers on the same plant, or by crossing flowers on two different clones of the same plant. But fortunately I have been able to acquire more than one clone of several spp. of *Pterocactus*, so that for example crossing flowers from different clones of *P.meglioli* has produced fruit and seeds - and similarly on *P.gonjani*.

In my collection I have a lot of *P.kuntzei* which were obtained from various growers, including plants which carry a selection of Kuhas field numbers; crossing flowers on different clones of this species will often produce fruit and seeds. Although I do have a lot of clones of *P.australis*, crossing flowers on different clones of this species has not yet been successful in producing fruit, until last year when fruit was set for the very first time. Also I do have a lot of plants of *P.valentini* which flower at the same time, but crossing different clones has so far not resulted in any fruit being set. Although I have tried using foreign pollen from *Tephrocactus* flowers and brushed it on to the stigmas of various spp. of *Pterocactus*, that has never resulted in any fruit being set.

Sometimes a flower may not open fully on a *Pterocactus* plant, especially during a spell of dull weather, but where a flower does open fully, the stigma lobes may remain closed. I have tried to open the stigma lobes out first, with a pair of tweezers, before daubing pollen on their inner faces. But I think that it is possibly best

to apply pollen to stigma lobes which have already opened.

All the fruits on my various spp. of *Pterocactus* form in a similar manner. The flowers, of course, appear terminally on the stem and it is not possible to see any real difference between the stem itself and the pericarpel of the flower. There is not even a difference in diameter between them, the flower tube and petals simply being carried on the top of the stem. When the flower withers it is not immediately obvious whether or not a fruit has set. The apparent short length of stem below the withered petals will be a pale brown colour and never actually looks green. However, if the withered flower remains are touched and it has not set fruit, it will become detached- if it has set fruit, it will remain in place.

Once the fruit has set, it will gradually increase in diameter as the seed ripens, as the ripe seed becomes larger than the diameter of the stem. Eventually the fruit will split horizontally about half way up its height, the split extending at least half way round the fruit. The top half of the fruit lifts like a lid hinged at one side, so exposing the seeds to view, which are stacked one above the other like a pile of plates.

.....from H.Middleditch

The distribution area for *Pterocactus* appears to extend for quite some distance from south to north in the southwestern part of Argentina. It might be useful to know the extent of that distribution.

.....from P.Crewe

The distribution area for *Pterocactus* in Argentina extends from province Patagonia in the south to just into province Salta in the north. This is a very extensive area of distribution between the two extremes which extends to 1800 miles or 2900 kms.

.....from H.Middleditch

Over the north to south extent of such a lengthy distribution area there will surely be a considerable degree of difference in the prevailing climate. It may be possible that this will influence the appearance of various characters which evidently do differ between individual species – such as the appearance of the flower tube and the nature of the fruit opening, as may be seen in the photographs from K.Gilmer on the inside front cover. The variation mentioned in the size of the individual seeds may also possibly be related to certain specific species. Also individual species of *Pterocactus* are unlikely to extend over the whole of the distribution area for *Pterocactus*.

## **FINDING SOME HAAGEOCEREUS IN NORTHERN PERU**

**From H.Sonnermo**

My first visit to Peru was in 2000 when I travelled into the mountains on a search for *Opuntia lagopus* and *Austrocylindropuntia floccosa*. Nearly at the end of my visit to Peru, I was back in Lima with just one day left. Having talked to Carlos Ostolaza, I decided to try and find the place where *Haageocereus tenuis* was supposed to grow. Taking a bus out of Lima, it was about an hour before the outskirts of Lima disappeared to the south and the desert took over. Near Chancay I got a lift in a passing car which took me north and then out on to the sand. On the inland side of the road I found some tiny plants of *Haageocereus* creeping along in the sand, partially covered with sea shells and hen feathers. Although these plants may extend as far as 1.5 square km., there was a great deal of bare ground in that area, and not many plants, as they were well apart from one another. There was just bare desert all round, without any vegetation at all.

When I first saw these plants they looked just like sticks lying in the sand, with very small stems. I did measure them at 1.5 to 3 cm thick, just as Ritter says in his *Kakteen in Sudamerika*, but I also saw some with thicker stems, about 3 to 4 cm thick. But I would not like to say if those had a stronger spination. In nature they had a starving look, looking just like the plants in the picture of *H.tenuis* in the K.u.a.S. of 41(2)1990, where the stems are lying decumbent, partially covered in sand and just a short length at the growing ends turned slightly upwards.

I collected one or two small pieces of this *H.tenuis* and back home I have been lucky enough with rooting them. One thing that I am quite certain about is that the thickness of the stem does increase in cultivation, up to 5 cm thick. I can also say that the flower does last only one night, opening at about 2100 hours and starting to close at about 0900 hours. The flowers have a length of 8.5 to 11.5 cm, which matches that given by Ritter. My cultivated specimens have also set fruit, of 3-4 cm in diameter, oval in shape and red in colour.

A second visit to Peru was made in December of 2013, when we travelled from Lima northwards along the coast road to Chancay. This road runs through desert-like surroundings of more or less level sand, or sand dunes, where there is a complete absence of vegetation. This desert zone extends for about 10 to 12 km from the sea to the foot of the mountains. At two places about 5 km apart, we stopped when we saw what appeared to be some cacti, so we walked across the sand to look at them. We found that they were groups of a *Haageocereus* which we could identify as *H.tenuis*. Both groups extended over an area of about 20 m by 20 m.



Each plant consisted of one solitary stem of a length of up to 30 to 40 cm and a diameter of 2 to 3 cm. Each stem either laid on the ground or was curved slightly upwards off the sand.

On this visit to Peru we travelled into the mountains again, but this time it was to search for *Haageocereus*. At the very foot of the hillsides where the sandy desert gave way to slopes of rock, we came across a *Haageocereus* in a patch of sand with some solid rock less than a meter away. This plant had nearly a score of stems, mostly growing not quite upright, up to about 30 cm tall, with two decumbent stems about 50-70 cm long, which were lying on the sand with just a short length at the growing point turned half upwards.

As we climbed further uphill, we saw some slopes which appeared to be completely solid rock, with what looked like a thin patchy cover of sand here and there. In this patchy sand we saw a few decumbent *Haageocereus*. The mature plants had a dozen or more stems of a grey colour, some 4 to 5 cm thick and up to about 50-70 cm long, with new spines of a yellowish-red colour. Most of the stems pointed uphill, next to the ground. Other stems which had started by growing downhill tended to curve round, so that in due course they would presumably also face uphill. These plants seldom grew in close proximity to one another - on one slope of 100 m or more across there was only one of these plants to be seen. Climbing a little further, we came across a *Loxanthocereus*, which we could identify by its single red flower. This plant had about half a dozen stems, the longest nearly a metre long, which curved from horizontal to a half-upright attitude, the other stems being decumbent.

Some upright growing *Haageocereus* that we now started to see were mostly in ground covered with broken rock or rubble, rarely growing closer than a few meters apart but usually widely separated from one another. Just like the lower slopes, there was no other vegetation whatsoever to be seen in their vicinity. This was the only place where we saw some open flowers on the *Haageocereus* - we also saw a humming bird visiting these flowers, apparently looking for nectar.

Still further up in the mountains we did see quite a number of *Haageocereus* in various places, amongst which were plants displaying distinct differences in their appearance. Some of these plants grew in a decumbent manner and others grew upright. Among the upright growing plants there appeared to be more than one species, displaying differences in such as height, stem thickness, and the nature of the spination. However, we were unable to put a specific name to any of them.

.....from C.Ostolaza & W.Rauh, K.u.a.S 41 (2) 1990

Along some 200 km of the Peruvian coast, southwards from about 40°S latitude, there extends a desert of about 50 km in width, which continues further into northern Chile where it is known as the Atacama desert. To the east the desert is bounded by the roughly 1500 m high coastal cordillera, behind which the main cordillera rises further to the east, up to about 7000 m altitude. This is a section of the longest uplifted mountain range in the world, the Andes, which extends for some 900 km north to south.

Although large tracts of the desert north of Lima, especially in the vicinity of the large rivers, are today transformed into valuable cultivated lands growing vegetables, sugar cane, and rice, whilst at only a few places in southern Peru does the coastal cordillera with its boulders advance to the edge of the sea, nevertheless huge areas of the coastal desert occur as sandy plains.

The basic cause of the existence of the Chile-Peru coastal desert lies in the cold sea current which arises from the Antarctic and travels northwards parallel to the coast. The existence of the cold ocean current was noted for the first time by the great explorer Alexander von Humboldt on his trip to South America. The water temperature off the coast of Peru is only about 18°C.

The coastal desert is of a special type since the air temperature is relatively low on account of the cool ocean current. The resultant mist, which extends up to 800 m altitude, occurs between April (May) and October (November), and is described as *Garua* in Peru. Virtually no rain falls from the mist, but only a fine precipitation of drizzle which moistens only the uppermost layer of the ground; however, this is sufficient for the development of a rich vegetation which is described as *Lomas*. This is predominantly annuals such as bulbous and tuberous plants which, for a short period, convert the sandy desert into a colourful tapestry of flowers. When the mist disperses at the beginning of November, and the sun shines down from a cloudless sky for the following six months, the *Loma* vegetation rapidly disappears and once again the sandy desert regains its grandiose monotony, which is broken only here and there by the occurrence of perennial plants.

There are two particular plant families involved, the Bromeliaceae and the Cactaceae. The first is represented by the grey terrestrial *Tillandsias* which often form stands a quarter of a km across, separated from one another by flat, sandy, vegetationless areas. These mostly rootless *Tillandsias* lie loosely on the sand so that an individual specimen can easily be blown along by the wind.

The cacti are represented by a greater variety of genera and spp. The larger, bush- or tree-forming cacti, often of huge size, are to be found only in places where the rocky slopes of the coastal cordillera extend

eastwards as far as the sea - for example in southern Peru at Atico with *Neoraimondia arequipensis*, *Corryocactus brachypetalus*, and *Trichocereus peruvianus*. An exception is the treelike *Armatocereus cartwrightianus*, which in N.Peru and S.Ecuador colonises the loamy-sandy plain in the immediate vicinity of the coast. More commonly however, the desert cacti of Peru are characterised by a short columnar to globular or decumbent, creeping, mode of growth. For example there belongs here the *Islaya* spp. of S.Peru, as well as the genus *Pygmaocereus* with its swollen rootstock supporting short columnar stems which in habitat attain a length of 5 to 10 cm. They are submerged in the ground up to the crown so that these plants are only to be found when in flower.

The representatives of the genus *Haageocereus* from the sandy desert are characterised by a decumbent, creeping mode of growth (probably on account of the constantly blowing wind). On the other hand, those spp. which are to be found more inland, in the region of the rocky desert with sparse precipitation, display an upright, bushy mode of growth.

To these decumbent, creeping spp. there belongs *Haageocereus repens*, from S. of Trujillo, *H.decumbens* from S. of Lima, *H.australis* and *H.litoralis* from S.Peru near Atico. All these spp. form extensive colonies, in which the growing point faces seawards, that is to say, pointing in the direction of the maximum airborne moisture. Early in the morning, during the Garua season, we were often able to observe the tiny water droplets which had condensed on the spines of these plants.

Also belonging to this decumbent-creeping group of desert cacti is *Haageocereus tenuis*, which was first briefly described by Ritter in 1986, although without knowledge of the flower and fruit; according to Ritter he had already discovered this plant in 1956. In that respect it is to be noted that Rauh had already found this plant on his first trip to Peru. It was, however, not described since neither flowers nor fruit were present. The habitat location for *Haageocereus tenuis* was also sought for again on his later trip, because the occurrence of these colonies is difficult to locate from the Pan-American Highway; but again with the same outcome: neither flowers nor fruit were determined.

With the description of *Haageocereus tenuis* as a new species, Ritter had done no more than that. When he wrote "this species is so characteristic that even without knowledge of the absent components of the plant, it is easily determinable" (Ritter p.1422), this remark cannot remain undisputed, since vegetatively *Haageocereus tenuis* is scarcely to be distinguished from one of the *Loxanthocereus* sp from central Peru which remain small. In March 1988 C.Ostolaza and W.Rauh, on a joint excursion, had the good fortune to find some specimens with flower buds and ripe fruit. These were cultivated by C.Ostolaza in his garden which lies within the zone of the coastal desert, where the plants came into full flower, so that now a description of the flower and the fruit can be made, together with an emendation of the Ritter diagnosis.

[Full description follows, including] Flowers rotate, 8.5 to 11.5 cm long, opening in the late afternoon between 1700 and 1830 hours, closing again at 0530 hours in the morning. Pericarpell and tube brownish to olive-green, with scales increasing in size upwards ..... fruit pale red, oval 3 x 2 cm, filled with pulp and small black seeds. Unfortunately the seed conveyed from C.Ostolaza had been crushed in transit so that a study under the microscope was not possible.

Location, between Chancay and Huacho at +/- 300 m altitude. Here the plants form a great number of colonies but their overall distribution is confined to a patch of about one and a half square km.

According to Ritter (1986) "this species is dimorphic, occurring in two different forms. Either the stems are 2-3 cm thick with 12-14(-15) ribs or they are 1.5 to 2 cm thick with 14-15 ribs. Without taxonomic experience it would be easy to consider that both forms of *Haageocereus tenuis* are two spp. or at least regard them as two varieties of the one species. Both grow intermingled at the same location and there are transitional forms between the two."

However it is clear that occasionally stems of the thicker, more strongly spined form, grow on in age to the fine spined form. Individual stems were noted which started as the thin form, then subsequently became thicker, whilst towards the growing point they adopted the juvenile form again. It is not appropriate to speak of dimorphism in this instance. It is merely a matter of morphological variation, occasioned by the external influences of temperature, light, condensation, and covering by sand. As Ostolaza has observed, the growths were only thicker in cultivation - up to 4.5 cm thick - as a consequence of the better prevailing conditions.

.....from H.Middleditch

In this article it is stated quite clearly that specimens of *Haageocereus tenuis* was found by Rauh in the course of his first trip to Peru in 1956, and then for the second time during the course of his subsequent visit to that country. Presumably this statement would emanate from Rauh, one of the co-authors of this article. However, a careful search of the content of Rauh's book about the Peruvian Cactus Vegetation, has not revealed any reference to this particular plant. Moreover, it is specifically stated in the above article that *Haageocereus tenuis* "was not described since flowers and fruit were not present". Nevertheless, dipping at

random into Rauh's book on the Peruvian cacti, there is included a description of *Cleistocactus crassiserpens* sp.nov whose “flores et fructus ignoti”, as well as of *Haageocereus tenuispinus* sp.nov., again whose “flores et fructus ignoti”. Why no mention of *Haageocereus tenuis* whose flower and fruit was unknown?

.....from C.Ostolaza

When we found *Haageocereus tenuis* in 1988, Prof.Rauh did not tell me that he had been aware of the existence of this plant since 1954. If he did know of its existence, why is it missing from *Descriptiones Cactacearum Novarum* of 1956?

.....from H.Sonnermo

When we first saw these decumbent *H.tenuis* we were very surprised to find that all the stems faced inland, away from the sea, and we discussed this between us at considerable length. I have taken a picture of a group of these plants and I can recollect their direction of growth.

.....from H.Middleditch

It is stated above by Ostolaza and Rauh that the growing points of *H.repens* from south of Trujillo face seawards whilst Sonnermo observes that the stems of *H.tenuis* face away from the sea. Does this mean that these two species grow facing the two different compass directions? Or are those observations open to question?

.....from J.Arnold

My impression of the *H.tenuis* that we saw was that the stems all pointed inland, facing away from the ocean. On the other hand, my overall impression was that the stems of *H.repens* that we saw to the south of Trujillo did point in the direction of the ocean.

.....from P.Hoxey

We found many decumbent *Haageocereus* in the coastal desert zone where they can only get moisture which the wind brings in from the sea. All these plants face away from the sea, perhaps because of the force of the incoming wind.

.....from M.Williams

As I recall, the stems of *H.tenuis* tend to grow lying on the sand with the growing ends turning upwards, with the stems lying more or less parallel to the Pan-Am highway, which makes them parallel to the coast.

.....from H.Middleditch

From the foregoing observations there appears to be two possibilities – either that the direction in which these decumbent *Haageocerus* face is not consistent or it could possibly be due the lack of any compass when they were seen – or no other guide to direction – which may account for the different comments.

.....from M.Williams

Having the guidance of C.Ostolaza we were able to find the habitat location of *Haageocereus tenuis* without any real difficulty. Approaching Chancay it was possible to see clumps of this plant from the road, on the inland side of the road. Their prostrate stems would be up to 2 m long with the growing ends turned half-upwards. There were not many of these plants and they were well spaced apart. From there, we headed further north along the coast. When we were not far to the south of Trujillo, we stopped to have a look at the *Haageocereus repens* growing there. In habitat, both *H.tenuis* and *H.repens* look similar to me. They both occur in large individual clumps, not many, and well spaced apart. These clumps comprise many lengths of long horizontal stems of more than a metre in length covered with loose sand, out of which only the spines project. Only the growing ends standing up, some vertically, for up to about 25 cm in length. The *H.repens* has less slender stems than *H.tenuis*, whilst the *H. tenuis* has predominantly grey spines and the *H.repens* has ginger spines.

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

Although wide stretches of the coastal desert of central and southern Peru are completely lacking in vegetation, on the other hand however extensive areas of sands carry a surprisingly rich vegetation, not only of annuals, but also of perennials. The most widespread plants in the real desert region are *Tillandias*. In this *Tillandsia* formation, there also occur some interesting cacti belonging to the genera *Haageocereus*, *Loxanthocereus*, and *Islaya*. Thus in the stretch from Chala southwards (with breaks) to Mollendo, *Haageocereus decumbens* commonly occurs in abundant populations, such as near Chala and at km 617.

Near Chala, *Haageocereus decumbens* grows predominantly in flat erosion gulleys in company with *Amaryllidaceae*, *Nolana*, *Oxalis*, etc. But *H.decumbens* is entirely absent from the elevated hills lying further inland which carry the Loma vegetation. Here at 200 m altitude above Chala on a fairly steep hillside the cacti are represented by the 3 to 4 m tall *Trichocereus chalaensis* (K 128). *Trichocereus* has its main area of distribution in Peru at much higher altitudes of between 2000 m and 3000 m but at this point, near Chala, it reaches its lowest altitude. *Trichocereus chalaensis* is confined to the valley sides where it can form dense stands, in the company of dwarf bushes.

Haageocereus  
repens  
near Trujillo  
Photo::  
J.Arnold



Haageocereus  
repens  
near Trujillo  
Photo::  
J.Arnold

Haageocereus  
repens  
near Trujillo  
Photo::  
P.Hoxey



.....from Heidelberg University

The records in our possession of the collections made in Peru by W.Rauh are far from complete. In the herbarium here we do have a large number of items originating from Peru which were deposited by W.Rauh. Unfortunately it would not be possible to commit ourselves to preparing a list of all these items.

.....from H.Middleditch

Would an abstract purely noting locations against a batch of field numbers be practicable?

.....from Heidelberg University

We are able to enclose an abstract of the range of field numbers used in the various sections of Rauh's travels in Peru, based upon the herbarium items in our possession.

.....from H.Middleditch

This list includes only four sections within the area of the coastal desert. Could the cactaceae which are recorded within these four sections, be listed?

.....from Heidelberg University

There are no specimens of cactaceae deposited here from the coastal desert areas of Peru.

.....from H.Middleditch

Which would appear to indicate that all the coastal desert items with an attached field number that are mentioned in Rauh's "Peruvian Cactus Vegetation" are held somewhere other than Heidelberg, or no longer exist.

## **FINDING SOME HAAGEOCEREUS IN NORTHERN PERU**

**From P.Hoxey**

A trip to northern Peru was arranged for December 2001 through to January 2002 in the company of Alfred Lau. After arriving at Lima we headed north along the Pan-American Highway, intending to go all the way to Trujillo, a 600 km stretch. This road passes through the coastal desert of Peru, the environment being very dry, particularly at the time of our visit. It is during these (southern hemisphere) summer months when the fog and mist, which blanket this region for much of the year, are all but absent and we were treated to strong sunshine. The vegetation along this road can be described as sparse at best and was totally absent for much of this journey.

On leaving Lima the first planned stop was to search for *Haageocereus tenuis* between Chancay and Huacho. This plant is reported to be quite localised and rare in habitat and endangered by disturbance from nearby poultry farms, but we were fortunate to have good locality information. I say fortunately, as from leaving Lima there did not look to be any promising cactus habitats and without pre-advice I am sure that we would have driven straight past this barren area without stopping. And indeed it was very fascinating where we did find them.

We took a small track leading east off the main highway, heading over a flat expanse of sand, seemingly completely devoid of any sign of moisture or plant life. But it was only a few hundred yards from the highway where we found the first specimens of *Haageocereus tenuis*. The plants were growing in clumps standing on slightly raised patches of ground, where sand and other debris had collected around them. The debris included shell fragments, rubbish, and chicken feathers from the nearby poultry farms which dot the area. During our visit the wind was blowing strongly although I do not know if this was typical or not. These clumps of *Haageocereus tenuis* consisted of many stems arranged in a haphazard way, and well spaced out one from the other, making it difficult to tell if we were looking at one plant or a group of several plants. Most stems appeared to be facing north. These stems were growing almost horizontal with the older parts buried, partially or completely in the sand, but with the growing point curving upwards. Blowing away the sand from a covered stem confirmed that it was rooting down from underneath.

The clumps were not great in number and tended to be widely spaced apart. The dryness of the area may make the establishment of new clumps from germinating seed very difficult. The conditions of the clumps varied considerably, some looking in poor health with few signs of growth, others looking more vigorous with ample evidence of new growth. The largest clump we saw was about 2 m across and contained 100 or more heads. I would say that there were stems of about one cm in diameter as well as other stems of about 2 cm in diameter. Walking further away from the highway, we found more clumps but the area of distribution was not extensive and explorations towards the hills some 3 km away from the highway revealed no more plants. Two clumps some distance from the main population had very well developed flower buds. A small piece of stem complete with a flower bud was taken in order to see the flower open in the next day or two as the 1981 Ritter description lacked details of flowers, fruit, or seeds. Our observations and measurements included:-



Flowers start to open one hour before sunset, fully open two hours after dark, closes about 5am while still dark; flowers arise from near the apex of the stem. Total flower length 12 cm, 40 to 45 mm across the flower opening. Tube, 5 cm long, 10 mm wide at base, 25 mm wide at top, dark brown. Scales start half way up the tube, lowermost 1 mm long, uppermost 8 mm long, white hair in the axils. Petals 25 mm long by 12 mm wide, entire, with slight touch of purple at the edges of the outer petals. Filaments 3 to 4 cm long, anthers 2 mm long. light yellow. Style 65 mm long, stigma lobes 8 off, white, 7 mm long.

There was much evidence of digging and scratching in the area around these plants and investigation revealed the remains of underground bulbs growing just below the surface. It was assumed that this was the result of animals searching for and feeding on this food source.

We continued with the vehicle along the track which headed off east towards the hills. Orange flowers spotted from the vehicle turned out to be carried on a single green stalk from a bulb. Each flower stalk had 4 or 5 flowers on it and in the majority of cases one of the flowers was male only with much enlarged anthers and no stigma.

On reaching the base of the hills we started to climb the rocks which were covered in lichen and a little moss but there was little other non-cactus vegetation. This hill rose some 100 m above the desert floor and had two species of cacti growing on it. One was a *Haageocereus* species of quite different appearance to *H.tenuis*, with much thicker stems having yellow spines with centrals of uneven length, which I tentatively identified as *Haageocereus pseudomelanostele*. It was growing in small clumps branching from the base with upright growing stems, which were much thicker than those of *H.tenuis*. Emerging near the growing point on one plant was a recently closed flower which was white in colour and green on the outside. Also present here was a *Loxanthocereus* sp. superficially similar to the *Haageocereus*. Again with yellow spines, but with thinner stems and lacking in central spines. The first few of these, I incorrectly assumed to be a small juvenile form of the *Haageocereus* growing here. But one was in flower, having the typical zygomorphic flower, reddish orange in colour. I tentatively identified this as *Loxanthocereus acanthurus*. Both the *Haageocereus* and the *Loxanthocereus* appeared to be in good condition and it was quite a surprise to see such prospering plant life, as I feel sure that the moisture available on the hillsides is similar to that on the flat desert floor. Some distance away on a north facing slope larger cereoid plants were spotted, but too far away to recognise, perhaps *Neoraimondia arequipensis*. It must be the nature of the sandy desert terrain which makes the growth of plant life much more difficult there.

Our next stop was to the south of the city of Trujillo. Again we had some habitat information, but we were initially rather shocked to see large areas of the dry desert converted into sugar cane fields. An irrigation scheme brings water down from the mountains, making agriculture possible in this rainless environment. Taking a track down past the sugar cane fields we stopped to explore the sandy desert at the base of the hills. Here we found our quarry - *Haageocereus repens*. Talking to a farmer we were told of plans to expand the sugar cane fields considerably, which will destroy all the cacti at this location. These *Haageocereus* grow on gentle sandy slopes, some standing upright out of the sand, others with more prostrate heads. These stems lying flat on the ground often get covered in shifting sand, with just the upward pointing heads above ground. They did not appear to root down as they went along.

There are also large colonies of *Tillandsias* in the same area. The *Haageocereus* looked to be in excellent condition, all plants displaying a few cm of fresh growth. Many plants had ripe fruits, just starting to split open to reveal the small black seeds in a white pulp. The fruits were red (some with a little green colour at the base) approx. 4 cm long by 3 cm wide, with dried flower remains of 2 cm in length. These ripe fruits are easily detached from the plant. The farmer told us that these plants had been in flower some 2 months previously, which would indicate that the flowering season is during October. The fruits, which can be eaten, are called tuna by the locals, a name more commonly used for fruits of *Opuntia* spp.

The population of *Haageocereus* in this area is very interesting and it is to be hoped that some plants will be left in habitat and not destroyed by the development of this area.

After looking at the *H.repens* growing on the sandy desert, we drove inland to the hillside. The *Haageocereus* were present in good numbers on the lower slopes, still growing in sand, but not so decumbent. The *Tillandsias* that we had seen on the flat sandy area continued to carpet the ground, with many in flower. The humming birds were seen pollinating them, although darting about far too fast to be successfully photographed. Higher upon these rocky slopes we found a few specimens of *Neoraimondia*. Growing with them again the *Haageocereus* and here it was also in fruit so presumably also flowers about October. It appeared to be the same species which we had found growing all the way up the hillside from where we had parked our vehicle.

.....from F.Larsen

After some days spent exploring for cacti in the mountains in company with a local cactophile, we stopped to take a look at the *Haageocereus* growing near Trujillo. They were growing in an area of flat sandy desert with no other vegetation – but with many plastic bags around. It is a very extensive area with many groups of these plants with the groups well separated from each other. I am not aware of any other habitat locations for this species. Some of them grew nearly upright but with a slight curve to the stem whilst others had stem that started by growing slightly above horizontal and then gradually curving upwards so that the stems finish pointing nearly upright, forming a quarter circle. They face in all directions.

.....from J.Arnold

On our visit to Peru in November 2009 we left Lima and travelled north along the Panam, making our first stop at a site to the north of Chancay to look at *H.tenuis*. I understand that these plants are normally found on the flat sandy coastal plain, where I have not seen it. The site where we stopped was on a small hill some distance inland from the road. Ascent was by way of a service road to the microwave station at the top. It was late morning and still misty on top of the hill. It was on the slightly sloping downhill side of the sandy hillock, where it was facing away from the ocean, where we found the *H.tenuis*, whose stems scrambled randomly but mostly faced away from the ocean. Some of them were in early bud and a few in advanced bud. There were moisture drops everywhere and on these plants of *H.tenuis* as well. Most of them were also covered in lichen. It was not an extensive colony and there may have been only a small number of individual plants. They were in good condition and in vigorous growth. Their stems were about two inches in diameter and up to about two feet long. This was a very favourable site and they shared it with two other *Haageocereus*, which were *H.ancranthus* and *H.pseudomelanostele*. There were also some *Loxanthocereus acanthurus pullatus* in flower.

Going further north along the Panam, we stopped just to the south of Casma. Inland of the road and in some low hills we found *H.chrysacanthus* with *Mila caespitosa*. Again it was misty and damp. These *Haageocereus* were growing upright to about two feet tall.

Our next stop, on the following day, was to the south of Trujillo, close to the road and on the inland side. This is a site for *H.repens* and was presumably much more extensive previously. It is being severely encroached upon by the ever expanding asparagus farms, so I suspect that it is extremely endangered. Some of the plants of *H.repens* that we saw were only feet from the boundary fencing of the farming area and those cultivated areas are enormous. There were a great many groups of *H.repens*, many very large, spread over the sandy and rocky plain. As this plain is largely sand, it is mostly devoid of any other vegetation, apart from some flowering *Tillandsias*, although it is obviously very fertile if it is irrigated. The *H.repens* are imposing and mainly stand upright up to several feet before laying down and creeping along the ground. By comparison with *H.tenuis*, I would estimate that the stems will be about 3 to 3.5 inches in diameter. Some of the stems are up to about six feet in length. The growing ends are up to two or three feet in length and always curve so that their very top faces upwards. They were in flower and fruit and at present they appear to be doing very well. My overall impression was that these *H.repens* grow towards the ocean, although in general the stems have a random orientation.

.....from H.Middleditch

The *H.repens* in the two pictures taken by J.Arnold to the south of Trujillo, tend to look fairly similar at first sight, as all the stem appear to be pointing in the same direction. Those plants in the picture which takes in the whole group apparently have much of the lower length of the stems lying on the ground, with just a short length at the growing ends turned half-upward off the ground. Other groups of these *H.repens* are just visible in the background and they also tend to give the same impression. A somewhat similar mode of growth may be seen in the Fig. 1207 picture of *H.repens* on page 1242 of Backeberg *Die Cactaceae* Volume 2.

By comparison, the plants in the picture taken by J.Arnold that is much closer to a different group seem to have rather less length of the lower part of their stems lying on the ground, and compared with those in the foregoing picture, a relatively longer length of the growing end of the stems curving upwards. This upcurving part of the stems is apparently all of a similar length, of about half a metre. But a careful scrutiny of the stems in this picture reveals that there are several stems which have started growing in a different direction to most of the other stems, that is towards the right hand side of the picture, but are curving their upper ends so that they are starting to face towards the left hand side of the picture. This suggests that the older these plants grow, the majority of them will have all the stems facing to the left of the picture, whilst all the newer stems that start by facing in the opposite direction will in due course be turning to face in the same direction as the majority, like the plants growing in the picture of the whole group.

A similar range of stem forms is also to be seen in the picture of the *H.repens* growing on a sloping hillside. It would be very useful to have some term which describes this variation in the direction of stem growth. The word “scrambles” used in the foregoing passage from J.Arnold would be handy in this respect,

but I have not previously come across its use for this purpose. What does it really mean?

.....from J.Arnold

My Oxford English dictionary describes “scramble” as (amongst other things) – “crawling over (rough) ground and mixing indiscriminately”. Some of the stems in the groups that I saw do actually crawl over others.

.....from H.Middleditch

The observation from J.Arnold in the foregoing passage makes reference to finding moisture drops on the *Haageocereus* which would presumably be deposited from the mist coming down to ground level at that spot. This echoes the observations by Ostelaza & Rauh (above) about seeing moisture being deposited from the mist in this part of Peru.

.....from H.Sonnermo

When I was in Peru in December there was seldom any fog close to or north of Lima - it was always sunny and warm. But the mist always comes in May, June, and July when there is no sun in Lima, but the mountains have clear blue sky. In June I spent a week in Lima and the highlands when the mist was not down to ground level - it was like a cloudy day. I also visited the site of *H.tenuis* which was under the mist band.

.....from K.Gilmer

When we visited the coastal zone to the north of Lima in October there was only mist in the early morning, and not every day. During the southern winter – May, June, July, it is misty in the coastal zone all day.

.....from H.Sonnermo

When I visited Peru in 2000 I went to the Botanic gardens at Lima where I was fortunate enough to acquire two cuttings off one of their plants of *Haageocereus tenuis*. In addition I also collected two cuttings off the plants of *H.tenuis* that we saw near to Chancay, where the plants appeared to be very starved and pencil-like. Offsets were very rare on the stems of the *H.tenuis* at this habitat location and both my cuttings came from the same stem, All these cuttings were about 20-25 cm long. Back at home these were not stood upright but were laid down horizontally on the compost in a shallow, long and narrow balcony box. I kept the compost damp from May to October, leaving them dry for the rest of the year, as my greenhouse can go down to about freezing point in the winter. There were no problems in rooting them down and they appear to want to grow in the autumn. All of them have continued to grow more or less horizontally, but I have not yet checked if they root down as they grow. The longest piece is now about 50 cm and it has grown new branches. Another visit was made to Peru in 2013 when we visited another location where *H.tenuis* was known to grow and once again we brought back two cuttings, which have also rooted down.

The cuttings from the Lima Garden flowered the year after they were rooted down, as did the two cuttings from near Chancay - despite their poor condition when collected. One of these plants produced seven flowers which were round the growing point. The flowers appear from within about 6 cm of the end of the stem. The flowers open in the evening and stay open all night, closing early the following morning. On one occasion both these plants flowered on the same day, one opened its flowers at 1700 hours, the other at 2100 hours. The two plants from the Lima Botanic Garden cuttings produced white flowers whilst those from the population near Chancay had pinkish coloured flowers. The two cuttings brought home in 2013 have flowered this year with pinkish-white coloured flowers.

One year when it was a particularly cold winter, I brought the two plants grown from cuttings collected from near Chancay into the house where they became infected with spider mite and after that there was no further growth from the top of the stems. Instead they started to produce offsets from the stem – many of them, of which I have removed forty or fifty and rooted them down. They are now about 40-50 cm long and they flower each year. I have cross-pollinated some of the flowers and they set seed – I have sown some of the seed and it germinated well.

.....from M.Williams

My three cuttings of *Haageocereus decumbens* came respectively from km 766 and km 796 - both north of Camana – and km 859, south of Camana. These three short stems all put out new growth in cultivation with a comparatively weak spination. This year I decided to try putting them out of doors for the summer months, from May to early October. The previous weak and poor spination has been replaced on this years' new growth by a longer and stronger spination that is about as good as the habitat spination. All three plants are now putting out fresh branches from close to the base.

From near Chancay I was able to collect several cuttings of *H.tenuis* which flowered regularly for me, on one stem as short as six inches long. On the other hand, my collected piece of *H.repens* from south of Trujillo is 5 to 8 cm in stem thickness and has never flowered. It was planted upright in the compost and reached 20 cm in height before it became decumbent, as in habitat. It is now over 1.5 m long with the growing end turned up and no offsets.

.....from P.Hoxey

I cut two offsets from the *H.tenuis* that we found between Chancay and Huacho which were brought home with me. They were laid down on the compost in a seed tray and grew horizontally, as in habitat. They rooted down quite quickly and I have now put them in a shallow tray instead of pots. Once the summer weather starts in Spring I give them some water as usual for my plants, and then dry in winter. As well as growing longer they have put out a few branches and have flowered for me several times. The flowers come from both the cultivated length of the stems as well as from the offsets.

.....from H.Middleditch

The general impression of flower colour on *Haageocereus* would appear to be that only *H.carneoflorus* displays red flowers and all other *Haageocereus* have white flowers. Would the pink flowers on the ex-habitat cuttings cultivated by H.Sonnermo be an anomaly?

.....from Backeberg, *Die Cactaceae*, Vol.2

A description of the genus *Haageocereus* can now be stated as:- (Body and spine details provided) The flower narrow or wider funneliform, with more slender or more robust tubes, almost smooth or fluted, these straight or partially somewhat curved, sometimes somewhat sharp-ribbed, the petals from white through pink to dark carmine-red.

.....from F.Ritter, *Kakteen in Südamerika*.

*Haageocereus pacalaensis*. *H.pacalaensis*, *laradensis*, and *repens* can only be regarded as localised forms of a single cohesive range of varieties. Laredo lies east of Trujillo, Pacala lies east of Hacienda Casa Grande. I found no varietal differences at both of Backeberg's locations, but a more or less identical breadth of variation in their habit. The illustrations of *H.pacalaensis* and *pacalaensis* v. *laradensis* included by Krainz in *Die Kakteen Cva* of 1.X.11, 1962, are only forms singled out from a continuous range of variations. *Haageocereus repens* is a decumbent form from south of Trujillo, which was known to me prior to its publication by Rauh & Backeberg, without my finding it it appropriate to attach a particular name to it. *Haageocereus pacalaensis* is very closely related to *H.multangularis*. However, I believe that it is justifiable to regard it as an individual species.

.....from Backeberg, *Die Cactaceae* Vol.2

*Haageocereus pacalaensis*. Up to 1.7 m tall, 10-20 cm thick or somewhat more. Peru, Dept. Libertad on stony ground of the Pacific coastal mountains. Due to a misprint the name first read as *Haageocereus tapalcaensis* in *Die Kakteenfreunde* 54, 1933. According to Ritter (as he wrote in 1958) *H.pacalaensis* – although it is upright, very thick and particularly short-spined – is identical with the much leaner and longer spined *H.laredensis*, or be a synonym of it, likewise of the creeping *H.repens*. Apparently Ritter does not know the right kinds at all, because otherwise he could not express such a view.

.....from H.Middleditch

In the *Die Kakteenfreund* for May 1933 there was a picture (Fig. 64) of *H.tapacalensis*, which was evidently taken on a rocky and very steep hillside. In this picture there is a figure of a man standing close to almost a dozen stems of this species which could be said to confirm their reputed height of up to 1.7 metres. It does seem to be rather difficult to accept the idea that this could be synonymous with the creeping *H.repens*, even though this species might well have decumbent stems of a similar length.

.....from P.Hoxey

Looking at the photographs from J.Arnold of the *H.repens* seen growing on the sandy desert ground, these plants display a classical example of their mode of growth. I would agree that their stems tend to face in one direction and those that start growing in the opposite direction do turn so that when the lower length of their stems become decumbent they all face the same way. On the far right hand side of the picture of a close-up of part of a group of these plants there are two young stems growing in opposite directions in an upward curve so forming a U shape. I have taken a picture of a similar young pair of stems forming a U shape which I saw growing on the rocky hillside. On this slope there were also some plants with new stems that which were growing vertical up to about half a metre tall and then started to become decumbent, drooping downhill.

The *H.pacalaensis* is stated to be upright and up to 1.7 m tall. I am not sure whether making a species distinction between two forms of plants based on how decumbent or vertical they are is important. Backeberg evidently thought so and Ritter did not. The golden spined *Haageocereus* in northern Peru extend over a wide area and many names have been given to them.

.....from H.Sonnermo

There are other interesting *Haageocereus* to be found in these coastal deserts. I believe that *H.australis*, *H.lanugispinus*, and *H.tenuis* are very closely related. I think that no one else has found *H.lanugispinus* since it was collected by Ritter in 1957.

## TEPHROCACTUS ROSSIANUS From F.Vandenbroeck

We made our first visit to Bolivia over a period of seven weeks during July and August of 1988, when the sun was chokingly hot in an absolutely speckless sky for all the time that we were there. At that time of year we found many of the smaller cacti were shrivelled, or covered with dust, or withdrawn into the ground altogether. We had to use a pickaxe to dig out some specimens of *Tephrocactus* – it was to the south of Lecori where we dug up a youngish specimen of *T.rossianus*. None of these plants were in flower at the time, but there were fruits to be seen on *T.bolivianus* which were of a larger size than the plant segments.

On a return visit to Bolivia in September of 1992, this was in the rainy season which made travelling very troublesome due to the state of the roads. On this occasion we came across *T.rossianus* at many locations, such as near to Potosi, Yamparaez, Culpina, and Mal Paso, where many of these plants were in flower. At most places the flower colour varied from lemon yellow to purple red, although one population near La Quiaca displayed only red flowers. On this trip, we saw some *T.rossianus* with few segments, partially hidden in the ground, and some large, flat plants. Near Iturbe we again unearthed a specimen of *T.rossianus* which had the same sort of tap root that we found on the plants we unearthed at Lecori on our previous visit to Bolivia.

We made a stop at about 50 km from Potosi, when coming from Challapata, where we found a large specimen of *T.rossianus*. This was between two indian villages whose name we did not know, but a girl we saw as we drove along the road, told us that they were Yocalla and Cieneguillas. Occasionally we did see some large hemispherical plants of *T.rossianus* there.

Between Culpina and Salitre, on the Culpina plateau, we noted a large number of red flowers emerging from the sand and found that they came from very small segments with soft hair-like spines. I do not know if this was a form of *T.rossianus* as Ritter does mention plants of *rossianus* which have smaller segments and develop shorter and thinner spines. On later reflection, it seemed to be quite probable that they could be *T.subterraneus* as the plant bodies are quite different to those of *T.rossianus*. Ritter states that he found *T.subterraneus* near Villazon and La Quiaca and that the Type habitat for this species is even more than 200 km from these two places. But nevertheless, this species may occur as far north as Culpina.

We made another visit to Bolivia in December of 1996, when again the wet season made travelling difficult. On this occasion we came across *T.rossianus* on the Pampa Mochara.

.....from W.W.Christie.

During my visit to Bolivia in company with Brian Bates in October 2001, we travelled from Santa Cruz to Cochabamba. Before my departure my attention had been drawn by H.Middleditch to a possible location for *T.rossianus* at about 110 km before Cochabamba. This location was known to B.Bates, where *Sulcorebutia polymorpha* and *Lobivia caespitosa* also grew. When we stopped there we did indeed find *T.rossianus*. The ground was very dry and all the plants were covered in dust or soil, so that it was difficult to see much of them other than the flowers. In fact I only found three plants, growing close together at the edge of an area that appeared to have been cleared for cultivation. We also found *T.rossianus* at about 1 km to the east of Kayrani at 2525 m altitude, growing in a stretch of rocky flat ground about 50 m wide between the road and the river gorge. The plants were pulled down below ground level but dead flower remains from the previous year, together with a few spines in a circular depression about 12 cm across, betrayed their presence. In 2003 we found a few plants growing near Cuchu Ingenio at 3550 m altitude and again north of Vilamani at 3550 m. in deep soil, similar to those seen on the earlier trip. We also came across some of these plants at BB 442, about half way between Culpina and Padcoya, at about 3700 m. altitude, which were growing in rocky soil on a slight slope, together with *Lobivia pugionacatha*, and occasional rough grasses.

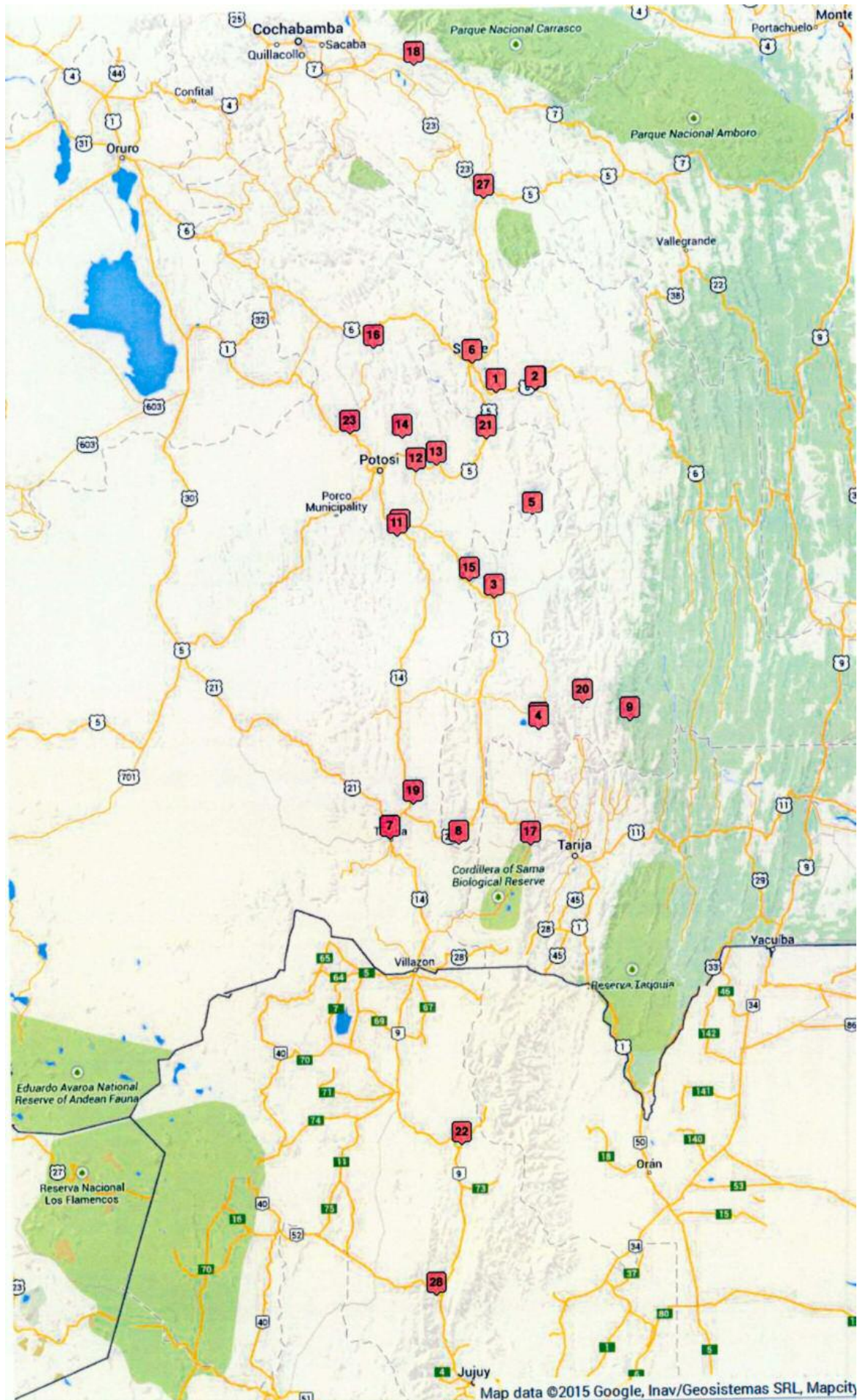
.....from J.Carr

*Tephrocactus rossianus* is found over a very wide area so some variation is inevitable. Different sites can also vary with large or small clumps, probably dependant on altitude and on climatic conditions. Any species with a wide habitat range is going to be variable – location, habitat, and altitude will all create differences. I have also seen *T.rossianus* growing alongside *T.subterraneus* and *T.bolivianus* and sometimes it is difficult to tell them apart unless you look at them closely.

.....J.R.Kirtley

In the course of the visit to Bolivia in November of 1989, undertaken with B.Bates, the southernmost point of our travels was reached at the town of Tupiza. From Tupiza we were intending to drive to Impora, so our journey next day was to take us across the Mochara Pampa. This involved travelling back north for some way along the road leading from Tupiza to Cotagaita and then turning off towards the east. About two km beyond this junction, on the road to Impora, we found another sort of *Tephrocactus* which is very different from the plants of *T.bolivianus* which we had seen previously on this trip.





Tephrocactus rossianus - Field No. locations

Map - P.Crewe

We were walking back to our jeep across flat ground, through dwarf bushes and tall grasses, when we noticed some yellow flowers close to the ground. On looking more closely we found these flowers were on a *Tephrocactus*, which grew with perhaps only 1 cm of its segments visible above the surface of the ground. The plants observed consisted of 6 and 10 segments, each segment of approximately 2 cm in diameter, tuberculate, brownish grey, with the areoles located on top of the tubercles, spines 3 to 5, flat, papery, white, 3 cm long, lying flat with the ground, at right angles to the segments. Flowers are deep yellow, 4 cm in diameter when fully open, having whitish bristles around the base of the tepals. Stigma lobes and stamens are whitish. These plants grow in good earth with a mixture of stones, among dry bushes and low growing dry grass.

On the east side of the Mochara Pampa more *Tephrocactus* of this same species were seen, growing in flat shale bedrock, in company with *Parodia* sp. and *Oreocereus trollii*. The plants seen and photographed here have red flowers, but otherwise are similar to those plants seen on the west side of the Pampa Mochara.

From Impora we turned north, travelling through Villa Abecia, Camargo, Otavi and Otuyo, towards Sucre, eventually coming to Yamparaez. At a distance of 3 km beyond Yamparaez, on the road to Tarabuco, at two separate locations close to the road and near to the railway line, on gently sloping and flat, stony and sandy, bare, ground, we again found the same sort of *Tephrocactus* growing in considerable numbers, together with a species of *Lobivia*. Here the flowers ranged in colour from orange through to deep red. In most cases, the stamens and stigma are colour matched to the petal colour. The bristles at the base of the flower are straw coloured, varying in length being either long or short. In places a larger number of segments indicative of bigger plants were just visible above the surface of the ground. The colour of the segments, their shape and even individual tubercles closely resemble the small stones among which the plants grow. When these plants do grow among the low, dry grass, they are nearly impossible to find unless they are in flower, as the spines so closely resemble a dried blade of grass lying on the ground. Some of the plants display grey spines on older areoles. Most of the plants have three spines per areole; some spines are very short, only 1 cm in length, others are up to 5 cm long. The HS 95 *Tephrocactus* sp. Yamparaez are probably representative of these plants.

.....from J.Carr

On our visit to Bolivia in 1996 we drove for some way along the road which runs from Cochabamba to Santa Cruz. At km 89 from Cochabamba we stopped at what is probably the Type locality for *Sulcorebutia polymorpha*. We were amazed at the numbers of these plants that we found there - they were as prolific as daisies. Many of these plants were out in flower. We also saw some red flowers which seemed to be growing out of the surface of the ground, as the whole of the plant body was below the surface of the ground, with only some spines lying flat with the soil. There were not many of these plants around - only about six or seven that I saw. The largest one could have been about twelve or eighteen inches across. We did take a photograph of the flower and when we were back home we put this upon the screen. We had thought that it might have been a *Lobivia*, but when we saw the bristles on the flower tube we realised that it was a *Tephrocactus*.

During my first trip to Bolivia we were fortunate to find *Tephrocactus rossianus* at several locations. One of these was along the road from Sucre to Potosi, where we made a stop at the Rio Taranita, roughly 17 km to the south of Millares. After walking some distance from the road, we found some plants of *Tephrocactus rossianus*, which were in flower.

.....from H.Middleditch

The route between Sucre and Potosi is one which was travelled by Pentland during his period as British Consul to Bolivia. Could the *T.rossianus* at this spot be seen from the road?

.....from J.d.Vries

No, we only saw these plants at this spot when we had walked some way - but not a great distance - from the road. But bear in mind that this road, like many in this country, has been radically altered in recent years. It has been widened and bends have been improved by cutting into the hillsides, so that in a great many places the sides are so steep that one cannot walk off the road. New sections have also been made, but because of the lie of the land these usually follow close to the line of the original road.

.....from H.Middleditch

At the 1989 Chileans' Weekend we were shown a fine selection of slides by K.Preston-Mafham taken during his trip to Bolivia. Amongst these was one of a plant seen not far from Betanzos, similar to a photograph which subsequently appeared in "Cacti and Succulents in Habitat", described as "probably *T.pentlandii* with fully open flowers [whose] colour varied from yellow to red". The segments on this plant are packed close together and appear to project very little above the surface of the ground; they also look globular, with distinct tubercles. Spines bend very sharply at their exit from the areole, flattened, one, two, or three per areole and on the topmost areoles only; spine length barely attains segment diameter. Several fruits - possibly quite fresh - display perhaps four or five reddish-brown leaves fairly regularly disposed around the broad scar left by the detached flower. This has all the hallmarks commonly associated with *T.rossianus*; even the newly-

growing segments have the tiny slit-like areoles and no spines, just as on my own cultivated plants which carry this name.

.....from K.Preston-Mafham

Leaving Millares on the way to Potosi, the road climbed higher and higher over the Altiplano, then went across a pass. At about 13000 ft we made a stop to examine the slope because to my eyes it looked absolutely right for cacti, as indeed it proved to be, although there were none to be seen from the vehicle. There were thousands of *Lobivias* which I took to be *L.cinnabarina* v. *walterspielii*, covered in buds. We did not see the *Tephrocacti* until we were actually walking up the slope, because they are very low-growing plants. They did not form crowned humps at this locality. They were widely scattered, several feet between each plant, and no seed pods on them. The slope was quite stony, with rocks mostly tending to be about fist-sized, with a few larger ones, and plenty of grass tufts, not unlike the picture on pp. 18-19 of my "Cacti & Succulents in Habitat".

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

From Cochabamba we set off on the road to Punata, from where we climbed to La Villa. Near Tiraque we came across *Sulcorebutia steinbachii*, then went further on past Huakani. Near Kayarani we met with *S.polymorpha*. At about 3400 m we came across *Tephrocactus rossianus* with semi-globular segments and reflexed, adpressed spines.

.....from T.Marshall

In 1996 at BLMT 9 we found a few plants of *Tephrocactus rossianus* not far from Kayarani. They seemed to be just starting to flower (it was the first of October), with buds forming and a few actually out in flower. They were growing with *Sulcorebutia steinbachii* v. *polymorpha* and *Lobivia maximiliana* v. *caespitosa*, on flat ground on the edge of a sharp crevasse which had been cut by river erosion. The *Sulcorebutias* were very common here, the *Tephrocactus* was less common but the two were growing side by side. The surrounding vegetation consisted mainly of planted *Eucalyptus* trees and general arable farmland. On a later visit to Bolivia, we stopped at a couple of km to the SW of Yuquina where we found *L.salitrensis*. Here, the vegetation was quite sparse with much bare ground that was rather stony. There were some *T.rossianus* to be seen, but only a few in number and they were projecting only a few cm above the ground. We did find several plants with unripe fruit.

.....from J.d.Vries, *Succulenta* 77-5, 1998

When I was out in the field in Bolivia in 1996 my curiosity was aroused when I made the acquaintance of a cactus which was later determined as *Tephrocactus rossianus* on the basis of the slides taken at the spot. *Tephrocactus rossianus* is generally found in arid conditions often practically underground, when only the buds or flowers are visible. That is why the plant was not recognised straight away.

A quite well known location for *Sulcorebutia polymorpha* lies on the road from Cochabamba to Epizana, roughly half way, in the vicinity of Kayarani. We visited the habitat location and it was in this way that we found here the never before recorded population of *T.rossianus*. But now it is evident from the field number list of J.D.Donald that next to *Sulcorebutia polymorpha* he had also found *Tephrocactus rossianus*.

In addition, in 1997 I found many populations of *T.rossianus* in farm fields in the centre and south of Bolivia. Chiefly around Yamparacuz and Tarabuco. Also in the direction of Potosi, not far from the Type location; and quite surprisingly in the direction of Turuchipa, this last being seen at the highest altitude. Here the plants look really somewhat different and the flowers were significantly smaller. For us, this was the highest habitat location at 3720 m. In any case, still within the upper altitude of 3800 m quoted by Ritter.

.....from B.Bates

I have seen *T.rossianus* at 54 different BB locations and 18 BDH locations. The most northerly location is near Kayarani, which is on the road from Cochabamba to Santa Cruz at about 17° 29' latitude and the southern limit is west of Purmamarca in Dept. Jujuy in Argentina, at about 23° 40' latitude.

.....from P.Crewe

It will be about 700 km between these two locations of Kayarani and Purmamarca. I have searched many field number lists and found 64 entries for *Cumulopuntia rossiana* that quote altitudes, which run from BB 271.01 at 2900 m to VoS 3-073b at 4100 m altitudes. Twenty eight locations are plotted on the accompanying map. These are shown by the small red shields.

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

A considerable distance beyond Kayarani, as we were coming to the banks of the R.Lopez, there were *eucalyptus* trees growing along the banks of the R.Lopez and near here we found *T.rossianus* and *Sulcorebutias* growing together. The clouds could be seen pouring over the ridge from the east side of the Cordillera.

.....from J.D.Donald,

It is possible to find oneself completely enveloped by mist and clouds on this part of the road.

.....from M.Cardenas, Memoires of a Naturalist 1972

In June of 1946 we made a trip to the Yungas of Yana Mayu. We passed the night at Jatun Pino, quite close to Monte Punco. We were not able to get to sleep on account of the unbearable cold and humidity which chilled us to the marrow.

.....from H.Middleditch

It would appear that a high level of humidity can occur in this area both in day and night hours.

.....from A.F.H.Buining, Succulenta 54.7:1975

In Cochabamba we made preparations to drive to Santa Cruz in company with L.Horst, R.Vasquez, and E.Aquilar, leaving on 18 October. After about 50 km we left the broad plain of Cochabamba and entered the mountains. The mountainsides were initially overgrown with *Cleistocactus*, *Corryocactus*, *Lobivia*, and *Echinopsis obrepanda*. Shortly after Tiraque we saw a form of *Sulcorebutia steinbachii* at 3340 m. Near Torolapa we passed a fine looking experimental establishment for potato breeding, where *Echinopsis toralapense* grew. Next we came into the Ayarani valley at 3500 m where amongst other plants there occurred the giant *Puya raimondii*. Here is also the growing place of *Trichocereus totorensis* and by good luck we found *Tephrocactus bolivianus* in flower with two colour variations. *Sulcorebutia polymorpha* also occurred there, quite hidden. We came across *Puya raimondii* with its long floral spike, with fruit that was not yet ripe. The large numerous flowers produce abundant nectar much sought after by humming birds.

.....from H.Middleditch

Comparing the account by L.Hoevens and by Buining, it would appear that the *T.rossianus* of the former and the *T.bolivianus* of the latter may be at the same location near Monte Punco and are one and the same sort. The picture of this plant taken by L.Hoevens gives the impression of being a fairly typical *T.rossianus*, which would be supported by the "two flower colours" noted by Buining. Either this population and that at Kayrani are two isolated populations or else trekking off the highway between those two locations, at suitable altitudes and in suitable landscapes, will show that they are not that isolated after all.

Bearing in mind that the Buining habitat slides are reputed to have been donated to the Succulenta slide library, then perhaps there might be a slide of this "*T.bolivianus*" in existence.

.....from J.Deckers, Slide Librarian, Succulenta

The Buining slides passed through a number of hands before they came into the possession of Succulenta. All the slides of *Notocactus* are now held by Internoto, for example. All the slides appear to have originally been numbered sequentially and now the gaps in the slide numbering presumably represent slides that are absent from the collection here. There does not appear to me to be any slide of a *Tephrocactus*, or even an *Opuntia*, on the section of the Cochabamba to Santa Cruz road shortly before Epizana.

.....from H.Middleditch

The plant seen near Yocalla by F.Vandenbroeck was also captured on film by J.Kirtley; it is a somewhat untidy hummock with an appearance not atypical of the *T.bolivianus* seen in this area. It is in flower and the flowers have quite distinctive red midstripes on the outer petals. It appears that this is classed as *T.rossianus* by F.Vandenbroeck because it does not display a plain yellow flower.

.....from R.K.Hughes

I have a plant of *T.rossianus* in my collection which produces yellow flowers and in Bolivia we saw yellow flowers on these plants in one or two places. We found another population where there were flowers of both yellow and orange and two more different populations where there were flowers ranging from red through to yellow. I have also grown some plants from seed which came from Brian Bates which was collected at BK14, one of which flowered a pure yellow and another had an orangey-yellow flower.

.....from P.Bello

During my brief visit to Bolivia I went to Tarabuco, where I walked out of the town on the main road going to Zudanez. This crosses some rising ground where there are no bushes, only low dry grass and, around the stones which cover much of the ground, lichens and moss. There were *Lobivia cinnabarina* growing here as well as *Tephrocactus rossianus*, which did not seem to occur in large numbers and were well scattered, about 20-30 m away from one another. The largest of the *T.rossianus* would have about 30 to 40 segments, forming a low mat or very slightly raised hummock, about 20-30 cm in diameter. At the time of my visit it was August so there were neither flowers nor fruit to be seen.

.....from R.Hillmann

After we had taken a look round the Culpins basin in Bolivia we headed north past Inca Huasi towards Santa Elena. From there we followed little-used mountain tracks until we reached Chini Mayo. Here we found compact plants of a *Tephrocactus* which we believe to be *T.rossianus*. Many of these plants were in flower at





Tephrocactus  
pentlandii  
near Cieneguillas

Photo::  
F.Vandenbroeck

Tephrocactus  
rossianus

ex BB442

Photo::  
W. Christie



Tephrocactus  
rossianus  
RH887

Photo::  
C.Hunkeler





the time of our visit, with deep orange coloured flowers.

.....from H.Middleditch

From a picture taken by R.Hillmann of these plants in flower, it was possible to see that they had globose, humped segments with the rather sword-shaped spines tending to lie more or less parallel to the ground. The overall appearance was typical of what has come to be expected of *T.rossianus*.

.....from G.Hole

On the more recent Rausch field list there is an entry against R 913 for *Tephrocactus glomeratus* at Tacomayo. Having seen a specimen of this number when I was over in Austria, I would have described it as *T.rossianus*.

.....from R.Hillmann

I have searched for the habitat location of R913 called Taco Mayo. This find was made on a trip made with some students from La Paz and also a German botanist. Now at last I have found this place on my 1:50,000 scale Instituto Geografico Militar La Paz map, as Tacu Mayo. It is located on the main road about 7 km to the south of Muyuquiri, on the banks of the Rio Tacu Mayo. On the 1:250,000 scale map it is situated about one cm to the south of Muyuquiri, where there is a sign 'Tel' on the map.

.....from M.Lowry

We were able to see *T.rossianus* at many locations in the course of our 1996/97 visit to Bolivia. We identified it based upon the spination, which is quite characteristic, bending sharply as it exits the areolar depression. The first spot where we saw these plants was near Kayrani which is east of Cochabamba on the road leading to Epizana. These plants were reportedly in flower during the second week of October when they were seen by J.Carr and they had many fruits in December when we visited the same site.

There appear to be at least two forms of *Tephrocactus* with this typical spination. There were those with small green joints, of some 12-15 mm in diameter which were seen at Kayrani, Yamparaez, and on the Pampa Mochara, whilst elsewhere they had medium-sized bluish-green joints - at Betanzos, Huari-Huari, Yuquina, Salitre, Culpina, Iscayache and La Lava. Specifically at La Lava, some 10 km SE of Cuchu Ingenio, the joints were some 20 mm in diameter by 30 mm long. There were *T.bolivianus* at this same location and it might have been an interesting thought that this segment form might have represented a cross between the globular segmented *T.rossianus* and *T.bolivianus* - except for there being no globular segmented *T.rossianus* at this site. Indeed the *T.rossianus* which displayed bluish-green joints were mostly found in close proximity to plants that would be called *Tephrocactus bolivianus*.

Looking at the photograph taken by J.R.Kirtley of the *T.rossianus* found at Yamparaez, it is probably very close to the place where we stopped, between the road and the railway line. The big difference is that there is not a blade of green grass to be seen on the picture taken by J.R.Kirtley in November, whereas when we were there it looked almost like a lawn. The grass, however, was not even up to ankle height; on the picture taken before the onset of the wet season I can see the blades of dry grass lying flush with the ground. In addition, there were no plants to be seen in flower when we were there at the end of December, although many plants were obviously in flower in November. Because of the absence of flowers and the presence of the green grass, you could not just stand and pin-point the plants growing on the bare ground up to a couple of stone's throw away, as you can when looking at the picture taken by J.R.Kirtley. We had to walk round and search for the mats of *T.rossianus* which grew only a very little distance above ground level.

When my own cultivated plant of *T.rossianus* starts into growth at the beginning of the year it puts out new spines which stand almost upright. It is only later on in the season that these selfsame spines bend abruptly at the exit from the areole and take up an attitude lying very close to the surface of the segment. I am also pleased to say that it has finally flowered for me.

.....from J.d.Vries

I found one place to the south of Tarabuco near the Rio Pisili where there were hundreds of big clumps of *rossianus* which were flowering. The rainy season had already started at that time, in 1997. I was there again in 1998 when it was extremely dry and you could hardly find these plants. So, like a lot of plants in the high Andes, they disappear under the soil. This is where a lot of stories arise that plants are dying or have been overcollected.

.....from J.Carr

In the course of making several visits to Bolivia I have been to a *T.rossianus* site in one year when I saw plants and flowers - then, in a different year, exactly on the same date, I could find nothing. And a couple of years later I found plants but without flowers. It all depends upon the nature of the season. The seasons vary from year to year in the nature of the weather just as they do in this country. At the end of the dry season, plants will be mostly below ground, but it only takes one local thunderstorm to start them flowering and after a couple of weeks the plants will swell. However, some km down the road there may not have been any rain so

the plants there remain below ground without any flowers. The real growth is after December when the rainy season is at its height. Often at the end of the dry season a plant can be totally underground and only the flowers are projecting above ground level. When the rossianus do grow above ground level after rain, they do not form hummocks, just flat mats.

At some sites these plants only make small clumps of just a few heads, at other sites you may see plants with over fifty heads. Because *T.rossianus* is to be found over a very wide area and altitude range, some variation is inevitable – location, habitat, and altitude will all create differences. Any species with a wide habitat area and altitude range is going to be very variable. I have seen it growing alongside *T.subterraneus* and *T.bolivianus* – which is also a very variable species - and sometimes it is difficult to tell them apart unless you look at them closely. But basically I would say that the segments on *T.rossianus* are globular to slightly longated and about 1.5 cm in diameter, with spines from the topmost areoles.

.....from D.J.Ferguson

My experience of seeing plants of *T.rossianus* habitat in Argentina is that in some populations all of the plants tend to stay flat. However, if they grow old enough they may gain some height above soil level

and even mound up a little bit, but they do not mound up into a hemispherical form. However, the larger plants do reach a point where they remain above soil level all of the year – but seldom more than the height of one stem segment.

.....from J.Carr

I agree that *T.rossianus* does not form hummocks but it will rise above ground level after the rain, often at the end of the dry season.

.....from B.Bates

From seeing *T.rossianus* at many places in Bolivia I would be inclined to say that the segments are always spherical and about 1.5 cm in diameter. Also these plants are always flat to the ground, not forming mounds.

.....from W.W.Christie

From my visits to Bolivia I brought back with me two single unrooted heads of *T.rossianus*, one from a few km past Alto Lecori (BB 1198) and the other from a pass between Culpina and Sucre (BB 442) at about 3700 m altitude. At BB 442 they were growing in a rocky soil on a slight slope together with *Lobivia pugionacantha* and occasional rough grasses. Both of these rooted plants still have small segments of about one to two cm in diameter. No new segments have been produced from the tops of these plants so that the tops of these plants remain about 5 to 6 cm deep – in just the same way that as they grow more or less flat and close to the ground in Bolivia. The spines are lying more or less horizontally across the tops of the plants. Both of them have grown slowly in cultivation, forming substantial tap roots and spreading sideways by growing new segments around the edges of the head. The plant from BB 442 has put out just the one flower – bright yellow and 5 cm across when wide open.

.....from R.Mottram

I have earlier grown one or two *T.rossianus* which always produced new segments from the same position – that is, around the periphery of the plant so that the natural habitat of growth is therefore ground-hugging. One of those plants was a propagation from a habitat plant that came from T.Marshall. I have also grown two plants of *T.pentlandii* which differ from *T.rossianus* mainly by the plants forming hemispherical mounds by higher branching as well as by having less truncated segments. Hence I agree with Ritter that *T.rossianus* does deserve the species status to which he transferred it as *Cumulopuntia rossiana*, from *T. pentlandii* v. *rossianus* Heinrich & Backberg in his 1980 *Kakteen in Sudamerika*.

.....from J.Carr

By comparison with the shallow height of the flat clump of heads formed by *T.rossianus*, the *T.pentlandii* grow steadily into hummocks which can be almost hemispherical in larger plants. I think that the segments on *rossianus* have all their areoles when the new segment appears out of the clump. But on *pentlandii* I believe that as the new segments grow longer, they grow additional areoles further down the segment, at a different angle to the segment, so that the first new spines stand more or less upright and then the angle of the spines changes down the segment to about half-upright.

.....from J.Iliffe

I have grown good material that corresponds to Salm-Dycks *pentlandii*, and good *rossianus*, and the two were certainly quite different. Equally it was easy to see how they could have been confounded for so long – as I think Salm-Dyck did. However, the two may approach each other in their range of variation, thus adding to the confusion. I would point out that the seeds could settle the question at once, for the seeds of *rossianus* whilst broadly of the globose type, are very distinctly sculptured.

Having come from the city of Cordoba via the town of Carlos Paz, we were travelling towards the western side of the Sierra Cordoba. Quite near to Tanninga the road was crossing a wide and more or less level valley, but at one spot the road had been driven straight through a low hillock. We decided to stop and climb to the top of the hillock. From the top we could see over the valley to the south where there were hundreds of palms growing almost as far as the eye could see, reaching up to about 10 m tall. However, on the top of this hillock there were only a few scattered palms which would be barely 5 m tall, as well as some *Prosopis* bushes. Much of the ground between was covered with grass and low herbs that would be about a foot high. In amongst them we came across some plants of *G.calochlorum* and some *G.tanningaense*, growing in a ground of black loam with many stones and rocks. The *G.calochlorum* were in fruit and several of the *G.tanningaense* were in flower. Both sorts were solitary, flattened-globular and projecting an inch at the most above the surface of the ground. The bodies of the *G.tanningaense* were a slate-grey colour, and some 1.5 to 2 inches across. In cultivation my own *G.tanningaense* did take on a more grey-green colour, being nowhere near as dark as they were in habitat. It is likely that the dark colour of the epidermis is just a response to the light intensity in their habitat. It also offset, a feature that we did not see in habitat.

.....from M.Meregalli

In the habitats where *G.tanningaense* can be found, you can generally also find *G.intertextum*, *G.parvulum*, or *G.gaponii*. The *G.tanningaense* is not particularly variable, but in habitat it can be impossible to know if a plant is a *G.tanningaense* or a small *G.intertextum* when they are sympatric and of similar size – which is often the case. The variation that I saw in habitat was in the density of the spination, but local effects tend to be important. When plants are very dry and very small they are quite different to plants that grow in the shade, or after a week or two of rain. The plants of *G.tanningaense* are seldom larger than two or three cms across when spotted amongst grass and gravel in the dry season. I only saw larger plants in places where two or three of these plants were hidden under shrubs.

Indeed plants of *intertextum* and *tanningaense* all have the same dark body colour and also spines are more or less always the same. In habitat they really look rather uniform, but it is always difficult to distinguish between *tanningaense* and a small, young, *intertextum*. Things are different for large specimens of *intertextum*. The plants of *G.tanningaense* are generally small and I have never seen larger plants. I do not know what they might look like after a period of rainfall, but I do not think that they will get any larger in habitat – not as large as in cultivation. But the characteristics of these two species are more distinct in cultivation.

The large plants of *intertextum* do not pose any problem of identification, as also any size of plant of *G.parvulum*. Also a *G.gaponii* is usually greener, with yellowish spines that are slightly reddish at the base, so even the smaller plants of this species that are to be seen are readily distinguished. But it is the smaller plants that can be really impossible to identify and *G.tanningaense* is seldom larger in habitat.

.....from W.Phillips

I have been growing a *G.tanningaense* for some ten years or more. It was only a single head when it was acquired, starting off as a slow grower, putting out one offset which developed slowly until it was almost as big as the original head. This was followed by another - and yet a fourth one, all growing to a similar size. I must confess that I was a little taken aback by the number of new offsets it has put on this year! The ribs do not protrude a great deal from the general outline of the body and the tubercles are not really prominent. The spines are slender and fairly short, only standing slightly away from the body. It does flower.

.....from H.Middleditch,

A count of the small new offsets on this plant produces a total of fifteen - as yet only 12 or 15 mm in size. Although Piltz does say that this species can offset, this may be an unusual number.

.....from J.Piltz,

Certainly I have never seen a plant of this species either in habitat or in cultivation with that number of offsets. From the picture of this plant, the colour of the body seems to be green, possibly a greyish green, but *G.tanningaense* should have a grey body colour.

.....from G.Hole

When I visited the Piltz collection he had a number of collected *G.tanningaense* which all had dark brown bodies. These plants usually remain solitary in habitat but in cultivation they frequently produce offsets and I was able to obtain one or two of these offsets from the Piltz ex-habitat plants. In my own greenhouse they have retained their dark brown body colour. In habitat these plants are depressed globular with a carrot-like lower part of the body below ground level, but they do not grow in this manner in cultivation, which is probably due to the far less harsh environment in the greenhouse.

.....from G.Charles

My own *G.tanangaense* P 212 always has a body of a dark grey-brown or dark grey-green colour, which is dependant on the exposure to the sun.

.....from A.de Barmon

The body colour for my *G.tanangaense* depends upon the season. In winter it is more of a grey-brown colour but when it is growing it becomes a blue-grey.

.....from H.Middleditch

It appears that the body colour of *G.tanangaense* can vary when in cultivation, possibly due to differences in shade or exposure to sun, use of fertilisers, frequency of watering, nature of the compost, and so on. On the other hand, climatic conditions and the nature of the ground in habitat do appear to result in a fairly consistent grey colour to the body.

.....from L.Bercht

In the vicinity of Taninga, province Cordoba, we found *Gymnocalycium moserianum* (or *intertextum* if you prefer) growing together with *G.tanangaense*, not in separate groups but intermingling. There is of course no difficulty in distinguishing these two species by their spination, the colour of the epidermis and the form of the body. In addition the seed of *G.tanangaense* is *Ovatisemineae* whilst that of *intertextum* is *Trichomosemineae*. *Gymnocalycium tanangaense* is to be found more to the west from Taninga - for instance, my LB 1003 from close to La Mudana is also *G.tanangaense*. At both locations the plants are growing on flat ground, with rocky stones, in company with grasses as well as some palms.

.....from P.Bint

My impression of my *G.tanangaense* GN.91.378.1264 is that it bears no resemblance to my specimens of *G.moserianum* or *G.intertextum*, for several reasons. The body colour is olive brown as opposed to blue-green or green in *moserianum* and *intertextum*. The spines are black and weak as opposed to paler brown to white fairly robust in the other two. The areoles 2-3 mm are barely woolly as opposed to larger and woollier in the other two. The spines are 5 minimum plus one downward pointing central as opposed to a 3-5 count and no central in the other two.

.....from J.Lambert

The plant of this species which I kept in cultivation for some time, is on record as glaucous green. I would not be inclined to describe it as grey, a colour which is better illustrated by *G.parvulum*.

.....from M.Muse

My *G.tanangaense* P 212 was originally a leaden grey colour when small. However it is now a brownish green and has about five offsets of the same colour.

.....from J.Lambert

There is one feature which differentiates *G.tanangaense* from practically every other known *Gymno*, as this species displays white flowers with a green throat, a seldom seen if not unique character. The only other *Gymnos* which more or less approach this are the yellow flowering spp. such as *G.andreae* or those from Uruguay.

.....from H.Middleditch

The fully detailed description of this species provided by Piltz in K.u.a.S. 41(2)1990 does say that "in many specimens the base of the innermost petals is a pale yellowish colour, so that the throat appears to be yellow".

.....from W.Phillips.

But Pilbeam says that the flower has a "pale yellow throat" and Anderson says "yellowish throats".

.....from M.Meregalli

I have had a look into the flower on my *G.tanangaense* and I have to say that I find it difficult to define the colour of the throat of the flower, which is between greenish-white and greenish-yellow. There is no trace of any red or pink, but not completely white.

.....from H.Middleditch

By "throat" do they mean the lower part of the inner petals - which Piltz says are yellow? Or has this coloration been mistaken for that of the inner wall to the receptacle?

.....from R.Gillman

My *G.tanangaense* has produced two flowers and in order to be able to see clearly the colour of the inside of the lowest part of the flower I have sectioned them. I find that the throat is greenish-yellow in the region of the stigma lobes and stamens, but pinkish below.

.....from H.Middleditch

Could it be that the throat was somewhat greenish to some eyes and somewhat yellowish to others? The actual colour may well be more readily visible when a section of the flower is taken.

In his original description of this species, Piltz not surprisingly records it as having been found near Taninga, which lies in the western side of the Sierra Cordoba (see Chileans No.65 Cordoba map), as far as La Mudana to the west of Taninga, with *G.intertextum* (moserianum) to the north and *G.gaponii* to the south. This is a rather restricted distribution area – have any other sightings have been made of this species?

.....from P.Crewe

Searching through various field number lists for records of *G.tanangaense* I find an MT 8-409 recorded from 7 km SW of Cienega del Coro, which is about 30 km to the north of the foregoing suggested distribution area, along the Sierra Guasapampa, about 3 km to the north-east from Guasapampa.

.....from M.Meregalli

Travelling south alongside the base of the ridge of the Sierra Guasapampa, we stopped at several places before reaching the suggested distribution area for this species, and came across some *G.tanangaense* at MT 1333 at about 12 km to the south of Guasapampa. However, these plants were far outnumbered by the *G.intertextum* which we saw at each of our stopping places along that stretch.

.....from H.Middleditch

This certainly extends the distribution area for *G.tanangaense* northwards from La Mudana. Looking at my Argentine Automobile Club map of Sierra Cordoba it is evident that there is very little in the way of roads to the north of the Taninga to La Mudana area, which might suggest that there could be plenty of *G.tanangaense* in that area since it is not really readily accessible.

.....from P.Crewe

More recently I have come across a field number STO 96-1161 for a *G.tanangaense* collected by H.Amerhauser at a location between Las Palmas and El Mirador. This road goes to the south for some 40 km from La Mudana via El Mirador and Villa Bochero to south of Mina Clavero, from where GC 945.02 was recorded by G.Charles as *G.tanangaense*.

.....from H.Middleditch

This record extends the distribution area for *G.tanangaense* to quite some way to the south from Taninga, but apparently with a fairly narrow east to west area of distribution. The road from Las Palmas to El Mirador runs almost the whole way along the western side of the Pampa de Pocho so the *G.tanangaense* at that STO location could be growing on the lower slopes running down from the adjacent ridge of mountains.

.....from F.Vandenbroeck

There are similar long gentle slopes lying between the mountain ridge and more level ground near La Mudana.

.....from M.Meregalli

The picture taken by F.Vandenbroeck near La Mudana is of the landscape with a long gentle slope from hillside to nearly level ground. This is very similar to the surroundings where we found *G.tanangaense* near Sierra Guasapampa when travelling from Los Gigantes to La Mudana, with lots of green vegetation and palm trees.

.....from G.Neuhuber

*G.tanangaense* will not be found in the immediate vicinity of La Mudana because that is rocky ground and this species will only be found growing in sand.

.....from H.Middleditch

Does this possibly explain why these plants remain solitary in habitat, growing in sandy ground, but offset in cultivation where they are very probably being grown in a typical compost mix?

.....from A.de Barmon

My plants of *G.tanangaense* P212 were grown from seed sown in 1997. Their compost consists of equal parts of perlite and garden soil and they are given about 10-12 waterings each year. They are now about 4 cm in diameter and still have no offsets.

.....from M.Meregalli

I have been growing some *G.tanangaense* for three or four years and they are still solitary. My compost consists of 40% sand, 30% grit of 3 mm size, and the other 30% is the universal compost that can be obtained in garden centres.

.....from H.Sonnermo

I have been growing a plant of *G.tanangaense* for about ten years and it has not yet put out any offset. All my *Gymnocalycium* are planted out of doors with a free root run in a bed of compost for the summer and are brought into the greenhouse in October, where they are laid in a box on the floor. The compost they are grown in consists of 50% sand and gravel, 25% vermiculite, and 25% humus.

.....from S.Stuchlik

My plants of *G.tanangaense* are both without offsets – one plant is 17 years old which was grown from



seed from F.Strigl and the P 212 plant that came from H.Till is 20 years old. Both are about 5 cm across. All my cacti are grown in a mixture of equal parts of soil, peat, and sand.

.....from M.Kurka

I grow two plants of *G.tanangaense* which were grown from seed and are now five years old and so far they have not produced any offsets. They are grown in the same compost that I use for most of my South American cacti, which is a mix of equal parts of garden soil and sand. They are about 4 cm across and the swollen root is bigger than the head of these plants. So far I have not seen any offsetting plants of this species in cultivation.

.....from G.Neuhuber

My *G.tanangaense* do not make offsets in cultivation unless they are damaged. My compost that I use for these plants is a mixture of 95% granite sand and 5% lava. All my *Gymnocalycium* are grown in this same compost and they do not give me any problems. I do not give them a great deal of water, to which I add a little fertiliser.

.....from J.Piltz K.u.a.S. Feb. 1990 *Gymnocalycium tanangaense*

Whilst searching for *G.horridispinum* Frank ex Till in July 1980, in the western foothills of the Sierra Grandes, we stumbled upon a population of small growing, flattened globular cacti of the genus *Gymnocalycium*, the body colour being a matt lead-grey, which appeared very exceptional to us, as we had never before seen such plants, neither in European collections nor in any of the habitats in the field. The collected samples changed very little in cultivation here. They fill out during the growing period but remain more or less flattened globular during the first year. After nine years of cultivation they have now become semi-globular, a few have produced offsets - a form which was not observed in habitat. It is worth noting that the characteristic body colour did not change after many years in cultivation. The typical colour of the epidermis can be seen at numerous places where growth has taken place during this period.

The thoughts that the new species possibly belonged to *G.calochlorum* was not confirmed as the first flowers and fruit were observed. *Gymnocalycium tanangaense* has pure white flowers; on many examples the base of the inner petals are pale yellow, giving the appearance of a yellow throat, whereas *G.calochlorum* without exception has a reddish to somewhat pinkish throat. The pericarp and receptacle on the new species are shorter and thinner than the longer, thicker, fleshy flower of *G.calochlorum*, which is associated with the characteristic features displayed by the form-circle of *G.capillaense*.

In comparative examinations the relevant seeds of *G.calochlorum* (P 109, Nono; P 109a Las Rabonas; P 109b east of Villa Cura Brochero; P 203, north of Villa Carlos Paz) are barely 1 mm long, the outer surface appearing to be matt-black despite an adherent arillus, that is to say, this arillus layer is present in remnants, whereas the seed of *G.tanangaense* certainly exceeds the 1 mm boundary. Also the testa surface clearly appears to be brownish because of the scarcely loose and thicker brownish arillus layer. After removing it mechanically, the matt-black surface appears here, too. *Gymnocalycium calochlorum* consistently displays white radial spines lying close to the body - only on one population were pinkish brown spines observed - P 211, south of Mudana, whilst in *G.tanangaense* only at the tip are the spines light grey, darker towards the base, becoming almost black. Moreover, central spines are observed on the new species whilst they have neither been described or observed on *G.calochlorum*.

The *G.tanangaense* grows in a transition area between the xerophytic Chaco forest in the north and the landscape of the Monte (sensu Hueck) which starts to the west - the Chaqueno Serrano district according to Cabrera who favours finer divisions. Here we found the preponderant *Prosopis* sp. in which are scattered isolated Palms - (*Butia Ytay?*). The sandy-clay soil with a sprinkling of small stones contains hardly any humus, while the fallen leaves do not decompose because of the lack of dampness.

.....from H.Middleditch

This very last observation from J.Piltz might suggest that to keep a plant of *G.tanangaense* in cultivation which will remain solitary as in habitat would require it to be grown in a compost similar to the nature of the ground where it grows in habitat. This would appear to be correct from the preceding comments about the compost used which has produced plants of *G.tanangaense* which do indeed remain solitary in cultivation, that is, a compost which is mainly inert material and includes only a fairly small proportion of humus.

**COMMENTS H.Middleditch**

If any member has any comments or opinions about the contents of this issue, or any other issue, it would be appreciated if they could send those comments or opinions to me so that they may be included in a future issue. Any comments or observations from readers on growing, or problems with growing, *Micranthocereus* would be very welcome.

**ACCOUNTS. Chileans Volume 22 Numbers 70 to 72**

Income		Expenditure	
Balance brought forward	4753.27	Printing	848.02
Subscriptions	2075.00	Postage, Stationery, etc.	2468.68
Back Numbers	643.04	Computer repairs, etc.	320.00
Bank interest	369.77		
Sundry income	78.06		-----
	-----		
	7919.14		3636.70
Less expenditure	3636.70		
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Balance carried forward	4282.44		

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**Note:**

This version of No.73 was created for online publication as a PDF file. The pagination is different from the printed version but the contents are the same.