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ON CACTUS-SAFARI IN BRAZIL - 2

(Translated from Succulenta, February 1967)

Mhr. Buining, President of the Dutch Cactus Society, writes from South America:-

On Monday November 21st, our extensive trip towards the north of Brazil from the state of Rio Grande do Sul began. On Wednesday morning we came to Ponta Grossa in the state of Parana, where we visited the family of Dr. H. Meyer. He is the owner of the Hacienda O'Recanto, about 15 Km. to the north of Ponta Grossa.

They have a most extensive property and we hoped to find some particular cactus there. The hacienda lies about 1,000 metres (3,300 ft.) above sea level, and the nights were deliciously cool. Through Dr. Meyer, my friend Heer Horst from Arroio de Seca and I, were already in communication with a Dutchman, Heer Biersteker, who lives at the Dutch colony of Carambei. With him, we drove towards a very rocky region and soon found a new Notocactus which is probably allied in some measure with Notocactus ottonis.

This enormous rocky terrain descends in terraces towards one of the many rivers, in which little waterfalls frequently appear.

Under a brilliant hot sun, we struck out on foot, heavily laden with cameras and rucksacks for carrying plants. For about three hours we wandered round in this extraordinarily interesting region, where we fortunately saw no snakes, although we did meet an enormous iguana about 75cm. in length. In the course of the coming months I will describe the new Notocactus, it will probably be named Notocactus carambeiense. It grew upon ground of pure sandstone and also among the bushes and plants nearer the stream where eddying flood-waters had dropped sandstone in the form of quartz, between the vegetation. These plants grew here in the midst of, amongst others, Tillandsia, Bromelias and, occasionally, very short, thick, columnar Rhipsalis. We gathered many plants and seeds.

We went the following day, under the leadership of Dr. Meyer, to examine the so-called gallery-forests along the River Pitangi, which forms the boundary between his property and that of his neighbour. Gallery forests are strips of virgin forest which have become established along the rivers over the course of centuries. These rivers have frequently cut themselves deep channels in the sandstone ranges, so that real ravines are formed with vertical walls frequently more than 100 m. deep. In this dense virgin forest, through which we had to clear a way with the aid of large sharp chopping knives, great quantities of Rhipsalis grow, over old dead trees and on those partly fallen over the river, hanging down in great bundles full of fruit berries. These trees are also frequently densely overgrown with orchids and splendid ferns.

As I was saying, we cut our way with difficulty through the exceedingly dense growth of lianas, frequently with horrible thorns, dense bunches of bamboo, and so forth. At one particular point we could cross over the river by a waterfall, but to reach a certain cliff-formation we were faced with an almost vertical wall. With great care we slowly climbed this

wall over small protruding ledges, each footstep precisely considered and tested. On the one hand was a vertical wall, heavily overgrown, dropping to the river at the bottom, and on the other hand the moisture dripping cliff wall covered with slippery green mosses and algae, and splendid ferns. With great difficulty we succeeded in reaching the plateau and from thence, the rocky spot where Dr. Meyer thought there might be cacti, although he had not found any.

Before long friend Horst gave a shout, and he too had found a group of Notocactus carambeiense upon the Hacienda O'Recanto. We found the handsome red-spined species again and again quite nearby. It was noticeable that they grew largely in termite heaps. These groups of small termite hills consisted of a type of dark peaty soil, of which Dr. Meyer estimated the acidity to be about pH 4.

I hope I can elucidate all the information acquired later with the aid of the many slides I took. Unfortunately, I had further film undeveloped, so that this work must wait until I am back again in Holland about mid-February.

These two days were unforgettable, as were so many in Brazil.

Today we travelled via Curitiba to Sao Paulo, so that we may go from there, via Bello Horizonte, to the wild mountainous region of Diamantina and farther. Provided the weather and the car do not let us down, we hope to cross the Rio do San Francisco near Petrolina. Close to Petrolina the famous Cephalocereus dybowskii is said to grow. Everywhere here the soil is full of holes which the armadillo digs in the night for roots and so on. For two days we have happily seen not a single snake.

(To be concluded)

TOPOGRAPHY AND CLIMATE

The region traversed by Mhr. Buining in the journeys described in his three letters, is part of the eastern highlands of Brazil. This is a very extensive elevated region with a base of ancient crystalline rocks. Covering these crystalline rocks, especially in the interior, is a mantle of younger stratified rock formations.

In the rainy tropics, the granites and gneisses of the ancient basal rocks are speedily decomposed and acquire a covering of soil, forming hills with a distinctively rounded outline. The stratified rocks, chiefly sandstones, are much more resistant to erosion than the crystalline rocks. They have weathered into tabular plateaus with steeply scarped margins, generally standing higher than the rolling, verdure covered hills. Vegetation is adversely affected on these highly porous formations, so we have the 'Bald bizarre heads towering above the forest covered rolling hills' which Mhr. Buining describes. He tells us that most of the cacti were on these sandstone mountain tops.

Sandwiched between the layers of sandstone and other strata, sheets of dark coloured igneous lava are found in southern Brazil - and small patches elsewhere in eastern Brazil. This material is particularly resistant to weathering, and the edges of the lava sheet stand out prominently as cuestas - lines of steep cliffs. Waterfalls, great and small, form where rivers plunge over the edge of these lava beds. Mhr. Buining describes the 'terrace' effect of thin lava beds and the many waterfalls which these form on the rivers. The Parana plateau in

Southern Brazil - the region covered by Mhr. Buining's first two letters - is a large accumulation built up by successive lava flows; there are, however, no volcanic peaks in this region.

Mhr Buining describes vividly the richness of the thick jungle he traversed during the first half of his journey. In the latter part of his trip, he will refer to the preponderant thornbush and cactus vegetation established on similar soils, despite the violence of the rains which so affected some roads that they had to make an alteration in their route.

This apparent contradiction in rainfall and vegetation arises from the annual distribution of rainfall determined by the climatic controls affecting this region. In winter an anticyclone (area of high barometric pressure) covers all but the southern end of the eastern highlands of Brazil. An anticyclone brings drying winds so that, during the winter, little rain falls on the Brazilian highlands, away from the coast. At the same time, the southern part of Brazil and adjacent parts of Paraguay, Argentine and Uruguay, are visited by weak atmospheric disturbances which bring rain. Very approximately, a line drawn east-west from the Argentine-Bolivia border, through the middle of Paraguay, to Rio de Janeiro, divides the country with a dry winter from that having a damp winter.

After the southern winter, the sun travels southwards over Brazil, followed by the North Atlantic Trade winds. At the same time, the anticyclone over Brazil retreats towards the South Atlantic, leaving a corridor between it and the Andes about half the width of the continent. Usually, in September, the North Atlantic Trade winds sweep in from the Caribbean through this corridor, turning from N.E. to N.W. (due to the rotation of the earth) as they pass the equator. By October, they have brought rain to the interior parts of the Brazilian highlands, and by about November, to the parts nearer the coast - where Mhr. Buining had to make his diversion. In April, the Trade winds usually cease, and the rainy season is over. North of the latitude of Rio, the cacti in the Brazilian highlands will be back to their eight or nine month's dry spell.

The high summer sun over the low, flat, inland plain of the Gran Chaco develops an intense low pressure system (cyclone) which draws in the moist South east Trades from the South Atlantic, the North Atlantic Trades which have already crossed the north of the continent, and irregular surges of cool sub-antarctic air which have broken off northwards through the land corridor in the eastern shadow of the Andes. The interaction of these very different air masses over south-east Brazil and adjacent territories produces the irregular summer rains, similar to the weather-front rains in Western Europe. As Mhr. Buining notes, the arrival of cloud (which would be associated with a cold front) brought several days of torrential rain. The south-east of Brazil thus receives rain in both summer and winter, spread more or less through the year.

The same latitude that roughly divides the region of summer aridity from that with a more even annual rainfall, also forms the division between more or less regular occasional night frosts and the southern limit of substantially frost free climate. This division is represented by a change in the natural vegetation - the subtropical forest, formed of species which cannot withstand frost, becomes Araucarian or Parana pine forest and the short grass.

Travelling northwards from southemmost Brazil, one passes from a region which enjoys an all-year-round rainfall and occasional night frosts in winter, to one with distinct winter aridity and quite frost free. This change is reflected, not only in the general vegetation, but also in the cacti - not just in the species, but in the genera. This may be seen more readily by reading Werdermann's "Brazil and its Columnar Cacti" in conjunction with the letters from Mhr. Buining.

It will be evident that Melocactus and Cephalocereus do not occur outside the frost free winter drought region (i.e. they will not accept either air or ground temperatures under 32°F and would probably be unhappy in cultivation if they had to face dampness at a temperature not far above freezing). Where the rainfall is spread round the year, but the porosity of the soil modifies the vegetation, we find Notocactus, Malacocarpus, Frailea and outlying examples of Gymnocalycium.

H. Middleditch

SEED RAISING

Most collectors of cacti will have tried their hand at raising plants from seed, at some time or other. First attempts are often outstanding failures or a huge success. Once a fair range of species have been raised, or two or three seasons of seed sowing have passed, a fairly reliable system of raising seed has usually been established and it becomes possible to recognise variations in germination which are due to peculiarities of the seed, rather than the vagaries of one's method of cultivation.

Sowing seed straight from a well-ripened fruit off a plant in one's own collection commonly results in both rapid and a high percentage of germination. In the light of this experience, poor germination from bought-in seed is commonly attributed to the seed not being fresh. However, this may not always be the case, as the following observations on the germination characteristics of the seeds from a wide range of xerophytic plants (adapted from "Life in Deserts" by J. L. Cloudsley-Thompson & M. J. Chadwick) might suggest.

"In the adverse and unreliable desert environment, the stage of seed propagation is one of those points in the life-cycle of a plant that determines the degree of success of the species and establishes which plants will thrive and which others, through lack of sufficient adaption, will disappear. Many diverse mechanisms are adopted by nature to effect dispersal of seeds of desert plants and enhance their chance of securing a suitable location for survival. Nevertheless, it is probably the species' germination characteristics which determine most effectively the success of seedling establishment.

"If all the seed, produced annually by many desert growing plants, germinated promptly, not only would considerable wastage of resources take place, but also, owing to the vagaries of the desert environment, reproduction would be by no means certain. Few species can afford such a hit-or-miss approach to the problem of survival and nature reduces this waste by two means. One way is by equipping the seed with a mechanism which will give germinable seeds over a period of time. This delaying action thus gives 'dispersal in time'. The second way is by equipping the seed with mechanisms which only allow germination to take place when ecological conditions are such that successful germination and establishment will occur.

"The germination of any seed is determined by a number of factors both inherent and external. Factors inherent in the seed include maturity of the embryo, permeability of the seed-coat and presence or absence of inhibitors. External factors affecting germination include temperature, moisture level, illumination, oxygen level and the level of other gases and, in special cases, many other factors.

"The effect of moisture on germination is often of relevance to the whole future of the plant. Germination often reacts to moisture conditions in such a way that it is restricted to those habitats with moisture conditions which will be suitable for the whole subsequent growth and development of the plant. But seed germination is not necessarily ensured by a mere supply of moisture.

"Tests carried out on seeds of desert plants have shown that seeds of many species require a certain temperature, or specific day and night temperatures, before germination will occur. In some seeds a temperature in excess of 20°C (68°F) is required; a few have an optimum germination temperature in excess of 30°C (104°F), whilst others have their highest germination percentage at under 15°C (59°F) under short day conditions - 8 hours light, 16 hours darkness.

"Some seeds are able to germinate immediately after shedding if external conditions for germination are suitable. Seeds of other species, however, require a period of after-ripening to overcome dormancy, mechanical resistance of the seed coat, or seed coat impermeability. This dormancy is often due to immaturity of the embryo and if low temperatures are applied, this after-ripening takes place very quickly e.g. it can result in the embryo in the seed changing from an undifferentiated mass of cells into a differentiated embryo.

"A common cause of germination delay is to be found in seed coat impermeability. This can be overcome in cultivation by scarification with some abrasive, or sulphuric acid treatment. In the wild, the seed coat evidently becomes modified as the seeds age and gradually seed capable of germination is produced, over a period of time.

"Some seeds with impermeable coats have a micropylar opening (in the flattened portion of the seed) which is usually initially plugged. When this 'plug' is loosened or removed, water may gain access to the embryo. It is possible that in its natural environment, continuous impactation by sand particles, high temperatures, or diurnal temperature variations together with accompanying changes in relative humidity, may all contribute to an increase in seed permeability.

"Another attribute found in desert plants, to ensure germination over a period of time, is the possession of two (or more) types of seed which differ in their germination responses. Some desert plants produce seeds which differ in colour and size within the same species - the phenomena being called morphological heterocarpy.

"Light coloured seeds usually have water permeable seed coats and germinate freely; seeds which are darker in colour have impermeable seed coats and do not germinate easily when first shed from the parent plant; they may take a year or longer to become permeable, but all do not reach the condition together. At least one desert plant has seeds which take 5 years to become permeable.

"The seeds which take some time to mature remain viable for many years; those which will germinate immediately after being shed lose their viability rapidly in storage.

"Other desert species exhibit staggered seed germination arising from a slightly different phenomena. The distal seed in the pod germinates first, the proximal seed doing so in later years.

"The mechanism for staggering germination is not uncommon in desert plants; by providing seeds readily capable of germination combined with dormant but viable seed which provide material for subsequent attempts at establishment. In this way 'dispersal in time' is affected".

It is enlightening to compare this authoritative work with the experience of our own members. E.W.Barnes comments on seed germination: "I have found some seeds germinate better if kept for a while - but not as long as our Czech author (Chileans No.4) suggests, as my storage conditions are not too good. I have tried on various occasions to germinate fresh seeds from one of my Melocacti (M. macrocanthus cross pollinated with M. macrocanthus f. Linkii), but I have had no success. However, seeds from an old dried up fruit that I discovered in the cephalium germinated within a few days. Conversely, Frailea seeds seem to germinate better if sown fresh. I sow mine directly out of the seed pod ! I look at the pod every day and if it is hard and of a shiny green colour, the seeds are unripe. But as soon as the pod begins to yellow and when rubbed between the fingers a grating is felt, the seeds are ripe. I don't wait until the pod bursts ! If the pod seems slow to ripen I make a slit down one side of it, exposing some of the seeds. This accelerates the ripening process, at the expence of a few seeds which are in the vicinity of the incision.

"The only seed I have ever tried cooling has been Maihuenia sp. If the seeds have very hard coats - such as Eriosyce - I soak them in water overnight and then rub one side of each seed with a piece of emery paper before sowing. This is the only form of pre-sowing treatment I give any of my seeds.

"I have had a number of batches of seed which germinated at intervals. The strangest occurrence was with a tray containing 1,000 Eriocereus bonplandii. About 300 germinated and after four months I transplanted them. I used the sandy seed compost from the germinating tray, mixed with some leafmould, as compost for three seeds of Mango magnilifera indica; these need plenty of water for germination, which they received. One seed germinated successfully, together with about twenty E. bonplandii. The compost was soaked every day and yet the Eriocereus germinated. I am wondering how many more would have germinated late, if they had all been close to the surface rather than being mixed in the body of the compost.

"I have noticed many times the different colours in one batch of seeds of the same species, but have never taken the trouble to check how each germinated. I will try a small amount this spring with some light and some dark coloured seeds sown in separate pots. I have noticed, however, that when a seed pod is opened, any seeds that are not quite ripe never seem to attain the colour of the pod-ripened seeds, but always stay lighter in colour".

K.H. Halstead comments that "I have never noticed any different coloured seeds in the fruit, mainly because I have never looked for it, but I will watch out in future and should I come across any, it may be interesting to sow the respective colour seeds in separate parts of the seed pan and note their different reactions.

"The practice with hard seeds, very often, is to freeze them in, say, a refrigerator, for a day or two before sowing. This helps to crack the outer casing and enable the embryo to germinate. I was told of this procedure by Tookey of Hurstmonceaux, Sussex and he always had to freeze the seeds from his Sclerocactus whipplei before they would germinate. In fact, he left his plants in a shed during freezing conditions to simulate the habitat of the Sclerocactus and this enabled him to obtain a good reaction from their seeds. I recollect sowing some of this species once, but they failed to germinate; this was because I ignored Tookey's good advice".

R.Moreton says "Some seeds certainly need cooling. Ones that come to mind are Maihuenia, Utahia, Sclerocactus. I have never tried abrading seeds, but I know that I never get much success with Eriosyce, so maybe that is why (it would look like that, judging by the

preceding contributions. H.M.) The colour of seeds is often affected by the juice in the fruit, so that seeds can vary between quite pale and dark brown. This is certainly the case with the brown seeded Mammillarias".

G.E.H. Bailey tells us that "I use J.I. seelding compost plus one third silver sand, in 2" square pots, with covers of perspex and one layer of paper. These stand in trays and are watered from below en masse, draining off the excess after the water has risen to the top in the pots. I have tried quite a few species of Neoporteria and have had fair success with all except Reicheocactus. Of the Chileorebutia, I have had germination with aerocarpa v. fulva, mitis (glabrescens), and napina. Some species germinate very well - for example N. chilensis v. australis and v. borealis, Horridocactus tuberisulcatus, Neoporteria minor (U 653), nigrihorrida and subgibbosa. This last shows very interesting variation of spines and vigour".

Mrs Y. Allingham says that "As regards special equipment (for seed raising) like propagating boxes etc., I have none. My seeds are sown in individual plastic pots, as mixing different varieties in one pan makes it complicated due to different rates of germination. As long as you have the right humidity and heat, I don't think the media in which you grow matters as long as it is sterilized. I use J.I. seed compost mixed sometimes with vermiculite. When seeds germinate I keep them in shade throughout the first summer. I tried leaving some exposed to strong light once and they were a sorry sight'.

"As soon as seeds germinate it is important not to let them dry out. I spray them (with a little plastic handspray from Woolworths) and never actually water them. I have had success with Copiapoas and Neoporteria senilis and multicolor. The Neoporterias are now three years old, a good half inch diameter, and when I transplanted them last summer they had lovely fleshy roots. The seeds were from Winter and germinated well".

Miss E.M. Colley tells us that her "methods of seed raising are rather hit or miss; I sow my seeds in plastic seed pans at the end of April or early May, soak them from below and stand them in trays in the sun, keeping a little moisture in each. I cover the pans with glass and at first a sheet of newspaper also, then - when a fair number of seedlings have germinated - I prop up the glass so that air can get in and gradually replace the newspaper with first a double layer of buttermuslin and then a single one. I think that, in my anxiety not to let them dry out, I keep them too moist, especially when I am away from home and I seem to get a lot of moss and algae.

"It is hard to say which sources of seed give me the best results, as I feel that failure is often my fault, but I have had good results from I.T.T.S., Abbey Brook, and D.W. Sargent. Species raised successfully include N. Jussieui, hankeana, and paucicostata v. viridis, and Copiapoa marginata.

"I certainly find that seeds of the globular euphoribias and opuntias need to be filed before sowing or I get no germination, but I feel more may be needed as the germination is still small. I would like some information on this".

I suspect many of us may echo this last sentiment. Any further comments on the various points covered in this article would be welcome.

Backeberg gives the habitat of Maihuenia as the High Cordillera (Andes) of Southern Chile and adjacent parts of Argentina. From the preceding article dealing with the climatic characteristics of this region, it will be evident that night frosts are quite severe in winter

during which time the seeds will presumably be dormant. At lower altitudes and northwards the winter frosts will be less severe, so one might expect other species with less harsh winter conditions would germinate without pre-cooling of the seeds - such as the Oreocereus and Sulcorebutia which are found at over 13,000 ft. in places.

STOP PRESS: E.W. Barnes writes that he has sown some Eriosyce ceratistes without any pre-treatment and that these have germinated.

COLLECTING NEOPORTERIANAE - 2

P. Beeston, Wellington, New Zealand.

In our house both my wife and I are cactus cranks and our collection is quite mixed, but with a strong leaning towards South American plants.

When we first started we had mainly Mammillarias, gradually adding to these with Notocactus, Lobivias, Echinopsis, Ferocactus and Thelocactus. Many of our original plants have been either given away or planted outside. I get most pleasure from acquiring small seedlings and growing them to flowering size. Until now we have had only a small 9' x 6' glasshouse, but I am now extending it. I had hoped to get it finished over Easter, but the weather hasn't co-operated so far.

During the last few years our collection of plants like Copiapoa, Neoporteria, Pyrrhocactus, Matucana, Parodia, and Arequipa has grown steadily and we are now starting on Neochilenia and Chileorebutia, but only have four or five of these so far. I would be quite happy to have a glasshouse full of Copiapoa and other Chilean cacti. We keep our Chilean plants in a sunny position and have so far flowered three of our Copiapoas and quite a number of Pyrrhocactus and Neoporteria; we have Matucana in bud for the first time at present. In previous years one Matucana has been in bud, but the bud has not developed; this year's buds are quite well advanced so we hope for some luck this time.

The roof of our glasshouse is Novaroof (a semi-transparent plastic) with glass for the side windows. In summer we open all the windows and only close them at night: even with the windows open the temperature can go over 100° during the day and keeps a steady 70° at night. In the winter we keep the windows open during the day, except in the very wet and windy weather which we sometimes get here; the temperature is usually around 60°, dropping to 48° at night except during the southerlies when it gets much colder.

We live on elevated ground about 100 ft. above sea level and we are only about $\frac{3}{4}$ mile from the beach, so our plants get quite a bit of salty breeze which doesn't seem to worry them. Our soil is made up from about one part good soil, one part peat and two parts gravel which I get from the beach. I do not wash the gravel but use it just as it is and it does not seem to have done the plants any harm, although we are always told over here to use only river gravel. Of course, we add bone meal and charcoal.

I keep the plants growing all the year round though slowing them down considerably in winter. This is only possible because we get very few frosts and we have never lost plants by doing this as long as the plants are well ventilated. I start spraying the plants in spring

(September) and start watering once a week or ten days depending on the weather and, as summer comes (December) keep up watering - in the height of summer I water at least twice a week. From autumn (March) I start to slow down on water to once a week and stop spraying. Even during the winter I still give a little water, not letting them get bone dry. The only month I don't water is late July to early August.

I missed out on flowering the Neoporterias last year through shifting the plants while they were in bud, and they did not flower as well as usual. We did have blooms on Neochilenia chilensis, P. taltalensis, P. pulchellus, P. tuberisulcatus, N. jussieui, and Copiapoa intermedia. At present I have about 17 Copiapoas, some of which have flowered. Incidentally, all our plants are in plastic pots.

I have given this information about how I grow these plants, but conditions differ a great deal throughout New Zealand and only a few miles away people would have to treat their plants quite differently. A friend only about 150 ft. up the hill from me with an all glass greenhouse burnt his plants very badly just a few weeks ago through not giving them enough ventilation and shading, although another about ten miles away who has a similar glasshouse does not shade at all and gets very good growth and flowering. A lot of the difference is probably in the ventilation.

..... from P. Locuty, Thoune, Switzerland.

I have been collecting cactus plants for twenty years, my specialities being chiefly the Peruvian and Chilean types. For many years, I have been pursuing systematic researches to determine what would be the best conditions allowing the culture of the said plants on their own roots, in conditions as close as possible to nature. I have obtained excellent results by controlling on the one hand the pH, and on the other, the composition of the soil.

My soil is essentially free of chalk ($CaCO_3$), being a mixture of tile debris and decomposed peat soil. The debris I find, quite easily, in the tile works in the form of a kind of sand, the dimension of the crushed debris being about 1 to 5 mm.

The pH value of the soil is maintained between 5 and 6 by adding to the water (rainwater only) a solution (5 c.c. per litre) on the base of phosphate and nitrate, of which the composition is as follows:-

200g of Sodium phosphate (Na_2HPO_4)

100g of Ammonium nitrate (NH_4NO_3)

The pH value of this solution is regulated to 4.5 by adding some phosphoric acid (H_3PO_4).

I add 5 c.c./litre of this buffer solution to the water, just once a week and only during the growing season i.e. from April till September.

As to pots, I use rectangular aluminium receptacles which I make myself, the dimensions being standard with heights between 8 - 16 cm. and width between 6 - 25 cm., at intervals of 2 to 4 cm. The body is glued with an organic glue - such as Araldite - and the bottom is simply

obtained by turning down the borders, thus leaving a passage for the water. The resistance to corrosion of this kind of container is excellent. I have been using them for ten years and up to now they have always been perfectly satisfactory.

I am more interested in the culture of the plants themselves than in the questions of nomenclature. My aim is to have the plants growing perfectly upon their own roots, to flower them and to obtain seeds, all so they resemble as much as possible the imported plants.

At the moment there is a veritable explosion of flowers amongst all the Chileans I am collecting. In fact I possess several hundreds of Copiapoa, Eriosyce, Eulychnia, and especially Matucana and Oroya. I presume, after all, that the very interesting results I obtained this year may be attributed to the kind of greenhouse I had constructed at the end of last year. It is made up entirely out of transparent hard P.V.C. and lets through practically all the light. My greenhouse is, in fact, constructed only with sheets of 6 metres (not quite 20 ft.) in length which are bent to the ground by aluminium bars.

If any of your members spend their holidays in Switzerland, I should be most happy to show my collection and give an idea of what results my experience in growing Chilean plants upon their own roots have led.

..... and from other subscribers

During a visit to the Abbey Brook nursery at Sheffield, B.Fearn commented upon the rather sluggish rate of growth exhibited by Neochilenia paucicostata in comparison with N. paucicostata v. viridis. H. Middleditch finds his own pair of these plants, grafted on like stock, exhibit similar comparative characteristics. W.T. Holton has a N. paucicostata which had a clear green epidermis when grown down on the staging, but on placing it up close to the glass the body turned a pinky violet colour. D.W.Whiteley has a small seedling of N.paucicostata v. viridis, which is not very close to the glass but has a bright violet coloured body; he also has some seeds sown of N. paucicostata atropurpurea which would suggest a purplish coloured body (should one change the label with a change of body colour ? - H.M.)

D.W. Whiteley also tells us that "I believe that the plant Neochilenia woutersiana which is stated in the Chileans No.2 p.5 to have appeared under the title B.A.W.3 should more correctly be referred to the number A.W.III. My plant is now growing well on its graft and has produced some very attractive spines, jet-black in colour with no signs (at the moment) of turning grey. The body is a very deep and dark green which, when contrasted with the black spines, produces a very handsome looking plant indeed". W. Welsh tells us that his N. woutersiana is now forming buds. We look forward to hearing if the flower proves to be dioiceous, as Backeberg suggests. Backeberg also describes the spines as greyish black with darker rings, although this characteristic may only be observable in mature specimens. We have available the full description (in English) of this plant, which Backeberg named Delaetia woutersiana.

At the National Show we were shown some plants grown from seed by R. Davison; these were four years from seed and were in excellent condition. One plant was over 2" across and appeared to be Paucicostata v. viridis, another - rather larger - was thought to be N.

subgibbosa. Yet another had reached over 3" diameter, was flattened globular, a very deep green epidermis with an infusion of dark bottle green, about 16 ribs formed into typical neoporterianae chins. The areoles were about 1.5 to 2 cm. apart, each having about seven central spines about 1 cm. long, one of these standing erect and the rest leaning out around it, greyish in colour; radials 14 to 16, pale in colour and from one upper areole appeared a brilliant green bud, devoid of hair or bristles, about 7 mm. long. (I have a similar looking plant with a rather more reddish infusion into the body colour - also un-named. H.M.) This plant was raised from mixed seed from Fearn and the nearest positive suggestion for a name was Horridocactus de Illapel - any suggestions for a name will be welcomed.

We were informed that these plants had all been grown in a soil of three parts J. Innes No. 1 to two parts Bedford sand. They receive fairly regular spraying, in the evening when the sun is high, and in the morning in order to dry out before nightfall in colder months.

SULCOREBUTIAS - In cultivation and habitat

Following the contribution on Sulcorebutia in The Chileans No.5, E.W. Barnes tells us that he "is quite surprised that R. Hollingsbee has had difficulty in rooting Sulcorebutia cuttings. With me, they root quite well - I just throw a few cuttings in an empty plastic seed tray in one corner of the greenhouse and wait until rootlets form (from 6 to 8 weeks, in general) and then pot them up in a sandy mixture.

"Of course I keep them shaded until they have become turgid again. But I have noticed that cuttings with large cut surfaces sometimes fail to root. I find that offsets about 3/8" to 1/2" in diameter root best. Those with a narrow neck root much better than those with a wide neck which goes concave when it dries off.

" I agree with J.D. Donald, Sulcorebutias do exhibit polymorphism to a great extent. This is quickly noted in collected plants, but I find that plants grown in full sun compared with those grown in shade differ in length of spines and in body colour. Also, those grown in shade have duller coloured spines. This is only to be expected however. (Because of the natural amount of strong sun and ultra-violet light the plats receive at high altitude in habitat ? - H.M.) If the plants are grafted, the stocks seem to have some influence over the length and colour of the spines, perhaps more so than many other genera.

"Sulcorebutia seem to grow readily from seed, particularly S. tunarensis. I have five species in my propagator this spring - also seed from my own plants of S. steinbachii v. gracilior, ex Uhlig, collected".

H. Middleditch reports three buds appearing on a grafted S. sucrensis which is only $\frac{1}{2}$" in diameter; the buds are a deep red, almost maroon, in colour. S. Tunariensis and S. kruegerii are both producing new spines at the crown which are standing up well proud of the body. On S. tunariensis the new spines are orangy-yellow at the base, shading to chocolate-brown towards the tip. On S. kruegerii, the new spines are pinky-brown at the base, deep brown at mid-length and a lighter fawn colour at the tip.

Mrs. J. Mullard tells The Chileans that she now has fourteen species or varieties of Sulcorebutia, all but five being on their own roots. Seven of those on their own roots have now flowered. S. kruegerii had a flower which shaded from yellow, through brown, to red. (This compares well with Backeberg's description of yellow-gold to orange'), S. weigartiana had fawn-yellow flowers. A grafted plant of S. steinbachii has produced flowers of a dark mauve-red, the buds being a deep maroon colour; another plant, on its own roots, is in bud this year. (Backeberg describes the flowers on this species as scarlet red). S. steinbachii v. gracilior is an imported plant, ex Uhlig, in 1965, with two quite large heads, to which a further six have since been added. The flower was similar to S. steinbachii but smaller. S. tunariensis has a very long tap root indeed; it has maroon buds and a dull brick-red flower. (This would not appear to match the description of the flower from Backeberg, who quotes outer petals of purple orange and inner petals of deep red, shading to golden-yellow at their roots). S. glomeriseta has yellow buds - Backeberg gives the flowers as yellow and illustrates the plant in his Lexicon - Abb. 358.

S. tiraquensis has had mauve flowers; there is a colour illustration of this one also in Backeberg's Lexicon, Abb 405. One of these plants was entered in the National Show, contrary to the Schedule. It was nearly 3" across, globular, producing numerous pups from the base. The central spines were much longer than those illustrated in the Lexicon, being some 1" to $1\frac{1}{4}$" long, thin, curved slightly inwards on the crown and slightly upwards elsewhere on the body; they were chocolate brown in colour. There were well over a dozen buds and flowers on the plant, these being a mauve colour rather like Rebutia violaciflora.

M. Gilbert also "finds I have no great difficulty in rooting Sulcorebutia cuttings. I place the pups on dampened vermiculite. They are much slower to root than Rebutias - a S. steinbachii took about two months to form roots and a S. tunariensis took much longer over the winter months. I had a S. steinbachii v. gracilior which kept growing right through the winter - probably due to it being kept in a warm and humid atmosphere - and in the subsequent summer put out offsets on practically every areole: these pups even put out roots before they were detached from the main stem. (One of our late Branch Members got good results with slow rooters by soaking them and putting them in the propagator - has anyone tried this with Sulcorebutias ? - H.M.)

In regard to S. glomeriseta, confusion has arisen from material which was collected from the Hacienda Resini in the province of Sucre in Bolivia. This was distributed by Uhlig at first as Aylostera sp. n. Resini and later, supposedly after 'identification' by Backeberg, as Rebutia glomeriseta. These plants were actually Rebutia fiebrigii v. densiseta and nearly all the plants in collections, labelled Rebutia or Sulcorebutia glomeriseta are, in fact, not the correct plant. I did have one plant which I was fairly sure was the true S. glomeriseta, it differed from the incorrectly named one in having somewhat elongated areoles and curved spines These spines were exactly the same colour as Rebutia fiebrigii f. densiseta and this probably accounts for the confusion.

My plant of S. weingartiana has rather different flowers from those described by Mrs. Mullard. They had lemon yellow petals, but the most striking feature was their texture; they seemed much thinner and had a satiny sheen rather like that seen on some Gymnocalycium flowers, and a ragged outline at the apex".

The March/April 1966 issue of the Cactus and Succulent Journal of America contains an article by Cardenas, dealing with the cacti of Bolivia. It tells us that Mount Tunari is the

highest summit of the line of peaks which runs across the Department of Cochabamba from west to east, forming part of the eastern range of the Andes. The rainy season is from January to March. Parts of the mountainside are covered with loose rock, part with grassy terrain, and part with shrubby and herbaceous vegetation or stunted trees.

On the dry north eastern slopes, buried amongst small, loose stones conglomerated with clayish soil, is the pretty little yellow-flowered (sulco) Rebutia kruegerii. On the western slopes on the banks of the highway to Morochata, at about 3,200m. altitude (app. 10,000 ft.) the minute (Sulco) Rebutia tunariensis emerges from the hard soils in open spots in the grassy terrain. The flowers are red outside and orange-yellow inside. On the east section of the mountain, and ranging from 3,600 m. up to over 3,000 m., the proliferous and polymorphic species, (sulco) Rebutia steinbachii is common. It also appears on the Andean chains to the east of Cochabamba, these belong to a different orographic group of mountains and extends from Colomi in the province of Chapare to Tiraque in the province of Arani at an average altitude of 3,400 m. This curious species has typical Rebutia stems with very short, adpressed bristles and, on the same root system, other larger stems reminiscent of Lobivia stems with long, acicular to subulate spines. The colour of the flower varies too, from bright red to magneta and light pink.

Just in one narrow spot one can find at least three or four morphological types of this species which are so different that certain European cactophiles, having them in their fingers, would not hesitate to describe them as different and valid species.

LINZ BOTANICAL GARDEN - CACTI IN 1966

By Alfred Bayr, President of the G.O.K. (Austrian Cactus Society)
(Translated by E.W. Bentley from the G.O.K. Newsletter for January 1967).

The Linz Botanical Gardens has one of the richest collections of Gymnocalyciums, and during the year we had flowers on G. chiquitanum (= G. hammerschidii = G. spec. Robore of Uhlig). Interesting, too, were the flowers of a G. denudatum imported by Uebelmann that differed from the usual flowers of this species. Plants from Herr Uhlig under the names of G. hybopleurum and G. pugionifer - the latter with prominent, robust, comb-like spines - brought forth a rich display of flowers last year. If one blows into the fully open flower, the pollen goes and the previously yellow anthers become a beautiful red; this may perhaps be an explanation of the origin of the species G. rhodantherum or rosantherum. The fruits of these plants are a fine blue, bringing out the fact that they belong to the G. Mazanense group.

Also obtained from Uhlig were plants under the name G. nidulans which were notable for a long and strong tap root. At first, on account of the tap root, one assumed it was G. glaucum. Whether it is Ritter's G. glaucum seems doubtful, however. The fine blue fruit points in any case to the G. mazanense group. Some of these plants flower pink-red, the others white. Into flower also came G. sp. Andalgala collected by Rausch and Markus. This plant is very sensitive to humidity in winter. Imported plants of G. baldianum are very variable in spination. The blood-red flowers mark them out clearly as baldianum, however. Under the name G. denudatum v. paraguayense, plants were obtained from Uhlig that flowered tender

salmon-pink, and with certainty are referred to G. baldianum. Also an Uhlig importation was a specimen under the name G. mosti v. kurtzianum; the middle spine, however, was lacking. The flower is quite short and flattened.

A plant collected by Werner Hoffmann under the field number 1114 is, from the flower, a G. zegarrae; it showed very many reddish anthers and a particularly large stigma. G. marquezii v. argentinense and G. lagunillasense are in flower form and colour scarcely distinguishable from G. zegarrae, and came from the same distribution area.

One of the earliest cacti to flower is G. bruchii (G. lafaldense), plants of which were collected by Rausch and Markus and bloomed in 1966. One plant differed in having an almost pure white flower. A few specimens of G. andreae were found by Rausch and Markus; some of them had the typical yellow flowers.

From the firm Winter two G. cardenasianum were bought in the hope of obtaining seeds from them and the plants already here. In spite of careful fertilisation they gave no seeds. G. ragonesii has also flowered, a plant which Herr Pfeiffer had obtained from Uhlig and gave to the Botanic Garden. The small perianth tube and the not widely opening flowers, along with the habitat, lead one to conclude that this species belongs to the G. asterium group. A large number of G. vatteri prove to be very free flowering. The number of spines varies between 1 and 3. G. vatteri belongs perhaps to the G. ochoterenai form-group. Plants bought in 1963 from Uhlig as G. vatteri proved from the flowers to be the plant newly described by Dr. Schutz as G. moserianum. This, and the certainly very near G. species Serr. and G. sp. Hig., are characteristically earth-brown when imported. In cultivation, however, the plants become steadily greenish, like imported G. asterium. The afore-mentioned species are outstanding bloomers, from April into the autumn.

Rausch and Markus brought back a supposedly formerly unknown Parodia, which flowered brilliant orange; the perianth leaves show a darker middle stripe. Uhlig's Parodia sp. ex Tucuman belongs, from its flower and seed, to Parodia microsperma. Parodia penniciliata came into a beautiful blood-red flower. There are two forms here, one with yellow and one with whitish spines. A stone-hard frozen Parodia tarabucina withstood its frosty journey and produced its first flowers last year. From the same area as Parodia tarabucina came Parodia ocampoi (yellow flowering) and Parodia ocampoi var. compressa (carmine red flowers). Whether the Parodia tarabucina described by Prof. Cardenas can be regarded as a true species is questionable.

Collected by Horst and marketed by Uebelmann, some very remarkable new Notocacti came from Southern Brazil. Plants brought on to the market as Notocactus brunnescens were described as Notocactus succineus by Buining. Very strongly flowering, with a typical Notocactus flower, is N. paucispinus (no longer called N. acutus). Also new is N. ottonis v. rubispinus with characteristic reddish spines. N. paucispinus-quevedoi belongs to N. acutus. Also new is N. tortuosus (what this name is based on is not easily imagined). Plants marketed in 1965 by Uebelmann under the field number HU 9 as N. horstii are now called N. arachnites.

Similar is N. cerassigibus with very strong tubercles. Plants obtained as Notocactus gracilis are now called N. tenuicylindricus. HU 17 purchased as plants of N. horstii are red flowering and definitely keep the name N. horstii. Horst collected also quite pretty, very readily flowering, and good fruiting plants: Malacocarpus leucanthus without the middle spine, Malacocarpus brasiliensis with 2 middle spines, in this form of stigma is most striking. Is it a Malacocarpus?

Also flowering last year was Copiapoa barquitensis FR - plants branching at the base, large tap-root - identical with Copiapoa hypogea ? Also Neochilenia aerocarpa v. fulva with reddish flowers and Helianthocereus grandiflorus.

Comments from E.W. Putnam.

It is in Austria and Czechoslovakia at the present time that some of the most intensive study of Gymnocalycium is taking place. A considerable collection of this genus is housed in the Linz Botanical Gardens and is used in these studies. It is therefore particularly interesting to have Herr Direktor Bayr's notes on some of the more recent acquisitions at Linz.

Most of the species mentioned are available to collectors in Europe, at least as seed. Herr Bayr's comments (e.g. on the species close to G. zegarrae) serve to underline the difficulties to be found in distinguishing many species in this genus, a difficulty being faced more and more frequently now by authors referring dubious plants to 'form-groups' rather than type species.

"G. sp. Serr" and "G. sp. Hig.", which are closely related to or possible conspecific with G. moserianum, were collected at Serrezuela and La Higuera in north-west Cordoba, Argentina.

There is some confusion over the correct spelling of G. hammerschmidii, helped by Backeberg misspelling Father Hammerschmid's name with a "t" in the Lexicon, though he spelt it correctly when he named the plant.

Gymnocalycium enthusiasts are being well-served at the present time by the tireless activities of collectors working in Argentina, Bolivia and Paraguay. Prof. Cardenas, Father Hammerschmid, A.M. Friedrich, Friedrich Ritter, Fechser, Rausch, Markus, and Hoffman have all contributed to recent discoveries in this area. As more and more plants are found so do the problems of nomenclature become more difficult and more interesting. There is a great need for amateur studies of the new plants and the well-known ones; the stay-at-home collector can contribute a great deal by seed raising and close observation of his cultivated plants if he is keen enough to record his findings diligently and accurately.

The Linz Botanical Garden is in the pleasant city of Linz, Austria, about halfway between Salzburg and Vienna. It has a large part of the glasshouses devoted to cacti, forming an I.O.S. protected collection. It was visited by our party on the 1964 Tour to Austria and can be highly recommended to anyone visiting that country who is interested in seeing good (and many uncommon) plants grown well. - H.M.

SLIDES

We now have the following slides available on loan. These have been reproduced (by permission of the G.O.K.) from the Austrian Society slide set of Chilean plants. It is regretted that, for reasons outlined in our previous issue, the quality of the copy in both definition and colour balance leaves much to be desired.

In order to conserve our small funds, borrowers are requested to pay postage both ways. A list of Neoporterianae in cultivation of which we have slides available on loan (many in flower) will appear in our autumn issue.

1. Trichocereus litoralis growing in company with a Puya on the rocky coast of Middle Chile near Los Molles.

2. A rocky foreshore in Middle Chile: on the steep cliff plants of Neochilenia chilensis can be seen, some in flower, some grown into columnar form in old age. A clump of low Eulychnia castabea grows on top of the cliff.

3. Typical vegetation inland from Los Molles, including Trichocereus litoralis, Eulychnia castanea, and Neoporteria subgibbosa (in flower).

4. An old Neoporteria subgibbosa of columnar form, about half a meter in height, in the coastal cordilleras.

5. Eulychnia spinibarbis and Neoporteria subgibboso.

6. Looking inland along a dry valley, north of Los Molles, with hills of the coastal range in the middle distance and the peaks of the snow-capped Andes in the background; Trichocereus coquimbanus in the foreground.

7. Trichocereus coquimbanus in flower, with scrub covered slopes of the coastal cordilleras behind.

8. Cattle graze on the scant vegetation between Eulychnia spinibarbis which are up to about 25 ft. in height.

9. A fallen Trichocereus litoralis produces new stems; nearby, Neoporteria subgibbosa in flower; behind, a rocky slope nearly barren of vegetation.

10. Further inland, where the snow covered peaks of the main chain of the Andes appear closer; the arid valley in the middle distance exhibits signs of agriculture; in the foreground Trichocereus coquimbanus.

11. A column of Eulychnia spinibarbis appears to be aflame with the red flowers of the parasite creeper Phrygillanthus.

12. Further north, near Coquimbo, the countryside is even drier and harsher. Here we see a natural cristate head on a T. coquimbanus.

13. Near coquimbo, a Copiapoa coquimbana; in the foreground, with pink flowers, a Neoporteria subgibbosa.

14. Growing near Coquimbo, Copiapoa coquimbana in company with a flowering amaryllis, Hippeastrum.

15 & 16. Ditto

17. Copiapoa coquimbana amongst large rocks, together with another variety of amaryllis.

18. Well up in the coastal cordillera, an opuntia (Tephrocactus) miquelii grows alongside Copiapoa coquimbana.

19. On the coastal hills, where moisture laden fog has encouraged some transient green vegetation; Alona glandulosa and Opuntia (Tephrocactus) sphaerica are in flower.

20. A rocky hillside with Opuntia (Tephrocactus) sphaerica and a Trichocereus coquimbanus amongst the thorn scrub.

21. Near Vicuna, rocky slopes with Neoporteria nidus in flower - and a plant with fern-like leaves in the foreground.

22. A few N. nidus growing in a rocky cleft.

23. Short vegetation and a N. nidus in flower.

24. N. nidus growing alongside Hippeastrum bicolor, near Vicuna.

25. On flatter, sandy ground the shade of this thorn bush and the water-drawing power of its root system form a micro-climate of some six feet spread in which a spherical opuntia, some grasses and other non-succulent plants make a greener patch amongst the surrounding brown and grey.

26. Copiapoa cinerea - mature plants probably over 12" high, near Taltal in north-central Chile. For practical purposes there is no rainfall at all here, only condensation from the winter fogs.

27. Further inland at this latitude only the occasional valley carrying seepage water from melting snow in the high Andes, can support vegetation. Here we see a Trichocereus coquimbanus, together with bushes of acacia, willow, pepper, etc.

28. In the coastal hills, again with only the winter mists as a source of moisture, we find Eriosyce ceratistes, the larger plant being over a foot in height and width.

29. Another Eriosyce ceratistes, some 20" high.

30. From the top of the coastal cordilleras - perhaps 5,000 ft. high - looking over towards the main chain of the Andes. The snow line here will be about 17,000 ft. altitude. The high peak in view is Mount Aconcagua which, at 22,800 ft. in elevation, is the highest peak in the western hemisphere. It is about 75 miles from the photographer, thus attesting to the cleanliness of the atmosphere.

NEWS AND VIEWS

Thank you for returning the readership survey forms; we shall be very pleased to receive any further completed copies from other subscribers. In the meantime we have the following preferences indicated:-

	less	about the same	more
Environment, climate, etc in habitat	1	7	9
Cultivation experience, hints and tips	0	4	13
Plant identification	0	7	10
Nomenclature	2	8	5
General aspects	0	11	4

Articles preferred on:- Copiapoa 7, Matucana 2, Notocactus 2, Eight others 1 each.

Our Treasurer reports for our first year of operations:-

	£. s. d.		£. s. d.
Subscriptions	29. 18. 6.	Printing bulletins	28. 11. 3.
Donations	13. 0. 0.	Postages	5. 15. 9.
Plant sales	46. 4. 6.	Cheque Charges	4. 0.
		Slide copying	5. 5. 0.
		Stationery	15. 6.
		Plant purchases	39. 5. 0.
			79. 16. 6.
		Balance carried forward	9. 6. 6.
	89. 3. 0.		89. 3. 0.

We have already received £14.15.1d. against subscriptions 1967/68 and purchases of the 1967 Year book.

ERRATA

K.H. Halstead has drawn our attention to an error and an omission in the Notocactus check list in the No. 4 issue of The Chileans, as follows:-

Add Notocactus werdermannianus Hert

For N. scopa v. ruberrima read v. ruberrimus.

After our injunction regarding the spelling of Sulcorebutia in Issue No. 5 we have to record the following errors:-

P.1. for N. horstii v. juvenalisformis read v. juvenaliformis.
for Sanda Catherina read Santa Catherina.

P.5. for Sulcorebutia canequeralii read S. caniqueralii

P.6 for S. kreugeri read S. kruegerii.

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