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BUXBAUM - CACTUS FRANCE

CLEISTOCACTUS BAUMANNII

CLEISTOCACTUS SANTACRUZENSIS FLOWERS From R. Mottram

The plant shown here, a cultivated seedling from Hollygate Nurseries, Ashington, has grown in two seasons from about 30 cm up to 1 m in height. In its first flowering season (1975) some of the early flowers failed to produce fruit after artificial cross-pollination, but some was set from later flowers.

The stem of the plant illustrated was erect but somewhat bent in places, deep green, flowering randomly from anywhere on the upper half of the stem. Stem ca. 1.5 cm thick in upper part, but up to 2.5 cm diam. in the thickest lower parts. Ribs 8, at first divided by a well-defined slightly wavy groove, becoming indistinct on the older parts. Areoles ca. 2 mm diameter, grey felted. One central spine up to 2.3 cm long, at first whitish with brown base, passing slowly to grey, carried \pm at right angles to the stem, except on young growth where they are directed upwards. Many areoles also carry a second central, not as strong as the primary and directed downwards. Radials ca. 13, whiteish, 3-5 mm long.

The flower is about 6 cm long including the exerted style, deep orange-red with darker ovary and tubescales. Ovary and tube carry weak scales, bearing a few weak white hairs in the axils. Tube bent about 60° at the nectar chamber, causing the tube to be carried on an upward slope of ca. 20-30°. Limb obliquely zygomorphic, with anthers and style exerted. Ovary ca. 3.5 mm long. Nectar chamber ca. 5 mm long and 4 mm broad, containing copious sweet nectar at the stage shown in the drawing. There is no diaphragm enclosing the nectar chamber, and when tilted below the horizontal, the nectar pours from the mouth of the flower. Filaments in two series. Lowermost filaments ca. 3 cm long, extending from the nectar chamber mouth for ca. 1.2 cm of the tube. When the flower is sectioned vertically, these filaments and style immediately move upward as shown on the flower section in the diagram, having released the pressure exerted on the upper wall of the tube. Uppermost filaments 8-9 mm long, arranged on an oblique throat-circle. All filaments white, shading to orange-red near the top. Anthers deep maroon. Stigma lobes 5, not spreading, pale yellowish-green.

The plants are self-sterile, but cross-pollination between two plants of the same species usually produces fruit readily. The flowering period extends from about June to October, and fruit may be set at any time during this period. Fruit ca. 2 cm long and ca. 1.6 cm in diameter, with dried perianth persisting and detachable only with some effort. Immature fruit dark red, \pm flask-shaped with dried perianth scar forming the truncated apex. On maturing, the fruit expands within a few days from ca. 1 cm length to ca. 2 cm length, and swelling to become \pm globular, with areoles of the ovary becoming small and insignificant. Simultaneously, the colour changes to a lively pink, semitranslucent with some of the black seeds faintly visible through the skin. No dehiscence has been observed, but the whole fruit is easily detached from the stem, leaving a tiny pore at the point of attachment. Ripe fruits remain attached to the plant for some time (at least ca. 3 months), but it may be that they eventually fall away. The seeds are embedded in a fleshy white funicular pulp, under a hand lens looking rather like a mass of bubbles. The pink skin of the fruit however is quite tough and resilient, and there seems no possibility of the seeds being released without some creature consuming the flesh. The skin may be peeled away from the rigid pulp quite easily - rather like peeling the skin off a dutch cheese. The best way of gathering the seeds seems to be to macerate the pulp and agitate in water until the seeds fall to the bottom of the container; then decanting the fluid with most pulp remains, and drying the seeds on newspaper or other absorbent material. The pulp is virtually tasteless, drying readily on exposure to the air to leave very few remains. A samply fruit contained 232 seeds.

Seeds glossy black, ca. 1 mm long, pyriform with sub-basal narrow hilum and prominent dorsal rib; finely

pitted.

Backeberg's original description of this plant is technically invalid because it lacks a holotype. It also differs slightly from the above description as our plant is slightly more slender with fewer ribs (only 8 against 15-17) but slightly longer centrals. This species is allied to Cl. baumannii, the flowers being almost identical, save for slightly hairier tube scales on the latter and a slightly larger, more open-limbed flower. Since Cl. baumannii has a wide geographical range, it may be more appropriate to regard the Santa Cruz plant as a regional variety of this variable species.

The contorted stems arise usually as a result of the weight of flowers or other factors causing the stem to lean, the growing tip then continuing its vertical growth. The drawing shows the top of the plant described with flower and fruit drawn to scale. A feature of great interest is the lack of a diaphragm. Supposing the theory that a diaphragm is only required to stop the nectar from falling out, then this species with its upturned flowers does not require a diaphragm, whereas the straight-limbed flowers such as those on Cl. straussii have well-formed diaphragms. This apparent compatability of theory and observation is, however, confounded by Cl. flavescens which combines an upturned tube with a well-formed diaphragm.

Comments

.... from J.R. Gooch

My Cleistocactus santacruzensis starts flowering in May and since then has never been without open blooms so far this year. Another peculiar feature of this plant is the fact that it produces quite large pink, turgid fruit. These fruits persist on the plant for a month or more after apparently ripening, and unlike all the other Cleistocacti fruits that I am familiar with, they never split. The fruit is the largest of any I have had and unusually "succulent". The shape is something like an inverted pear. The flowers are produced both on this season's growth and last years. In fact I would guess that growth made as little as one month before is capable of flowering, and my plant, having apparently stopped growing for the season, is even now showing flower buds close to its apex. These are unlikely to develop further now, I fear, due to the poor light and lowering temperatures of late autumn. The petals of the flower do reflex slightly, the stigma being exerted prior to the petals reflexing and subsequently the stamens grow and overtake the stigma before the flower fades.

One difference between CI. santacruzensis and its likely close relation CI. baumannii is the presence of clearly visible hairs on the flower tube of the latter species. The hairs on the flower of CI. santacruzensis are far fewer and shorter though they are certainly present. This latter has fruits of up to 2 cm diameter on my plant, and the Kakteenlexikon gives a fruit size of 1.5cm for CI. baumannii. Unfortunately I have not encouraged fruit to set on CI. baumannii in previous years, and the cutting I took when moving house this year and leaving behind all my free root-run Cleistocacti, has not flowered yet.

I have dissected a flower from CI. santacruzensis and find no indication of a covering diaphragm to the nectar chamber. I have not been able to lay the flower of CI. baumannii against one from CI. santacruzensis to check for likeness or otherwise, but differences in body form between the two are not very great. One could sum up by saying that C. baumannii appears a slightly stouter and more densely spined plant, but I feel sure that both plants will be found to vary in rib and spine count. Comparisons on two specimens:

	Cl. baumannii	Cl. santacruzensis
Stem	Grey/Green 3 cm diam.	Grey/Green 2 cm diam.
Ribs	12	9
Areoles	Grey 7-10 mm apart	Dark, felty, lighter in age 10 mm apart
Radial spines	14-16 up to 10 mm long	8-10 up to 7 mm long
	Fine and white	Fine and white
Centrals	1 up to 3 cm, dark brown	1 or 2 up to 3 cm, brown or reddish
	with much paler tips	brown below, straw coloured tip,
		sometimes banded reddish brown.

.... from H. Middleditch

This particular species of Cleistocactus is not one with which I am in any way familiar. However, at a local Chileans gathering we had an opportunity to screen some slides of this particular species from the collections of both Jim Gooch and Paul Sherville, and to compare them with the plant described by Roy Mottram. In addition, Tom Lavender had a slide of this same species which he had seen in the Jardin Exotique at Monaco, this particular plant being fairly heavily laden with fruit. Some of the fruit was a very deep purple colour and appeared to be somewhat hairy whereas quite a number of fruits were almost spherical, with hardly any visible hair, and bright pink in colour. It quickly became evident that the dark purple fruits were those which were not yet ripe and the bright pale pink fruits were those which had ripened. The ripe fruits were all very similar indeed on each members' slide, although there did appear to be some differences in the plant bodies which it was not very easy to define.

It was suggested that the flowers on this species bore a distinct resemblance to those appearing on Cl. baumannii, both being an orange-red colour and of a lazy 'S' shape. It was also suggested that there was considerable similarity in the body appearance of these two species; not only that, but with Cl. chacoanus as well. There were immediate suggestions that Cl. chacoanus could be distinguished by the bicoloured or multicoloured tinting which changed along the length of the longer spines. A subsequent reference to Backeberg's Die Cactaceae and Kakteenlexikon revealed that Cl. baumannii was the very first Cleistocactus to be described, but information on its habitat and distribution was indefinite. Cleistocactus baumannii was stated to have up to 16 ribs, Cl. santacruzensis to have 15-17, and Cl. chacoanus to have 8 ribs. Does this mean that all plants with the low rib count are Cl. chacoanus and not baumanii or santacruzensis? from R. Zahra

Now regards these closely related species of Cleistocactus, I have grown all three species from seed and I have never really checked how they stand with the official descriptions. I must also explain that while Cl. baumannii is planted directly in the ground, Cl. chacoanus and Cl. santacruzensis are still in small plastic pots. All three species have flowered for me and the flowers are indeed all very similar, all being of the lazy 'S' type. The largest flowers are found on Cl. baumannii, but this is a larger plant and being planted directly in the ground it is growing much better than the other

two. On the other hand CI. santacruzensis is very thin, being no more than 12 mm in diameter (excluding the spines); however this could be because it is also growing in the smallest pot and thus it is also not growing too well. In fact, one of the two plants that I have has a top that has died back, and I consider this a sure sign that the plant needs more room for its roots.

The spines on Cl. santacruzensis start as a very light brown, but very soon turn white. They are also very thin. The spines on Cl. baumanii are a little thicker, and remain brown longer. On the other hand those on Cl. chacoanus are longer, denser (more spines per areole) and although not as dark as those on Cl. baumannii, they are certainly darker than those on Cl. santacruzensis. The ribs on all three species are between ten and fourteen in number, the least being on Cl. chacoanus, but I don't consider this significant; however the grooves between the ribs are deeper in Cl. chacoanus and this gives this species a very different appearance, because this brings the denser spines close together thus hiding more of the body.

It seems that the fruits don't form unless the flowers are cross-pollinated with those of another plant. I have never had fruits forming on Cl. baumannii or on Cl. chacoanus, but I have lots of fruits on the other one. The fruits are just like the description given above — it is quite true that they don't fall off readily. However here I must explain that very soon after they swell up, I cut them to collect the seeds. With the other species of Cleistocactus like Cl. tominensis, tupizensis, and ritterii, there are always a few fruits that are not picked in time and split and fall before I get round to collecting them. This has however never happened with Cl. santacruzensis.

.... from P.H. Sherville

Among the plants which I bought from Phil Allcock were quite a number of seedlings under the name of Cleistocactus santacruzensis; quite a few Chileans members had plants from that batch, as they were in flower for one of our southern meetings. These seedlings had either 8 or 9 ribs; my own plant has 8 ribs and is very tapering towards the top just like the illustration in the Kakteenlexikon. I notice also from the description that whilst the stem is 3 cm in diameter—that's about 1¹/⁸ — my stem is barely half that diameter, but the spine description fits perfectly; the spination on my Cl. chacoanus does not fit the description of santacruzensis nor is the flower strongly zygomorphic. I have slides of the first years' flowers on Cl. santacruzensis which were almost straight and standing straight out from the stem, the tube near the body being almost cylindrical, the outer half tapering outwards slightly, the petals in line with the tube, the purple anthers just projecting out of the flower and the green stigma just exerted beyond the anthers. The second years' flowers were quite strongly S-shaped and moderately zygomorphic; from my slides it looks as though the petals did not reflex at all, but remained closed up to the style.

The only other description in the Kakteenlexikon which comes near to my plant is that of Cl. muyurinensis which apparently cohabits the same region. This has 10-13 ribs and most other details fit so it is possible at 8 ribs on a seedling that an adult plant could develop some new ribs; or we could be seeing a cultivation effect as this plant is extremely fast growing (to four feet this season when it is four years old) and it is possible that with slower growth, more ribs will be formed. Similar effects occur naturally and affect the number of ribs of Carnegia gigantea and also the Lemaireocereus group; it is possible to see a run of good seasons followed by a run of bad seasons, the change in the number of ribs giving this indication.

.... from Mr. & Mrs. Lavender

Our plant of Cleistocactus santacruzensis came from Gordon Foster about five years ago. It had been grown from seed, but was not under this name. We have now seen a number of Cleistocacti in flower which have been labelled C. santacruzensis, which were like our plant, and we also find that it conforms to the description in Backeberg's book. It has now grown to about 1 m in height but it has not put out any branches so far; the stem has remained fairly slim, being about 3 cm thick. It flowered for the first time about one year after we purchased it, when it was still only about a foot high; it has flowered regularly each year since, starting in May and going on until September. Sometimes it will even produce flowers over longer periods — it has even been in flower on New Year's Day. The flowers appear sporadically and it is seldom without at least two or three flowers during the summer. The flowers appear from all over the top half of the stem and from all round the plant, but mostly on the south and east facing sides, as this is where the plant receives the most sunshine. It does not set fruit for us, but we have not tried to pollinate it by hand.

When discussion in the Chileans turned to humming bird flowers and the occurence of nectar in some cactus flowers, one of the first flowers which we cut open to examine for nectar was taken off this plant – and we did find quite a large amount of nectar present. In a subsequent year when we took one or two flowers from the plant to section them, we found to our surprise that there was no nectar present. This led us to carry out an experiment by taking flowers off the plant at what we were fairly certain were different ages; by watching certain buds grow and taking specific note when they opened, we were able to tell pretty accurately how long these particular flowers had been open. We took three flowers of different ages off the plant in order to slice them and we found that in both the freshly opened flower and in the flower which was about to wither, there was no nectar present. In the other flower, which we judged to be at anthesis, the nectar chamber was full of nectar. After that we tried several younger and older flowers, which proved to our

satisfaction that these were quite consistent in exhibiting a complete absence of nectar.

Indeed, after we had sliced a fairly large number of flowers we began to think that we could tell by the appearance of the flower whether or not it was at anthesis and we could then see if we were right by slicing the flower to check for the presence or absence of nectar. By going into the greenhouse every day we became fairly familiar with the flowers and found that we had got to know them well enough to be able to tell which flowers would contain nectar just from their external appearance. A little later on we had a look at a Cleistocactus which was in flower in Harry Middleditch's collection — another species this time — and although we were not familiar with these particular flowers we tried slicing one which we would expect from its external appearance to contain nectar. However, when we did slice it, there was no nectar present; we suspected that perhaps this was a species which did not display the copious nectar in the nectar chamber, but when we tried slicing a second flower which appeared to be a little older than the first one we examined, it was found to contain a good quantity of nectar.

We have laid our pressed and dried half-flower from C. santacruzensis over Roy Mottrams's sliced flower sketch; the overall sizes are exactly the same but our flower is more of an S-shape with the bends in a slightly different place, also the ovary is larger and the nectar chamber is more elongated. There is indeed no visible "roof" to the nectar chamber.

.... further from H. Middleditch

All published data on G. baumannii credits this species with a closed nectar chamber, whereas the observations made by our readers on flowers of 6 santacruzensis are (so far) consistent in regard to the complete absence of any roof or diaphragm enclosing the nectar chamber. Does this really constitute the basic difference between the two species, and not the number of ribs, or colour of spines, or hairiness of flower tube? Why should just one particular Cleistocactus species lack one of the basic characteristics of a humming bird flower i.e. a well protected store of nectar?

A.M. FRIEDRICH – CACTUS COLLECTOR By G. Moser Translated from the January 1965 G.O.K. Bulletin by E.W. Bentley

A.M. Friedrich, born a Viennese, emigrated to Brazil in 1923 and lived there for some years with relatives, up-country. In 1926 he moved to Paraguay which has been his home ever since. When war came to the Chaco district, A.M. Friedrich was taken on by the Paraguayan army as a war correspondent. Prof. Dr. Hassler of the Asuncion Botanic Gardens took the opportunity to ask Friedrich, whilst he was prowling round the up-to-then roadless Chaco, to make a study of the cactus flora at the same time.

After brief instructions from Prof. Hassler, Friedrich – accompanied by Theodoro Rojas, an assistant of Dr. Hassler, moved into the war-torn Chaco. There the work of collecting was made easier by the provision of a military vehicle and soldiers and by the lines of communication already constructed by the forward troops.

And so between 1933 and 1935 he systematically collected in the Chaco – which even today is dangerious for the cactus collector on account of the wild animals, snakes, scorpions and insidious diseases. A.M. Friedrich found and gathered a mixture of new and of known species, including 14 Gymnocalycium, 5 Echinopsis, 20 Cereus, 4 Rhipsalis, 23 Opuntia, 2 Quiabentia, 2 Peireskia and 1 Pfeiffera species.

Gymnocalycium mihanovichii discovered by Fric was again found by Friedrich in very many areas of the Chaco in quantity. The range of this species stretches from Bahia Negra in Northern Paraguay to Toro Alarachi in Northern Argentina where Fric in 1926 found the variety stenogonum. This gives a range of round about 1,000 Km. The discovery of the plant called after him, G. mihanovichii v. friedrichii was noted by Friedrich in his diary as follows:

"It was also along this road that I suddenly noticed from a moving car, a small pink flower thick on the ground. Naturally from the car I could not decide clearly what it was. I had the car stopped in order to see the objects more closely. There to my delight grew the small Gymnocalycium that later was to become the variety friedrichii. Quickly every man jack of us, forgetful of all dangers, for some minutes gathered some hundreds of this wonderful species, in order to drive on again quickly. This was the only place, along a length of 1 to 1½ km, in which I have seen this species." It was 55 Km east of Santa Fe on the River Parapeti, in the vicinity of Laguna Redonda in present day Bolivia.

Further information on habitats: G. mihanovichii (type) near Puerto Casada up to 140 Km inland, then in the vicinity of the town of Conception and along the shore from the Paraguay river. G. pflanzii in great quantity and up to head-sized plants near Fort Garrapatal, G. fleischerianum near the Pirareta waterfall in the territory of the Cordillera (grows there often like a carpet). G. megatae and tudae 40 Km. south-east of Filadelfia near Isla Poi, a military post, (plants up to 30 cm diameter and 15 cm high). G. denudatum v. paraguayense in the Achay range, 95 Km east of Asuncion. Echinopsis of all species were found almost all over the Chaco. Notocactus schumannianus in the Sierra San Tome, Dept. Paraguay. A.M. Friedrich lives in Paraguay as a very wealthy man. It is much to the credit of Herr Moser to have located his whereabouts. A number of interesting plants and plentiful seeds have been the reward of this contact. The object of the lecture was not least to tell the story of a man who had contributed substantially to the study of Paraguayan cacti.

Now followed the presentation of about 150 colour slides, almost all the gift of A.M. Friedrich, which gave a good idea of the country and people of Paraguay, of the supermodern appearance of the capital Asuncion, of the flora of the country and of many cacti habitats. These slides, excellent throughout, showed that Paraguayan cacti grow in dense grass-steppe, in bushes on the edge of forest and even in damp places; none are desert plants and they like half-shade. These observations are significant for the grower of these plants.

HOOKED ON THE CACTI – A COLLECTING TRIP IN THE GRAN CHACO By A.F.H. Buining Translated by R. Moreton from K.u.a.S. 20.8:1969

My dream, once again to visit the Gran Chaco of Paraguay materialised thus: on a thundery, rainy morning of October 8th 1968 my wife, Leopold Horst & I were driving through the states of Rio Grande do Sul, Santa Catharina (where we collected a beautiful, golden soft hairy spined form of Notocactus graessneri) and Parana to our objective. On the way we visited again the family of Dr. Meyer in Ponta Grossa where at an elevation of ca. 1,000 m we found Noto. ottonis var. villa-velhensis and another new species of this group. We also found the above-named variety near the famous and beautiful cliffs of Vilha Velha. On the road to the waterfalls of Foz do Iguazu we found a Noto. linkii, so far the most northerly appearing form of this species. The waterfalls of Iguazu are among the most beautiful in the world. From there it was almost 300 Km through jungle and undulating plains to the capital of Paraguay, Asuncion. In the evening we again visited the well-known cactophile A.M. Friedrich in his tropical gardens. He showed us some of his famous colour slides^{*} and proposed that we make a visit to the Gran Chaco under his guidance.

Next day we made all the preparations for the long journey, such as obtaining dried cakes, packages of salt for the Indians, and an extra 200 litre barrel of gasoline. Thanks to the good relations between A.M. Friedrich, the Ministry of Public Works and Communications, and the Director of Tourism, we were able next morning to set off, the military posts having been informed by radio of our journey. However, as we were crossing the river Paraguay on the ferry, it began to rain and thunder and we were not permitted to drive into the Gran Chaco. The Ministry had forbidden it due to the great damage caused to the expensive roads by driving on them in the rain. As we had to wait for three days we went with A.M. Friedrich to the habitat of Notocactus grossei and schumannianus. N. grossei grows on fairly flat rocks, always under shrubs and covered by long grass. The plant is considerably smaller than schumannianus. It grows up to 50 cm high and has up to 24 ribs. Also the spination is quite different. I was able to measure N. schumannianus up to 1.80 m high and with up to 45 ribs. It grows between rocks more or less on mountain slopes. At the habitat of Gymnocalycium fleischerianum near Pirareta we also found the long lost Frailea cataphracta, which was recently rediscovered by a lady cactophile from Asuncion.

In addition we discovered the very beautiful Frailea schilinzkyana which is only found in a degenerated form in European collections. Near Nuevo Italia we found the very localised habitat of a Frailea species which grows there in large groups and which is the only species we have collected so far which offsets freely without needing to be damaged. It could be Frailea grahliana, but the definite determination of the various species can only be undertaken at home in Holland. At the habitat of Noto, schumannianus there also grows a Cleistocactus species which is also widely distributed in the Gran Chaco.

On the 19th October the news came at last that the roads were open again and at 10.0 o'clock we stood on the west bank of the river Paraguay where the Gran Chaco begins. The Gran Chaco of Paraguay consists of three types of landscape — tropical forest, palm woodland, and the xerophytic part which is called in Brazil "Sertao". The forests and also to some extent the palm woods have a rich flora and fauna. At the water holes we saw many specimens of beautifully coloured Ibis, Heron, Ducks, Geese, and Storks. We were also able to observe the birds of prey, song birds and pigeons. As far as the large and very beautiful Mennonite colony in Filadelfia hardly any "Sertao" was to be seen. In the neighbourhood of Filadelfia (where we were able to sleep in a good hotel) we collected Gymnocalycium tudae, which is probably a caespitose form of megatae, and — once again — the Cleistocactus species which we were able to trace even into Bolivia. In the xerophytic region it grew longer, more highly coloured spines.

We drove next morning into the dry area of the Chaco. Even by Estigarribia, the capital of the Chaco, military posts were stationed and further on one met only these posts and occasionally Indians, who live partly in huts and partly wander around the Chaco as nomads following water and wildlife. Soon one sees along the road the great trees of Stetsonia coryne with their white flowers and remarkably small fruits. Everywhere one sees Echinopsis chacoana (or is Ritter right that it is only the old Echinopsis rhodotricha?). They were certainly up to 75 cm high and stood more or less protected (by other vegetation?—R.M.). Further on one sees here and there Pilosocereus species with a strong development

of bristles in the flowering zone and red flowers.

At post Lte. Agripina Encisco we were greeted in a very friendly manner by the Commanding Officer. We still had enough time to collect there Gymnocalycium moserianum and G. pflanzii, which also occur in the Bolivian Chaco. In this area (where it had not rained for 7 months) they had shot eighteen jaguars in nine months.

Next morning we were right in the Sertao area where only soldiers and Indians live, where by day the hot dry sun reigns, where one is happy to get a little warm water to drink and where the enormously large and thick kapok bottle-trees adorn the landscape. At the post Nuevo Asuncion, where Gymno. friedrichii v. albiflorum grows, we drank the last cool drink for days. From here to deep into Bolivia grows G. megatae, in large, mostly flattened spheres, but only on top of sandy hills. From the crossing point Mr. Long we had to drive 90 Km due north to Mendoza, the most northerly post we could reach on this occasion. This sand track is only passable for jeeps with four wheel drive, with which we got through. Here one is signalled from one post to another, so as to get help quickly in case of trouble with animals or Indians. The temperature lay between 40 & 45 C. All along the road and around Mendoza as well as 20 Km into Bolivia we collected interesting, probably new, forms of Gymno. friedrichii. At the very primitive post of Mendoza we had to stay the night and the Commanding Officer did what he could for us.

The return journey next day was very difficult, but we arrived nevertheless at the large frontier post General Garay where the friendly C.O. celebrated his birthday with us. From here we drove 90 km deep into Bolivia. In this Bolivian Chaco as well, forms of G. friedrichii appeared. Our hopes of finding the true friedrichii, the pink flowered one, were in vain. A.M. Friedrich himself was able to collect this plant by accident during the Chaco war of 1932-35. He only remembered that it came from somewhere on the road from the border to the next town, 150 km into Bolivia. The wilderness in this area is terrifying. To gather the cacti we had to search carefully and slowly with long knives. Everything had spines — and what gruesome spines! The ground in this region is covered with very spiny Bromeliads, Cleistocactus, Monvillea, and Harrisia. It is almost impossible to go into the underbush among the shrubs without often getting badly injured by spines or by the hairy leaves which cause a burning pain by just touching them.

The innumerable stinging bees, the flies and myriads of other biting insects makes searching there a misery, although on the other hand the undisturbed nature there was a treat for the true nature lover. Although the burningly hot Chaco nearly laid us low after four days, we were thankful to have had the opportunity to travel about 2,000 Km through this country where we saw jaguar, wolves, wild boar, deer, tapir, and snakes, all of which we safely hunted with camera, not with guns. Hopefully the many fine plants we have collected will bring us a few more surprises.

A GRINGO ON THE HUNT FOR CACTI By Wilhelm Knoll

Translated from the Austrian Society G.O.K. Bulletin for October 1974 by H. Middleditch

On the morning of our third day in Asuncion we betook ourselves opportunely to the Comando Ingeneria, a detachment of the Paraguayan pioneer Corps. There we were introduced to their commanding officer, General Careaga, who obligingly gave to us a letter of introduction to the Military posts in the Chaco. This was a real blessing for us, because we could then stop overnight in the military encampments..

After we had stowed away our equipment and a 200 litre petrol drum into the truck, we set off at 4.00 in the morning from Asuncion, crossing the river by ferry at Villa Hayes and started off on the drive to the north. As far as Pozo Colorado the countryside was still fairly humid, palm groves lined the route and an enormous number of birds were to be seen in and around the numerous lakes. Then it became drier, the first stout kapok bottle trees appeared, a sure sign it rained very sparsely here. After 430 Km we reached Filadelfia, the German colony in the midst of the Gran Chaco region. In a very pleasant hotel we found accomodation and whilst my uncle left the truck to the mechanics (oil change and filter cleaning was essential for the forthcoming journey), Herr Friedrich and I engaged ourselves in searching for cacti.

According to Herr Friedrich's recollection there was a growing place of Gymnocalycium tudae straight outside Filadelfia. We certainly arrived at the spot but ascertained that there were few cacti to be seen. Herr Friedrich retraced his steps whilst I searched somewhat further on my own for a while, but without success. Finally it seemed to me to be a waste of time, so I crossed over the road and pressed into the low growing brushwood. And here there was indeed a surprise; almost completely covered with fine sand there grew there G. mihanovichii without spines and a quite peculiarly coloured body. Many plants exhibited a real riot of colours from pale yellow through green to violet brown. Quickly I collected some plants to show to Herr Friedrich at the Hotel, then started on the way back home, for it was already getting dark. Herr Friedrich expressed great surprise over my discovery, as he himself had found no more G. mihanovichii in this area since the Chaco war. Whilst my uncle went to fetch the truck from the mechanics in the morning, Herr Friedrich and I visited yet once again the small growing area of G. mihanovichii and collected there. Indeed, there were not many to be found. Then we set off in a northerly direction. In the neighbourhood of Mariscal Estigarribia we looked out for the Indian mission of Santa Theresa and asked the sister for a couple of Indians to send out on the search for cacti. We went on further to the northwest beyond Ochoa, and darkness fell just as we reached the military post of Teniente Encisco, the preliminary objective of our first trip, at a distance of 700 Km fron Asuncion. Since we had left Mariscal Estigarribia we had seen no more hamlets, other than the solitary building of the Ochoa Post. We found ourselves now in the true wilderness of the Chaco region.

The commanding officer of the post Tenient Encisco, only a young lieutenant, welcomed us most cordially obviously pleased to be able to talk to a pair of strangers after a long interval. Naturally there was no entertainment in this godforsaken region. For supper a Tatu was served, a small armadillo, whose dark flesh tasted excellent. In the morning we set out in company with some soldiers to search for G. friedrichii v. moserianum and G. pflanzii in the bush. In the beginning we found nothing, but then we apparently reached the proper growing place, for there were many at that spot. Always solitary stood G. friedrichii v. moserianum, under bushes and shrubs, handsome green coloured, only now and again pale violet in the crown. Young plants especially of this species exhibited a splendid whitish cross mark on the ribs, and it was quite an unforgettable sight when up to 10 specimens stood near together.

Gymnocalycium pflanzii (WO 80) grew in large_clumps, the individual plants often up to the size of a child's head. We found clumps where over 20 individual plants stood together. Especially beautiful to look at was the handsome red spination when the spines were still moist from the morning dew. In our eagerness in collecting plants we quite overlooked that some of them differed from the normal appearance; they had thinner spines and not spreading but more napiform roots. Only later in Vienna was I told that they were G. marquenzii. At their growing place I had not noticed that however and I saw no flowers at all at that time.

We collected thereabouts for the whole day, also on the next day. Although there were many cacti, it was however difficult to find handsome and altogether undamaged plants. The soldiers helped us diligently, we rewarded them with cigarettes and whisky. Towards midday on the third day we departed towards the northwest; we wanted to be still further towards Nueva Asuncion, the Air Force Base close to the Bolivian frontier. On the next morning we arrived there, where again we were very cordially welcomed and naturally we had to pass some appreciable time conversing with the Commanding Officer and his charming wife.

Near to the military station a school for Indian children had been established under enthusiastic teachers, who both paid great attention to us and demonstrated what went on there. I will never forget this remarkable picture. In one large pleasantly arranged classroom some 30 Indian children sat and studied, in their snow-white school smocks, barefoot, generally a little dirty, their long black hair tied up at the back. Older girls embroidered truly beautiful covers and kerchiefs, whilst the boys modelled traditional objects from clay. In the evening we sought out a pair of Indian huts on the edge of the forest and talked to the Indians, who declared that they were prepared to collect cacti for us. In return we offered salt, dry bread, and cigarettes, articles which are greatly desired by them. In this area they cannot cultivate corn because of the dry weather; salt and cigarettes they can only procure from the Village 230 km away.

The morning again seemed pleasant if somewhat sultry, when we left with the truck to search around in the sand dunes lying to the north for Gymnocalycium megatae. After about 25 Km we stopped and climbed around in the dunes. Soon we had the good fortune to find large plants of this species widely separated in the fine sand. The large, flat bodies of this species are always coloured pale to dark-brown, only when they have taken in water for a pretty long period do they change the body colour into a dark green. The Indians in these parts call this species "corona de novia" which is "bridal crown", because that is just what the flowers standing in a circle in the crown look like.

Quite early in the morning we turned back towards the Post, where we also looked at the produce from the Indians. They had collected quite diligently, for besides G. megatae they also brought a capital number of G. Friedrichii v. albiflorum. Amongst them a quite exceptional rarity, a cristate of this species, a really splendid specimen which did not survive the later transport to Europe. We also collected on the following day in that neighbourhood, then when we had sufficient we dismantled the tent and began our return trip. On this day we went as far as Teniente Encisco, where we had to stop overnight again. There had arrived there a group of hunters who were keen on jaguars, of which this area still yields a number. Unfortunately I could not stay, otherwise I would not have let that experience slip by. But instead I was compensated on the drive to Mariscal Estigarribia when we came across a file of about 15 wild boarsdirectly on the road, but they took flight at our approach.

The Santa Theresa Indian mission brought a surprise of another sort. The Indians had collected a large number of plants, mainly forms of G. mihanovichii. The exceeding richness of forms in this species appears to me especially worth mentioning. Our truck already sagging at the springs, we accordingly stowed everything away in it and carried on towards Filadelfia. There we stopped overnight. On the next day we went as far as Pira-Hu, where our homeward journey came to a temporary halt. It had rained heavily here in the southern part of the Chaco Boreal in the meantime and the road

had been closed. Towards the evening we were permitted to go further on still to Pozo Azul, where however we had to stop overnight. The following day came better weather, the road dried up slowly but it was round about evening before it was reopened. At 21 hours we reached Villa Hayes, crossing over the river with an additional ferry run and arrived safe and sound in Asuncion once again at 23.00 hours.

This country is for me without exaggeration the finest which I have got to know up to now, in spite of or possibly because of its naturalness and primitiveness and because of its friendly inhabitants. Whosoever has once that aveiled through the endless breadth of the Gran Chaco, goes back there again, just as I today would readily travel to that most delightful place once again.

Comments

.... from H. Middleditch

After several of our own members and also the Linz I.o.S. collection, no less, had expressed the view that several of the Gymnocalyciums from the Gran Chaco were not the easiest of plants to grow, it comes as some help to find out the sort of conditions under which they do grow in habitat. I gain the impression that G. mihanovichii is to be found growing where there are shrubs and bushes, as if these fruticose plants provided a degree of shade for the cacti. No wonder these cacti do not like to be grown in full sun next to the glass in a European greenhouse. And if the spines on G. pflanzii were red in the morning dew, is this a regular source of moisture for the cacti growing in the Gran Chaco? Would broken shading and regular spraying be a useful cultivation recipe for these difficult plants?

SOME GYMNOCALYCIUM from the PARAGUAYAN CHACO From Mrs. L.E. McIntosh

Among the Gymnocalyciums in my collection are a number which are perhaps in a group together: G. schickendantzii, pungens, michoga and knebellii (all older plants) also G. marsoneri, megatae, and knebelli v. blossfeldiorum, all younger seedlings. I had been so happy with these until Chileans No. 23 arrived and left me with a bigger problem than ever for then all the names became suspect. The older plants had already flowered and set fruit but for the three year old seedlings I had to wait a further year to see them in flower and fruit. It is very fascinating to watch them all develop from seed at the same time and to me each name is a species in its own right, for they all have characteristics of their own, and each is easily separated from any other, although they have a long way to go before they look like my old man knebellii.

I use the collected plant of G. knebellii as a guide to this group of plants — it came to me in 1965 when it was imported and it appeared then to be a large seedling. The body is dull velvety brownish-green, flat at the top and without spines, 85mm wide, 35 mm high, 18 ribs with S shaped furrows between the base of the ribs; tubercles large and angular with sharp chins, areoles oval with wool in the youngest ones which is lost after flowering, 5 spines, occasionally seven, strong, curving, back over the body, hooked at the ends, pinky-grey with brown tip, 2-3 spreading sideways each side of the areole, the lowermost pair horizontal, opposed, always the longest, 15 mm, the topmost ones shorter, 10 mm, the lowermost spine pointing down, 13 mm. You may be interested in the G. knebellii flower for it seems to be the only odd colour, all the rest being white; the flower is 4½ cm long, made up of 1½ cm tube and 3 cm petals, flower tube narrow at bottom, 7 mm across at the bottom, 10 mm across at the top, pale blue, many translucent scales with rose centre, all petals pastel salmon pink, the inner petals with deeper mid stripe on inside and green midstripe outside, outer sepals have a wide green centre band — altogether a very lovely flower. The appearance of the body does change with age but it appears that age does change the flowers as well; the pollen from flowers on younger plants sets fruit on the old plants, but the young flower, whilst it did set, only produced a pod about 5mm tall (minute!) which had four seeds; you now have the fruit from knebellii, the result of this pollination. As I felt even that a poor effort it will be interesting to know what amount of seed it will produce.

Now coming to the G. knebellii v. blossfeldiorum, this plant was grown from seed which I bought from New Mexico Cactus Research. I am always suspicious of any seed from the U.S.A. with "Bloss" tacked on to it so I have been quite interested watching it develop. I have found these brown — bodied plants hard to get past the. seedling stage (hence I now only have one of each) whilst the green bodied plants are on a par with ordinary seedling plants. At first I was inclined to think this particular seedling of variety "Bloss" was a megatae, but it flowered at four years of age with a very weak pink flower rather like a damsii flower. At that time it also produced one offset at soil level — this has happened over the last three seasons in the spring — some weak pink flowers and one new offset, but last autumn the plant flowered again with two large fully developed flowers exactly like knebellii. At eight years from sowing the plant measured 70 mm wide and 35 mm high, flattened but well spined at the centre, body dull brownish olive-green, 12 defined ribs divided into many high chinned warts, with deep furrows below, areoles small and oval, slight wool, 5 thin needle-like hooked spines, horn colour, brown tip, set on the areole just like knebellii, the longest spine 10 mm, the shortest 8 mm. The flowers are large for this group and are identical with knebellii, with the stigma deep down

in the tube.

The seedling marsoneri R 159 is becoming unmistakably a plant quite different from the rest of this megatae group, which all have sharp ribs, for marsoneri has wavy ribs – trapeziform I think you call them. The tubercles are rounded, with a very small chin and only a slight furrow below. The areoles are long oval shape, 4×2 mm, with white wool only in the youngest, with 7 – 9 spines, straight, pointing outwards, horn colour, ginger tip, only lower one hooked; the growing point is very spiny, like my megatae. The flowers are very distinct from any of the others so far, the bud is flat on top and the tube is long, greyish, the scales and unfolded petals the same colour as the tube, both with bright cerise tips; the flower becomes tulip shape, the outer sepals greyish-white with cerise tip, the outer petals cream (not white), the stamens and stigma cream.

The two seedling plants of G. schickendantzii are rather older, both with dark mat grey-green bodies – greener than G. michoga and not spotted, 55 mm tall and 90 mm wide, with 16 'S' shaped ribs, angled tubercles with sharp chins, areoles oval, large, and some white wool in the youngest, 7 spines, heavy and flat, light reddish-brown, lower spine longest 20 mm, slightly heavier than others, side spines 10-18 mm all standing out from body, flowers white. I also have two seedling plants of the same age, as G. michoga, with dark matt grey-green body and spotted, 80 mm tall and 90 mm wide, ribs 25 mm wide with deep furrows between; tubercles large, rounded, with sharp chin and furrow below; areoles oval with little cream wool; spines reddish-brown, later grey, 7, needle-like, 20-25 mm long, lower one longest; one plant shows 1 central from all areoles, 20-25 mm long, and standing straight out, flowers white.

The G. megatae seedling is five years younger, with an olive greeny-brown body, 10 defined ribs, rounded tubercles, sharp chins pointing upwards, very small areoles, less than 2 mm across, orange coloured, with wool only in the very youngest, 7 spines, cream with brown tip, hooked, standing straight out from body and curving back to it, crown armoured.

The two plants of G. pungens are again older seedlings, body dark olive green and shiny, 70 mm tall and 80 mm across, pyramid shape, 13 ribs, straight, high & sharp, with deep furrows between, broken into angled tubercles with sharp chins below, areoles oval, no wool, spines 5 to 7, horn colour with ginger brown tips, needle like and flexible, all pointing out and up, longest spines at side of areole 50 mm, lower spines shortest 40 mm: I think these spines are longer than average, for the second plant is otherwise similar except that the spines are much shorter: flowers white. You will note that the only likeness G. pungens has to this group is the fact that it flowers from the lower areoles, but the flower itself is different from the rest of this group. Whilst the tube is long the bud is not the 'belisha beacon' shape, and the petals are untidily arranged, just as G.J. Swales has observed. But the main difference is in the stigma being well exerted beyond the petals and no trouble to pollinate. With all the others, the stigma is well down in the tube and I have to destroy the flower to get to it: this I do by removing the pollen, then cutting across the bottom of the petals, which also cuts off the stamens, then splitting down the tube until I can find the stigma.

All these plants flower late in the summer, but they also flower in spring and summer but at that time being almost impossible to fertilize. I think they need a lot more heat to ripen the pollen: but since I have to cut up the flowers to fertilise them, who really wants to destroy flowers so early in the season?

I am rather puzzled that no one seems to count G. lumbrerasense FR 962 in this group: surely it is an earlier discovery than G. megatae? This is my oldest seedling plant in this group and certainly my favourite. The body is a dark grey-green, dull but not velvety, 50 mm wide and 30 mm tall, 10 ribs of 'S' shape, tubercles large and round, without chins, only two per rib, areoles wide oval with sparse cream wool which are placed on the upward facing part of the tubercle; spines 5 radial and 1 central, fairly uniform in length, 10-12 mm long, hooked, cream with bright ginger-red tip, all standing up from the body like a bundle.

As you will see from the descriptions above of these megatae group plants, most of them have hooked spines. In none of the literature that I possess can I find any reference to this – unless John Donald's "Curved spines" refers to this characteristic – I cannot find a curve, but a true hook which will attach the spine to my finger. They are always hooked downwards, never upwards.

There is at least one quite big difference between all these plants, that surely could be an identifying feature; whilst all the berries are very large, they do all differ in colour when ripe. Gymno. schickendantzii is a lovely sky blue with a white bloom; G. pungens is a shiny bright cerise; G. michoga is dark green overlaid with purple — and all the rest differ too. The berries are supposed to split longitudinally, I believe: however, none have ever split with me. I have to wait until they fall from the plant, which they just won't do until the plants go to rest. They do stay on the plant all winter if one is careful and they look so gay, especially the cerise ones. I have left fruit on the plant all winter and they simply get less and less secure on the plant and usually fall or are knocked from the plant just before it comes into growth again — which is very much later than other Gymnos. I left a fruit on a high shelf at one time; after a very hot spell I went out to find the greenhouse reeking like a vinery. I traced the smell to the fruit, which had fermented inside, with the skin still firm and intact. I wonder what really happens in habitat! I have sent cleaned seed of these three species to John Hopkins for the seed pool. You may be interested to know the colour of the pulp of each, which is very mushy.

The G. michoga pulp is dark purple, in G. schickendantzii pale glassy green, and in G. pungens a bright cerise – so very much like the colour of the berry. Gymnocalycium marquezii also has berries this colour, but they do split and become a pulpy mess for the skin is very softsand rots quickly.

Comments

.... from S. Johnson

I have managed to set seed on my plant of G. joosensianum which remained green for several months, following which it gradually turned into a deep red colour. After 14 months it still showed no signs of splitting – I expect that it will just dry up round the seeds.

.... from J.D. Donald

I should likesto revert to the article which you reproduced in The Chileans on Gymnocalycium megatae-tudae-marsoneri by Dr. Schutz. I have quite a large collection of these plants from A. Lau., van Vliet, D. Muhr, W. Rausch, and A. Buining and do not find them very puzzling now. Gymno. tudae/megatae are really only the two ends of a very variable single species, of very large distribution covering N. Paraguay, S. Bolivia and N. Argentina as far south as Sierra Medina. Gymno. marsoneri is Argentinian of fairly limited distribution in the Quebrada del Toro, i.e. R 157, B 64 and van Vliet's "marsoneri" Campo Quigano. Albert Buining has let me have a selection of the plants collected by himself and A.M. Friedrich as G. tudae H 316 and G. megatae H 317. The G. tudae H 316 are very similar to Lau's plants from southern Bolivia, whilst G. megatae H 317 is similar to Lau 397 from Paracari.

If the ribs are rounded and the spines laterally disposed or even tightly adpressed, then it is G. marsoneri. If the ribs are angular and the spines laterally disposed then it is G. tudae. If the spines are outstanding and the ribs quite acute then it is G. megatae.

Reverting to Geoff Swales suggestion that it is incorrect to include G. marsoneri, tudae, and megatae in Buxbaum's schickendantziana section and that I am quite wrong also to associate B 54 with marsoneri: presumably this is largely due to his belief that the seeds of the three species above along with R 159 and G. knebellii are quite distinct from the schickendantziana section. This I accept as possible as I have not studied the seeds so minutely as he has — my own very superficially conducted observation under a X 10 magnifier agrees with the comment made by Harry Middleditch of a "footprint" overall shape to the hilum. But basically I feel that this is a small difference compared with the other differences that separates the other sections of Buxbaum's classification. To me it is almost the same difference that can occur between some species in other sections. In other words it is pointing to a close specific relationship between these plants rather than taking them outside the section.

His other point concerning the body morphology needs a closer study. Again I would agree that there is a recognisable difference between these species and G. schickendantzii sensu stricta. The difference is even larger if one compares imported plants with seedling grown G. schickendantzii. I challenge any difference in body morphology between G.smarsoneri ex van Vliet Campo Quigano and B54 ex Frau Muhr. The most obvious difference appears to be the flattened depressed body form of these species, compared with the more globular to short cylindrical G. schickendantzii. The cross groove between the tubercles of the three species isstrongly present, but only weakly so or even apparently absent in strongly growing G. schickendantzii. The tubercles of G. schickendantzii are almost invariably round or oval, whereas thosesof G. megatae and G. tudae are angular. However, G. marsoneri has rounded tubercles with a deep cross groove. Gymno. schickendantzii and its form de laetii and also G. michoga & G. knebellii have bicoloured pubescent spines, the other species have horn coloured spines.

If we compare only imported plants from Lau, Muhr, and van Vliet, all have very similar floral morphologies identical with G. schickendantzii:-

- Lau 473 from Salinas Grandes: a schickendantzii in every respect but possesses a cross furrow. Globular body.
- Lau 486 from Mazan: a schickendantzii in every respect even without cross furrow. Lau 486a likewise but with cross furrow. Globular body.
- Lau 445 from Sierra Medina, a schickendantzii with strongly incurved pubescent spines and deep cross furrow. Globular body.
- Lau 446 from Sierra Medina with much greener epidermis, tubercles more angular, spines not pubescent, nearer to G. marsoneri and R 159. Seeds as for 445. Flattened body.

Lau 396, from Boyuibe: very angular tubercles, nearer to G. tudae, flattened body.

Lau 397 from Paracari: very green body, plump somewhat angular tubercles, white or pink flower, outstanding yellow spines: between schickendantzii and megatae. Semi-globular to flat body.

B 54 and Campo Quigano. - a G. marsoneri with white flowers, rounded tubercles, deep cross groove, flat body; B 54 can have either white or pink flowers, occasionally both on the same plant.

G. blossfeldii Hort. A globular schickendantzii type body but with white spines. Flower as for schickendantzii. Cross groove present.

There is thus no easy morphological separation between all these forms, which integrade with one another. The flower and fruits remain very similar. All in all to me it seems that it would be difficult to place the three species mentioned above anywhere else than in the schickendantziana seed section.

Some of my Gymnocalycium plants like G. melocactiformis and G. mihanovhii v. stenogonum, flowered late in October and their flowers lasted 8 and 10 days respectively. They did not close up at all during the night.

Certainly some of the Muscosemineae Gymnocalycium flowers do stay open all night and yet others don't seem to open up properly even in the strongest sun. Looking at my own plants in flower, I find that the white flowers generally stay open through the hours of darkness, whilst the pink flowers either close up or nearly close. On the other hand the two bronze green species have trouble trying to open even on the sunniest and hottest day. Apart from flower opening times, anther colour doesn't seem to have been mentioned. I have a G. megatae which has dark anthers, but I also have two G. joosensianum which I obtained from P. Allcock, labelled "De Herdt seed 1974"; one of them displays white anthers and the other dark anthers. I will follow these features next year on my other plants.

This year I tried to bring my G. megatae into growth in the April, but it immediately lost its roots. So I put it on a pot of fresh dry compost and by the first week in June it had rooted down and also started to bud. This plant starts to put out buds near the centre, on the edge of the previous season's growth; by the time the flowers actually open they have moved out quite a noticeable distance from the centre of the plant. From this I think that G. megatae doesn't really start into growth until late in the summer. I usually get a second crop of flowers in late August or early September, situated at about the same distance from the centre of the plant as the first crop — a circle of flowers some 60 - 70 mm in diameter on a 150 mm diameter plant. I find that there are no spines on the current year's growth, but these soon pop out in spring on last years' growth.

..... from H. Middleditch

Observations on the presence or absence of the dark anthers (or pollen?) on this group of plants would be welcomed. The large, bright-coloured fruit which appear on these Gymnocalycium from the Chaco, together with the large tomato-like fruits on the G. marquezii and allied species from the western fringe of the chaco, are quite different from the fruits to be found on all other species of Gymnocalycium. Is the local influence which brings this about also responsible for the uncommon long-lasting, bright coloured fruit on Cleistocactus santacruzensis?

VARIATION IN COPIAPOA CINEREA (Philippi) Br. & R. By P.C. Hutchison From the U.S. C. & S. J. XXV.3:1953

Copiapoa cinerea (Philippi) Britton & Rose is a little-known endemic restricted to a narrow coastal belt in northern Chile bordering the Atacama desert in the southern part of the Province of Antofagasta. C. cinerea is the most conspicuous and widespread echinocactoid species from this area. It is also highly polymorphic and appears to integrade with an undescribed, caespitose species in the southern part of its range, and with Copiapoa marginata (Salm-Dyck) Br. & R. in the north. In herbaria these integrades have been variously determined. At least one new species (C. gigantea Backbg) has been based on a plant from one of the outlying populations in the northern range of C. cinerea. Another name (C. haseltoniana Bckbg n.n.) has been proposed for a yellow-spined variant of C. cinerea. These two names will be discussed later. The purpose of the present paper is to clarify typification of C. cinerea and to present data on natural variation in a population in Quebrada Taltal and adjacent hills, an area which presumably includes the locality of collection of the type. Field studies were made in January 1952 during the University of California Botanical Garden Expedition to South America, 1951-52.

Philippi's original description as Echinocactus cinerea reads: "E. omino cinereus diametri 4-pollicaris; costis numerosis; verrucis vix 2 lin. inter se distantibus, diametri 2½ lin., vetustioribus immersis, planis; aculeis 5-6, nigris, teretibus, supremis duobus parvis, circa 2 lin. longis, inferioribus circa 6-8 lin. longis, centrali 9-10 lin. longo; apice lana alba densissima, 9 lin. longa tecto, flores plures vix e lana emergentes, 9 lin. longos, flavos emittente. In litorali a valle Taltal a 25° 24' lat. m. usque ad Cobre 24° 25' lat m. frequens, inter majores recensendus, valde ramosus, massas interdum diametri 1½ ped. formans".

No type plant has been designated in the literature. Judging from the confusing array of annotation labels on the various specimens of the type collection which I have seen, some elaboration of the history of the dried material which Philippi collected is necessary, since my choice of a lectotype differs from that of Rose. Rose's choice was later reiterated by Dr. Carlos Munoz P., who annotated Rose's choice as "Typus" and photographed this sheet at Santiago (SGO No. 041282) for distribution to other herbaria. My citation of the Philippii collection preserved at Santiago follows, and an explanation for it and the complex history of the sheets examined is given immediately thereafter. Chile, Prov. Antofagasta, Dept. Taltal, Quebrada Taltal, "Hueso parado", R.A. Philippi, Dec. 14-15, 1854 (Herb. of F. Philippi No. 791) (SGO No. 502667 – lectotype; SGO No. 041282 – isotype, US fragment).

Rose examined the material which Philippi collected and deposited in the Herbarium of the Museo Nacional de Historia Natural, Santiago, Chile. At the time Rose saw it, this material was unmounted and there were three labels for it, each with slightly different data. These labels read respectively, "Hueso parado. Decembri 18 4 Ph.", "Des Atacama", and "Dr. R.A. Philippi leg. Taltal in des. Atacama. Herb. F. Philippi 791." Rose apparently assumed that these labels referred to different collections and that the material, which showed considerable variation in spine morphology, represented more than one species. He separated from this material several areoles which showed spination which agreed most closely with Schumann's plate of this species and took a fragment from his separation which is now mounted at the National Herbarium, Washington, D.C. (US).

The remainder at Santiago was mounted later as SGO 041282, and Dr. Carlos Munoz P. annotated it as the "Typus" for Echinocactus cinereus Philippi. I examined SGO 041282 at Santiago in 1952 and the fragment from it at the US Nat. Herb. in 1951 and this material is definitely taken from a single plant which was a typical of Copiapoa cinerea in a population at the type locality (see notes below) and further, does not fit Philippi's description. It may be described briefly as follows: areoles with two central spines 12mm long, no radials; flower ca. 17 mm long, limb 13 mm wide. The label chosen (by whom?) for this material and mounted on SGO 041282 reads, "Dr. R.A. Philippi leg. Taltal in des Atacama. Herb. F. Philippi 791."

The balance of the material left after Rose separated the material of SGO 041282 (and the fragment of it at US) was eventually mounted at Santiago as SGO 052667 and bears the label "Hueso parado. Decembri 1854 Ph." Rose's annotation label "a mixture here" is now mounted on this sheet. This material may be briefly described as follows: rib section of 8 areoles, central spines two, 19 to 22 mm long, radial spines 3 to 6, 3 lower radials 12 to 15 mm long, the central lower one usually 1 to 3 mm longer than the two lateral ones, 3 upper radials much shorter (up to 4 mm long) but occasionally 1 to all of the upper radials missing, flowers as in SGO 041272.

Rose's concept of this species, which he did not study in its habitat, was apparently largely based on Schumann's figure of a plant with usually one or two short central spines and no radials. Philippi, however, describes his Echinocactus cinereus as having 5 to 6 spines, so apparently his concept was based primarily on the material now mounted at Santiago as SGO 052667, which Rose, and later, Munoz, considered to be of another species, or at least atypical of Copiapoa cinerea. As is shown below, all of Philippi's material falls within the range of variation in a population of C. cinerea at the type locality, but it was apparently taken from two different plants. Rose correctly separated the material from these two different plants, but was in error in assuming that what was left represented a different species. In fact the material left is the most typical of C. cinerea and since it fits Philippi's description more closely, it should be designated the lectotype (i.e., SGO 052667).

As to the proper locality for the type collection, and the status of the three available labels, it is my opinion that F. Philippi, (R.A. Philippi's son) wrote out additional labels for this material for his herbarium and casually altered the data each time. The data on all labels could equally well apply to one locality, indeed there is a hierachy of specificity with regard to that locality as is readily seen by the following information on the localities concerned.

Johnston (Contr. Gray Herb. 4 (85): 1-138, 1929) reports that Philippi collected in the Quebrada Taltal on Dec. 14th & 15th 1854. He labelled all specimens taken on these dates as "Hueso Parado". His campsite was recorded as "Agua del Clerigo" which is probably either one of the two localities now known as Agua de Perales (a spring on the south base of Cerro de Hueso Parado) or Agua de la Lora (a spring in a Quebrada of the southeast flank of the same mountain, now known as Cerro Perales). While at this station he collected from there to the shore now called Caleta de Hueso Parado. His collection of C. cinerea must have been taken inland near his camp, however, since shoreline populations of C. cinerea have generally longer, thinner spines which are brownish or yellowish (compare P.C. Hutchinson 401, UC) rather than black or grey as is typical of inland populations of this species, as well as of Philippi's herbarium material. Since one of the two plants which Philippi preserved has no radial spines, it is likely that it was taken in one of the plateau populations on the flanks of Cerro Perales in Quebrada Taltal, for as is mentioned below, forms with no radial spines were found by the author only in plateau populations and those on the slopes above were always more spinose and always bore radial spines. Forms with radial spines, conversely, do occur in the plateau populations, and probably Philippi took his material of this type of plant (designated above as a lectotype) from a plant nearby the one from which he took the material with no radials (SGO No. 041282).

In January 1952, the author found Copiapoa cinerea abundant on level rocky plateaus, slightly raised above the quebrada bottom-lands, 10 Km east of Taltal in the Quebrada Taltal, and again on similar plateaux 5 to 10 Km inland in the Sierra Esmeralda 30 to 50 Km to the south. It occurs in less dense stands and often as isolated individuals on the hills above Quebrada Taltal and extends from there continuously over the coastal range, reaching the coast about 5 Km north of Taltal, then receding into the hills about 15 or 20 Km north of Taltal. In the Sierra Esmeralda its

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distribution, as far as known, is almost exclusively on small inland plateaux, rarely on hillsides, and apparently not at all on the coast. I was unable to confirm its distribution further north than Quebrada Guanillo above Paposo although, as stated above, Philippi records it as far as Cobre and Johnston reports it in "the region north of Paposo". In its densest stands on the plateaux it is rarely associated with any other cactus but on hillsides a common associate is Eulychnia iquiquensis (Schum.) Br. & R.

Most plants are columnar, to 1.3 meters tall usually single or with 1 to 5 branches commonly from the base. There is little or no variation in stem shape. One extremely large plant examined in the hills 2 Km west of Breas (P.C. Hutchinson No. 394) had 19 branches from the base, each about a meter long, with 29 smaller branches from the apex of these stems. In this same area I found the only examples of fasciated stems which were observed in any population of Copiapoa – about ten large plants each with three to eight stems ca. 1 meter tall, and with one to several stems fasciated. These are apparently the first example of fasciation to be reported in the genus Copiapoa. Several of the fasciated stems were in flower. It was interesting to find that these fasciated plants were all growing together at the top of a narrow, steep gorge cutting the sides of the Quebrada Taltal, and apparently occurred nowhere else. I could find no evidence that an environmental factor was responsible for the fasciated stems. They were not isolated from normal plants.

On the slightly elevated, flat plateaux of lower altitudes, where C. cinerea is most abundant, the plants are usually smaller, seldom more and generally less than 0.7 meters tall. A single main stem is most common, with subsidiary stems from the base or, in most cases, from the lower half of the plant, being half as long or less. Occasionally a cluster is found in which all stems are of uniform length and form a mound. The smaller size of the plants in plateaux populations is probably attributable to a scarcer water supply. The plateaux were below the limit of the winter fogs (called "camanchaca" apparently the primary source of water in most years, for rain is rare in this area), whereas all of the largest specimens examined on the sides of the quebradas grew in the fog zone.

Britton and Rose in The Cactaceae 3: 85-90; 1922 used the number of ribs as a key character for distinguishing species of Copiapoa. Subsequent authors have considered this character to be diagnostic for some species of this genus. In C. cinerea the variation in number is at least from 14 to 30. Number of ribs is probably correlated with age and size of the plant as influenced by climatic conditions, since the oldest plants in the most favourable habitats had the largest number. The various stems of a single plant show little variation in number when they are of equal size (usually a variation of 0 to 3 ribs), but when different stems of one plant are of various sizes (and, presumably, ages) the variation is larger. Areoles may be nearly approximate or up to 2 cm apart. The epidermis in all specimens examined was always ash-grey.

Central spines are either one or two, most often the latter, with the uppermost spine appearing first and often attaining greater length; length varies from 1.3 to 3.3 cm. Radial spines may be lacking (rare) or from 1 to 7, but commonly 2,4, or 6; length varies from 0.5 to 2 cm, but radials are usually shorter than the centrals. On most specimens there is fluctuation in spine pattern on various parts of a single stem, the only notable exception being plants with a single central and no radial spines. When radial spines occur the number of centrals may vary at random between one and two on a single stem, two being more common. In general, plants at higher altitudes on the quebrada slopes within the fog belt are more heavily armed with stouter and longer spines and bear at least two centrals and 4 or more radial spines (commonly 4, 5, or 6). Nearer the coast and at lower altitudes in the plateau populations, spines are much shorter and plants with 1 or 2 centrals and no radials occur. There is considerable variation, however, within the general limits described above, but not exceeding these limits i.e. 1 or 2 centrals, with 0 to 7 (usually 2, 4, or 6) radial spines.

There is no consistency in arrangement of spines in any particular area other than as pointed out above and the dominance by numbers of plants with radial spines occuring in pairs.

At all localities spines are extremely brittle, especially the older (lower) ones. The lower half of most old stems is usually completely naked due to the loss of these brittle old spines. Spines are usually black, fading to grey-black or grey, but at one locality ca. 20 Km north of Taltal on the coast road to Paposo some plants bore brownish or yellow-brown spines which became under cultivation, more markedly yellowish (compare P.C. Hutchison 401 UC, also cultivated at UC Botanical garden No. 52.585 and No. 52.585S). This form has been called Copiapoa haseltoniana Bckbg. n.n. (C. & S. J. U.S. 23.4:1951).

Flowers of C. cinerea are 1.7 to 3.5 cm long and 2.0 to 3.5 cm wide across the spread limb; generally length and width are about equal. Colour ranges from yellow to yellow shaded pink to dark red on the outer surface of the petals. Flowers of a single plant are usually of the same size and colour, but variation occurs between flowers of different individuals. No significant variations in morphology, other than size, were noted. Both flowers and fruit have a mass of white or cream-coloured hairs attached to the base below the ovary. In extracting flowers from the stem apex I found that the hair is often not attached, as it is apparently more strongly affixed to the areolar tissue than to the flower tissue. The individual strands of hair in C. cinerea are ± 2 cm long.

The fruit is cream-coloured tinted pink, to almost pure carmine, naked or more usually with 1 to 5 short, erect, deltoid to lanceolate bractlets at the truncated apex and occasionally with a few smaller bractlets subapically. These

bractlets may be lost during development. The ovary is at first totally immersed in the densely matted hairs of the stem apex. Shortly after fertilisation it begins to colour. As it matures it swells upwards until finally the apex is almost flush with or a mm or so above the surface of the apical hairs. The perianth dries and is at first persistent on a circular disc at the apex of the ovary. Dehiscence is usually accomplished by the drying of this disc prior to the drying of the ovary walls. As the disc shrivels it breaks from the sides of the walls of the ovary; later it is attached by a very narrow section to one side and may be lifted at an angle above the ovary. The withering-persistent corolla usually breaks away in the wind at this time. Attachment of the flower to the disc is always weaker than that of the disc to the ovary; if the withered flower is grasped, it usually pulls away and the disc remains. As the disc first ruptures, seeds are extruded through the narrow opening and, in most cases, these seeds are still attached by the funicles to the placentae, or at least, the broken funiculus remains attached to the hilum. In the sun the fleshy remnants of the funiculus dry rapidly and the seed becomes scattered over the apical wool, to be blown away or eventually to drop to the base of the plant. As dehiscence nears the halfway point, the ovary begins to dry up and shrink back into the wool; the disc and attached flower usually break away at this time. As the capsule shrivels, all seed is extruded or some may remain, so that a dried capsule may be empty or contain seed. The dried capsule is usually again totally immersed in the matted hairs of the stem apex.

Occasionally the disc may not rupture and the capsule dries about the seed without dehiscing. The capsule is later disgorged and lies on top of the apical hairs of the stem. This dried capsule is round or oval, very brittle and tough, and solidly filled with seed. The withering-persistent flower, in such cases, becomes lost before the capsule is disgorged. Capsules which have lost their discs sometimes continue to grow and are usually distorted in shape and fissured by pressure against surrounding structures.

Plants in the plateau population 10 km east of Taltal were infested with a scale insect (Diaspis sp.). The infestation was most severe on young plants or on young basal offsets of mature plants. No infestation by scale insects was noted at any other locality. There was no evidence of infestation or damage to C. cinerea by any Buprestidae, as has been demonstrated for C. humilis (Phil) Hutchison and C. taltalensis (Werd) Looser.

In summary, it has been shown that variation in certain characters, previously presumed to be diagnostic and static, of the Chilean endemic species Copiapoa cinerea (Phil) Br. & R., is extremely wide. This is particularly true with reference to habit, ribbing, areole placement, spine number, size, arrangement and colour, flower colour and size, and finally, fruit colour and morphology. Conversely, there was little variation in general shape of stems, epidermal colour, details of floral morphology other than size, and seed morphology.

Comments on Copiapoa cinerea

..... from H. Middleditch

In the course of searching the literature for information dealing with the Copiapoa cinerea speciescomplex, I have had occasion to read material written by Backeberg, Buining, Knize and Ritter and I must admit that the above article by Hutchison — although perhaps lengthy — would appear to be not only the most thorough treatment but also a model of clear descriptive writing. The account of the Philippi herbarium specimens is so explicit that one almost feels, in the course of reading it, that one has actually been examining the herbarium specimens oneself.

Quite apart from the valuable observations made by Hutchison there would seem to be several interesting points unresolved. For example, Hutchison offers his opinion that F. Philippi "casually altered the data" on the herbarium specimens. Now I would not be unduly surprised at such goings-on in a commercial nursery, but it is hardly what one expects of a professional botanist. However, this begs two questions: was R.A. Philippi's son a trained botanist? And were other Natural History Museums equally casual at that day and age? On either point one may perhaps feel that Hutchison's opinion could be of value.

This species is described as integrading with an undescribed caespitose species to the south of its distribution; when one considers the relative ease of travel through this dry northern territory of Chile and the very thorough collecting activity of Ritter there, not to mention other collectors in that field, it is somewhat remarkable that any undescribed species could be left, even in 1953. With a geographical plot of the various species reported from Chile, including those found by later collectors, it is still not at all clear whether Hutchison was referring to plants which were given a species name by another collector between that time and the present date. In his account of his collecting work in this vicinity (Chileans No. 16) Knize refers to the richness of the cactus flora between Taltal and Paposo, thereby implying that it is more sparse to the south of Taltal. About 25 km to the south of Taltal is Cifunchos, the place reported by Lau as the location for our cover plant; Knize reports collecting C. cinerea KZ 77 "South of Taltal" but this does not tell how far to the south the collection was made. Hutchison states that C. cinerea is found as far south as the Cerro Esmeralda (which lies about 40 Km south of Taltal) but indicates that plants were found as far as 50 Km south of Taltal. This is barely 10 Km from Latitude 26^o S which Ritter gives as the habitat location for Copiapoa columna-alba. These plants, however, are described by Ritter as solitary and so can hardly be the "caespitose species in the southern part of the range of cinerea" with which cinerea intergrades, according to Hutchison.

The ground to the north of Paposo was not covered by Hutchison, but it was travelled by Knize, who refers (Chileans No. 16) to the absence of Copiapoa cinerea in that area, although it was reported from there by Philippi. Knize poses the question whether a marginata-like plant was taken for a northward extension of cinerea, whilst Hutchison suggests that C. cinerea intergrades with C. marginata to the north. It would be nice to have some clear idea of what was each writer's conception of "marginata", for then it would be less difficult to know what each one meant when comparing other species with C. marginata.

There are some excellent illustrations accompanying the article by Hutchison; some of these depict grooves between the ribs which are slightly wavy on younger growth in the crown, but none show the very wavy groove to be seen on our cover illustration and on Ritter's photographs of C. dealbata. There is a passing reference to white or cream wool in the crown, but no reference to the orange coloured wool on C. haseltoniana. Some of these illustrations would suggest that sunken areoles, such as those described by Ritter for C. dealbata, do occur on plants of C. cinerea which we observed by Hutchison, but this receives no mention in the text. Either the photographs are misleading, or perhaps Hutchison considered it a matter of no importance.

The barrel-shaped fruit is described by Hutchison as a "dehisced capsule", presumably a normal type, since he then describes the tapering tri-cornered fruit as abnormal. Of those copiapoa which have set fruit for me (not cinerea sp.) this latter fruit shape has certainly not been abnormal.

THROUGH THE CACTUS PARADISE OF SOUTH AMERICA By Gerhard Frank Translated by E.W. Bentley from K.u.a.S. 8.10.1957

After one and a half day's journey from Potosi by rail through the bare sterile high salt steppes of South Bolivia and North Chile, I finally reached the saltpetre port of Antofagasta. Here I had entered the region of a cactus genus that had long been numbered among my secret loves and which for that reason I kept a special eye on — the Copiapoas. In vain did I search the completely vegetationless coastal rocks around Antofagasta for Copiapoa marginata which according to the literature is located here. Later, in the Herbarium of the University of Santiago I saw it and learned of the habitat details: a barranca or ravine 30 Km from Antofagasta. I would have liked to have known that previously.

I now flew with intermediate stops from Antofagasta towards the south. My first touch-down and visit took in Taltal, the type-locality of C. cinerea. Here I was at last able to acquire a broader appreciation of the species. Already on the auto drive from the airfield, situated 25 Km away, to the port of Taltal I had seen on the bare scree-slopes, the grey-white somewhat bulbous Copiapoas crouched like tiny people in the twilight of the already falling night. The whole of the next day I wandered through the broad strands of the C. cinerea and as a result completely forgot about lunch. Almost lovingly I examined these solitary plants growing up to 80 cm high with their chalk-white coats, mostly short, ebony-black spines and small yellow flowers in the grey-felted crowns. I had always had a burning desire to have such a plant in my collection. Now the desire was being fulfilled and I could even collect it myself. At the same time as the flowers, there were ripe fruits, so that I could harvest copious amounts of seed. By careful examination of the plants I noticed again and again marked variations in body form, clump-building, rib-number and – above all – spination.

Though I was very much on the look-out for seedling plants, I found none and also I could not imagine how in this completely rainless desert, seeds could germinate and seedlings could survive the first critical year. But as I began to clear away the coarse pebbles round a group of old plants, I found the solution to this puzzle; from deep down arose quite thin cereoid young plantlets, that certainly required many years of growth before they finally emerged from the shade of the stones. Then the head broadens out and the long, often twisted neck is transformed into a lingnified root-stock. As the only companions to the C. cinerea plants emerged occasional groups of some 3 m high long-spined, besom-like Eulychnias with their distinctive grey-brown spined fruits. The strong, downward-directed central spines often reach a length of 30 cm and are used by the local women as knitting needles. On the coastal rocks south of the township of Taltal, I discovered another Copiapoa species which set in crevices and had a long tap-root. It reached only about first-size, did not clump, had strongly curved brown spines and exhibited only a weak white-grey covering. I decided that this plant was Copiapoa taltalensis.

I next broke my flight at Copiapoa, the town after which the Copiapoas are named. Here, according to the details given in the literature, C. cinerascens and megarhiza grow. In my extensive wanderings through the mountain rocks in the near vicinity of the town I encountered exclusively a markedly varying species, which, however, is patently not identical with C. cinerascens. I later learned, in fact that the habitat of this species lies further north from Copiapo. The Copaipoas here were accompanied solely by a very pretty little Tephrocactus with yellow spines, thick yellow areoles and dark red flowers. Will I live to see those beautiful flowers on the collected pieces?

As the plane came in to land at Vallenar on the way to La Serena, I saw indistinctly on the desert floor, groups of a many headed spherical cactus plant. Scarcely had I heard on landing that we would have a 15 minute stop than I was already storming across the sandy runway towards the distant cactus clump. I was astonished to find yet again a Copiapoa species which consisted of many heads of about first-size, with stronger spination, but with only a weak grey coating on the epidermis. The plant reminded me immediately of that known to me as C. fiedleriana. I was so deeply immersed in seed harvesting and cutting off suitable heads that I completely forgot the time and finally noticed only as a result of the airfield siren and the violently gesticulating people, that my aircraft wished to take off. I do not know what the airfield personnel and aircrew thought when they saw the "gringo" who had delayed the flight, toddle in with a bag full of cacti from the sandy wastes!

From La Serena I was due to continue my journey by express coach to Santiago. There remained to me only a few hours before its departure. Where now do I quickly find C. coquimbana I thought feverishly, and scanned the cultivated land around the town. Then following a sudden inspiration, I joined an autobus to the 15 Km distant Coquimbo. But right and left as far as the eye could see I found only cultivated land, until the town of Coquimbo came in sight. There I discovered at one point, between the fields and fruit groves, a small rocky knoll on which some Eulychinas stood. I bade the driver halt immediately, got out, and marched down the lane to the small hill. I was in luck! Close to thick Opuntia and Eulychnia hedges I came upon many, over one-hundred headed groups of C. coquimbana almost 1 meter high. Immediately I recognised the great resemblance to the plants found on the airfield at Vallenar. Here, near Coquimbo, the heads were merely larger and the spination somewhat weaker.

Santiago de Chile was a large town after my own tastes; modern, lively, with a pronounced European atmosphere, in a healthy, temperate situation, directly at the foot of the Andean chain and its perpetual snows.

COPIAPOA CINEREA (Phil) Br. & R. By Curt Backebrg Translated by E.W. Bentley from "Die Cactaceae" Vol. VI Copiapoa cinerea v. columna-alba (Ritt) Backbg comb. nov. Synonym: Copiapoa columna-alba Ritter "Cactus" (Paris) 14.65:1959

Ritter's habitat picture of a large stand of C. columna-alba Ritt. resembles quite remarkably Hutchison's Fig. 48 in the U.S. C. & S. XXV.3:1953, of C. cinerea from the locality between Taltal and Breas. The latter picture shows both solitary and offsetting plants. Ritter's statements about offsetting or not offsetting are contradictory – C. cinerea (Phil) Br. & R. being distinguished as. "single, rarely offsetting" (Cactus 14.63:1959), later as "offsetting, rather short" (Cactus 14.65:1959), and specifically, up to 75 cm high. This contradicts the older literature. I refer to Britton & Rose with their Fig. 98 (The Cactaceae III) from Schumann's Fig 15 (Gesamtbeschreibung der Kakteen, Nachtrag 1903) who declare that these plants agree with the herbarium material of "Echinocactus cinereus" of Phillipi which they studied. Schumann adds, moreover, "in its native place, reaches 1.10 m in height".

Hutchison's illustrations also show partly sunken areoles (see under C. dealbata Ritt), the spination resembling less that of a C. cinerea of my Fig 1825 (Die Cactaceae Vol III) than Ritter's C. columna-alba. With Fig 54 (U.S.C. & S.J. XXV.3:1953) Hutchison reproduces a sturdy clump of equal-sized heads of the spiny form which, together with his general description of this species-complex, allows one to equally appreciate with what care this difficult group has been studied, and also that Ritter's division into species is not tenable. Nothing in this is altered by the comparative tabulation in "Cactus".

Shortly before Ritter's diagnoses were published, my Vol III (Die Cactaceae) appeared; in it I had to take a position on the plants known to me. Since I had not seen the above descriptions in the French Journal, I held that it was not possible to split off Copiapoa dealbata Ritt., in view of Hutchison's Fig. 54 quoted above. I had, however, seen chalky-white plants with yellow spines and this did not agree with the original description (by Philippi). In his description, Ritter said for the first time that black spines also occurred. Because of this I proposed the name C. cinerea var. flavescens nom. prop. as a diverging variety in my Vol. III p. 1901, by means of which the main type variations at least could be distinguished, at least amongst the chalky-white plants.

The latin diagnosis of C. cinerea by Philippi reads: "E. ominino cinereus diametri 4-pollicaris; costis numerosis; verrucis vix 2 lin. inter se distantibus, diametri 2½ lin., vetustioribus immersis, planis; aculeis 5-6 nigris, teretibus, supremis duobus parvis, ca. 6-8 lin. longis, centrali 9-10 lin. longo; apice lana alba densissima, 9 lin. longa tecto flores plures vix e lana emergentes, 9 lin. longos, flavos emittente. In litorali a valle Taltal a 25° 15' lat m. frequens, inter majores recensendus, valde ramosus, massas interdum diametri 1½ ped. formans."

A type plant was not designated amongst the herbarium material; Rose chose the form that Schumann figured (from material collected by Soehrens). I also saw that form near Taltal and northwards in the direction of Paposo and reproduced it in my Vol III p. 1901, Fig. 1825. Hutchison now says that the lectotype selected by Rose from the herbarium material which was in some disorder at that time, was not a typical one for C. cinerea at the type locality. Hutchison has correctly recognised that plants growing at higher levels are spinier and that where considerable dryness obtains, they are then more low-growing. I cannot agree with him however when he asserts that "the population on the coast in general have more brownish and yellowish than black or grey spines".





succulenta 38.11:59

BACKEBERG

Wunderwelt Kakteen



U.S. C&S J. XXV. 3.1953





SEED





FRUIT

COPIAPOA CINEREA

Excluding the dull olive-greenish C. haseltoniana with brownish crowns, yellowish-brown spines, and lateral offsets (and also possible natural hybrids), in addition there still remains on the coast an abundant distribution of black-spined plants and clearly also some with smaller and finer spination as illustrated by the examples collected there by Soehrens and myself. That is to say: even if particular forms have been designated — like C. columna-alba by Ritter — Philippi has not encompassed the full range of variation in his description and it is therefore tiresome to argue whether a particular form collected by Philippi or the one chosen by Rose as the lectotype, should be given priority. In any case, Rose has supplemented Philippi's description and there is therefore no reason to change it. On the other hand, now that the Rose lectotype has been chosen, one could highlight as varieties the markedly differing forms e.g. with pure yellowish spination (about which Philippi says nothing) likewise those plants exhibiting conspicuous clumping.

Although in C. dealbata Ritt. the crown wool is as grey as in C. cinerea, no less in the few-spined coastal forms, (brownish however in C. haseltoniana which is never black-spined), it is orange coloured in C. columna-alba Ritt., according to Ritter. This by itself, however, is not a decisive character since seedling plants have white wool.

I have seen seedlings that were already whitish-coated when young and had black spines (Vol III, plate 144, above left, Die Cactaceae). The seedling plants of my fig. 1829 differ from these insofar as they were brown with white spines. If some possible arrangement should or could be undertaken at least it should take account of the principal characteristics which in my opinion should be firstly according to the body colour and secondly on the basis of important divergence of spine colour from the original description. Therefore I proposed the name C. albispina nom. prop. for the brown, white-spined plants. Ritter called these plants C. cinerea v. albispina Ritt. According to my contention he thereby rejected the most important differentiating characteristic. (I leave the name in accordance with Ritter's designation since I do not have at my disposal the necessary living material in the form of larger plants required to reach a definitive judgement).

I include C. dealbata Ritt. below as a variety of C. cinerea because the plants are also chalky-white, but markedly clump-forming. In this connection certainly, Hutchison's figs. 51 and 54 would not be irrelevant. For this reason one cannot then regard Ritter's description of C. dealbata Ritt. in "Cactus" 14.63:1959 as sufficient by itself. If one now compares Hutchison's stock pictures fig. 48 and fig. 49 with the majority of single growing plants, it then seems prudent to at least classify the clump-building form as a variety. To me, the separation of a species (e.g. C. haseltoniana Bckbg.) seems possible only on the basis of quite differing body and spine colour, as well as the manner of offsetting (for example, laterally: as in C. haseltoniana). On the other hand it also seems a necessary separation if one wishes in some measure to obtain a clear view of the whole species complex. The crown colour is less decisive.

It so happens that Hutchison as well as Ritter did not figure plants with single and thinner black spines. This permits only the conclusion that they did not collect further north from Taltal, as did Soehrens and myself. The distribution data must therefore read: from Paposos through to Taltal to Breas; to some extent also inland.

Consideration of everything that has been said then establishes that Rose (with his quite brief description, but a good one as far as the data went on the more or less readily offsetting, partly black spined species) has given an adequate diagnosis of the species. Also it is my opinion that there is no case for opposing the lectotype chosen by him, because – from the aspect of the full data on the spine coating – this gives just as incomplete a picture as any other. In any case only one can be finally selected. It would be otherwise if the species were to be further sub-divided.

I hope however, that the above discussion adequately establishes why I have included with the above and following varieties the corresponding particular species of Ritter.

Copiapoa cinerea v. dealbata (Ritt) Backbg comb. nov.

Synonym: Copiapoa dealbata Ritt. "Cactus" (Paris) 14.63:1959

Ritter states that he found the plants only relatively far to the south. Yet it so happens that this clumping form with usually only one spine, resembles in this the northern form of my Fig. 1825 (likewise emanating from the coastal area) only that the former is clump-forming. Such clumping has however been established by Hutchison for the stronger and more numerously-spined plants, as well as a bigger range of variation, including many-headed plants. The foregoing variety then only comprehends a part of the more robust clump-building plants, is not whiter than those collected by me north of Taltal, and so is equally only a part-description, as is that of Philippi, for the species.

At A.M. Wouters I saw plants grown from FR 509 seeds (C. dealbata Ritt.) with very pale brownish-white crown wool, very long spines and almost completely green body. Either we have here a mix-up in the seeds or seedling forms differing here markedly. These plants in any case do not resemble overall my coloured picture in Plate 144 (Vol III Die Cactaceae) below, right.

Copiapoa cinerea v. albispina Ritt. nom. nud. (FR 207 a) is a brownish plant with white spines (my Fig. 1839, middle and bottom, Vol III). In my opinion this is a more markedly diverging plant, for which I therefore proposed in 1959 the name C. albispina. Since these plants have not yet been described I leave it for the present under Ritter's catalogue designation. Presumably the plant in my Fig. 3462 is a natural hybrid between C. cinerea and C. haseltoniana Backbg.

Comments

..... from E.W. Bentley

I have seen a slide from H. Middleditch which was taken in the collection of Locuty at Thun, Switzerland, of a plant grown from seed of FR 207a Copiapoa cinerea v. albispine from Winter. This also has an almost completely green body, very long outstanding central spines, well separated areoles and plenty of wool in the crown. I cannot imagine that this has any connection with Copiapoa cinerea.

.... from H. Middleditch

There is an article (published in Chile) by Reiche which clearly indicates that the persistence and thickness of the mist on the coast of Chile is greater between Taltal and Parposos than it is further south. This mist will condense as dew during the night; it will condense not only on the ground but also on parts of a plant and it would seem to be quite probable that it will condense on the spines of any cacti, since the spines can be expected to cool down fairly sharply overnight. Now the Copiapoa cinerea which grow between Paposo and Taltal would appear to possess very few spines, just one or two short spines in each areole. The plant shown on the front cover seems to me to be a little spinier than those in the accompanying photographs. In the autumn of 1976 Knize offered in his latest catalogue a "Copiapoa cinerea v. uhligiana" from near Chanaral, which is further south than any previous recorded finding, so I sent for a specimen. It quite definitely has more spines than those plants would appear to possess which grow in the more mistrich area to the north.

On the other hand I can quite imagine that local changes in the depth of rock cover on the ground, the orientation of a slope or quebrada which in turn affects exposure to the sun, together with the distance from the sea, would combine to bring about a local microclimate different from that typical of the valley floor. This could well lead to patches of ground supporting plants which differed in some aspect or other of their appearance from the general run of Copiapoa cinerea. Is this the origin of C. haseltoniana, gigantea, cinerea albispina, columna alba, and so on? If these plants are grown from seed in a European greenhouse climate it is perhaps not too surprising that they present an appearance differing from that produced by the local habitat climate.

.... from G.J. Swales

It is interesting to compare the original latin diagnosis for Copiapoa cinera by Phillipi, with that quoted by Backeberg. It is remarkable that there is a mistake in the quoted version. Whereas Phillipi states, for spines, "aculeis 5-6, nigris, teretibus, supremis duobus parvis, circa 2 lin. longis, inferioribus ca. 6-8 lin. longis, centrali 9-10 longo", Backeberg omits the words "circa 2 lin. longis, inferioribus". In addition, Backeberg quotes Hutchison as saying that "the populations on the coast in general have more brownish and yellowish than black or grey spines" whereas the words Hutchison actually used were "shoreline populations of C. cinerea have generally spines which are brownish or yellowish rather than black or grey as is typical of the inland population".

Backeberg goes on to consider the degree of variation in spination and degree of offsetting and then suggests that "one could highlight as varieties the markedly differing forms, e.g. with pur yellowish spination (about which Phillipi says nothing), likewise those plants exhibiting conspicuous clumping"; I do not understand this particular observation.

.... from H. Middleditch

It would appear that Backeberg does not have much regard for Hutchison's careful assessment of the difference between the specimen with five or six radial spines which was chosen by Phillipi as the Type, and the specimen with only one or two spines which was taken by Rose as the Type. He appears to accept that this degree of variation does fall within the compass of "Copiapoa cinerea"; his following observation (which puzzles Geoff Swales) seems to be suggesting that both those plants which clump conspicuously and also the plants which bear only yellow spines, can be given another designation, possibly as varieties of C. cinerea. For quite some time I have regarded only those Copiapoa seedlings which had one or two black spines as C. cinerea, and I had wondered whether those with purplish-tinged bodies, and others with rather different spination, were the result of some dabbling with a paintbrush in a nursery or collection somewhere. However, it would now appear to be quite likely that they could well be just the juvenile form of the degree of variation found in plants in the wild.

COPIAPOA CINEREA (Phil) Br. & R. By Karel Knize Translated by P. Collins from Kaktusy '69 No.3.

Echinocactus cinereus, described more than 100 years ago, is undoubtedly one of the most beautiful (and I would also say well-known) Chilean cacti. The author of the description, R.A. Philippi, was numbered among the greatest experts on the Chilean flora in the past century. In his study of unusually interesting plants in his native country, he dedicated himself to a considerable extent to cacti, and so his name is associated with many species.

In the year 1860 he described several cacti, among them Echinocactus cinereus. The author's "broad" statements about the habitat of this species must today be regarded as unconvincing, especially at that point in the

description where mention is made of a continuous, cactus-covered area between the township of Taltal and the settlement of El Cobre. All authors (including Hutchison and Backeberg) later took over these original statements, although it is immensely difficult even to get across the coastal desert to the north, not to speak of a more detailed investigation; it is not a question of a few kilometres, but a full hundred in very challenging, parched terrain.

The coast in this rugged landscape is broken up by rocks, so that there is almost no continuous, sandy beach. The many cliffs, as it were, often drop straight into the sea. The landscape opens out in a wide bay, and among the hills, reaching up to 300 m high, lies the township of Taltal. The only water-course here is the Quebrada de Taltal, a small brooklet, often drying up, in the neighbourhood of which, along the lower part of the stream, are the most important and most abundant stands of Copiapoa cinerea. This area was presumably not always so dry, a fact to which numerous dried-up river beds testify, just where these very fine specimens grow. I have seen a thousand acres of the whitish columns of these magnificent plants, a metre tall in places. In the next part of the Quebrada de Taltal – at a distance of about 5 Km from the Town – almost uniformly black-spined plants grow for a space of about 3 Km. Copiapoa cinerea also occurs plentifully on the neighbouring hills, where however, I observed them to be different in the colouring of their spines, especially on the crown. Among experts, the plants which have black spines on the crown are considered as the Type.

On my own expeditions I have found solitary plants of this species, as well as crested plants and those which grow in groups; a widely-branched cluster is not exceptional. Hutchison in his own work mentions various forms and he designated several distinct groups, which, all things considered, form a logical species complex. There remains only the question of designating those variations which remain constant from generation to generation. I also found pure white forms which correspond to the Ritter novelty, Copiapoa cinerea var. albispina (FR 207, FR 207a); nearly all the specimens had white spines, only a few were coloured yellowish or brown. The wool in the crown was whitish or greyish. I do not regard this form as stable, because white spines occur — though rarely — in a lot of other places. It is very interesting also to compare the number of the spines, which are difficult to differentiate into centrals and radials. Most common are the forms with 6 spines, the rarest are those with one; the spines are generally stout, glossy, slightly curved, up to 3 cm long. The epidermis of mature plants is chalky white; in small seedlings up to 6 to 8 cm in diameter it is brownish to reddishviolet.

There are also considerable differences in the flowers, and in the form and number of the straw-coloured petals. The 1.2 to 1.7 cm long fruits have a cylindrical form and are as a rule hidden in the wool of the crown. The fruit at maturity splits at the top and gapes open, so that the seeds may slip out easily; unripe seeds are often destroyed by ants, which will consume up to 90% of the crop.

The vicinity of Taltal, then, is the principal discovery-place of Copiapoa cinerea, the last specimens of which I found at a distance of about 8 Km from the town (in a southerly direction) near the sea, while in a northerly direction they occurred up to 5 Km from the town and even then only scantily; further to the north (18 to 20 Km from Taltal) I found yet another species, known as C. haseltoniana. I believe that only a more detailed phytogeographical investigation will define the real extent of the habitat.of Copiapoa cinerea.

Comments

..... from H. Middleditch

From other published literature it would appear that the length of coast between Taltal and Paposo is blessed with a slightly heavier, frequent, and more reliable blanket of mist than any other part of this arid coast to the north or south of this section. By comparison with the general nature of the vegetation in the adjacent areas, that between Taltal and Paposos probably struck Philippi by its comparative richness. It does occur to me, therefore, that Philippi may be using some author's licence when he describes this area as "continuous cactus-covered", whereas it was the relative richness of the flora which he was trying to emphasize. To date I have been unable to gain sight of Philippi's book describing his trip through the Atacama desert, which might provide some indication of the context in which this statement was made.

It does come as something of a surprise to find from Knize that the single-spined version of this species is far less common than plants with several spines per areole. We might possibly have been excused for thinking otherwise — the photograph used by Frank to illustrate his account of his visit to Chile, the plant selected by Backeberg for his "Wunderwelt Kakteen", the photograph used by Knize to accompany the above article, all depict Copiapoa cinerea with a single spine per areole. Prized seedlings of this species in U.K. collections seem to display one spine per areole rather more frequently than other versions. So the diligent field collectors have treated us all to the rarities, have they, rather than to the ecological type? And does our cover sketch more nearly represent a typical Copiapoa cinerea? It is now fairly easy to understand that when Phillipi chose a specimen with five or six radial spines as the Type for Echinocactus cinerea, he was selecting the variation which was most numerous at the habitat site.

ABSTRACTS from "DESERT TRAILS of ATACAMA" By Isaiah Bowman. 1924

To the traveler on the desert coast of Chile and Peru it is a source of constant surprise that the sky is so often overcast and the ports hidden by fog, while on every hand there are clear evidences of extreme aridity. The big desert tracts lie east of the coast range and there, except for slight summer cloudiness, cloudless skies are the rule. The littoral is in many parts only a narrow fringe quite unlike the real desert beyond. The fog bank overhanging it forms over the Humboldt current and the upwelling cold water between the current and the shore, drifts landward with the onshore wind, and gathers on the seaward slopes of the coastal hills as the inflowing air ascends them in its journey eastwards. Sometimes it lies as fog on the surface; more frequently it is cloud that hangs some distance above. On many parts of the coast its characteristic position is from 2000 to 4000 ft above sea level. In Peru the coastal fog is known as Garua, in Chile as Camanchaca.

There is much variation from place to place in the position and habits of the fog. It is characteristic of Antofagasta during the winter season; by contrast it is largely absent at Iquique. On the coast at Caldera, the principal port of the valley of Copiapo, the fog hangs over the hills and bay a good part of the time. Paposo has a little pasture supported chiefly by the coast fog. Where the hills of the coastal range are high or there is a convergence of slopes toward a central point, the fog may thicken to an actual drizzle and determine the location of a settlement. The fog bank is thickest from June to September, and in that period the sun may be hidden for weeks at a time except for occasional glimpses through the fog or at sunset when it peeps from beneath the cloud cover before disappearing below the horizon. There may be said to be a cloudless season in the southern summer from November to April.

The fog sweeps up the valley in the small draws of the coast range that slope directly down to the Pacific. Further inland where the valley is more or less enclosed by the surrounding hills, the fog settles down from aloft as night comes on and in the morning the whole valley may be filled with it. It is indeed a strange experience to be in the midst of desert country and yet awake in the morning to find the air filled with a clammy, cold, fog. It does not long survive the morning sun, and after a few hours of daylight the edge of it may be seen retreating up the slopes to the crests of the coastal hills. Riding northward through the coastal desert towards the Huasco valley, Darwin in 1835 observed the belt of fog from elevated points along the trail and wrote: "During the winter months, both in northern Chile and Peru, a uniform bank of clouds hangs, at no great height, over the Pacific. From the mountains we had a very striking view of this white and brilliant aerial-field, which sent arms up the valleys, leaving islands and promontories as the sea does in Tierra del Fuego".

Among the native inhabitants the Changos are the only ones that seem to have had a regular dependence upon the resources of the coast in the belt of mist on the coast of Chile. They are a tribe of Indians, primitive fisher folk of the desert coast; the Spanish writer Lozano Machca stated in 1581 that there were 400 Indian fisherfolk in the Bay of Atacama (Cobija). They depended largely upon the sea for their living. They were necessarily nomadic, with canoes of sealskin. One of their chief settlements was Paposo, situated where the configuration of the coast appears to lead to an unusual amount of fog and likewise of vegetation. Philippi himself found the seaward slopes about Paposo at elevations of 500-1800 feet enriched with vegetation during nine months of the year.

Comments

..... from H. Middleditch

I find an apparent inconsistency in Bowman's observations that "from June to September the sun may be hidden for weeks at a time" by the fog, when considered with the fog does not long survive the morning sun and after a few hours it may be seen retreating up the hills". On the other hand, the long established record of settlement at Paposo and the relative richness of the vegetation at that particular point on the coast is in conformity with the similar observations made by Reiche, elsewhere.

NOTOCACTUS WERDERMANNIANUS Herter sp. nov. By W.G. Herter

Translated by G.J. Swales (Latin) and E.W. Bentley (German) from Revista Sudamerica de Botanica Vol VII No. 2/4 1942

Cormus luteo-viridis, elongatus, 13 cm altus, supra 10 cm, infra 7 cm diametiens. Costae c. 40, rectae, supra divisae. Aculei marginales c. 16, haud pungentes, albidi, 5 mm longi, centralium c. 4 inferior maximus, c. 15 mm longus, recte patens, sed vix pungens, toti primum lutei, postea canescentes. Flores 6 cm alti, sulphurei. Stigmata purpurea. Uruguay: Tacuarembo.

Body yellowish-green, elongated, 13 cm in height, 10 cm in diameter above, 7 cm in diameter below. Ribs about 40, straight, divided above. Radial spines about 16, by no means capable of piercing, whitish, 5 mm in length. Central spines about 4, the largest towards the base, about 15mm long, straight, spreading, but barely piercing, all (the centrals – G.J.S.) yellow at first, later becoming grey. Flowers 6 cm in height, sulphur yellow. Stigma lobes purple. Uruguay: Tacuarembo, on red sandstone; collector Walther.

Related to N. leninghausii (K. schum.) Berger ex Hill and N, elachisanthus (Web) Hert. Belongs to the scopa group but through the drawn-out chin forms a transition to the mammulosus group. The body is an inverted pear shape; rounded at the top and narrowing towards the ground; the body colour is yellow-green (somewhat darker than Saccardo 33). The ribs are straight but frequently divide upwards, they are low and are sinuously grooved. The areoles which sit in the indents below which are chin-like projecting humps, are uniformly elongated, 1 — 1.5 mm in size, 5 mm away from each other, wool-felted when young, later becoming bare. The crown is deeply sunken, without spines in the centre, covered with quite short white wool-felt. The yellowish-white radials are mostly set sideways, of the centrals the lowest is stronger than the radials and projects straight out. The flowers are set above the areoles, near the crown, are shortly funneliform and approaching 6 cm tall; fully open they measure over 7 cm. The outer perianth leaves are a silky-lustre light yellow (about Saccardo 25), with a greenish glint, particularly at the bud stage, lanceolate, acute-tipped, some dentate at the apex, the outers with a weak, greenish middle stripe, which in the very outermost perianth segments runs out as a very light reddish little tip. The longest stamens reach half-way up the perianth. The filaments are light yellow like the strong style; the anthers are yellow (Saccardo 23) and the 11-rayed stigma, overtopping the anthers, is light purple. The scales of the receptacle are green, with yellow bristles and white wool.

Comments

.... from G.J. Charles

I have compared my plant with the description given by Herter as well as with a slide which I have of a collected plant in flower at Clive Innes' collection. My own plant is still small and so dimensions do not match Herter's description, and rib count increases with age as well. The origin of my plant is a graft from Uebelmann in 1973. At that time imports were

scarce and expensive.	Herter	Ex Uebelmann	Innes
Body	Yellowish green	Yes	Yes
size	10 cm max. diam.	6 cm	About 10 cm
Rib count	ca. 40	29	ca. 40
Rib humps	Chin like	Yes	Yes
Radial spines	About 16, soft	Yes, but difficult to distinguish from centrals	Yes
Radial spine length	5 cm	5 cm	Not known
Central spines	About 4	Usually less than 4	Not known
Central spine length	About 15 cm	Up to 15 cm	Not known
Central spines	Yellow	Yellow	Yellow
Flower diameter	7 cm	7 cm	7 cm
Stigma lobes	11	11	Not known
Stigma	Purple	pinky red	pinky red

This looks like a reasonably good match to me, no serious inconsistencies. The flower grows in size after initial opening of course and reaches 7 cm eventually. The "perianth leaves" very clearly exhibit the "greenish middle stripe" which certainly does resemble a "reddish tip on the outer perianth segments" — this shows at the tip of the bud just before the flower opens. I cannot tell if the perianth leaves are a "light yellow with a greenish glint" in the bud stage since the bud is entirely covered with a thick layer of light brown wool and brown bristles, noticeably more brown than the spines on the body. What are the references to "Saccardo 33, 25," etc.? Is it a standard colour scheme? My plant clearly shows the naked sunken (depressed) centre which is not so well defined or as extensive as in a typical Notocactus concinnus. The white wool felt is present and the strongest central is indeed the lowest and the majority of radials are set sideways. The stigma does overtop the anthers both in a newly opened flower and in a fading flower.

The stamens are spread round the flower cup rather more like N. scopa than the typical "bunch" of mammulosus-like stamens round the style. I must section a flower next season and try to distinguish the two sets of stamens which scopa is supposed to have, but which I have not yet personally seen. This species seems to be much more readily available now on the continent although the purity of the plants offered may sometimes perhaps be open to question.

In the N.C.S.S. Journal for December 1968, Buining writes about his trip to Uruguay and says he found Notocactus werdermannianus off the road from Tacuarembo to Paysandu i.e. travelling west from Tacuarembo. Buining also says that van Osten gave the growing place of this species as "Cerro Porton". Does this information appear in van Osten's original publication of this species?

.... from G.J. Swales

I do have a copy of the original description of this species by van Osten and he does indeed refer to the location of this species as Cerro Porton.

.... from H. Middleditch

From my 1:1,000,000 map of north-west Uruguay I have no difficulty in picking out the main road from Tacuarembo running towards the west in the direction of Paysandu; first it passes over the principal hill range in those parts,

the Cuchilla Haedo. From the Cuchilla Haedo parallel spurs run out towards the River Uruguay and the road to Salto forks off from the Paysandu road in one of these spurs, the Cuchilla del Arbolito. About half way from Tacuarembo to Paysandu there are one or two Cerros marked on the map and to the north side of the road is Cerro Porton. The statements by Buining and by Osten regarding the habitat location of Notocactus werdermannianus would thus appear to coincide.

.... from K. Halstead

I am glad you have asked my opinion on N. werdermannianus as I must be very scathing about the description by Herter. The first paragraph and the location are acceptable but the last paragraph contains three unacceptable contradictions. Related to N. leninghausii and N. elachisanthus!!!! Bless my soul, N. leninghausii and N. elachisanthus are not even related to each other let alone to N. werdermannianus. Noto. leninghausii is Eriocactus and elachisanthus is Brasilicactus, probably the original N. graessneri v. albisetus. Brasilicactus is not even proven to be Notocactus in the true sense.. And belongs to the Scopae group!! I understand that N. werdermannianus is closer to the Mammulosi group which is some way from the Scopae group. Nor would I agree that the body is inverted pear shape except perhaps on a graft.

I have two specimens. The first came from a nurseryman in Belgium in 1973 on a graft and has grown rather slowly. I degrafted it earlier this year but it has not re-rooted. Offsets are forming on the portion of the section left on the grafting stock. This plant does not quite fit the description of the true N. werdermannianus as it has wool in the crown, somewhat longer spines and less ribs. It is only 3.5 cm in diameter and therefore could be an immature specimen or even N. van vlietii which is very close to if not synonymous with N. werdermannianus. My second plant was obtained from Hollygate nursery this year and is 7 cm diameter, has 34 ribs and in most respects fits the official description.

A number of plants offered for sale under this name by continental nurserymen about seven or eight years ago were not true Noto, werdermannianus but closer to N. floricomus. I obtained two such specimens. It is only in the last six years that the true species has returned to our collections although it has been known since 1942.

I was really amazed how N. werdermannianus could be related to N. leninghausii (an Eriocactus), to N. elachisanthus (a Brasilicactus), belong to the scopa group of plants and at the same time form a transition between the scopa and the mammulosus group of plants. What a freak this plant must be. On the other hand the word related might mean related geographically since they all grow in Uruguay and southern Brazil, but I think the text does mean related botanically. I would agree that N. werdermannianus fits in quite well in the scopa group with N. scopa and N. succineus. But I cannot agree that it forms a transition between the scopa and mammulosus group of plants. To start with its spines are quite thin and soft, whilst N. succineus has much stronger spines. I would say however that because of the tuberculated ribs it is forming a transition between the scopa group and the tabularis group. Although the tabularis group is then related to the mammulosus group, I do not believe that N. Werdermannianus is directly related to the Mammulosus group of plants.

.... from H. Middleditch

And how are these groups related to each other – by body morphology; by floral characters; by seeds; by geographical location? or by a combination of these features?

.... from R. Mottram

The original description gives little information about the variability of this species, and one might almost suspect that it is based on a single specimen only! Comparison with plants here does suggest that quite a degree of variability exists in this species, and I might add that yet another example was brought here last year which had almost totally white spines! (This was claimed to be from NCSS seed). We have two plants at Whitestones grown from New Mexico Cactus Research seed, which was sown in 1972, the first year of flowering being 1976. Comparing these two examples with the original description:

	Herter	Two plants here
Body	Yellowish-green, Elongated, 13 cm high, 10 cm diam.	Bright green, Globular, 8-9 cm high, 10 cm diam.
Ribs	About 40, divide upwards.	29 and 34, none divided yet
	Straight.	Slightly spiralled, one clockwise and one anticlockwise.
Tubercles	1 — 1.5 mm in size.	1.5 to 2 mm in diameter, or up to 3 mm diameter in flowering areoles.
Radial spines	About 16, not stiff, whitish, up to 5 mm long.	Bristle like, pale yellowish, tipped brownish when young, up to 9 mm long, uppermost very short and weak

Central Spines

About 4, 15 mm long, barely piercing, all yellow Usually four, arranged in a cross, up to 17 mm long, or up to 20 mm on flowering areoles, stronger than the radials but still bristle-like, occasionally with bent or hooked tips, pale yellowish, at first tipped brownish, like the radials.

Areoles

5 mm apart, 1-1.5 mm across.

Set 6-8 mm apart, 1.5 to 2 mm in diameter, or up to 3 mm in flowering areoles.

I also have some fruit and seed which enables me to amplify the original description:— fruit ca. 8 mm long without the dried perianth (about 25 mm with perianth), carrying the white wool and red-brown bristles (up to 1 cm long) of the ovary, thin-walled indehiscent. Seeds filling the dry chamber, loosely packed, the average contents of 4 sample fruits being 47 (26 to 97) seeds. Seeds black with prominent whitish arillate basal hilum, ca. 1 mm long, strongly tuberculate. The fruits on these two N. werdermannianus were not as strongly attached to the plant as on many other Notocacti, and they come away intact. However, in many other respects there is little difference from N. sucineus. Notocactus sucineus is given as from Sao Gabriel, Rio de Sul (presumably Rio Grande do Sul) in Brazil, which I cannot see on my standard atlas.

Considering other species which might be considered to have some affinity with N. werdermannianus, I have some plants named as N. vanvlietii var. gracilis but these are almost certainly impostors; it does seem possible that some seedlings of N. vanvlietii which arrived from Israel not long ago might prove to be the right thing. It is very annoying to have to rely on material or horticultural origin all the time. Can we not persuade Dr. Moyna to do some collecting, if we provide information on locality? I'd be very interested to get specimens — or even just seed — of any species population he comes across. With conservation laws becoming steadily more and more impossible, I fear that by the time one of us gets a chance to get out there it will be too late!

With regard to the plant's systematics, I can't argue with the observation that it belongs to the scopa group. The enlargement of the flowering areoles indicates this, as does the fruit and seed. However, I can't understand the reference to N. leninghausii, whose relationship seems remote. I notice that Tony Mace refers the species to the Mammulosi group, which is just possible, but I think it is much more at home in the Scopae group alongside sucineus. As we don't know the full range of variability or geographic distribution of N. werdermannianus, I think it is necessary to consider the position of all the sections relative to each other in order to conclude whether there is a link to another section. I am certainly very reluctant to consider bristly spines, or tubercles, as significant indicators of relationships, since they seem to occur randomely in almost every genus of the cactus family!

I don't know of any other species of Notocactus which might help to complete the equation in the area of the habitat of N. werdermannianus, except possibly the N. herteri/allosiphon group of Rivera, which N. werdermannianus resembles superficially. How about N. pseudoherteri from Cochilla Negra – "an der ostlichen abhangen der Cochilla Negra in 150-200 m hohe" – Kakteenlexikon, 1976 edition?

.... from A.W. Mace

My Notocactus werdermannianus has indeed flowered and the flowers seem to fit well with Herter's original illustration that you sent to me. Certainly the flower is similar to N. scopa — the flowering areoles are enlarged and have stronger central spines as is frequent with most of the Mammulos and scopa group plants. As to the comment about my placing of werdermannianus in the Mammulos group, I was perhaps strongly influenced by the pronounced humps between the areoles. The plant has certainly some similarity with the scopa group and may well fall somewhere between the two. It certainly has no links with the Brasilicactus or Eriocactus group; this confusion was obviously originated at a time when much less was known about the Notocacti than now. But this species has caused us much trouble over the past years, for so many of the specimens originally produced about ten years or so ago were impostors and have confused the situation. I think that the plants we have now are correct as they seem to fit quite well with the original description. further from G.J. Charles

The article by Buining led me to believe that N. werdermaniannus should be found on Route 26, west of Tacuarembo. But if van Vliet could see this hill when he was only some 500 m away from it and also only 23 Km from Curtina, then the locality must be much further south.

.... and from H. Middleditch

The Cerro Porton which I have located near Route 26 would indeed seem to match Buining's location, but van Vliet only said that when he was 23 Km from Curtins, he was shown a hill where N. werdermannianus was supposed to be growing; he does not say that it actually grew there. I make the Cerro Porton about 70 Km from Curtina and so I would query the suggestion of the local farmer that this species was also found nearer to Curtina.

.... further from G.J. Charles

But surely van Vliet would ask the local farmer for the location of Cerro Porton, not for the location of N. werdermannianus. Is there more than one Cerro Porton?

.... response from H. Middleditch

With the information provided by Schlosser's article, a search of the 1:1,000,000 map of Uruguay has revealed a further Cerro Porton in the location which matches that quoted by van Vliet.

.... from J.R. Gooch

Notocactus werdermannianus flowered freely this year for the first time. I have three plants, the largest being only about 7 cms in diameter. All are ex Uhlig. None of them have the 40 ribs that Backeberg quotes as possible but then they are a long way from maturity. Mine have 20, 24 and 28 ribs respectively, these being straight and narrow with small humps between areoles. A distinctive feature is the rather pale green colour of the plant bodies. Spines start life a brownish yellow ageing to a pale golden yellow, radials are barely ½ cm long while the central is 1 cm long.

The flower buds are covered with light brown wool and darker bristles, eventually enlarging to reveal a greenish tinged bud. Flowers opened from late morning to mid afternoon, lasting 4 days. Colour pale yellow, 5 cm long and the same in diameter, remaining broadly funnel shaped, the petals never reflexing back. The flower structure seems to tie in with the mammulosus type rather than the scopa form which I had half expected. The stigma lobes on my plants were light purple, never opening out, the 8 lobes remaining bunched together. Golden stamens grouped round the style on the first day of opening and subsequently opening out to fill the flower base.

I seem to think that I have seen N. werdermannianus with flowers having a yellow stigma; this might have been in the Holly Gate collection; however, the more Notocacti I acquire the more I find that stigma colours can vary considerably amongst different forms of any species.

.... further from R. Mottram

Now I have been able to make some observations on this flowers of this species I can add the following details: Flowers up to 5 cm long and 4 cm diam., campanulate. Inner petals clear pale translucent yellow, ca. 3 cm long by 4 to 5 mm broad. Outer segments with dorsal pale red-brown midstripe. Tube bearing fleshy, elongated podaria, ca. 5-8mm long, extending into a short (ca. 1-2 mm) acuminate scale, bearing 3-6 red-brown bristles, 5-15 mm long, and a tuft of short white to pale brown wool (the uppermost areoles have the longest bristles which are also paler at the base). Ovary dark green, ca. 6 mm long and broad, bearing tiny 1-2 mm scales and the wool and bristles of the tube, but no podaria. Nextar chamber extremely small, less than 1 mm long. Filaments inserted in a single series, the lowermost encircling the base of the style, 10-12 mm long, yellow. Anthers bright yellow. Style ca. 2.5 cm long by 2 mm diam., pale yellow like the petals. Stigma lobes 12, magenta-red, ca. 2 mm long, thick and stubby, pubescent.

Comparison of the flower form with the near-related N. succineus reveals the following differences: The flower tube of N. succineus also carries elongated podaria, but they are much less prominent. The bristles are fewer in number and shorter, but the wool is darker in colour and is much more copious, covering the ovary and tube completely. The filaments of N. succineus are much shorter and are strongly incurving towards the style, whereas in N. werdermannianus they are hardly so. The style of N. succineus is dark red, shorter and thinner; the stigma lobes are also much weaker. Notocactus succineus also has a very small nectar chamber – under 1 mm long – but it is slightly more prominent than in N. werdermannianus, I could detect tiny beads of nectar in the former but not in the latter.

All these features tend to suggest that N. werdermannianus stands in a primitive relationship to the existing species of the Scopae group, but sufficiently close to be regarded as a member of it. The longer spines in the flowering areoles are, as far as I am aware, unique to Scopae in the Notocactus, and provide a useful identifier for plants. in this series.

.... from H. Schlosser, Montevideo

Cornelius von Osten wrote about N. werdermannianus, without using that name, in the "Annales del Museo de Historia Natural de Montevideo" entitled "Notas sobre Cactaceaes". He gave the number of his herbarium specimen and added two illustrations. In the foreward he noted "Tacuarembo, Cerro Porton, arenisca, Sao Bento, leg. Dr. Walther. Already cultivated many years." Although these "Notas sobre Cactaceas" were published in 1941, von Osten almost certainly wrote them in 1922. In his article he wrote: "flowers at the end of November 1921. Belongs to the group of scopa, but by its prominent chins is related to the group of mammulosus." A little further on he wrote "May be a new species," and makes comparisons with N. leninghausii and N. elachisanthus. From all this there appears as a logical conclusion:

(i) von Osten did not know the habitat. He made his studies only on one specimen obtained by Dr. Walther. When referring to the number of flowers he says "8 in the specimen examined" and in the whole of the article he always uses the singular and never the plural i.e. "the!" specimen.

(ii) That he wrote "Cerro Porton" instead of the correct name "Cerro del Porton" may be either his faulty memory or that of Dr. Walther who gave him the plant. This kind of error is commonly made by strangers and especially if they obtain information second or third hand. Sometimes they do not understand very well the country people's pronunciation or their expression which is often not quite correct. I can quote you many examples of this. For example, Dirk van Vliet and Walter Rausch were seeking cacti in 1967. They reported that they had been in the

"Cuchilla de los once Cerros". But that was only partly correct. They used to rely on a map issued by one of the petrol companies, which marks the "Cuchilla de los once Cerros" but not the "Sierra Gauna" which lies close by. It is not easy to get correct maps.

If Buining stated that he found N. werdermannianus off the road from Tacuarembo to Paysandu, this could only be route No. 26. I have never seen the plant there, but that is not conclusive. I see that H. Middleditch writes that he has found the name "Cerro Porton" about 65 Km to the west of Tacuarembo. What is the origin of this map? I cannot find any hill with this name anywhere thereabouts. Is it situated near route 26 or 31? Here in Uruguay there are many names of hills repeated in different places. There are at least half a dozen "Cerro Chato" (flat hills). The same thing occurs with "Cerro de la Cruz" (hill of the cross) or "Cerro Palado" (naked hill). But "Cerro del Porton" exists in only one place to my knowledge. This name is derived from a very peculiar rock formation at one side of the Cerro which looks like a very big gate and this is unique.

NOTOCACTUS WERDERMANNIANUS Herter By D.J. van Vliet Translated by W.W. Atkinson from Succulenta 50,5:1971

In Revista Sudamerica de Botanica Vol. VII, 75 Tab II, 1942, Herter publishes two new species from the genus Notocactus. He uses for the purpose details bequeathed by Osten. The first of these two, Notocactus megapotamicus, has not remained unknown in our collections; in a separate article I will return to this species. It has gone quite differently with N. werdermannianus. Although the publications which appeared on this plant lacked nothing in clarity, the plant was completely unknown in our collections. Thus it hardly needs mentioning that the species stood at the top of the list of the plants I was resolved to find when I arrived in Uruguay in 1968.

Nevertheless things went quite other than expected, and although I was able to import the first N. werdermannianus into Europe. I must say with disappointment that I was not able to find the plants in Uruguay. Yet, and this is still more remarkable, I know exactly where they grow and even saw the spot. Which obliges me to give an explanation, and this is the basis of this story.

In Montevideo I made the acquaintance of Mr. Marchesi. During a visit to his collection of habitat collected plants, which we would call "imports", he showed me N. werdermannianus. It was the first time I had seen the plant, and after this first impression I was more than ever resolved to find the growing place. Three months later, my travelling companion Rausch and I arrived by bicycle in the N. werdermannianus area. Because of the quantity of plants that we had already found, the memory of Marchesi's plants was not very clear. This was the cause of our identifying some (to me) unknown plants with N. werdermannianus. A mistake which, however, I did not subsequently regret.

Using the map of Uruguay at my disposal I wanted to approach the growing place by a circuitous route marked thereon. What a presumption! It was not just a by-road, but a detour to end all detours. Insofar as it was a road at all, it seemed to be nothing more than a series of tracks through the extensive estates of the farmers, along which the cattle were driven, sometimes over very great distances. The roads were therefore as it were "diverted" through the farmyards. On parts with standing water the conditions were still worse, and patches of mud had to be circumnavigated. Bad enough on foot, but with bicycles, often completely impossible. They sank to the axles and often had to be unloaded, carried over the obstruction, reloaded and pushed through the pasturelands around the morass.

In many places we came across plants that we presumed were N. werdermannianus. As a result of all the difficulties the day came rapidly to a close, and we still had 23 Km to go in the darkness to the village of Curtina. Just before we were about to set out in this direction, we spoke with a farmer who directed us to the hill where N. werdermannianus should be growing, about 500 meters away. Because we thought we had already found the species, as well as because of the late hour, we decided not to inspect the hill. In spite of all the difficulties and hardships we managed to enjoy a meal of beer and cheese — nothing else was served in the local restaurant.

Back in Montevideo we showed Marchesi the plants, and not without some pride. He quickly made it clear that they weren't N. werdermannianus, but plants that were unknown to him also. Later Rausch proposed, in permanent remembrance of the journey, to give my name to the plants, and described Notocactus vanvlietii in K.u.a.S. 5.89:1970. I will return to this publication in a separate article. Happily Marchesi was kind enough to give me a plant of N. werdermannianus as well as a fruit with contents, and so it happened that the first plant of this species to be imported to Europe was in fact brought by me. For the description I refer to my opening, giving the quoted publication of Herter, although this is a copy of a description by van Osten of an Echinocactus (Notocactus) species in Notas sobre Cactaceas:51 Lam XXXVII and XXXVIII, 1941. If one compares the two descriptions, it seems that Herter has taken van Osten's word for word, except that some important details, principally the relevant measurements, have been left out or wrongly interpreted. This confirms the suspicion that Herter did not know the plants at all. I would like to make a few observations about this.

Firstly that Osten states that the height of the plant without flowers is 13 cm, with a diameter at the top of 10 cm and at the base of 7 cm. At Marchesi's I saw specimens that were considerably larger and exceeded 20 cm. Secondly, Osten says (as stated by Herter) about the spines, "up to 16 radials, up to 5 mm long. Centrals about 4, of which most are up to 15 mm long". Thirdly "flowers up to 60 mm long and, in full sunlight, up to 70 mm in diameter". These particulars are completely in agreement with the specimen at my disposal. The illustration of the flower section of my plant corresponds very closely with Osten's description.

In Osten's text it is erroneously stated that the areoles have a width of between 10 and 15 mm. This should be 1.0 to 1.5 mm, as was noted by Herter. Osten accompanies his description with two photographs; Herter has reproduced one of them in his publication. In my opinion not the best one, as the other gives a glimpse into the flower. The table with which Osten compres his species with Echinocactus leninghausii and Echinocactus elachisanthusis is also reproduced by Herter, but he suggests that N. werdermannianus should be related to Echinocactus leninghausii and E. elachisanthusis. As far as the latter is concerned we can treat both authors with reserve. Neither Osten nor Herter knew this as yet unrediscovered species. As far as N. leninghausii is concerned, one has only to compare the flower sections of these two species and one can understand what Osten so pointedly says, "Por la description no se piede identificar con ningua de ellas". Translated: "As far as the description goes, one cannot identify it with one of these". I go along completely with this remark. It makes clear that Osten had a good practical understanding of the plants.

About the relationship of N. werdermannianus, Osten himself states that the plants belong to the group around N. scopa. "Although", and once again I quote Osten "convergent with the group round Noto. mammulosus because of the prominent chins". The thought of a relationship with N. scopa is not to my mind unacceptable, except that in my own field study several species have appeared that are directly related to N. werdermannianus but also show similarities with the group around N. concinnus. These are N. vanvlietii, N. vanvlietii var. gracilior and some species I have yet to publish. With this in mind, consideration will have to be given to a new group around N. werdermannianus.

Neither Herter nor Osten give any details of seed or fruits. In connection with a forthcoming article on N. vanvlietii, in which the relationship with N. werdermannianus will be discussed, 1 would like herewith to describe the fruits and seeds of the latter species: Fruit berry like, egg shaped, light green covered with green scales from which white wool and yellow to light brown bristles grow, shrivelling, going to a powder and springing open just below the flower remains, containing about 200 seeds. Seed bell-shaped, testa having oval, matt shiny black lumps, sometimes covered with the remains of the arillus; hilum irregularly shaped, slightly raised at the edge, weakly wavy and light ochre-yellow, outgrown round the micropyle to a caruncula, position of funiculus difficult to distinguish.

In order to provide optimum growing conditions it is important to know that the plants grow in stony places, in full sun and in a well-drained miner-rich loam of pH 5 to 5½; flowering April-May. For plants on their own roots always spray and give a little water in the winter and spring. They should not be allowed to remain dry. Winter and spring in habitat is the growing time. After flowering, resting period. Keep spraying and do not allow to dry out completely. Autumn, dry. Temperature, night – low – careful with frost; by day – over $15^{\circ}C$ especially in the winter.

Comments

..... from H. Middleditch

Van Vliet's description of the location of Notocactus werdermannianus "on a hill away from the road" was brought very much to life by the account given to us by Dr. Moyna in his talk about collecting plants in Uruguay, and the slides which he showed us of the isolated hill tops on which the plants were to be found. These hills lay some distance over the fields from the track or road. On the occasion of his talk to us, Dr. Moyna suggested that one might well be able to find different sorts of plants on each of the isolated hilltops. From the account given by van Vliet it would seem that he and Rausch must indeed have been going from one such hilltop to another on their trip. No wonder that we have subsequently had a steady stream of new Notocactus "species" appearing in the literature.

The hints given by van Vliet on growing conditions puzzle me a little, for he would appear to refer to conditions in their natural habitat as "stony places, full sun, well drained, flowering April-May. Winter and spring is the growing time, after flowering, resting period". But April-May is autumn in Uruguay; and if winter and spring is their growing time, my calendar puts these after autumn, the intimated flowering time. So how can there be a resting period after flowering?

In the description of the seed, van Vliet refers to the remins of an arillus. Is there indeed an arillus layer present on the seeds of this species? Or on any other Notocactus seeds? I come back to the original illustration of seeds of G. horstii which accompanied Buining's original description and depicted remnants of an arillus layer covering the testa; but when Geoff Swales examined the seeds from his plant of G. horstii he was unable to find any such feature. He further queried the use of the "hand lens" which it was suggested may have been used to examine and sketch the seed, which could have led to some residual pulp being inadvertently mistaken for an arillus layer. What is the real situation with the seeds of N. werdermannianus? Does the residual arillus layer appear on the seeds of the associated species of

which van Vliet speaks, i.e. N. vanvlietii and others. And what precisely are the other species which in 1971 were "yet to be published"?

In discussing relationships between N. werdermannianus and other species of Notocacti, van Vliet suggests that it shows similarities with the group around N. concinnus. Does he mean similarities of body appearance, of flower size, or flower form; or what? Is it similar in any of these respects? And how does the seed compare?

Several writers refer to "van Osten" but it would appear to me that the word "van" simply does not occur in original literature carrying this author's name. It seems that he should be named as Osten in the same way as one speaks of other authors, such as Rausch, or Ritter, or Buining.

NINE DAYS ON A CACTUS HUNT IN URUGUAY By Hugo Schlosser Translated from K.u.a.S. 28.1.1977 by H. Middleditch

Since the outcome of the first seven days was only to make sure where no cacti occurred, it is much better for me to begin these notes with the past history of the cactus hunt.

For years a fixed idea haunted me of accurately establishing the ditribution range of Notocactus werdermannianus Herter. We have in this one of the most handsome and also very interesting specifically Uruguayan species. Up until now, only one solitary, very isolated hill has been known as a growing area and in addition to this, the actual location there is confined to only a very small zone, which I was able to verify for myself in December 1969. This hill, the Cerro deal Porton, viz: Hill of the Large Gates, so-called on account of some peculiar rock formation, lies like a lone wolf in the surrounding rolling countryside, separated from its nearest neighbour and two almost parallel ridges by many kilometers of generally quite trackless pasture lands. This isolated situation of the hills has perhaps led to this one single hill being regarded as the sole occurrence site. For some time before I had not wished to accept this without further information. Simple country farmers of that district told me of a "tuna amarilla", a yellow cactus beyond the Cerro del Porton, without being able to state the precise location. So in the year 1970 I spent one long hot summer's day in searching the adjacent hills.

My wife, my son and a hired help assisted me. We searched at least eight hills thoroughly and found nothing. At best a few Malacocarpus were all this entire area yielded. Just as, finally, a rising thunderstorm obliged us to break off the search in order to reach the firm highroad before the earth road was changed into soft soap by the action of the rain, my son found a few specimens of the so avidly sought Notocactus werdermannianu. That was at a distance of 10 Km as the crow flies from its previously known habitat location. It was not possible for me to go back to that place for a whole year. The real distribution range of Notocactus werdermannianus consequently remained concealed for the time being, since it meant thoroughly searching a very extensive area.

Now it would be on the 11 January 1975 before I set out once again. This study trip took me through the loneliest regions of Uruguay. I wished to search systematically in a broad sweep everywhere around the Cerro del Porton that offered some degree of promise of cactus vegetation. We searched for cacti over a semi-circular area, that extended over a distance of approximately 25-30 Km in a straight line from south through east to north round the mountain. The other regions were either already known to me in broad outline or were reserved for a later extension of the programme.

A 30 cwt Chevrolet pick-up truck, built in 1952, served us for transportation. It was thoughtful enough to compel us to delay the start of the journey for about 24 hours whilst the petrol pump (already put out of operation previously) was fixed. In the nine days of our trip, in places on quite dreadful roads which really scarcely deserved this designation, it then behaved itself in an exemplary fashion. Now and again these roads rather resembled stairs with level steps, going through streams, rivers, and mudholes. In one we remained stuck fast up to the rear axle and occasionally travelled a kilometer long in bottom gear. It never left us in the lurch. In view of its make it was called "Chevy". We renamed it during the trip and changed two vowels: it was now called "chivo" after the billy-goat, since it even clambered over rocks.

The first stop was made after 12 hours journey at an Estancia, which served us for two days as a base for operations. The brother of an employee of mine is the "Capataz" there. This position is difficult to translate. It is half manager, half foreman. Here we — this is to say, our elder son, my wife and I — had the convenience of being able to sleep under a roof and in beds. The others lay on their mattresses upon the ground in the open air and covered themselves up with blankets and a glorious starry sky. A "baqueano" i.e. someone who knew the locality well, accompanied us on the next day to the southernmost point of our trip. Already previously we had paid a visit to some stony places within the bounds of the Estancia, which is more than a thousand hectares in extent. The first objective was an isolated hill lying on the border of the reservoir of the Rio Negro, lying practically in the centre of Uruguay. In sight of this not very large mountain my cactus-seeking heart began to execute leaps for joy for it appeared to have all the pre-requisites of a cactus paradise. So much greater was the disappointment as nothing, absolutely nothing, which appeared to resemble "tunas" was to be found there.

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Somewhat later we found, on a cluster of rocks which bordered a stream, some Notocactus mammulosus, Malacocarpus corynoides and erinaceus, and Frailea pygmaea, thus just those representatives of the cactus flora of Uruguay that are distributed over the whole country. The atmospheric barometer then fell even lower, so that, what should have been a road, turned out to be a confusion of cross-furrows, long ruts, rock ledges and boggy channels. It took us 3½ hours for a 28 Km stretch, naturally excluding stopping times. Here our pick-up truck truly earned its new name for itself.

The following day we went further to the north, where some isolated hills and some extensive hilly areas formed the centre of attraction. These hilly areas, always watersheds of more or less considerable importance, are often populated by Gymnocalycium and Frailea. We found nothing there however. A larger hill, the Cerro del Ombu, again seemed to possess all the attributes for an abundant cactus flora, and was on account of its isolated situation particularly interesting. Once again it was but an illusion. Next, further on to some other isolated uprising hill, the Cerro Cardozo. However, although it was only 23 km away in a direct line, we had to cover a distance of about 170 km on the most wretched roads, frequently having to retrace our steps because no through road was practicable. This will only be really understood by those who know South America away from the main traffic routes. The "roads" are frequently only 20-30 meter broad strips of field between fences that border immense plains of pastureland. They zig-zag about according to the ownership of the land and the nature of the terrain. Depending upon the density of traffic, they may develop into more or less recognisably used tracks. These are however often not easy to pick out. Often they also go straight across estates. Then one just has to open the wire gate in the enclosing fence. It happened however, more than once with us, that these wire gates were also spanned above with wire on higher sideposts. Then a goods vehicle, be it ever so small, does not get through. In such cases it is necessary to go to a place some distance from the gate, where one can shift the fence by pulling up one or two posts. Then two men station themselves on the fenceline, one drives over then everything is put back again into its proper place.

Obviously we always travelled with a map. The motoring map from the petrol companies naturally held good only for the larger roads and only then with limitations. I procured maps for myself from the Military-Geographical Institute at a scale of 1:1000,000 — above all for the topographical detail and on the assumption that the indicated roads would, after all, exist. I had then simply to ascertain whether they were passable. However, we were greatly mistaken! Perhaps the roads had existed when the maps were prepared perhaps 20 years ago. The present day reality is entirely different. Where a road and a ford across a river is indicated, it went rhough grass reeds considerably higher than the bonnet of the truck. Rapidly we came to a stop and became stuck fast and sank in, up to the back axle and the sump. The Cerro Cardozo lay at about 5 km distant tantalizingly ahead of us, on the opposite side bank of a river, through which a ford should have gone. In the selfsame direction for about half that distance extended a thicket that always grows along the river. There the country house on the Estancia must then lie. So the young lads took themselves off in that direction, to fetch help. In the meantime, it had come up to six o'clock in the afternoon.

Our men and reinforcements returned mounted on horses. The latter consisted of the "Capataz" from the Estancia and two workmen. Since they were occupied there exclusively in cattlebreeding on natural pasturelands, there was no tractor and also no oxen. The Estancia is 20,000 hectares in size, of which about 5,000 hectares stands under water in winter. The exceptionally splendid riding horses were naturally not capable of pulling our truck out of the morass. Finally that was ahieved with an implement which they employed for tensioning up the wire on the kilometer long wire fences. The Capataz was a practical fellow, a Gaucho the like of whom is now only as a rule to be found in the illustrations in books. All to a man truly ready to help. These people are insulted if one speaks to them of payment for their help. After we were "afloat" once again we camped immediately at the same spot, for in the meantime it had become dark.

The next morning we retraced our steps several kilometers. Far above, we were then able to see the river, which consists there of two branches, one crossed by a ford and one by a bridge. But here also still occurred unexpected incidents. Once the road was impassable on account of irrigation works and drainage ditches for rice fields. Once more back again to seek the proper track. We set out for the country house of the Estancia. It was at this time in the possession of the former Brazilian President Jao Goulart. We at once replenished our stocks of drinking water and one of my companions asked if we were able to purchase some meat, since we were somewhat short. He saw there several freshly slaughtered lambs destined for consumption by the employees. The Manager, a man of about 80 years of age, then replied: we have no meat for sale, but so as to show consideration for friends, please take a half-lamb with you. One recognised what obvious dignity lay in these words and their expression. He deliberately avoided "giving" us the meat for that would have ranked us with beggars.

We were thus again well provided for, even for the possibility that we became stuck fast again somewhere. The next village was, however, reached without any further trouble, where all other reserves also could be replenished and we could also obtain exact particulars about the subsequent road and the inevitable diversions. In spite of that, it was not easy to get to the foot of the Cerro Cardozo, that now already for more than 24 hours had been the aspired objective. As we finally reached it on an unusually hot and sultry afternoon, all seven participants were completely exhausted. (In the previous village, a young man, a Botanical Assistant in the University of Montevideo, had joined up with us). All thoughts were directed only towards a refreshing bathe in the River Tacuarembo. Then the camp was pitched, the fire made for the "asado" (fibre-grilled meat) and the fishing tackle spread out, to provide some variety in the Menu for a change. The Cerro Cardozo must await our visit until the next day.

On the next morning, we let ourselves be guided by an ca. 12 years old yough, son of our only neighbour here for far and wide. He showed us through which wire gates we must drive, where a fence must be laid down, in order to come close to our hill, really even more or less right up to the cliff. He even helped besides on the search for cacti. We were four men, as well as the youngsters. One extra remained with my wife and a servant girl in the camp. For 2½ hours at a stretch we searched systematically. The outcome was 2 specimens of Frailea pygmaea! If I wished to charge all the preceeding effort and costs relating to this journey to both these minute specimens, they would indeed be the most expensive pieces in my collection.

The sultriness of the previous days did not lessen and threatened to relieve itself in a heavy thunderstorm. If it surprised us in such an outlying district, practically without roads, we knew that this would mean immobility for several days. So the camp was hurriedly broken and a start made on the return journey. Nevertheless the stormy weather still caught us with full force where we least wished it. Rapidly the earth road became so softened, that the truck began to make ruts in it. My son, who sat at the wheel, despatched short fervent prayers to the heavens — "Only 100 meters more, then we have made it" "Now only 50 meters more". Oh heavens, let us not get fast only 20 meters from the hard road. And then the great sigh of relief; we had made it: the heavens had looked after us. Certainly we must even yet be made to feel the objects of its spite. In the middle of the storm the mechanism that operates a side window of the cabin refused to close. Naturally right on the windward side, and there I sat. So I received storm and ice-cold rain at first hand. The whole witch-dance lasted over half an hour. Then the storm and rain were past and I could change my clothes in the middle of the main road, right down to my underclothes.

With this stage the widely extended sweep round the known site of occurrence of Notocactus werdermannianus was completed. The experience gained, that in spite of suitable pre-conditions not everywhere yields cacti, is naturally most interesting. Nevertheless at the particular moment one needed a goodly portion of love for the business in order to further develop the programme as planned. The next place in this programme was the eastern part of the line of "Hills of the Eleven Peaks" (Sierra de los Once Cerros), and approximately thereto parallel lying hill chain Gauna. In this area Walter Rausch and Dirk van Vliet had established the isolated existence of various species and I had also found earlier Notocactus werdermannianus, as mentioned above. We must now tackle a certainly 160 km long sweep, so as to stay on good highroad. The only direct and interesting road, 35 km long, that was originally scheduled, we could not use after the rainstorm. In the neighbourhood of a stream a new campsite was struck, from which then the search again started. Straight away the next morning the tide turned. There were Notocactus megapotamicus in great numbers, together with Notocactus vanvlietii var. gracilis, Notocactus ottonis, Frailea pygmaea, and the inevitable Malacocarpus corynoides and erinaceus. Only Notocactus werdermannianus was conspicuous by its absence. Rocky slopes many kilometers long so-called Quebradas - and a rocky hill, were thoroughly searched with fluctuating luck. Frequently we found nothing. When cacti were present, then Notocactus megapotamicus represented the predominant species. Here and there it grew between the rocks, but also on flat, fertile meadowland, completely hidden under 30-40 cm high grass and bushes, where one did not see it, but on the contrary felt it with the feet.

First thing the next day, which had to be the last of the searching process, brought me confirmation that Notocactus werdermannianus occurs in the Sierra Gauna also and not only on the Cerro del Porton. It grew here in company with Notocactus vanvlietii, but the variety gracilis of this latter was not forthcoming. On the other hand there, where we found this variety, we saw no Notocactus vanvlietii. The discovery place of Notocactus vanvlietii does not agree with Walter Rausch's data in his original description. This lies a good 20-25 km in a direct line northeastwards. Whether my discovery place of Notocactus vanvlietii is identical with that stated by Walter Rausch, remains for the time being difficult to say, since the designation of ridges of hills gets confused between various maps. Whenever possible I leave it to the expressed views of the local people.

Particular circumstances forced me to confine my investigation only to some parts of the fairly lengthy Sierra Gauna. It is to be hoped that I will be able to cover the unexplored part, soon. The area is very interesting and can still conceal many surprises, but it is very difficult terrain however and is of a nature such that it is impossible from the cactus flora of one part of the area to be able to draw conclusions about those of the next adjacent zone.

Comments

..... from H. Middleditch

When he speaks of the drive up to the Cerro Cardoza, Schlosser describes how they finished "right up against the cliff". This would suggest that the hill concerned had very steeply sloping sides, of the sort which appeared in the photographs shown by Dr. Moyna at the talk which he gave to Chileans members in 1976. Dr. Moyna did also say that those hills which he had visited were usually a good walking distance from a decent road. From the above account we can gain an idea of the problems involved in trying to drive closer to the foot of some of those hills. In their account of collecting in Uruguay (Chileans No. 13) Rausch and van Vliet make passing reference to the difficulties involved in cycling along these country roads. It is probably very difficult for people in Britain to appreciate that not only are the ranchlands the original grass and herbaceous vegetation which has never once been ploughed and resown, but that the access lanes between adjacent perimiter fences are simply running across the original grassland, without any pretence whatsoever at either hardcore, surfacing, or drainage.

From the evidence afforded by the above account and that given by the original description of Notocactus werdermannianus, one cannot avoid becoming sceptical of the statement made by Buining that he obtained this species from the Cerro Porton which lies" close to the road from Tacuarembo to Paysandu". When I refer back to the December 1968 N.C.S.S. Journal, I find that although this is the obvious location to be understood from his account, it is perhaps not entirely impossible for the diversions incurred in searching for this location might have led them to the Cerro Porton which Schlosser visited, but in view of the distance involved it does seem to be unlikely.

When the vehicle used by Schlosser became bogged down in the reed margins of a river, it is observed that a "thicket always grows along the river". Among the photographs of typical vegetation in Uruguay which Dr. Moyna showed to the Chileans meeting, there was one of gallery woodland alongside a river – not dense woodland like that in Bahia, but open like the African bush with well-spaced-out trees hardly three or four meters high.

This account provides valuable information for anyone thinking of doing field work in that part of the world. Even the residents of Uruguay evidently do not disdain the services of the real locals when it comes to advice on navigation round the country tracks. Even the need to carry adequate supplies of drinking water is brought out here, a point which I do not recollect being covered by any other writer who collected in Uruguay.

THE CHILEANS 1976 ANNUAL GATHERING Reported by P.H. Sherville

It was evident from the start that this was to be a very good session, and an excellent collection of members' plants soon amassed itself on the tables in the foyer of the new lecture block. After tea, everyone was welcomed to the weekend by Harry Middleditch. A continental speaker had been invited to attend but did not confirm the booking so the £1 contribution to his expenses was returned to all present.

After the general programme for the weekend had been outlined, Paul Sherville took the floor; he had succeeded in borrowing some slides of the Leeward Islands, taken by Bryan Adams, a Chileans member who is now back in Montserrat for another year. The slides depicted the cacti to be found on the islands of Antigua and Montserrat, together with some views of the general flora (including dense tropical forest) and also some evidence of the volcanic activity still present on the islands. Of the cacti, the Melocacti – and specifically M. intortus – were present in great numbers, together with some Opuntias, Mammillaria nivosa and Pilosocereus royenii. The Melocacti generally inhabited the coastal regions and the cliffs, often in very precarious situations on the crumbling cliff faces. The rock is quite porous and the roots seem to be able to find secure anchorages until the rock finally falls to the sea or beach below, taking the plant with it. These Melocacti were also to be seen on normal level soil growing amongst sparse grass and low shrubs, some in really excellent showbench condition, others (sadly) eaten, or going rotten as a result of pestilence. Some displayed cristate cephaliums, and those with the crests all seem to be around the same area, as though something at one time in the past had induced the cristation in these plants simultaneously.

The Opuntias also occurred on the crumbling cliff tops, as well as on more secure terrain usually amid shrubby Mesembryanthemae; there were flat-padded and ovate padded forms to be seen. Mammillaria nivosa was again to be seen on the porous rock and scree slopes. The Pilosocereus royenii occurs in great stands, perhaps up to 6 m high. They were seen amongst the trees on the edge of the forest zones and also by the roadside. The degree of hairiness of the pseudocephalium varied from nil (the flower emerging as in the normal Cereus-type) to quite dense growth in patches near the tops of the flowering stems. Although no flowers were to be seen on these plants in the slides, it is reported that they occur in a range of colours from white through pink to quite deep reds. Some green fruits were seen, but no ripe fruit; on ripening the fruit quickly turns red and within 24 hours has been completely devoured by wasps or ants – a highly efficient mode of seed dispersal!

A general discussion then followed in which members showed slides of particular interest to themselves. Jim Gooch led the field with a slide of an imported Austrocactus patagonicus in flower. The view was expressed that this flower showed a close affinity to that of a Notocactus. Then came a short sequence of slides of Acanthocalycium violaceum flower and fruit, together with the comment that the fruit dehisces whilst still green and the shiny-black seeds can then be seen in a white pulpy flesh. When the fruit dries, however, the flesh turns brown (just like an apple) and the seeds develop the normal light brown and corky looking appearance of Acanthocalycium seeds. Another slide of a redflowering Acanthocalycium Lau 444 (variiflorum) brought forth the comment that this sort looked rather like Pyrrhocactus! At our 1975 annual gathering, Roger Moreton showed a slide of an unknown plant which he described as "like a Cleistocactus with an Echinopsis flower". We now saw a few slides from the slide library depicting Arthrocereus, Pygmaeocereus and Setiechinopsis; the flowers looked rather similar to those on Roger Moreton's plant and some of the bodies also looked akin. Paul Sherville also produced some slides of a plant bearing the name Arthrocereus odorus FR 1354, with the comment that he did not think it was an Arthrocereus. He also produced a slide of HU 330 (Arthrocereus ferruginispina n.n.) for comparison, the latter having a very thin naked flower tube and the former a typical "Pseudolobivia" flower. In the discussion which followed it was decided that the FR 1354 could indeed be an Arthrocereus and that the HU 330 was atypical of the group! A few slides of Gymnocalycium and Lobivia followed, by which time it was almost Saturday morning!

After breakfast on Saturday, Roger Ferryman took the floor and gave a geographical analysis of plants belonging to the genus Neoporteria sensu stricta. Starting in the north of Chile, the first plants to be encountered belong to the N. castenoides/laniceps group which are characterised by small flowers and fine spination. As one proceeds south, N. villosa and N. wagenknechtii are next in sequence with slightly stronger spines and slightly larger flowers. Proceeding still further south along the Chilean side of the Cordillera we next encounter N. nidus, which has very much longer stronger flowers and much stronger spination. Continuing southwards we encounter N. mammillaroides which has the fiercest spines and largest and longest flowers to be met with in the genus. Yet further south plants belonging to the N. subgibbosa/ castanea group are found, which have reverted to smaller flowers and weaker spination albeit not as small and weak as those of N. laniceps, etc. Various species of Neoporteria plants were laid out geographically on the speakers' table and demonstrated the change of spination although of course not sufficient plants were in flower to demonstrate the change in flower size. It was pointed out that as one progresses southwards the plants enjoy increasing rainfall starting with perhaps 4" per annum for N. laniceps increasing to around 20" per annum for N. subgibbosa etc. It was thought initially that this could account for the differences in the spination and flowers, but of course this argument could only apply as far south as N. wagenknechtii. Samples of soil taken from imported material have indicated a pH of between 7.3 and 7.8 which would suggest a calcareous subsoil. This is surprising as most plants seem to prefer a slightly acid soil of pH 5.8 to 6.5. Support to this talk was provided by slides of Neoporteria in flower from David Whiteley.

After the mid-morning break, Harry Middleditch took a look at the pollinating agents which might visit Neoporteria and Neochilenia, which generated a discussion that lasted until lunchtime, and in typical Brooksby style the programme schedule went by the board! After running through the available slides of Neoporteria sensu stricta in flower, it was observed that the inner petals of the flowers, which remained closely applied to the style during the greater part of the flowers' life, reflex back to the outer petals to reveal the stamens only about 24 hours before the flower dies. The stigma remains exserted throughout the life of the flower. In the lively discussion which ensued, Harry Middleditch proposed that here was a case of a flower which was in mid-stream in its evolutionary cycle, in that for most of its life it behaves as a humming bird flower, but retains its option on the last day of becoming more of an insect flower, in case the humming bird system failed. The discussion developed its liveliest pitch when he suggested that shortly (in geological time) the flowers would become wholly humming-bird orientated! The discussion centred around what was considered to be advanced. The speaker continued to stand by his idea that specialisation was more advanced than non-specialisation. Reference to various published works showed that both humming birds and various insects were present in the region inhabited by the plants in question, so either system was feasible for pollination. Geoff Swales, probably our most botanically inclined member present, put forward a very valid thought here by warning of the error in attributing thinking mechanisms to our plants rather in the style of Walt Disney! Such phrases as "the plant thought to itself: if I produce a long tubed flower with a lot of nectar at the bottom I will attract a humming bird and not all these dreadful insects" are admirable for bringing out a point in a discussion but highly erroneous when one actually starts to believe it happening!

Geoff Swales indicated that thinking in terms of the evolutionary (geological) time scale, sometime in the past a plant produced a "sport", a chance variation of some kind (but indeed not by design) with a genetic configuration which resulted in the production of a relatively long-tubed high nectar-content flower. Provided the environment in which the flower found itself was such that humming birds were available and that these birds did indeed pollinate the flower, then its chances of producing off-spring were slightly enhanced. The new strain would then develop at the expence of its neighbours which did not have this particular construction and were not quite as well served by pollinating agents. It would of course be equally possible that suitable humming birds did not frequent the area, in which case the flower would not be pollinated; in that event the insect orientated flowers would continue to flourish. At this point, Joan Hobart suggested that such high degrees of specialisation were highly susceptible to a change in the environment a situation which was detrimental to either party; in an extreme case, if some catastrophe befell either party, the other half of the ecological system would also die out. Returning to the Neoporterias, it was equally possible that the flower was evolving from a humming-bird type to an insect-type and was in the early stages of this, instead of being in the later stages of the reverse course.

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After lunch Paul Sherville took the floor to give an insight into plants belonging to the general Matucana, Submatucana, and Arequipa. Starting with the generic names themselves he distributed charts showing the way in which the plants were related, according to both Backeberg and Donald (splitter and lumper respectively). In stating that his preferences lay with the Backeberg system, the speaker did acknowledge that in the current "lumping" climate, the system according to Donald was probably more acceptable to authorities, but made the point that we had to be careful as Taxonomy — like computers — could become our master and not our servant. Taking a simple case of body morphology (much frowned upon in modern taxonomic circles) he held up two fairly typical plants, one a Matucana, the other a Submatucana, whereon the difference was immediately apparent to everyone present. The system was of practical value even if theoretically unacceptable.

Turning to geographical distribution, maps were produced showing the relative occurrence of various species. The Matucanas were wide ranging in that they could be found from Balsas in the N.E. of Peru (M. herzogiana) right through to southern Peru about latitude 18°S. If Arequipas were to be included in with Matucana, this would extend the range into Northern Chile. The Submatucanas were then considered in more detail: these were confined between 5°s and 10°s, more or less within the gorge of the River Maranon, with some exceptions which had crossed the western rim of the gorge and reached westwards to Otusco and Santiago-de-Chuco, also as far as Cajamarca. As with many of our plants, the early descriptions are confused and probably the commonest encountered plant, Echinocactus aurantiacus Vaupel, means different things to different people. The plant most nearly fitting the original description is the one recently imported as Submatucana aurantiaca var. densispina Lau 118. The plant that most European growers associate with the name S. aurantiaca is the bright glossy green stemmed form which was introduced by Blossfeld in the 1930's allegedly from Sondor. Now Sondor, as was shown by the maps, is far away to the north-west of any other Submatucana (or even Matucana) and Lau was unable to find any globular plants at all in this vicinity during his trips; K. Knize however is now offering plants from this location so we must wait and see what arrives!

A good display of plants were available on the speakers' table which covered most of the possible forms of Matucana/Submatucana. A Matucana haynei and a M. pallarensis in flower served to show the different floral characteristics. Also in flower was a M. axiosa, a beautiful lively pinky-mauve bloom, which demonstrated admirably during the course of the weekend the phenomenon of the stamens overtaking the stigma. At 2.00 p.m. on the Saturday when the flower first opened fully, the stamens were 3 mm below the base of the stigma lobes (i.e. their point of attachment to the style); by tea time they had reached the base of the stigma lobes and by Sunday morning they were flush with the tops of the stigma lobes. There are three possible mechanisms here, either (1) the tube grows, taking the stamens with it, or (2) the stigma contracts after its initial extension, or (3) the filaments elongate. It was considered that the second alternative was most probable as many styles are rubbery and also of tubular construction. If these dilate in cross-section then they would also contract in length, assuming no actual addition or subtractions to the initial tissue. It was decided that some further observation and measurement was needed to settle this question; we look forward to an enterprising member coming to next year's gathering with some more ideas on this!

Following the talk, some slides were shown both of typical members of the genera under discussion and of the stamen-elongation sequence during flowering. This was followed by some excellent slides from Roy Mottram showing both Matucana and Submatucana flowers in section, displaying clearly the large nectar chamber and its roof, the latter formed in most cases by the fused filament bases. It was also demonstrated that this nectary was not always constructed thus. Slides of other flower sections from Roy Mottram then followed and that of Haageocereus decumbens in particular exhibited features differing from those expected.

After a break, Graham Charles reviewed some Notocacti, including one or two of those species discussed briefly at the 1975 weekend. More evidence had become available concerning N. muegelianus and there were valuable slides of N. horstii showing the variation of flower size and colour. These slides showed two flowers, one just newly opened and the other had been open for some days. The older flower was at least 50% bigger and much paler in colour than the new one, suggesting that the flower has a certain initial pigment density within the petals and this becomes progressively diluted as the flower expands. Armed with this information we returned to the slides of N. muegelianus and N. linkii and it now seemed evident that these two "species" may well represent only normal gradations of a single species — N. muegelianus. Another quite variable plant was N. herteri. It exhibits considerable variation in body colour, spine colour, degree of 'humping' on the ribs and lastly a variation in stigma and/or style colour from red to pink through to yellow. An interesting plant from S.P.I. which was offered as N. scopa/herteri, had a flower larger than a normal scopa and of a lively apricot-pink colour.

Here arose an interesting discussion when a comment was made that one could not rely on slides to indicate flower colour accurately; the particular colour concerned was the bluish-cerise colour of the petals of N. uebelmannianus, which one member had been completely unable to reproduce. Similar problems were noted to occur with some Lobivia flowers. But one slide of N. uebelmannianus was shown which it was felt did accurately reproduce this sheen — so it was possible! It was suggested that in order to capture this sheen it was best to work in shade or subdued sunlight; direct sunlight being relatively rich in U.V. light it may be this which 'burns out' the bluish tints.

Geoff Swales then took the time remaining before tea to continue the discussion started last year on Gymnocalycium horstii and buenekeri. Having gained access to more seed in the interim, it was not possible to be completely satisfied that the "Variety" buenekeri is not so closely related to G. horstii as was first thought and it had already already been published with specific status. Gymnocalycium denudatum v. pentacanthum would also be synonymous with G. buenekeri. On the speakers' table was displayed a range of these plants, some with fruit which further reinforced the separation of G. horstii and G. buenekeri. Slides of the plants concerned followed, in bud and flower. A quick map showed the considerable geographical isolation of the species buenekeri.

Considering another branch of the genus Gymnocalycium, some plants of the multiflorum/monvillei complex seem to be large seeded "Microsemineae" displaying all the seed characteristics of Microsemineae except the size! Could this be an intermediate form? Gymnocalycium multiflorum is found in N.W. Argentina and G. monvillei is reputed to come from the border region of Argentina and Paraguay. We now have G. buenekeri from S.W. Brazil, in Rio Grande do Sul, and G. horstii from the east of the same province. Further to the south, next to the border with Uruguay, G. denudatum occurs. Thus a continuous line of change may occur with G. monvillei acting as the link plant between the more western Microsemineae and the eastern Macrosemineae. Following on from the earlier discussion on "advanced" features, it had been suggested that large seeds were more primitive type of the genus, with the more "advanced" features appearing westwards. On a point of interest, some seeds had been found in the fruits on Geoff Swales' G. buenekeri which had already germinated, yet another case of endogenous vivapary to add to that reported previously in Islaya, Harrisia, Neoporterai, Astrophytum, Epiphyllum, and others. Another unusual feature had been Gymnocalycium seedlings which germinated with three and four cotyledons instead of two. None of the seeds of G. horstii which Geoff Swales had obtained, displayed any arillus layer such as that shown in Brederoo's sketch in Buining's original description of this genus; it remains unexplained why this occurred, unless the appearance of the seeds used for the original description were misinterpreted.

After tea Harry Middleditch again took the floor, this time to discuss a number of Copiapoas – specifically C. streptocaulon from Morro de Copiapo, C. lembckei from north of Caldera, and SH 829 C. bridgesii from near Chanaral, together with C. cinerea which occurs from Taltal north to Paposo. A sketch map showed the distribution of these species. A report was quoted of a trip made to Atacama in 1909 by Reiche, who travelled from Caldera to Paposo and noted that each evening a mist formed on the peaks of the coastal hills and rolled down into the valley floors. Reiche also recorded that the mists were denser and more persistent between Taltal and Paposo than between Caldera and Chanaral. The speaker suggested that if one accepted that the spines were not merely for protection, but in fact also acted as condensation points in these mist zones, then it could be argued that plants originating in the more persistent mist zones (between Taltal and Paposo) would require fewer spines to condense sufficient moisture for their needs, than those plants growing in the rather less misty zones (from Chanaral to Caldera). The available material was laid out on the speakers' table in correct geographical disposition, and was found to conform with this idea.

Two other points of interest came out of the Reiche report, firstly that apart from vegetation growing along the immediate edge of the shore, the vegetation commenced inland at 300 meters; it was not really clear from Reiche's account whether this meant 300 meters altitude or simply distance from the shore. However, from the altitudes quoted for habitat plant locations on Knize's latest catalogue it seemed that 300 meters altitude was intended by Reiche. There was also reference to the subterranean root system of an Echinocactus to be found in this zone, and of a very similar root system to be found on an Oxalis.

To complete the Saturday evening, a session was held on close-up photography. This was set away be Geoff Bagnall who described his system using a normal lens with extension tubes and a teleconverter next to the camera body. This gives quite a high degree of magnification but can add complications when a preset lens is used. Some very interesting slides were shown which had been taken using this system, including a Corryocactus in flower (the flower itself had been brought to Dr. Moyna's lecture at Brooksby in June and had been preserved in resin by Joan Hobart). A close-up of the tip of the plant revealed the existence of vestigial leaves. Paul Sherville then demonstrated the system which had been advocated by Geoff Swales at the 1975 Brooksby weekend, by simply reversing the standard 50 mm lens on to the end of a telephoto lens – 200 mm in this case. This system was made adjustable to see if any change of magnification could be effected, by means of a "zoom" type adaptor ring; on test, no real improvement was attained and the adjustment brought about no worth-while change in achievable magnification. It therefore appears that the magnification is determined by the lenses used. During the impromptu practical photography session on Sunday morning, the tele-converter lens was coupled between the camera and the telephoto lens, thus producing an effective 400 mm telephoto lens, which did show a marked increase in magnification, but not by a factor of two. The great advantage of the system was that the whole assembly is a considerable distance from the subject (about 30"). The extension tube system often creates problems due to its own shadow falling on the subject, which is often barely an inch from the lens!

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Some close-up shots taken with this system of telephoto lens plus reversed standard lens were shown; it was possible to fill the frame with two areoles of Discocactus horstii (about 8 to 10 mm overall). Other slides of spines on Discocactus showed the groove and split in spines of D. heptacantha and D. ferricolor. It was noted that with this system it was essential to stop down on the reversed front lens. If one stops down the telephoto lens then a circular or hexagonal picture is produced! Some further close up slides followed from Harry Middleditch, who had demonstrated problems with a spot of light in the centre of close-up slides at the 1975 Brooksby weekend. By taking close-up shots of a stigma or anther directly against a matt black background, rather than using the flower petals as a background, this problem had apparently been overcome; but it still failed to explain how the problem arose when taking close-up shots of areoles. These slides were taken with a reversed 50 mm lens mounted on extension tubes, using up to 750 mm total extension; stigma lobes of 1 mm breadth occupied about a third of the width of the screen. But definition was very erratic, due to the greatly reduced depth of field and loss of vision when stopping down.

Sunday morning saw Harry Middleditch briefly introducing the subject of Sulcorebutia and Weingartia, with a sketch map of central Bolivia showing the area of the Rio Grande and Rio Mizque basin together with the actual location of the Sulcorebutia and Weingartia species found there. Alan Craig then took up the theme of Sulcorebutias. He observed that, taking the Sulcorebutias as a whole, spination was exceedingly variable in density, arrangement and coloration, the form of the bodies also varied, some being cylindrical, whilst others were of spherical and flat-globular form. Flower colours also varied from mauves through reds and pinks to orange and yellow, including some bicoloured flowers.e.g. S. caniguerallarii. Unfortunately some plants under the same Lau numbers had produced both red and yellow flowers e.g. Lau 394. A series of slides of Sulcorebutia were then shown, mostly of collected plants in flower, and other members' slides were shown at the same time for comparison. The two-projector system introduced in earlier Brooksby meetings was used almost throughout this year's sessions and greatly facilitated such comparisons. The degree of variation in Sulcorebutia flowers was evident from the slides; some flowers had quite long slender tubes rather akin to some Aylosteras, whilst others were short and dumpy rather like some Weingartia. Finally came some slides of the purple flowering "Weingartias" which showed considerable flower variations even when carrying similar labels.

Reference was then made to the latest publication by Herr Brandt in which he transfers all Weingartia and Neowerdermannia into Sulcorebutia and Harry Middleditch suggested that this proposition was spoilt by the inclusion of Neowerdermannia. Paul Sherville then continued on from the Sulcorebutia with the Weingartias, which in many cases were obviously quite closely related. At the start it was indicated that only a general picture of the genus was to be presented. A number of authorities held the view that Sulcorebutia and Weingartia could be regarded as a single genus. Others took the view that some Weingartias were quite distinct. Paul Sherville suggested that the logical thing to do was to take the generic characteristic for Sulcorebutias and look for it in Weingartia. Now the genus Sulcorebutia was erected on the basis of a groove running from the areole into the axil of the tubercle; the word sulcate means "having a horizontal groove or furrow". A search of the plants labelled Weingartia in the speaker's own collection revealed that this groove was present in eight of the twenty names surveyed, it was definitely absent in seven of the twenty and difficult to see in the other five because of the dense wool present. However, it was the actual plants concerned which produced the surprises, for the groove was present (but not always) on W. fidaiana and neumanniana and always present on Lau 958 (neocumingii), pilcomayensis, lecoriensis, etc., and was definitely absent on W. totoralensis and hajeckiana, which are morphologically closest in appearance to Sulcorebutia. Other features which have been surveyed are chinned tubercles, flower forms, etc., but so far no correlation has emerged. Some slides of the plants concerned were then shown. It was noted that the Sulcorebutia groove also appeared in Lobivia cinnabarina and on a plant received as Lobivia friedrichii, which was halfway between L. cinnabarina and Sulcorebutia in appearance but retained lobivioid flowers.

The after-lunch session was opened by a suggestion from Harry Middleditch that the Trichomosemineae seed group of Gymnocalycium did not possess the "enlarged hilum" which has been regarded as the hallmark of these seeds since about 1935. This idea was supported by a fine slide of some Trichomosemineae seed from Francis Fuschillo and served to introduce Geoff Swales talking on his favourite topic of Gymnocalycium, this time on plants in the Trichomosemineae group. The plants on the speakers' table were laid out to follow a fairly well defined transition from species to species; it was suggested that G. ragonesei was at the end of the line as it has an exceptionally large hilum. It was proposed that the order of progression was: G. moserianum

G. quehlianum (occultum) - G. bodenbendarianum - G. vatteri

G. asterium - G. ragonesei

The final session of this year's Brooksby Gathering was occupied by Mr. & Mrs. Collins with some very interesting slides taken during the three weeks they had spent in Peru. They visited two cactus sites, one around Huarez, and the other in the upper Rimac valley near Matucana. They explained that the native population was quite hostile in the former region and far more friendly in the latter region. The time of their visit was the end of January to early

February. The Santa valley was quite damp, with twelve hours of rain at Caraz, where Borzicactus fieldianus, Trichocereus, and an Erdisia were in flower. On the pass from Huarez to Casma at about 9000 feet they found Matucana yanganusensis, still in quite damp conditions. The general landscape looked quite green on the slides. Some of these Matucanas were in excellent condition and others were decidedly tatty, much like the imports we have come to expect. This brought forth the comment that the people who collect plants must pick the poorer specimens! Moving on to the second part of the trip, starting with the Eulalia valley, we saw slides of Neoraimondia, of Loxanthocereus and Espostoa at around 3,500 feet, mostly to be seen growing in ground covered with large stones, in company with little other vegetation. Also seen were Mila peruviana in flower, together with other slides of Mila and Haageocereus, all growing in company with a little fresh green vegetation in the shape of Tillandsia, Convolvulus and Tradescantia. There were local additions of orchids and eidelweiss; the greenery became less sparse with increasing altitude and with the fairly reliable rainfall around Matucana, around 8,000 feet altitude, there was even more green vegetation. The plants were seen to be growing in a fairly fraiable sandy or gritty soil whilst others were to be seen growing among what could best be described as small slab-like boulders.

And with that magnificent ending, the Brooksby weekend was over for another year, with a word of thanks to all those who had helped in their diverse ways to produce a successful weekend.

Comments

.... from Mr. & Mrs. Collins

We thoroughly enjoyed our first Brooksby weekend and were only sorry that it seemed to go so quickly. The 'seminar' type of arrangement with constant audience feedback seems to us to be vastly preferable to the 'speaker-onthe stage' system, although this obviously means restricting numbers attending to some extent. We also liked the way the subject matter was allowed to create its own momentum, rather than being forced into the straight-jacket of a strict timetable. Really, the only unsatisfactory aspects for us were the result of not knowing what to expect, and so not coming fully prepared, However, we shall put that right next year, we hope. We shall certainly be bringing a camera next time and it would be nice to have some provision for photography.

Ever since returning from Peru we have been meaning to put pen to paper and expand our field notes into something that will be of interest to others. We should be able to find time for it this winter and we shall certainly do our best to put something together for The Chileans.

.... from D. Hooker

I have a couple of thoughts as to the contents of the week-ends programme. Firstly, would it be possible to obtain more habitat photographs? I realise that this requires some-one visiting the relevant locations and would depend on the contacts which may exist. Secondly, would it be possible to include more geographical and geological information, in the appropriate talks, relating to such items as aspect, soil, rainfall (quantity, distribution, etc.) and — if habitat slides are not available — the ecosystem in which the plants are found. I realise that most of these points were touched upon during the weekend at Brooksby, but I would like them to be enlarged upon and given more emphasis, if the information is available. Generally I am only sorry that there is only one meeting per annum.

A CHILEAN'S FIELD TRIP TO SOUTH AMERICA?

If it is the intention to seek financial support for the proposed field trip to South America, then I should be quite prepared to look after any cash that was subscribed for this purpose, on behalf of Chileans emmbers. It would be preferable to have someone other than myself who would be responsible for authorising release of any part of such funds. from D. Huxtable

I am prepared to subscribe a sum of £50 to be used for the proposed Chileans field trip, without any stipulation regarding the use to which it is put. Naturally I have high hopes that something worthwhile will materialise; if the boundaries of knowledge are edged back slightly, then the venture would, in my eyes, be a success. If contributions were only to be accepted conditionally upon receipt, say, of a number of habitat plants, the scheme could never succeed since individual preferences would differ. However, I would certainly hope that we might be able to read a detailed report of the trip in the pages of the Chileans, and I would like to have a great many habitat slides taken. from P.H. Sherville

I hope that it might be possible for us to record local meteorological and micro-climatic data when we are in the field. I have been invited to the Met. office in Berkshire to discuss these aspects of the trip; they have also put me in touch with Professor Monteith at Nottingham Unviersity for the micro-climatic side. I have drafted out a form on which meteorological data can be recorded for the comment of interested parties as to content.

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.... from D.W. Whiteley

When one reads about the most successful plant hunters one gains the idea that they almost always have to live off the land, carrying no excess baggage - almost no food but a handful of raisins in one pocket and a notebook and compass in the other, together with a very very small pack on their backs as one has to carry it a long way, fording rivers and scaling hills and rocks, etc; or the modern type of collector who drives a truck. Weight is little hindrance to the second kind, but it is everything to the first. I think that Paul Sherville will be in the former category and weight will matter, so no numerous forms or observations of secondary importance to the prime purpose, or he will ge nowhere of value. A small notebook and camera are all he will have room for in the recording line if he is to get off the beaten track to break new ground, carrying food and water as he will have to for mile after mile. The more trivia he has to occupy his time with, though it may be of fringe interest to the cactophile (it may be of more interest to the soil scientist, rockhound, agronomist, weather forecasters, etc.) but the discovery, recording of distribution and geographical localities and collecting of plants and seeds is the prime purpose of a collecting trip to the cactophile; most of the Chileans are interested in the plants, not the weather or the soil, as the same criteria do not apply to pot grown plants as to plants in open ground (hence the invention of U.C. and John Innes composts instead of using ordinary garden soil in a pot). And in addition the plants have to grow in England and its humidity, not in the South Americas no matter what the conditions there may be. In any case, I cannot see Paul being able to fill in one of his data sheets for every plant he comes across. reflection from H. Middleditch

I gather that the idea of the data sheet is not to use it for one specific plant, but to use it for a specific locality; if any sort of observations are going to be made concerning the topography, the ground, the climatic conditions at the time of the visit, and associated vegetation at a cactus habitat, then it must be recorded in a systematic fashion if it is to be of value. On that basis I would expect that some form of pre-printed sheet with spaces for entering specific information could well be of advantage; as far as I can see, the only alternative is to write down the same information in a field notebook. But to take note of temperature, relative humidity, wind speed, and altitude will require the use of a barometer, hygrometer, anemometer and thermometer and unless these are carried in a vehicle, then their weight and bulk would, I imagine, preclude their use if on foot. After all, Rausch only quotes altitudes for his plant discoveries, many of which he collected on foot.

Now to anyone who is primarily interested in cultivating cacti, then additional recorded information could well be regarded as trivia. But to anyone who not only wishes to grow these plants, but also to comprehend their relationships and in addition to understand how they fit into the ecological framework in the wild, I would have thought that this sort of information which paints a picture of the habitat in which the plant survives, is little short of essential. I might be inclined to agree that most Chileans would find a table of data by itself of limited interest, but I would have thought if the significance of the data was discussed and related to specific cacti, then it could well hold the interest of many of our readers.

.... from P.A. Smart

I have had a look at Paul Sherville's proposed data sheet, in company with one or two more Chileans members; it was generally agreed that information on Habitat conditions would be a first class idea. We could all think of occasions on which such data would have helped tremendously in solving some research problem or other. I can recollect commenting on more than one occasion that without more information on flowering time, seasons and general ecology, I was stuck! There was the reservation that to complete these sheets was a lot of work and the idea might not be realistic in practice. However, almost any such data that is recorded will be new, so it must add to our field of knowledge. I do think that there is some data of prime importance which has been omitted, i.e. Soil make-up, intensity of sunlight, assessment of whether plant is in flower/about to flower/has flowered, and also possible pollinating agents.

Whilst I have certainly indicated that I should like to go with Paul Sherville on his proposed trip to South America, I do not feel inclined to commit myself until a more definite programme has been worked out. I anticipate having to give up quite a lot to go, and therefore I'm not rushing into anything. I hope to have more ideas by Easter as to cost, itinerary, etc., but just at the moment I feel as if I'm not sure whether I'm coming or going!

I have been looking at Paul Sherville's draft data record and would suggest, firstly, that his programme is far too ambitious for a single site. To take such a comprehensive series of investigations every three hours would surely not be necessary for each site? Variation of temperature, humidity, wind, etc during a day would be useful, but unless one did the same test every day for a year, such facts as rainfall, windspeed, etc. would not lead to any significant conclusion. I think much more could be learnt from the plant life in evidence. Care should be taken not to produce a mass of information which is not statistically significant and from which no conclusions can be drawn.

Anyway, from the positive side, I can perhaps help be loaning Paul some equipment. It may be possible to loan a portable ph meter with soil electrodes, a soil thermometer, humidity measuring device, etc. A description of the

nature of the soil in which the plants are growing would surely be of use? from J. Forrest

I am envious of our members' south american trip and hope that on their return we will have many articles and photographs in the Chileans concerning their journey. I would certainly like to see an investigation made into the soil in which the plants grow, to learn something of the countryside where they are found, the prevailing weather conditions and to discover anything about the pollinators in each area. Photographs of plants in habitat may be quite informative but are better viewed in conjunction with a photograph of the area where they grow, with some information on the terrain, such as steepness of growing site. Habitat seed would be a very desirable result from the trip and provided it was accompanied by habitat data would make an investment towards the cost of the trip decidedly worthwhile.

To look for all the cacti which grow along their proposed route will be a giant task, but I hope that they will succeed and return home with many photographs, plenty of fresh seed, and sufficient information to keep us all reading and learning for a long time to come. My best wishes to all who intend to go on this trip.

Is the proposed trip the "Chileans South American Expedition" or is it an independent venture by Paul Sherville? Now there is little enough data on Andean cacti and absolutely no-one really knows just how abundant or how rare are the vast majority of species. I suspect that there will be no mean number of candidates for the Red Book. If data can be collected relevant to the situation in the wild – distribution, rarity, need for conservation, etc., in regard to as many species as possible within the reconnaissance area, I feel sure that the World Wildlife Fund would be interested. Have you considered approaching the W.W.F. for backing?

Naturally my own personal interests relate to Lobivioid problems, mainly in south Bolivia and north Argentina. The latter is to some extent more accesible than the former and R. Kiesling has been doing quite a bit of work there. How I would like to go!

.... from R. Ferryman

Paul Sherville and I have visited the meteorological offices at Bracknell (Berks) to discuss the proposed trip to South America and possible sponsorship for making suitable site readings. While the visit was interesting it proved fruitless. The major problem surrounded the length of time we estimated spending at each location; the Met. office required a minimum of 3 to 4 months. I am concerned that there is still insufficient information on likely costs in the field and the idea of taking a lorry out with the party does not appeal to me. It would be interesting to find out from our member in Argentina the sort of vehicle he would suggest for a trip into the Andes.

.... from Dr. P. Moyna, Montevideo

I see that there is the possibility of someone from the Chileans coming to south America. I wonder if you would be interested one of these possibilities: we have several students who would be interested in doing collections, either in Uruguay or even further afield in Brazil or Argentina, either as translators, drivers, or on their own. Most of them have a certain expertise in cacti and a botanical training. The second possibility would be to do a survey of cacti in Uruguay. J am planning a survey of this sort with a Boston-based group and it could be a good idea for one of your members to join us. In principle their is very little we can offer, but we could probably hammer out something useful to all those involved.

You say that one or two members of the Chileans are travelling to Chile and Bolivia in December 1977/ January 1978. Possibly they want to visit Argentina as well, although only two months is very little for even one of these countries. It is a good time for photographing flowers and they will probably find seeds as well. In northern Argentina and Bolivia, that period is the rainy season. This is more serious in Bolivia as the roads can break up. In northern Argentina the roads are quite good, only a few are liable to be broken by avalanches or by rivers in flood:— the Quebrada de Humahuaca at Volcan and between Tres Cruces and La Quiaca; the Quebrada del Toro in Salta, and route 40 near Belen in Catamarca. But these are soon repaired. I would like to go with them on their trip through Argentina, if they do come here.

..... from R. Ferryman

Until now all discussions on the proposed trip to south america have been based on the party providing its own vehicle; therefore the possiblity of Dr. Moyna or R. Kiesling organising transport would place a new aspect on the situation. I feel, however, that the offer of the services of one of his students is a luxury that we cannot afford. In my student days it was common for colleagues to offer their services (driving, working, etc.,) in return for a place in such a party and their keep — we called them working holidays! I never got further than Greece on that basis! But obviously this needs to be sorted out, for it would be very handy to obtain the services of a "local" member on any trip; however local knowledge can only cover a limited area.

Sleeping arrangements would depend upon vehicle and party numbers but a tent or several tents would appear to me to be favourite. There are other questions which I think should be put to our members in South America. The running costs of a vehicle is going to take the bulk of any resources and thus it is essential to obtain a reasonable idea

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of the sort of costs one could expect to have to face; this would obviously include anything purchased there. Is it better to buy equipment out there, or take it with us?

Obviously consideration must be given to moving the itinerary from the original areas in the light of these offers from our members out there. It would be nice if something even more positive could be suggested to members and I look forward to hearing of progress in this direction, at Brooksby.

..... from H. Middleditch

It has already been suggested that a party travelling to South America could make notes and observations on many things besides cacti — on mineral specimens, on fauna, of possible pollinating agents, and so on. If the trip were to take place at the appropriate time, cacti may be seen out in flower. What would be the appropriate time for seeing cacti out in flower?

.... from Dr. P. Moyna

There is no specific information about pollinators on cacti in Uruguay. But, from what we have seen, the day-opening cacti flowers are pollinated by bees, butterflies, wasps, or moths. The few night-opening flowers (Cereus peruvianus) work on a more restricted number of night moths. But no-one has done any sort of work on this. But these insects are usually around from October to March/April, and it is during this period that the cacti open: Notocacti in October to December, Gymnos from November to December, and Wigginsias January to March. The pollinators usually work all over this period, except some of the wasps that live for a few weeks in early summer and some butterflies that only come out in definite periods and then disappear.

We would indeed be very keen on having a member of the Chileans come to see us, and there are several ways in which we could work this in. In our work on the chemistry of cacti, one of the main problems encountered is the very vague and even irrational taxonomy of these plants. For sorting this out we have begun to consider the possibility of making a complete acre-by-acre screening of cacti in Uruguay. This work will take a long time and a lot of people – perhaps 10 to 15 years for the whole of Uruguay. We are looking to the possibility of making a start in January. from P.H. Sherville

I agree with the comment from Roy Mottram that the business of forming the trip as a limited company involves extra funds. However, the whole point of the exercise is to enable us to take out the country sums of cash larger than the £300 per person currently allowed. It seems that there are only three ways to do this. One is to provide an invoice for goods received i.e. normal commercial trading. The second is to emigrate, but even then there are limitations and restrictions on taking your worldly wealth with you. The third is for overseas research, which is the category into which we come. This facility is only available to limited companies and not to individuals and along with this go all sorts of conditions regarding what information is published and in what form. And for some things, time is running out; for example, if we have to take a vehicle with us, the last date to book shipping space is June 24th, for October departure, December arrival.

.... from H. Middleditch

It would seem that advice on transportation, accommodation, and provisioning would be appreciated from our members in South America and information regarding costs of fuel and provisions would be equally welcome. from Dr. P. Moyna

I am very interested in the possibilities of a field trip with your members and I will give you this reply in time for your Easter meeting at Brooksby. Now Uruguay is possibly the simplest country to tackle for cacti. Climate and geography are mild, distances small, natives quite civilised. The comparison extended to Brazilian sizes, Bolivian mountains, or Paraguayan situations is mind-boggling. We are trying to make a start on our survey or Uruguayan cacti in Rocha in January 1978 and I have started to establish contacts with groups and individuals in that area. If this proposal does get under way, we would be more than glad to have any Chileans with us. Whoever comes will see lots of cacti but from a very limited range of species and from a limited area.

So a slightly different outing is possible. Cars can be rented locally for around £10 per day, plus a mileage cost, plus petrol; this last item is now around £1.50 per gallon. The best lodgings I can think of is by camping, for there are no hotels in many places where cacti are abundant. A hotel bill of some £5-8 once per week would then be much more bearable. Bringing some sort of van, like a Land-Rover, would be superb, particularly if it is diesel powered — diesel fuel is a quarter the cost of petrol. If a slower pace of travel is acceptable, the standard trains (very slow) and buses (very good) could be considered. A trip to Rocha takes some four hours by bus or eight by train, at a cost of US \$10 return by bus or about 7 by train. The problem is that you can be 30 miles from your cacti when you arrive and that is almost as bad as being 3000 miles away. Those final miles can be too many to walk and with no local buses or anything moving around. So there are many logical reasons for moving round independently in your own car or van.

Since 1968 we have used a tent by Blacks of Greenock and it would probably be better to bring a tent and sleeping bags from the U.K. Other things like butane gas cooker, crockery, and so on, can be purchased over here better. Also bring some good walking boots. Usually our underbrush is spiny and there are some not-too-nice snakes so you would

need boots to keep them at arm's length. Insects we have by the thousands, so some effecient insect repellant is a must. In December there will be some quite hot days, with temperatures going up to the upper 30's centigrade. The sun is fierce and I would strongly advise hats. And some first-class gloves. Drinking water should be O.K., but anyway we already have a number of plastic jerrycans. I would imagine that things like cameras and film could be purchased most economically at the duty-free shops on the journey. However, the customs will not be amused if you show up with 100 unused films. The standard films can be obtained and developed here. Food and other supplies can be purchased in Montevideo. You will find that meat is an ever-present item in our meals. It is possible to dine out quite well for £3 or £4 and it should be possible to eat in camp for £2 to £3 a day with quite a sensible fare. A simple continental breakfast, a short lunch, an afternoon snack and a substantial supper with beef. Make the average £4 per person per day.

Now to what you can see. Usually October-November is a better time to see the cacti. December is usually dry and grasses, soil and cacti are all in a common dusty colour. There are a number of species that are flowering in December. A few are ripening their fruits, and another lot are getting ready to blossom in February. We ourselves have been out looking for cacti mostly in the south up to now. Around Colonia there are Wigginsia, Frailea, pygmaea, Gymnocalycium, Notocactus ottonis, N. tabularis, N. concinnus, Cereus and Opuntia. To the south-east, Maldonado, Minas, Rocha, there are roughly the same species. If the North American group does accept our proposal, we will try to start that expedition in January 1978 and it will be a rather easygoing roving camp. We would be more than glad to have any Chileans with us. But your group may have an idea of covering a lot of ground rather than settling for our plodding; I think there would be no problem in the Chileans group coming at the same time as the North American group, or one month before. But at that time we would be more restricted in the help we could give — December is still our exam period. I could probably go along on some of your outings, and I imagine one of our colleagues could go with you on each trip. I think that Uruguay is small enough so that after a number of minor points have been checked, it is possible to travel at short notice. It should be possible to arrange food and lodging on the spot, so I am quite optimistic about it.

There is one problem I should mention and that is the whole "philosophy" of the excursion, where we should try and avoid disagreements. As you can imagine, we from our scientific viewpoint, and others, would be greatly dismayed if anyone came over and made a general decimation of our native Flora. It would bode ill for all if someone came over with the idea of taking back enough plants to cover all expenses. That might be possible for one or two visitors, but definitely not for 6 or 10. We have had more than ample instances of the smart "white father" coming over, trundling off with all that was any use while the "natives" don't even receive acknowledgement of having climbed the hills and hacked out the rough parts. Like Queen Victoria, "we are not amused". If anyone comes with the idea of paying £1000 for fares, food, and lodging and going back with a clear £1000 worth of cacti, that would be inviting disaster. He could miss them — we have done so by 20 yards. They could rot — they do so in transit. Or they could realise less than the amount hoped for. He might even be tempted to try to play something underhand on the locals, and that way much would be lost and nothing gained. It is perhaps best to mention this in order to avoid false expectations and ideas.

Many of the questions raised may be clearer now. The main problem will be moving round, so transport is the first point to clear. Logistics should be simple for the group will not be too large. I hope this will be of use to you at your Brooksby meeting.

.... further from R. Ferryman

I would have thought that the answer to John Hopkin's question whether this trip is to be called a "Chileans Expedition" depends very much on the outcome of Brooksby i.e. if enough members commit themselves or their support to the trip. For my part I doubt very much if I would join the trip unless Kiesling is accompanying the party in northern Argentina. The time schedule for this trip will not allow many days of wasteful searching, so that the participation of some one who knows the actual plant habitats is absolutely essential. It is one thing to know the general location of a certain plant, but another to know exactly where it grows. This last point was brought home to me on reading a book dealing with the Flora of Suffolk, which quoted a certain plant "grows in the Stour valley". To most Chileans, this information conveys very little, but to me it means mile after mile of open countryside near my home: I would still have no idea whereabouts precisely to start looking for this particular plant.

.... from H. Schlosser, Montevideo

Normally February is a very dry midsummer month, but this last February had so abnormal weather we did not know what to do. We had 18 days of rain which added up to 350 mm which is about a third of the yearly average. The damage was very high. A large number of the cacti which I had outdoors rotted, mainly one year old seedlings. Also in the habitat (habit? – H.M.) of some kinds I could see later on that here and there plants were rotten. If some cactophiles want to visit Uruguay to look for cacti, October and November are better than January, which is very hot; flowering time is October/ November at least for most specimens like Notocactus. They should let me know about their trip with as much notice as possible, so that I can offer help and advice.

(We did not hear from our member in Buenos Aires in time for our Spring meeting at Brooksby).

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QUERIES and COMMENTS from MEMBERS

.... from K. Halstead

May I correct an error in Chileans No. 30 p. 117? My comment on Notocactus horstii should read "The flower sizes are approx. 4 cms diam., give or take ½ cm".

.... from D.W. Whiteley

I am trying to complete a collection of original descriptions of Neoporterianae as a first step to sorting out these plants. I can usually manage to get the Latin translated O.K. but as this is usually short it is not often a great deal of help; the lingua barbara sections of the original description are usually written by the same author and are a considerable amplification on the minimal Latin description provided just to effect valid publication. I can supply typewritten copies of the many original descriptions by Ritter which appeared in Succulenta and are in Dutch, to anyone who would be prepared to translate them.

In order to pursue my studies comparing Austrocactus, Pyrrhocactus, and Acanthocalycium, I would like to request complete Pyrrhocactus flowers; even slices or slides of flower sections on loan would be of help. I have sent complete flowers through the post in tubes. I would turn the flower upside down in the tube and trickle sawdust round the outside and then turn it right way up and trickle sawdust down inside the flower and tube. This held the flower firmly in the open position, and by using fresh sawdust this kept the flower moist. They always arrived in good order. from R. Senior (Cornwall)

Last year I put out a bed of Notocacti and they have done very well through the winter in the open. This summer I will have to bed out some Cleistocactus straussii, and C. hyalacanthus; Weberbauerocereus rauhii, winterianus, and weberbauerii are all trying to escape from the top of the greenhouse. I will build a bed under a balcony which will give them 11 feet of headroom and protection from vertical rain but they will take some of our 35" per annum and will not have any extra heating other than the house behind them. I imagine that they will have to take no more than 5 or 6° F of frost. Do you have any information on the "hardness" of Weberbauerosereus sp.? I cannot get much from Backeberg on this aspect.

.... from Mrs. L.E. MacIntosh

Must tell you that last year I started a pollen bank. I have experimented with pollen 12 months old and seed has set in every case. The pollen is kept in gelatine capsules and wintered in my linen cupboard. This is good to know of, for I will not need to hold more than 2 plants, which gives me bench space for more varieties. from H. Ewald

Although I have two or three plants of many species for seed production purposes, quite often the flowers come out at different times on the two plants. So I have tried taking pollen and keeping it until the other plant flowers; the local butcher is very co-operative and puts it into his freezer for me.

..... from Biology, Its principles and implications, Garrett Hardin.

Wind-pollinated plants typically produce large quantities of pollen, as they must if the probability of pollination by such a non-directional means is to be made sufficiently great. The shores of lakes in regions of conifers will at times have a visible window of wasted pollen grains. In some waters, particularly acid waters, pollen grains frequently survive for long periods of time. Since it is usually possible to recognise the genus (and sometimes the species) of the plant that produced the pollen, examination of pollen deposits in old lake bottoms tells us what plants flourished in the past.

.... from D. Helm, K.u.a.S. 8/76 Gesellschaftsnachrichten

In private collections there are to be found mostly only single examples of the rarer and "better" species, which do not become fertilised on account of their self-sterility. But it is just these species where propagation is of greatest importance. The problem is indeed to seek out a second plant of the species as pollen donor. Some initiatives by cactophiles, be it announcements in the specialist journals or by means of personal enquiry to other collectors, only rarely produces the hoped-for result. Extensive organisations such as the D.K.G. must undertake this service, for the purpose of establishing a "Central Pollen Exchange". The set-up should function thus: anyone interested submits their request and offer to the "Central" and notifies at the same time at what date the pollen will probably be required, or be available. In the Society bulletin of the K.u.a.S. they will be published at the proper time beforehand, for which species pollen is sought and for which it may be exchanged. The "Central" arranges between those interested, where it matches up the plants involved. Those interested parties must then agree over the despatch of the pollen and the terms of the exchange. Questions will arise for example over an exchange of pollen against refund of postage or against a proportion of the resulting seeds.

Although pollen should be viable for some days in a refrigerator, the most practicable prompt mode of conveyance is recommended, such as by express messenger or airmail. In the event of the pollen not being needed immediately, it can be preserved in the refrigerator up to the flowering time.

STUDY GROUPS/REFERENCE COLLECTIONS

T. Lavender, 62 Finchdale Avenue, Billingham, Cleveland, TS23 2EB.
E.W. Bentley, Northside, Crosspark Hill, Oakford, Tiverton, Devon.
J. Forrest, Beechfield House, Meikle Earnock Road, Hamilton, Scotland.
G.J. Swales, 5 Hillcrest, Middle Herrington, Sunderland, Tyne & Wear.
J. Hopkins, Primrose Cottage, Monks Lane, Audlem, Cheshire, CW3 0HP.
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Membership Secretary and

Orangiser

Treasurer

Back Numbers Seed Exchange

Slide Librarian

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