THE CHILEANS '78

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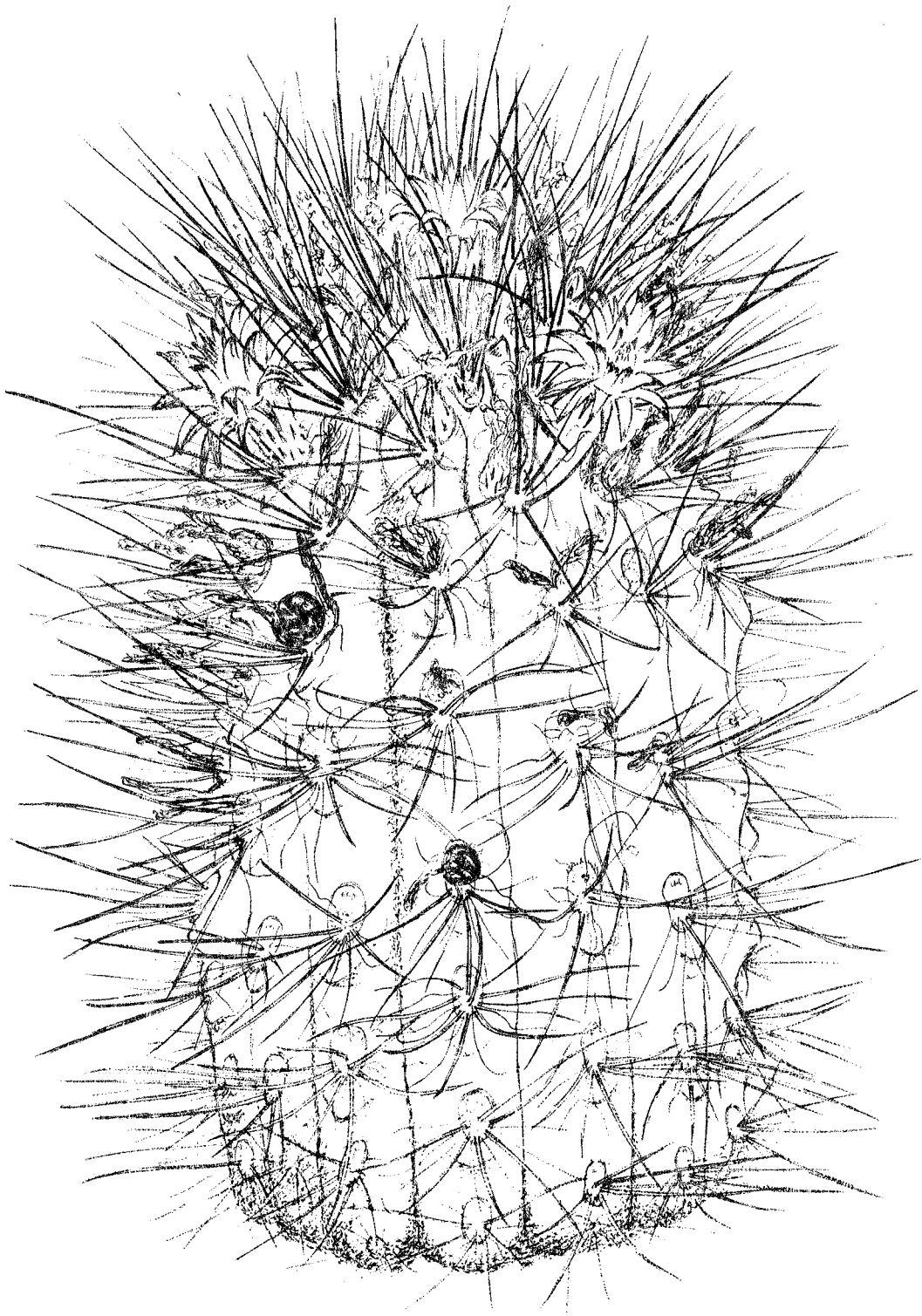
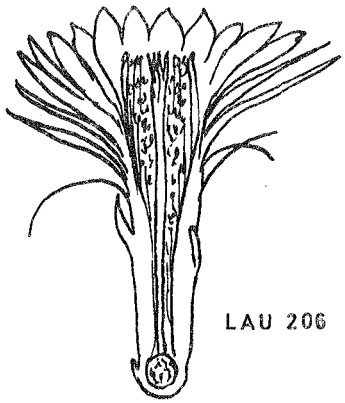


Neoporteria pseudolaniceps

KK 427



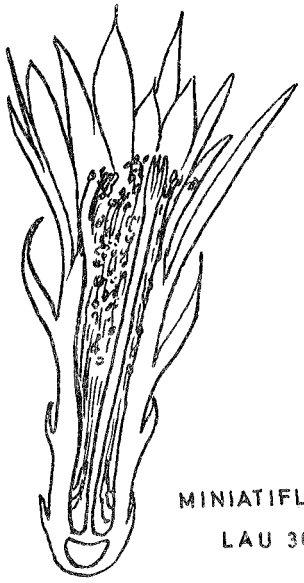
LAU 206

MISTIENSIS
ex LAU

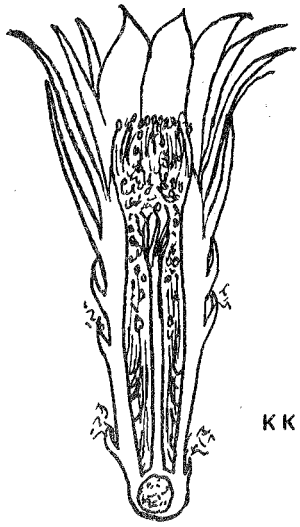
Lobivia Flowers
- from Seed Group 2

FULL SIZE

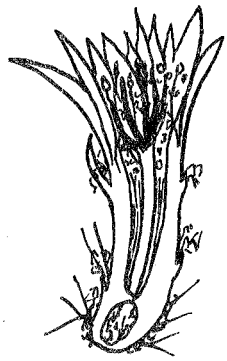
CMS



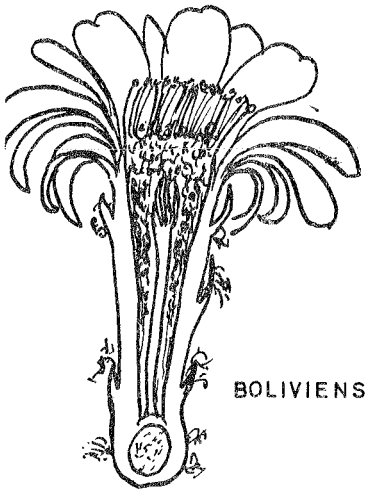
MINIATIFLORA
LAU 307



KK 813

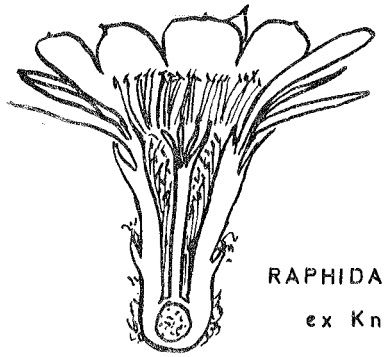


TEGELERIANA



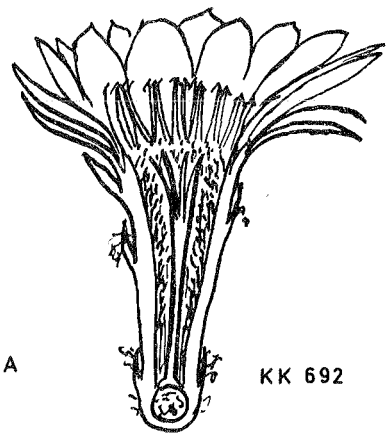
BOLIVIENSIS

Funneliform 'A'



RAPHIDACANTHA
ex Knize

Funneliform 'B'



KK 692

Funneliform 'C'

SOME LOBIVIA FLOWERS — A CLOSER LOOK

From J. Hopkins

In an earlier article (Chileans No. 24 p.157) I introduced the range of flower forms to be found within the genus Lobivia, which were based to a great extent on observing imported plants in flower in my own collection. John Donald elaborated on some of the forms in a subsequent article (No. 26 p. 110). I would now like to present the preliminary results of some closer observations which I have been able to make on flowers of those plants which fall within my Lobivia seed group 2 (see Chileans No. 23 p. 78). Before proceeding, it would perhaps be useful to update the list of species belonging to this group, which is here presented, divided into the flower form sections to be discussed.

L. caespitosa (Purp) Br. & R., R 57, Lau 310
L. miniatiflora Ritt., R 452

L. hermanniana Backbg., R 203, Lau 1002
Lobivia KK 813

L. intermedia Rausch., Lau 146, KK 784
L. lauramarca Rauh & Backbg., R 424
Lobivia Lau 206
Lobivia KK 649

L. westii Hutch., Lau 141, KK 1019
Lobivia Lau 154 (= corbula?)
Lobivia KK 427
L. aureosenilis KK 437 (= L westii?)

L. mistiensis Backbg.
Lobivia KK 1137

L. pampana Br. & R., R 446

K. akersii Rausch., R 387
L. tegeleriana Backbg., R 394, R 395

L. incuiensis Rauh & Backbg., R 443

L. charazanensis Card., KK 929

L. maximiliana (Heyd) Backbg., Lau 254, R 202
L. pseudocariquinensis Card., Lau 968

L. cariquinensis Card
Lobivia Lau 252

L. Quiabayensis Rausch., R 205, Lau 1004

L. schieliana Backbg., R 207

L. pentlandii (Hook) Br. & R., R 201, KK 425, KK 426, KK 441, KK 702
L. boliviensis Br. & R., Lau 135
L. varians Backbg., KK 631
L. higginsiana Backbg.
L. omasuyensis Card.
L. brunneo-rosea Backbg.
L. leucorhodon Backbg.
L. leucoviolacea Backbg.
L. leptacantha Rausch, R.422
L. chrysochete? Werd.
Lobivia KK 706

L. weghiana Backbg.
L. culpinensis Ritt., R 83
L. titicacensis Card.
L. johnsoniana Backbg.
L. raphidacantha Knize
L. argentea Backbg.
L. schneideriana Backbg.
L. simplex Rausch, R 423
Lobivia KK 692

& many other forms from Knize..

Comparison with the list which appeared in Chileans No. 23 shows that L. minuta, L. 'vilcabamba Lau 146', Lobivia Lau 154a and Lobivia Lau 973 have been omitted. The receipt of further examples of imported plants has shown that the original ones must have been distributed incorrectly identified. Lobivia Lau 146 does in fact reappear in the new list, above, but with its correct name of L. intermedia. The question mark beside L. chrysochete indicates seed material from a plant of doubtful origin.

These notes will be far from conclusive at this stage as many of the plants upon which my flower observations have been made, although from habitat, are labelled simply 'Lobivia species'. This is due either to mis-identification of the plants by the collectors or subsequent confusion of the collection numbers by nurserymen. On the other hand it is quite probable that many of the species are far more variable in spination and flower colour than the brief description of many of them would have us believe.

The range of flower size to be found within this seed group is considerable, from the small of Lau 968 to the large of L. westii, i.e. from about 2½ to 8 cm long. The variation in shape is also wide but several reasonably distinct forms can be picked out. Future work will consist of a more systematic examination of the abundances of pollen and nectar and a check on the presence of scent. Detailed information of this kind is lacking from almost every species description and variations do in fact exist.

A number of sketches depicting the flower shapes and some photographs of plants in flower are appended to assist the reader in assimilating the following discussion.

One of the more obvious flower forms involves a number of species from the La Paz area of Bolivia, viz: L. caespitosa, L. hermanniana, L. miniatiflora and Lobivia KK 813 – probably a miniatiflora form. These plants are distinguished by their long, almost parallel-sided receptacles covered by long, narrow, fleshy scales with little or no axilliary hair. These plants have essentially continuous ribs with areoles spaced about 5-10 mm apart. The ribs are not therefore divided so distinctively into the long hatchet-like tubercles so typical of many of the Bolivian members of this group. The areoles are very occasionally set slightly askew, particularly in L. caespitosa and L. hermanniana, and this gives a slight offset to successive tubercles such that a slight spiralling of the ribs occurs. All of these plants quickly become short cylindrical and freely caespitose from the bases of the stems. The flower colours are usually in brilliant orange or scarlet shades, KK 813 having a bluish tinge to the outer petals.

Similar flowers on a slightly smaller scale, and with more abruptly opening perianths are to be found in the Peruvian species – L. intermedia (red perianth) and L. Lau 206 (yellow perianth). These plants have been discussed in connection with L. westii (Chileans No. 27 pp 131-132). A sketch of the flower of the latter was reproduced in that issue and comparison with the sketch of Lau 206 with this article shows that the flowers do indeed differ. The receptacle of L. westii is longer, thinner, and gradually tapering compared with the shorter, wider, almost cylindrical receptacle of Lau 206. The prominent fusion of the upper circle of stamens into a narrow tube appears in both species and in L. intermedia and Lau 154. In this respect they differ from the L. caespitosa group which shows little or no stamen fusion. Lau 206 is in fact probably identical to the plant shown as L. leptacentha in Rausch Lobivia Vol. I p 38.

Lobivia KK 427, distributed as L. pampana, is another long-tubed flower. A definite bend appears in the tube, so that the flower arising from the upper sides of the stem has an almost vertical axis. Some plants distributed as L. mistiensis have produced similar flowers. Reference to the sketches shows that the KK 427 perianth scarcely opens, whereas L. mistiensis and L. pampana, (discussed in some detail below) have rather more funnel shaped flowers. It is possible that KK 427 and these aberrant L. "mistiensis" forms are closely linked to L. intermedia and that they also have the fusion of the upper stamens. They also extend the range of L. westii forms southwards so that L. intermedia does not now appear to be so isolated in the area around Challuanca. Rauh must have found one of these "mistiensis" forms on the slopes of Chacani, according to his account reproduced in Chileans No. 27 p. 128 – compare Backberg's description on P. 129 of that issue.

An interesting feature of all the flowers discussed above is the presence of nectar in small quantities and of a quite strong, pleasant scent in some of them. The combination of nectar, scent, the abundance of pollen, and the variable position of the stigmas in these species gives rise to speculation concerning the pollinating agents of these plants! Indiscriminate poking around with a paint brush failed to produce any fruits on L. miniatiflora and KK 813, but the westii group of plants set fruit without difficulty as did L. hermanniana v. breviflora Lau 1002, which has a prominently exserted stigma. The fruits of Lau 206 and L. westii Lau 141 are small, about 8-10 mm diameter and roughly spherical. The relatively few seeds are scattered in a stickly pulp which takes a long time to dry out. The fruits split slightly on reaching maturity and the wall begins to shrivel, but the seeds are not forced out to any noticeable extent in the process. The fruits on L. hermanniana are larger, up to about 1.8 cm diameter, roughly spherical, with a thick fleshy wall splitting longitudinally or irregularly at maturity, to reveal numerous seeds in a white pulp. They are similar in all respects to the fruits borne by the funnel-form flowered plants discussed below – the mainstream of Lobivia fruits.

The species discussed above have been treated as a separate section on account of their roughly cylindrical receptacles with a resulting narrowness at the point of insertion of the upper stamens which in some cases are fused together to form a distinct hymen. Continuing from this section there is a considerable divergence of forms with L. charazanensis from the Peru-Bolivia border regions to the east of Lake Titicaca, playing a prominent part. This plant appears to share a number of flower characteristics with other flower groups. It has slightly more funnel shaped flowers which leads to the other funnel-gorm groups of L. mistiensis and L. pentlandii. It also has the incurved inner petals of the L. maximilliana group of small tubular flowers, and one form which I have seen also has the fused upper stamens common to the Maximilliana and Westii sections, the latter probably being a development of the former. Thus in the Lake Titicaca area we have one of the most complex situations as far as Lobivias are concerned. Here also grows the very variable L. backebergii, but as it possesses and different seed form, it does not concern us for the present.

In L. mistiensis and L. pampana we find flowers with a more tapered receptacle, as shown in the sketch. There is much less evidence of fusion of the upper stamens in these plants and the flower width at the point of insertion of these upper stamens is greater than in the plants already discussed above. The long-lanceolate petals, however, are common to all of these Peruvian plants and to the Bolivian Caespitosa section, except for KK 427 in which the petals are rather shorter and more rounded. Lobivia mistiensis has large flowers with rosewood to orange to pale lilac coloured petals, and forms with pale pinkish orange petals having a darker central stripe, have also been found. The petals of L. pampana are red, becoming paler inside. These plants show the more typical feature of the majority of Bolivian species, having fairly widely spaced, deeply depressed skew areoles so that the ribs are divided into hatchet-like tubercles. To be sure, the L. westii forms also have tuberculate ribs, but the areoles are less deeply depressed. For this reason it is my belief that the Mistiensis section leads us to the morphologically similar Acantholobivias found further to the north,

which also have similar flowers to L. mistiensis but on a smaller scale. The presence of areoles and spines on the ovaries and fruits of some of the Acantholobivia forms has prompted suggestions that they may be closely related to the Westii section, some forms of which are similarly bespined. The latter section, however, has the fused upper stamens while the former has not, which is further support for a link with L. mistiensis. In addition, the large (2-3 cm diameter) fleshy fruits of the Acantholobivias are much more in accord with L. mistiensis fruits than with the smaller Westii section fruits.

An interesting recently discovered plant is KK 1137 from Madragal (in S. Peru?). It has the distinction of possessing a flower like L. mistiensis on a slightly smaller scale but with the typical petal colour – orange, sometimes paler with a darker median stripe. The body however is much larger growing than normal and is covered with long (up to 13 cm) thin flexible straw to pale brown spines and resembles very strongly some of the forms of L. boliviensis to be found in the L. pentlandii group. Rausch separated L. pampana/mistiensis from L. pentlandii before the discovery of KK 1137, but there would now seem to be little justification for specific status for L. pampana.

Returning now to L. charazanensis, it is possible that several plant forms are masquerading under this name. The original Cardenas description quotes an essentially sulphur-yellow, funnel-shaped flower some 5 cm long and 4 cm diameter. There is no mention of fusion of the upper stamens, which is very prominent on one plant with this name in my possession. This plant also has widely opening outer petals with inner petals continuing the line of the tube. In all other respects my plant fits the Cardenas description. The outer petals are purple tipped, becoming green basally, while the shorter inner ones are yellow becoming almost white below. This colour zoning, as well as the lie and relative lengths of the petals, leads us, as already indicated, to L. maximilliana.

At this stage it may be as well to pause and consider the origins of the two plants L. maximilliana and L. pentlandii, which in recent years have been at the centre of a great deal of confusion. Why this should have been so is difficult to comprehend as both of the original descriptions (reproduced below) quite evidently concern different flower forms. Both of the Latin descriptions are brief, but L. maximiliana is described in considerable detail in the vernacular and L. pentlandii is represented by a tolerable colour painting. This painting shows flowers which are a continuously tapering funnel shape some 4-5 cms long with all of the rounded-acuminate petals outspread. The flowers of L. maximilliana, on the other hand, are about 3½ cm long with a cylindrical tube 2½ cm long which scarcely widens. The petals are of various shapes but the significant part is that the inner petals scarcely open and so form a tube around the upper stamens. Despite these distinguishing features, confusion did arise and this was helped by the lack of citation of any habitat data for either species.

Many varieties of L. pentlandii (mostly spination and flower colour variants – see Borg "Cacti") were subsequently published in a number of German magazines and books, all without habitat data. Backeberg finally accepted only 3 varieties, while L. maximilliana and L. corbula were merged into L. pentlandii such that his revised description covering all the variations bears little resemblance to the original. Most of the plants illustrated in Die Cactaceae Vol 3 as L. pentlandii are quite different in flower form to the original plant depicted in Curtis's Botanical Magazine. Abb. 196 in Das Kakteenlexikon shows the Backberg interpretation of L. pentlandii and the plant shown would be better with the name L. cariquinensis attached! Figure 3882 in Die Cactaceae Vol. VI also depicts a form of L. maximilliana – not L. westii as cited; see Rausch Lobivia Vol I p. 26 for the true species.

Lobivia maximilliana appears to be a quite widespread plant, Rausch having found it in the Lake Titicaca area – R 202 – and Lau in the more northerly habitat around Macusani – Lau 254. In between these two locations there are apparently no reports of its occurence except possibly at Cuyocuyo – Lau 252 – south of Sandia. Lobivia cariquinensis is probably a form with stouter flowers, about 4 cm long and 3 cm across, with a tube about 1½ cm thick. Lobivia pseudocariquinensis from the Charazani area has a slightly smaller flower, about 3 cm long and diameter, but both of these species are otherwise very similar to L. maximilliana. Lobivia Lau 968 from further south in the Consata gorge appears to be an even smaller flowered form of L. pseudocariquinensis with flowers only 2½ cm long and 1½ cm across. The petal characteristics are the same, however, but the tube is thinner and tapers towards the ovary. The spines are more entangled sideways and these two features possibly make it the transition species from the L. maximilliana flowers to those of L. quiabayensis, which also comes from the Consata gorge and is discussed in more detail below.

We come now to the bewildering array of plants with continuously tapering funnel form flowers. These are to be found in virtually the whole of the Bolivian Lobivia habitat and into Salta and Jujuy Provinces of Argentina, as L. culpinensis, L. markusii, L. chrysochete and L. jajoiana belong to this seed group. The main concentration is to be found in the Lake Titicaca – La Paz – Oruro area, thinning out rapidly south of Tolapampa into a few widespread isolated localities (such as Culpina). However, the south of Bolivia is probably the least thoroughly explored zone in our area of interest as witness the dearth of collected specimens of L. rossii and L. claeysiana. Rausch has spent some time in this area recently and the new L. salitrensis appears to be a plant of some interest, but I will return to this shortly.

There are possibly four groups of the funnel form flowers, but whether they are truly distinct groups or not is a matter which will only be decided after observation of many more plants. One flower form involving L. quiabayensis has already been mentioned briefly, but the variability and the poor description of this species makes

it difficult to decide whether a distinct group exists. Some forms of Lobivia Lau 1004 distributed as L. quiabayensis appear to fit the Rausch description, except that the funnel shaped flowers are yellow (Rausch quotes orange to orange-red to dark red.) Other forms, however, have the petal characteristics of Lobivia Lau 968 as mentioned above and these characteristics could provide the link to the unusual L. schieliana. This species has petals of different lengths and shapes but they all open widely, indeed the whole perianth becomes slightly reflexed in hot conditions. The seed of L. schieliana is slightly different from the main stream of L. pentlandii seed. Lobivia Lau 966 is a deep red flowered plant again from Consata, which could almost equally be referred to as L. quiabayensis or as a form of L. schieliana. The flower opens widely as in the latter, but the spination is more akin to the former. All of these plants have a thin flower tube in common, as well as very similar sideways interlaced spination on relatively close set areoles. Indeed the spination is so dense on some of them that the epidermis is scarcely visible.

The remaining funnel-form flowered species are less easily divided into groups of related species. Broadly speaking there are three flower forms:—

A. Flower some 5-6 cm long with a thick tube, abundant pollen, some with scent, some with traces of nectar. Petals spathulate.

B. Flowers 3-4 cm long with a fairly thick tube, little or no pollen, some scented, petals spathulate.

C. Flowers about 4-5 cm long with a tube narrowing above the ovary, some scented, little or no pollen, petals more or less lanceolate.

The brevity of the available descriptions makes positive identification of most of these plants very difficult. Many of them seem to be very variable hence the Ritter and Rausch views that some dozen or more "species" could be included under one name. This may well be true, but from my own observations I believe that there are probably an equal number of distinct species as witness the variability in abundance of pollen, the prescent of scent in some flowers and the different petal shapes. Sketches of examples from each of the three tentative funnel-form flower sections listed above are re-produced here, as Lobivia boliviensis, L. raphidacantha and Lobivia KK 692. Most of my plants in this group have been mixed up by nurserymen so that I can place no reliance on their collection numbers or the habitat data, thus I can do little more at this stage than to indicate to which sections some of the described species may belong.

In section 'A' we will probably find L. boliviensis, carminantha, higginsiana, pentlandii, titicacensis and varians. To section 'B' may belong L. leucorhodon, leucoviolacea, and raphidacantha, while in section 'C' I would expect to see L. argentea, in addition to KK 692 (distributed as L. argentea KK 706) plus several other distinctive forms from Knize whose collection numbers have, alas, been confused.

The fruits of all of these funnel-form flowered plants are in what I earlier referred to as the Lobivia mainstream. They are fairly large, typically 1½ — 2 cm in diameter and roughly spherical as described for L. mistiensis. The body morphology is very variable, some have almost continuous ribs with slightly depressed skew areoles, while others have deeply depressed areoles breaking the ribs up into a series of displaced tubercles. The number of ribs varies from about 12 to 26 and the spacing of the areoles from about 1 to 2½ cms, giving rise to tubercles of all shapes and sizes. On many, the spination is well developed, with individual spines up to about 12 cm long. Some species have fairly distinctive spination, e.g. L. leucorhodon, and L. schneideriana where all spines are relatively short, others have all their spines long e.g. L. boliviensis, L. varians.

Many of my imported plants have flowered this year and many of these have set fruit, but others have yet to oblige: once seed is available from further imports it is hoped that a clearer picture will result and it is suspected that another group will emerge in the southern end of the habitat range. It may be recalled that I originally placed L. jajoiana (see Chileans No. 22) in my seed Group 3. This particular species has a seed with a shiny black testa with no arillus layer and consequently, the general shape being the same, it could equally be placed in the seed Group 2 now under discussion. To see plants of L. jajoiana and L. pentlandii in flower one would think that they were far apart flower-wise, but the only real difference is the more bell-shaped flower of the former and of course the purple-black filaments and hymen, compared to the usually whitish or pale yellow hymen and stamens of the latter. As far as the rest of the plant goes, the hooked central spine offers no problem as this is already found in some of the L. culpinensis forms. My ideas are without much concrete support at this stage as I have no definite evidence that seed group 2 does penetrate into North Argentina and I would expect to find some transition plants from the funnel to bell shaped flowers in South Bolivia.

I was therefore delighted to find just such an intermediate flower on a plant I have, reputedly of Lobivia Lau 919 from Culpina. (See Rausch Lobivia Vol 2 page 85 for an illustration of L. culpinensis with a red flower). The large areoles and spination of this plant recall L. jajoiana except that the central spines are not hooked. The flower is slightly bell-shaped with purple lower stamens but the prominent hymen of L. jajoiana is not so well developed. Regrettably I have no seed of this plant as yet. Further support for my idea seems to arise in the description of the new L. salitrensis Rausch, R 636, from Salitre near Culpina, a variable plant in terms of spination. It has a wide, funnel-form flower but it, too, has signs of L. jajoiana by virtue of its violet-red lower stamens and hymen. It appears to be the ideal intermediate plant between the main chain of funnel-form flowered plants and Lau 919.

Making reference to the map on p. 35 of Chileans No. 25, the main body of the funnel-form flowered Lobivia are to be found to the north of latitude 20°S. There are one or two species which are part of this main chain of plants which are to be found south of this latitude e.g. L. raphidacantha at a point between the "L" and "I" of Bolivia, and L. culpinensis near Culpina. The plants with intermediate forms of flowers, Lau 919 and L. salitrensis, also occur near Culpina.

In essence, my seed Group 2 embraces the groups 1:1, 2:2 and 2:3 in the Backberg system. He included several species which are quite obviously out of place. Notable examples are L. aureolilacea (ferox-longispina group), L. charcasina (cinnabarina group), L. larae (pseudo-cinnabarina group) and L. marsoneri and L. muhriae (marsoneri/haageana group). The interesting L. rossii group is, I believe, also wrongly included in his group 2:3 by Backberg. The seeds from those few examples of plants which I believe to be authentic, are quite distinct and unlike any other Lobivia seed I have looked at.

Further work remains to be done on the seed aspect itself as the possible inclusion of L. jajoiana in this group, although presenting no real problem, does introduce another variation in the hilum shape. In my view, L. jajoiana is much closer akin to L. pentlandii than it is to L. chrysacantha, under which Rausch has included L. jajoiana as a variety. Having examined much more material in seed group 2 since my original article, I am finding a considerable variation in hilum shape anyway, and it could be that, given more authentic material, that a subdivision of the group be could be made and it will be interesting to see if this ties up with the grouping by flower forms.

Comments

. . . . from J.R. Gooch

A plant of KK 427 came to me under the name of L. pampana and I was by no means certain what to expect for flower form. It turned out to resemble quite accurately the illustration in John Hopkin's article. I think that most Lobivia enthusiasts – myself included – would accept this more correctly named L. corbula. That said, I must add that of 7 or 8 forms of L. corbula which I have (of different collections) not two of them are identical. The tube lengths vary between 3 and 5½ cms, some stouter, some relatively slim; however, the basic shape is constant.

I only obtained a Lau 206 as a small offset from a habitat collected plant last year and so it has yet to flower. The illustration depicts a flower tube without hairs or bristles, and indeed very few scales. These points and the comparative shortness of the tube makes me doubtful if this is a westii form as was the original suggestion. To me it is more likely to be L. caespitosa or perhaps even L. maximilliana.

Now the only plant I have had ex Lau as L. mistiensis was his Lau 121. This turned out to be a L. corbula form. I have subsequently obtained several very different looking plants labelled mistiensis, varying from one or two plants of very cerioid form to multi-ribbed dwarf globular specimens. Although flower size and intensity of the pinkish orange colour varies, the shape of the flower is always as shown in the sketch, above.

The plant of KK 813 came to me from S.P.I. as L. aurea-lilacina. It produced a clear pale yellow flower with no hint of lilac or violet in the form of a median band or tip to the petals. I did not dissect the bloom but the size and external appearance seems right – which I suppose only goes to show that my specimen is from the same collection as that which produced the flower that is illustrated here.

Lastly to come to the funneliform flowers – if a name is to be appended to any of this group then it may reasonably involve the colour more than the flower size. I know that present trends suggest that all colours can be found in close proximity in habitat, but if my field collection numbers are correctly supplied then size in any group varies equally as much. A feature of these funneliform flowers, which I would acknowledge to be variants of L. pentlandii, is that there are very apparent differences in the development of their reproductive flower parts. That is to say, there appears to be male and female plants. The former produces blooms with very well developed anthers that bears copious amounts of pollen, but with a short stigma and only poorly developed stigma lobes. The latter has the situation reversed i.e. a large and much branched stigma but with poor anther development and often completely lacking pollen.

I also believe from observations this summer that 'male' flowers are frequently larger and of more intense colouring. It may be relevant that the only two plants in this group in which I could trace scent, bore female flowers. Dare one imagine pollinators being attracted to large, colourful male flowers and then to the scented female flowers? I only hypothesize! By no means all the plants with this flower shape are dioecious – indeed, the majority are not, but it certainly occurs in several named forms. I have obtained a limited amount of true seed by crossing male to female (and vice-versa); only the female flower ever develops fruit. In my opinion the illustrations of the funneliform flowers tend to depict male or bisexual flowers.

. . . . response from J. Hopkins

Jim Gooch's comments raise a few points which I have been able to clarify since writing the above notes. I now prefer to call the "male" and "female" flowers "normal" and "male sterile"; in general, no pollen is seen on the funneliform flowered plants of Types 'B' and 'C', although I have occasionally seen it on flowers of plants in Type 'A'. Only a few flowers of the first two types have turned out to be normal. There are three different flower forms on L. caespitosa Lau 310 – large normal flowers, short normal flowers, and short male-sterile flowers – quite a bewildering situation.

Referring to Jim Gooch's KK 813 producing a yellow flower, all of the KK 813 flowers I have so far seen are a red/orange colour with a purplish tinge; the bodies are a strongly golden-yellow spined form of L. miniatiflora (which is illustrated on the cover of Rausch's "Lobivia" Vol. 1) with a freely caespitose, short cereoid habit. The petals are shorter than those of L. miniatiflora and there is a constriction in the tube at the insertion of the upper stamens. The stigma is always exserted and even cutting the flowers open to pollinate them has failed to set a fruit.

. . . . from D.W. Jones

Lobivias are amongst the most floriferous of my plants. The majority of species will flower when quite small from seed, and bigger specimens will produce masses of flowers over a period of months in early summer. Certainly some plants are difficult to persuade to set seed. Plants of the akersii group will set seed quite easily, but individual plants are probably self sterile. I have set seed on L. maximilliana, but again from two separate clones which I cross-pollinated. Although I have several plants in the pentlandii group, I have never tried pollinating them amongst each other as they are so variable and distinct. Also my identification is possibly not good enough, so that the task of keeping track of any offspring has rather daunted me. Perhaps I should have a try now, just to see if they produce fertile seed. The production of pollen from a particular plant is something I have not made detailed notes about up to the present. Some individual plants do stand out, producing vast amounts of pollen which make photographing the flowers a bit difficult; Lobivia schieliana falls into this category, as does Lobivia KK 813 (if my label is correct). During the coming summer I will keep a sharp eye open for male-sterile flowers. If I recall correctly, my plant of L. higginsiana (which is one of the pentlandii group) produces normal stamens which bear pollen, but I have not tested its viability.

Many Lobivias have flowers which differ in size depending on the nature of the season – in most cases the early flowers are smaller. It may be that the southern counties have a longer season and thus produce a different pattern of flower and growth from the North of England. Lobivia mistiensis flowers for me in early May when April has been warm enough to allow regular watering and some feeding. Its May flowers are about 6 cm long and 5 cm across, but later flowers – in July – are up to 10 cm long and 8 cm across. I have not been aware of any scent on L. mistiensis flowers, but this is not to say that they are not scented, just that my nose does not get close enough at the right time.

Although I do have a selection of Lobivia from those included in John Hopkins' discussion, their true identity cannot be guaranteed. The considerable variability of the "species" and their varieties makes the exact identification of individual plants a bit difficult. Much of the material in collections, available from nurseries, and obtainable from seed lists, etc., is incorrectly identified and although the plants are worth having for their own merit, they are not really useful in a study of the genus from a taxonomic or botanic view-point. Distribution of habitat collected material (preferably offsets or seed) or propagation of type clones of known origin is important.

Plants raised from seed often show considerable variation within the same batch. A fruit from L. incuiensis which was present on the plant when it was imported and which contained some 60 seeds, produced about 45 seedlings, all of which were visibly different. The three plants kept until they were large enough to flower, all had slightly different spine and flower colours, ranging from straw yellow spines with flowers having red petal tipes and orange throat, to brown spines with flowers having dark red petal tips and scarlet throat. The flower colours change slightly with the length of time that the flower has been open. The throat colour of the first L. incuiensis flower is pinkish when the flower first opens, but fades within a few hours to a medium orange. I have also found other Lobivias – outside this seed group – also show a similar behaviour.

AMBLING AROUND LAKE TITICACA

From J. Hughes

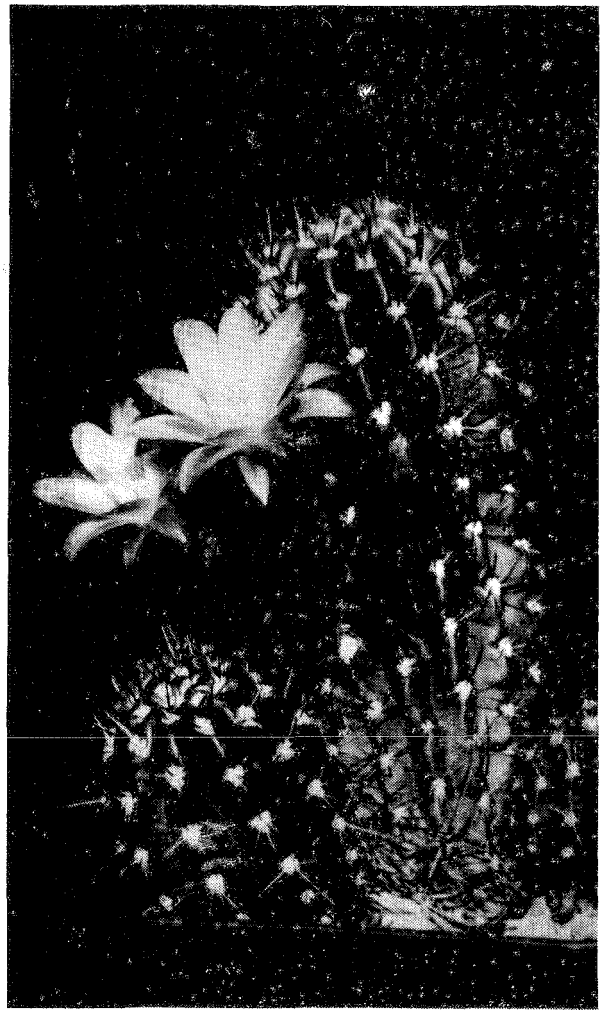
My stopping point during a visit to Peru was the railway station of Puno. To the tourist the interest in Puno lies in its proximity to Lake Titicaca, the highest navigable lake in the world, some 3,812 m above sea level. Being at this altitude, and lying at the southern end of Peru (further from the equator), it is interest in the Uros, the primitive inhabitants of the lakeside, rather than the climate, that attracts visitors. The average daily temperatures are supposed to vary from 9.4°C or 49°F in November to 5.2°C or 41°F in June. In addition there is a wide contrast between day and night temperatures. At night it can fall to as low as –7°C and although this may well be exceptional, frosts may be expected very commonly in the winter.

As with much of the Altiplano in Peru, the summer is the wet season, commonly accounting for up to 70% of the rainfall. The yearly rainfall figures show huge variations, from as little as 28.8 cm (11") in 1940 to 92.4 cm (37") in 1955. During my stay in March 1955, the rains had been so heavy that the Puno/Cuzco railroad was inoperable due to subsidence. There was much surface water lying on the lower land around the lake and even in hollows on the higher land above the lake.

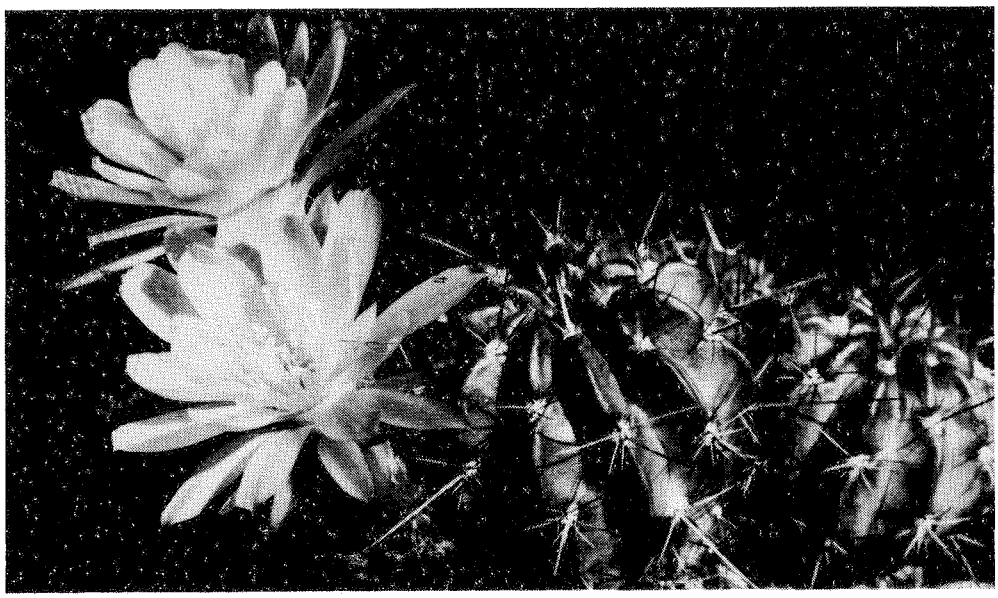
The southern puna near the lake is so high that only high altitude crops can be grown like potatoes, quinoa, and barley. Adjacent to where Lobivias were growing, llamas and alpacas were grazing, the area being too cold for cattle and sheep to exist successfully. The Lobivias were growing on the rocky hillside above the lake, perhaps 500 to 1000 feet above the level of the lake – but I had no means of ascertaining the altitude. Vegetation consisted of grasses and low growing herbs, bushes being almost entirely absent. These may have offered some protection to the cacti as there

LOBIVIA KK 813

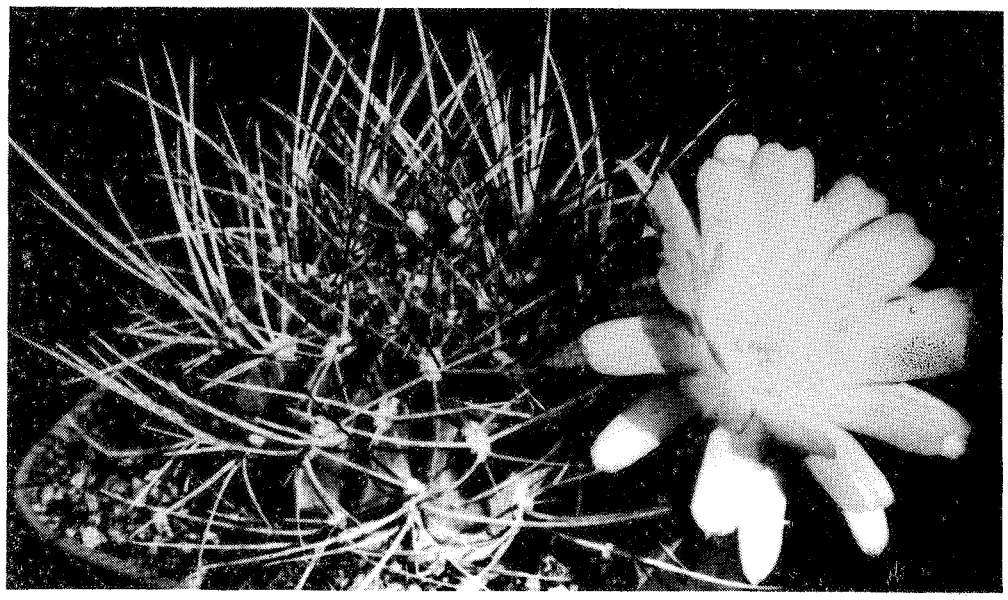
LOBIVIA VARIANS
male sterile form



LOBIVIA HERMANNIANA
v. BREVIFLORA LAU 1002



LOBIVIA
LEPTACANTHA
LAU 206



LOBIVIA
BOLIVIENSIS

LOBIVIA
QUIABAYENSIS
LAU 1004

Collection and Photographs - J. HOPKINS

were a great many clumps of rough grass perhaps twelve inches high and as much across. This rough grass was very characteristic of the high mountain Puna.

. . . . from E.G. Squier, "On the Basin of Lake Titicaca"
Transactions of the British Association for the Advancement of Science. 1870

The author gave the result of his recent explorations, in company with Prof. A. Raimondy, in the district of Lake Titicaca, in south Peru. The elevated plain in which this lake is situated forms a terrestrial basin, whose slope is gentle towards the south. Some of the tributaries of the lake are scarcely fordable even in the dry season and its waters are discharged through a broad, deep and swift but not turbulent stream, El Desaguadero. The difference of level between the dry and wet seasons amounted to from 3 to 5 feet. The dry season leaves bare a large tract of land, covered with a kind of tender lake weed, and this supports herds of cattle when the pasturage of the drier country is withered. The eastern, or Bolivian shore of the lake is abrupt, but the western and southern shores are relatively low, and the water in the bays and estuaries is grown up with reeds and rushes, amid which myriads of water fowl find shelter and support. It is easy to see that the lake once covered a much larger area than it now occupies. The lake had been explored by Mr. Pentland in 1827-28. Messrs Squier and Raimondy navigated it for three weeks in an open boat and the author of the paper bore testimony of the general accuracy of Mr. Pentland's observations. The lake never freezes over, but ice forms near its shores and where the water is shallow. Its waters during the winter months are 10^{o} to 15^{o} Fahr. warmer than the atmosphere, and therefore exert a favourable influence over the climate of its shores and islands. The prevailing winds are from the north-east, whence they often blow with great force, and severe storms are not infrequent. The efforts to place steamers on the lake have failed, chiefly owing to the scarcity of fuel.

. . . . from A.W. Hill, "A Journey in Bolivia & Peru around Lake Titicaca"
(Scottish Geog. Mag.) 1905

The Republic of Bolivia, in which I was travelling in the spring of the year 1903, is now wholly an inland country. The most thickly populated part lies in the great plateau region of the Andes, between the eastern and western ridges. The region between these two ranges, which has an area of some 106,000 square miles, is over 12,000 feet above the sea, and in it lies the great lake of Titicaca. It was around this lake that I spent a good deal of my time, studying the flora of the country generally and especially of the mountains on the eastern side. Afterwards I went up to Cuzco, the ancient capital of the Incas.

We reached Mollendo by sea on the 30th of December and from Mollendo the first day's journey brings the traveller to Arequipa, 7,500 ft. above the sea. After a brief stay to enable one to get accustomed to the rarified air, we journeyed to Puno, taking our muleteer with us, and went on board the steamer, where we slept the night. Steaming away from Puno early in the morning, we accomplished the journey to Chililaya in fourteen hours. The day was magnificent and the scenery one of extreme grandeur. In places the lake is so vast that one appears to be out at sea. Towards sunset (six o'clock) thunder clouds gathered in the west, and the effect was magnificent. To the west was an orange sunset, partly obscured by thunder-clouds, which every minute were ablaze with violet flashes of lightning, every variety of forked and sheet. Suddenly the storm struck us and the lake became like a choppy sea, whilst hurrying clouds blotted out the dying traces of a truly memorable scene.

After a second night on board we set out for the thirty mile drive to La Paz in the early morning, in a remarkable coach-like vehicle drawn by six mules. The so-called roadway ran indiscriminately through fields and rivers or over rocky stretches of country. At La Paz we spent a week buying mules, bedding, stores, saddlery and other necessaries for the journey and on January 20th 1903 we set out towards the southern end of Lake Titicaca, across the plateau, which is here arid and desolate. The country around the lake is in most places cultivated by the indians, who grow potatoes, barley, broad beans, quinoa – a kind of goosefoot (Chenopodium quinoa), ocas – a tuberous form of oxalis, lupins and other plants, with some success if the season is favourable. The rainy season in the plateau region occurs from December until the end of March and it is only during this period that it is possible to grow crops. During the dry season the soil is baked by day and frozen by night, so that only the most resistant types of vegetation are able to survive. The climatic conditions in this region affect the human traveller as well as the vegetable kingdom, and owing to the dryness of the air it is as well to regard the washing of oneself as a luxury rather than a necessity. The frequent oiling of one's face and hands is a necessary preventative against burning and loss of skin.

Travelling onwards from Tiaguanco, we came to the river Desaguadero, with hills composed of Old Red Sandstone in the background. Whereas many streams discharge themselves into the lake from the surrounding hills, the river – which is not very large – is its only outlet, and the water is therefore maintained at a general level mainly by the excessive evaporation. In the broad shallow reaches of the river and in the shallow waters at the margin of the lake a tall

sedge (Scirpus) grows in abundance and attains a height of six to ten feet. It is from this that the native boats or balsas are built. The sedge is tied up into long fusiform bundles of some ten to twenty feet in length; two bundles are then bound firmly together, their ends turned up to form a definite bow and stern, and a very servicable boat is thus formed, which will last for about a year. As there are very few trees on the plateau, wooden boats are not build by the indians.

From Desaguadero we went to Copacabana, where we made our headquarters for about a week; then continued our journey in an easterly direction, ferried across the lake with all our personal goods at the narrow straits of Tiquina. After crossing the watershed of the eastern range of the Andes, we arrived at the town of Sorata. The change in the character of the country and the abundance of vegetation on the eastern flanks of the Andes is very remarkable, a journey of some six hours taking one from an arid plateau into a region of semi-tropical luxuriance. Whilst here I made an expedition up the mountain Illampu as far as the snowline, here about 16,500 feet, in search of plants. On this, as on other occasions when I ascended to a high altitude, I found many curious plants of considerable interest, nearly all of them being peculiar in showing a very compact habit of growth with minute leaves and extremely long tap roots.

The genus Azorella (Umbelliferae) is a very typical Andean plant, and extends from Tierra del Fuego to Colombia. In the Andes of Bolivia this genus occurs between the altitudes of 12,000 and 15,000 feet, and often forms large mounds. The plant is much-branched, and the branches with their minute leaves are packed so closely together that a green hard mound is formed, which is often as much as three feet in height. As these plants are very resinous, they are largely used for firewood on the plateau and are known under the general name of Llareta. When these resinous Umbelliferae are unattainable, the firewood or Lena gatherers bring in small resinous bushes of Baccharis (Compositae), a peculiar Andean shrub. But Llama dung is the more common fuel, especially in La Paz and on the steamers on the lake.

From Sorata we returned over the pass to the plateau and continued our journey along the eastern shore of the lake, making frequent botanical digressions into the hills alongside our route. From Huancane we travelled to Juliaca, after crossing two of the largest rivers which run into the lake from the north. On reaching Juliaca I had come to the end of the longest part of my journey.

. . . . from K.G. Grubb "Amazon and Andes"

(En route from La Paz to Lake Titicaca). The elevated plains stretch away in all directions., bare or sandy, and in places covered with tufted grass. Far-off hills with a thin mantle of snow shut in the horizon. The small villages and isolated huts appear as insignificant irregularities on a monotonous and unlimited surface. Rocks there are, crowning slight elevations, and summits often of soft stone. Across the plateau run a few shallow streams. Towards the south the desolation increases. Bare white sand or low hills fill the landscape. Dried pools lie in the depressions and sparkling deposits of borax and salt reflect the pitiless sunlight. Above 12,000 feet the yareta plant and ichu grass form the principal vegetation. The former is squat and cushion-shaped, clinging to the ground-level for shelter and protection. The buds are well-concealed in an outer armour of closely packed leaves. It has a spongy texture. The ichu grass is a coarse growth which appears as tufts and serves as fodder for the llamas.

Lake Titicaca stands at 12,500 feet altitude, the highest body of fresh water commonly navigated in the world. Round Lake Titicaca the men wear peaked caps with flaps to fold over their ears, a necessary precaution against the biting winds of the Altiplano. They split up their trousers for a short distance up the back seam to facilitate turning them up when crossing streams. The shores of Lake Titicaca were lined with a margin of reeds. The road wound over low hills and among a scattered group of habitations. Here at Guatajata, the hills rise in gentle slopes from the edge of the water, bare and russet brown. On the road, in twos and threes, Aymaras urge on their animals, whilst others pick at the soil, heap the stones into immense piles, and plant their potatoes. A calm rests upon the waters of the lake, till the afternoon winds or a sudden storm ruffles the waters into foam. The soil is everywhere covered with stones. The indians pick them patiently off the soil and pile them into heaps which seem to occupy a large area of the fields themselves.

At the straights of Tiquina the promonteries press forward from either shore, and all navigation from Peru to Bolivia must pass through these straights. From the summit of an isthmus it was possible to look out over the lake on one side to the lines of remote and misty hills. On the other a similar expanse was limited by island slopes and a miniature archipelago. The coastal cliffs ran down to the water's edge in a series of steep, bold headlands reminiscent of the Devon Coast to the west of Bolt Head. Straight ahead the land descended to a fishing village with half a dozen masted boats. Pushing out from the opposite shore of the Lake was the other promontory, its slopes terraced out to utilise the surface for agriculture. The wind was cold and piercing.

A comparatively slight watershed separates the drainage system of the Amazon from that of the Lake Titicaca. Seated on the back of a motor lorry I made my way over the wretched road which passes close by the lake and goes down to Sorata. We passed through the village of Achacachi and headed north across the Altiplano. Presently we began to climb until we were far above the lake, which we could see in the distance. The eastern cordilleras of the Andes was visible at times but was mostly lost in clouds. It is a magnificent chain of peaks from 19,000 to 22,000 feet high. We ourselves were winding up towards the summit of the ridge at about 14,000 feet high. The indians cultivated the lands in all sorts of corners to the very summit of the ridge. At this altitude the wind was keen and the damp clouds were closing around. We skirted two forlorn and lonely tarns. I had been looking over the mountain pools when suddenly I truned round; a cleft had opened in the cloud and it was possible to gaze over a series of ravines far below to the almost perpendicular sides of Illampu, over 22,000 feet high.

Presently we began to descend into the valleys. The sides of the hills, even when they appeared too precipitous for the safe maintenance of an erect position, were divided into innumerable smallholdings, giving them the appearance of a vast patchwork quilt. The road ran on the very edge of a precipice. On descending the first two or three thousand feet, the principal vegetation was a coarse green scrub. We worked downward over a number of different rock and soil formations. Presently we passed over a spur into an adjoining valley, where still far below at about 9,000 feet we could see the little town of Sorata. Farther down great masses of red rock stood out on the mountain side; in some places the deep green of the trees marked the beginning of the lowland vegetation.

. . . . from H.A. Franck "Vagabonding down the Andes" 1917

On November 11th I took the train southward from Cuzco. A fertile valley, with many grazing cattle, frequent villages, and strings of laden indians, rolled slowly past. Before noon we caught the gorge of the muddy Vilcanota, with little patch-farms far up the face of the enclosing ranges and here and there steep, narrow-sided valleys rich with cultivation. Yet cultivable ground was scarce. Next day the valley rose gradually, until cultivation gave way completely to cattle and sheep, then to llama and alpaca herds grazing on the tough ichu grass of broad punas stretching to arid foothills that, in turn, rolled up into a great snow-clad range. An aridity, rarely touched with a cheering note of green, spread in every direction.

From Juliaca we turned south along a flat once-lake-bottom. Arms and branches of Titicaca, full of shivering reeds, appeared before we pulled into Puno. I took the steamer that makes the round of the shore. A penetrating wind caused our diminuative craft to roll and plunge merrily. We cast anchor first before the town of Juli, in the lap of bare hills sloping up from the lake. At noon Pomata held us long enough to unload a few boxes and bales at the usual cobblestone wharf. In the afternoon we churned into a wide semi-circular bay as far as shallow water and rustling reeds permitted, and I was soon climbing the easy slope to Yunguyo. Here there was much freight to discharge. The captain winked and indicated "contrabando".

Yunguyo lies on the neck of a little peninsula, part of which is Bolivian. I struck out on foot for Copacabana. A league from the landing the road mounted a stony ridge, and left the land of Peru behind, Bolivia was a stony country, in fact there were more stones than country. Everywhere they lay piled up in high masses with half-tillable patches between them. The countrymen were engaged in planting and ploughing, their hatbands decorated with newly picked flowers. On the Peruvian side, the shores of the lake had been reedy and shallow, with water birds. But as I topped the ridge of the peninsula, the lake rolled away in one direction over the horizon. At the end of a five mile stroll, the stony highway reached Copacabana, lying in its lap of terraced hills.

On the mainland, too, all the shores were terraced and cultivated from the water's edge to the tops of the ridges and hills, in long, square, rectangular, or such shapes of fields as the lay of the land required. To the east lay the great glacier mass of Sorata. Once more aboard the lake steamer, we slipped away round the peninsula of Copacabana and before long we passed the island of Coati, a low ridge terraced from end to end. The Bolivian mainland we drew near in the early afternoon was of reddish soil, with many patches of bright green and fields chequering the ridges clear down to the water's edge. At Guaqui, the landing place, I set out on foot across the plains of Bolivia for Tiahuanco, twelve miles away. It was a fertile, well-ploughed land; a shower that was half hail and all cold beat stingingly into my face. Tiahuanco, 12,900 feet above the sea, in a broad, open, plain, is frigid by night and not over warm by day. From a slight rise of ground the flat plain, sprinkled with many clusters of mud huts, stretches away to a broken ridge, here reddish, there green with vegetation. En route to La Paz across the bleak Collao, spring ploughing was at its height, amid much ceremony. Many of the oxen carried red and yellow flags. What a fertile plateau it was, compared to stony Peru!

. . . . from P.H. Fawcett, "Exploration Fawcett"

We spent one night in Arequipa, and on the following day took a train for Puno. Almost at once the heavy climb began, to the summit of the line at Crucero Alta, at 14,666 feet above sea level. After that the train descends past a series of picturesque lakes to Juliaca, junction of the branches to Puno and Cuzco. Then it runs on besides reedy flats and gleaming fingers of water to the port of Puno on the shores of Lake Titicaca. How strange it is to see steamers in operation up here on the roof of the world! The first was brought up from the coast piecemeal on the backs of mules, and assembled at the lakeside. The other ships were also delivered in sections, but came up by rail. Lake Titicaca can become surprisingly rough at times and perhaps nowhere else is it possible for a traveller to suffer from seasickness and mountain sickness at the same time!

We embarked that night on the "Coya" and next morning we were up at dawn to see the magnificent view of the main cordillera of the Andes, a chain of jagged snow-covered peaks. Passing the straits of Tiquina, we saw on either side lofty hills terraced and cultivated to their summits, and ahead numerous small islets of red earth with golden crops glowing in the light of the sun. Beyond were still more islands. Sailing or paddling over the silvery surface of the lake were reed balsas, rafts whose design has not changed in centuries. Thousands of ducks fled from the vicinity of the ship, and the chill air nipped us to the bone. The level of the present lake was once considerably higher, for on the surrounding hills can be plainly distinguished the old high-water mark.

I set out over the Altiplano (from La Paz) on the fourth day of July, 1906, bound for Sorata and the Beni. We crossed a rolling plain, where an unbroken stream of cargo animals -- mules, donkeys, llamas and indians -- carried

grain, rubber, and llama-dung fuel to the markets of La Paz. Llama dung was at that time the only fuel in general use there, and strangers had to get used to the acrid taste it imparted to food. It was snowing hard when we left, and I put on my poncho – the first time I had worn this new acquisition. It serves as a waterproof, and overcoat, and a bed-blanket. As a protection against driving snow nothing can be better. The snow fell thicker and thicker, till visibility was reduced to no more than twenty yards, and the stiffening wind whipped it under our ponchos.

The snow stopped when we came to Lake Titicaca and we had a wonderful view of the lake. No wind was blowing and its still surface reflected perfectly every cloud. The sun was brilliant. Little puffs of white cumulus lay along the skyline, as though some huge locomotive had idled across below the horizon. Birds were everywhere, so tame that they scarcely troubled to keep out of our way. Every hillside was terraced and cultivated to its summit. It was a long day's journey, and before we reached the end of it the snow was falling again, heavier than ever. At night we put up in the Posadas; they were dreadful places, incredibly dirty, cruelly cold, and devoid of any vestige of sanitation.

Our aching muscles and joints prevented us from sleeping that first night on the trail. Both of us were soft from easy living on board ship (from England – H.M.) and it would be several days before we began to harden up. From the inn next morning we looked out on a world completely covered in fresh snow. We breakfasted in a hut at 14,000 feet and then crossed the Divide, catching a last wonderful view of Titicaca spread out in a great sweep of shimmering silver, and reflecting the snow-covered mountains with absolute clarity. Then to the north we saw another unforgettable picture – the thin ribbon of the Mapiri river in a misty gorge thousands of feet below, half hidden by drifting clouds that were beginning to disperse in the warmth of the mounting sun. We could see the carpet of vegetation where the sub-tropical forest began. Away off on the other side of the gorge, tucked out of sight, was Sorata, our destination for the night.

We zig-zagged down a precipitous trail for seven thousand feet. At every turn we came upon some breathtaking view. As we dropped lower the vegetation increased. The bunch grass of the summits gave way to fields of vetch and a cactuslike moss. A few stunted trees made their appearance, short and twisted. Then we were in the midst of organ cactus, its dismal grey candles springing up from the slightest crevices in the rocks. We stopped and drank from a mountain stream whose water was melted ice. Eucalyptus and algarroba trees appeared. We filed down and down, twisting and turning, until at last the valley floor was reached. There followed the short climb to Sorata.

Next morning we bathed in the river, and were surprised to find the water was not unbearably cold, although it came from the snows only eight miles away. On the next morning we took our leave and started off up the precipitous trail towards the pass at 17,300 feet above sea level. It took us two hours to cover four miles and in that time we had climbed 6,000 feet. At Ticunamayo we reached a tambo, or resthouse, and here we spent the night outdoors in bitter cold and damp fog. Next morning we could see Sorata away beneath us in the light of the rising sun. We had our last view of it when we close under the pass, and then a turn of the trail hid it from sight and a freezing wind from the snow-field howled down on us. With the mules slipping and stumbling on ice, we struggled up the last slope and over the top.

People familiar only with Europe and the East can scarcely imagine what these Andean trails are like. The indians and the mules – and, of course, the ubiquitous llama – are about the only creatures able to negotiate them successfully. The narrow tracks are strewn with loose boulders and shifting gravel, they climb thousands of feet up what I can only describe as like the side of the Great Pyramid, and then drop down a precipice on the other side in a twisting series of tight zig-zags. Over huge boulders resembling a giant's stairway the mules jump cat-like from one to another. In places the tortuous way becomes nothing but a narrow ledge cut in the sheer rock hundreds of feet above the valley floor, and here the mules elect to make their way at the extreme other edge. The rider looks down into space and carries his heart in his mouth, knowing that accidents frequently take place. It is then that you recall the tales of false steps on loose rubble, and the scream of falling animal and rider, never to be seen again.

. . . . from W.T. Blake "The Pampas and the Andes" 1951

We had arrived in Bolivia during the height of the rainy season, and though the mornings were dry, rain invariably fell in the afternoon. We were particularly anxious to visit Lake Titicaca, the great inland sea lying on the Bolivian plateau. Of course, everyone told us that we should be extremely foolish to try and do the journey whilst the rains were on. Several times we decided to make our journey to one or other of the two places we wanted to visit but when we decided to move the rains fell. As the principal danger on this trip is the rapidity with which the mountain torrents rise, we had to try and find a more or less dry day and make a dash for it between showers. At last a day came which seemed as though it would remain fine so we decided to make a dash for Tihuanaco. We climbed from La Paz up to the Alto Plano, and headed in a north-westerly direction over a stony, rocky track. The journey was not a long one (only about forty-three miles each way) but before we reached the town of Laja, rain was falling and clouds were coming down almost to the level of the plateau itself. Roads were rapidly becoming morasses, so we reluctantly abandoned the attempt and turned back towards La Paz before we got stranded through the rising of the several rivers which we had already forded.

During the carnival week we made our attempt to get to Lake Titicaca and with clouds low over the plateau climbed from La Paz to the Alto Plano. It was somewhat difficult to find our way to Tiquina on the lake side, as tracks ran in various directions over the plain. We got a general direction to Lake Titicaca by compass. As far as Huarina the road was not too bad on the whole. There were the usual number of pot-holes and a number of rivers to ford, but as

these had generally only about a foot of water in them we got through without difficulty. Then we came to a deeper river which had been bridged though the bridge was lying in ruins, washed away by the torrents which poured down after the rain storms. A lorry coming into La Paz had tried to get through above the bridge and was standing with engine half under water. We stopped to prospect and find an easier way across. Two or three Indians left their herds of grazing sheep and came along to help us, wading through the river in various places until we found a ford. Then with one man walking in front to show us the depth of water and others on either side of the car, we felt our way over the rocks, the water just below the running boards, and made our way out safely on the other side. A few miles further on was another and even deeper river. Here we had to find our own way over the river and after walking up and down for some distance decided on a possible ford. Once again we got over. Shortly before reaching Huarina we breasted a ridge and saw in front of us Lake Titicaca. From that point to Tiquina we ran beside the water.

After Huarina, the usual collection of adobe houses with tin or thatched roofs, the road deteriorated until there were washouts and streams almost every fifty yards, some of them very rough and rocky, none of them, fortunately, deep. Everywhere there were big holes filled with water. Hereabouts the road was running several hundred feet above the level of the lake. The scenery was very beautiful; brown and blue mountains with a background of white fleecy clouds were reflected in the still waters of the lake. For several hundred yards from shore the blue waters were turned to brown by rain running down the mountainsides carrying with it quantities of soil. For a considerable distance the shore was reed-fringed, and in clear patches were generally moored numbers of balsas, the reed-built canoes of the Indians.

At Tiquina is a narrow strait over which a sailing ferry runs. All about, on the level places bordering the lake, the land was cultivated and sheep were grazing. Broad beans, potatoes, onions, wheat, barley and rye were growing in various patches, and clumps of blue lupins flowered everywhere.. By this time in the afternoon the usual rain was due to begin and, indeed, a few drops fell as we turned the car back from the waterside at Tiquina in order to reach La Paz before the swollen rivers made the journey impossible. An hour or so before La Paz we ran through a storm of hail and snow, but when the clouds cleared we had a magnificent view of the shining mountains, dazzling white with their new carpet of snow. Birds abounded; in fact we saw more birds in the neighbourhood of Lake Titicaca than in northern Chile or anywhere that we had been in Bolivia.

. . . . from H. Middleditch

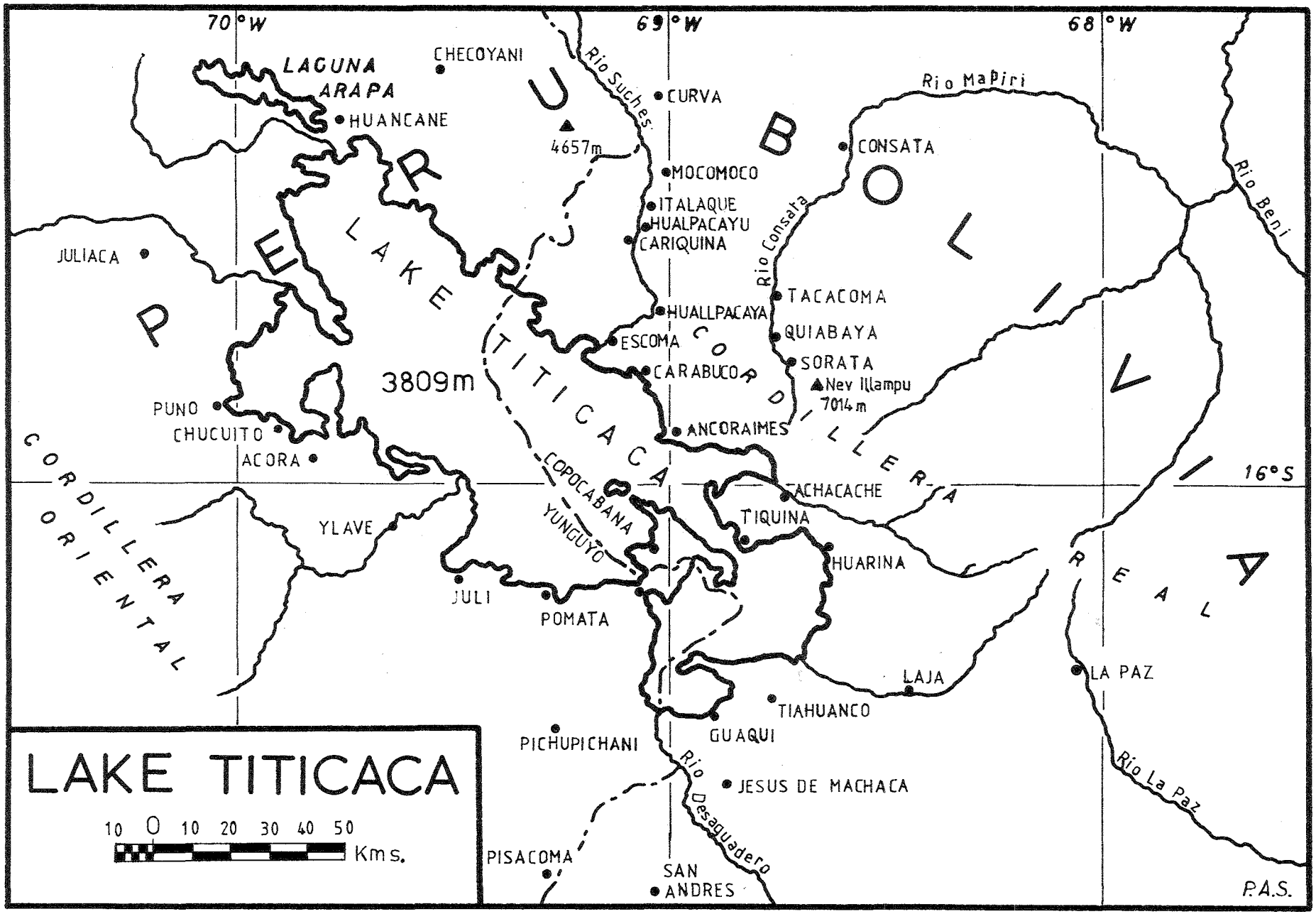
At first sight this account may seem to be concerned with little other than problems of driving over tracks hardly fit for motor vehicles and to be quite unrelated to cacti, until we recollect that the vicinity of Lake Titicaca is a home for many Lobivia. It will now be fairly obvious that these plants are going to get pretty wet, and not just once but for practically every day for weeks on end during the course of the rainy season. This might suggest that Lobivia from this area would appreciate lashings of water at the correct season – the growing season, perhaps?

. . . . from Mark Howell, "Journey through a forgotten Empire" 1964

There were several things we wanted to do in the vicinity of La Paz. Most of the indian settlements have been altered one way or another by contact with Europeans, but there were still a few villages in the remoter foothills of the main ranges that for most practical purposes are still of the sixteenth century. These would naturally be difficult to get to. I happened to mention to a British businessman in La Paz that we were lacking a vehicle and he told us that he could spare us a Commer three tonner for a week or so. The Anthropological Institute thought that a place called Charasani, way up north east of the lake, might do for our purposes.

Just before seven the next morning the truck started with a powerful roar. At a shabby petrol station we hired a fifty gallon drum and had it filled to the brim. For half an hour we climbed up the winding road to the Altiplano. We had decided to make a slight detour and shortly before arriving at Tihuanaco we ran into quite dense fog. For several hours the road remained fairly good as we skirted the south-east edge of the lake. The first big rut we dropped into bruised several sets of ribs. It was the first of many for the road started to climb slowly up the flank of the eastern cordilleras and every few feet a gulley had been carved in the road where water had rushed down from the steep slopes and across it. There were far fewer people in the fields and the fields themselves began to take on an abandoned look. As we climbed we saw fewer and fewer people until the grey-green rocky slopes seemed quite deserted. On one side of us the slope climbed craggily until it disappeared into the clouds and on the other the ground dropped precipitously to small but raging torrents. Fortunately the truck was a tractable beast and had no bad habits.

Early in the afternoon we came to a small village where we should have a last opportunity of buying bread and coffee. There would be nowhere else, no other settlements, until we had crossed the range. From the village the road started to climb in earnest. Soon we were in the clouds and isolated in a dripping white world. For hours we crashed through rock-filled pools; gradually the mud grew deeper and the sodden green and brown of our surroundings took on an air of fantasy. On a slight up-gradient, a sea of mud with one or two boulders showing in it, one wheel dropped into a water-filled hole, bounced out and settled into an even larger one just beyond. I could neither reverse nor go on. The six men ranged themselves against the front of the truck so that it began to roll backwards and forwards with increasing amplitude. At last we shot backwards three or four yards.


70°W
69°W
68°W
LAGUNA ARAPA
CHECOYANI
HUANCANE
Rio Suches
CURVA
4657m
Rio Mapiri
CONSATA
MOCOMOCO
ITALAQUE
HUALPACAYU
CARIQUINA
Rio Beni
Rio Consata
JULIACA
PERU
LAKE TITICACA
3809m
TACACOMA
HUALLPACAYA
QUIABAYA
ESCOMA
SORATA
CARABUCO
Nev Illampu
7014m
PUNO
CHUCUITO
ACORA
ANCORAIMES
CORDILLERA ORIENTAL
16°S
COPOCABANA
YUNGUYO
TACHACACHE
TIQUINA
YLAVE
HUARINA
JULI
POMATA
LAJA
LA PAZ
TIAHUANCO
PICHUPICHANI
GUAQUI
Río Desaguadero
JESUS DE MACHACA
Río La Paz
PISACOMA
SAN ANDRES
P.A.S.
LAKE TITICACA
10 0 10 20 30 40 50
Kms.

They stood aside while I backed about fifty yards and then accelerated at full throttle. The men caught up and pushed and with racing wheels we crawled forward. The back started to slew towards the edge where there was a steep grassy slope down to a black lake, then shot forward unexpectedly to the top. The road descended a hill similar to that on which we had been stuck. For several miles we churned on, slipping and sliding. Twice we rushed deep troughs of viscous mud. The rain increased and dusk started to magnify the oppressive heaviness of the mist. Just before dark we came to a shallow hill; twenty three times I backed away and rushed it; on each attempt the truck bogged in several feet of mud. Eventually we agreed that it was hopeless. Our universe was bounded by the haloed headlights and the noise of hissing rain and running water. I walked to the top of the hill and a few hundred yards along what must have been the road. Huge pools, almost lakes, covered several feet of mud. It was hopeless; we had to turn back.

. . . . from H. Middleditch

This is not the only account where I have read of the soil turning to thick mud during the rains, on the altiplano or the eastern cordillera. Do the Lobivia and the Corryocactus which grow in the basin of Lake Titicaca and its surrounding hills, occupy ground which turns to mud during the rains? In any event, they must become pretty wet.

DIE PFLANZENWELT DER PERUANISCHER ANDEN By A. Weberbauer. Die Vegetation der Erde XII 1911

The Titicaca basin

Only the floor of the basin and the lowermost parts of mountain spurs projecting into the plain belong to the central Peruvian Sierra zone – an elevated zone that extends from 3850 to 4000 m altitude. Among the formations, that of the grass steppe attains the greatest extent. It spreads over dry, level plains and slopes as well, although these are not stony or rocky, but patchily covered. Over a multitude of smaller herbs (often characterised by procumbent stalks), to which some grasses also belong, project almost separate tufts of robustly growing grasses, set out almost regularly. It is already recognisable from a distance that these largest grasses belong to several species, from their various colours – yellow-green, blue-green, and so on. Bushes are very sparsely represented, commonly procumbent, not over ½m in height when they are upright; by far the most frequently occurring is Tetraglochin strictum (Rosaceae). In the dry season the vegetation withers, but the above ground parts of the grasses remain just the same in the withered condition, both in the small and large sorts. This grass steppe is very closely related to the high-Andean bunch-grass formation and there is a gradual transition upwards into the latter. The significant difference lies in the Flora.

The vegetation of the drier stony or rocky slopes is a very scanty, motley mixture of herbs and small bushes, in addition to which there are associated some Bromeliaceae (species of Puya and Tillandsia) as well as some dwarf cacti. Floristic relations to places of lower altitude are manifested far more than in the grass steppe.

Standing and running water encompasses a consistent plant growth, whose fresh green contrasting sharply with the dun coloured steppe is maintained even during the dry period or at the most pales when relying on slender supplies of undergrown water.

Lastly there is also the vegetation of shaded gullies. There deserves mention here a Loganiaceae tree, that carries a thick dark evergreen crown, covered with tough slender leaves, on a short gnarled stem, somewhat reminiscent of the olive: the Buddleia coriacea, known by the natives as "culli". It is planted in many villages of the Titicaca highlands and often on account of very old or especially numerous specimens appears to represent a characteristic element in the landscape.

At about 4600 m the vegetation begins to become scanty; between 4000 and 4300 m many characteristic plants of the high Andes are absent and separation of the formations from one another is not always distinct. The altitude zone from 4300 to 4600 m is the region suited to the study of the significant plant formations.

The surroundings of Lake Titicaca are a territory of special character. The genus Lepidophyllum, so important an element in the western Andes of Peru and in a great part of the Bolivian altiplano, does not occur in this basin. There exists a good number of shrubs which are absent in the Puna. Among the formations the grass steppe is of the greatest extent. The steppe contains scattered shrubs, such as Tetraglochin strictum which is the most frequent, together with Adesmia sp., Colletia spinosa, Satureia boliviana, Solanum calycognaphylum, Grindelia sp., Senecio iadopappus, etc. On the north-eastern margin of the Titicaca basin, in the vicinity of Poto, there is to be found formations of the Puna mat, of Distichia moor in damper parts, of stony ground and of rocks. Opuntia floccosa and O. lagopus are to be found growing on the stony ground and Echinopsis pentlandii (Lobivia pentlandii – H.M.) among the rocks.

Comments

. . . . from H. Middleditch

Elsewhere (Chileans No. 26 p. 88) Weberbauer describes the isolated and scattered patches of stony ground which appear within the bunch grass steppe, as "warm oases" where plants are found at a much higher altitude than they more commonly occur. This can only be due to the relatively favourable micro-climate engendered by the rocky patches in relation to the general climate of the grass steppe. Weberbauer also places the Lobivia pentlandii

firmly in these rocky patches as their common habitat location. This might suggest that the Lobivia grow in very isolated rocky patches surrounded by a sea of bunch grass, in rather the same way that Buining appears to describe Eriocacti growing at very much lower altitudes on isolated rocky patches surrounded for miles on all sides by a mass of dense jungle. It is very probable that when Weberbauer uses the term "Lobivia pentlandii" this really encompasses a wide range of the species names discussed in this issue by John Hopkins.

ECHINOPSIS MAXIMILLIANA Heyder Translated by Mrs. J. Hopkins from Allgemeine Gartenzeitung 14, 1846

Ech. obovata, glaucescens, septemdecimcostata, vertue concavo, costis crassis repardis, sinubus acutis, areolis remotis immersis albo-lanatis, aculeis subduodenis albidis et brunneis arcuatis vel flexosis, lateralibus 8-10 biserialibus, intermediis binis, solitariis vel nullis; petalis fulvis. Habitat?

The largest of the existing examples is over 2 inches diam. and nearly 3 inches high, obovate, somewhat blue-green with a deeply depressed, unarmed, apex. Ribs 17, deep and acute, sinuate, thickened in the region of the areole; the furrows deep and acute. The areoles lie in deep depressions offset obliquely inwards from the rib axis and are nearly an inch apart, they are longish and bear whitish wool. The spines are very variable in number and form; on a fully developed areole there are usually twelve, 5 on each side and one above and one below, of which none can be regarded as a definite central spine; but completeness seldom occurs; of the middle ones, the lower is generally missing and often the upper one too, but when present, it is the strongest of all, a good half an inch long, brown, and weakly curved at the tip.; the lower one when present is only half as long, often only represented by a small point. The lateral spines are in equal numbers in two rows, the three middle ones are horizontal, the other two obliquely pointing upwards and downwards; they are all curved at the ends, seldom straight or either more or less arched or also perhaps somewhat wavy; the three middle ones in each row are usually present and are the strongest, nearly awl shaped, an inch long, brown; the upper and lower ones in each row are often missing, but when present are only half as long as the rest, or often quite short, much thinner, white and transparent. The flowers occur singly from the sides of the stem and are an inch and a half long, the tube and inch long, cylindrical below and nearly the thickness of a small finger, imperceptably widening at the upper end, a greenish-yellow-brown colour with small lanceolate, pointed reddish scales which gradually change into sepals which usually number 6-8 and which are nearly as long as the inner petals, lanceolate, pointed, more or less vivid yellow-brown becoming red near the tips. The true petals are in 3 rows, 5-6 in each row of which those in the outer row are longest, lanceolate, pointed and nearly all deep red-orange with only a few yellow shades at the tips; the following row are shorter oblanceolate, blunt, nearly rounded, imperceptibly pointed and finely notched, basally yellow, flame red coloured at the tips, the innermost row longish obovate, situated together and nearly forming a tube around the stamens, rounded like the preceeding row but without a distinct point, also basally yellow and flame red tipped. Stamens only slightly shorter than the inner row of petals, with light yellow filaments and only slightly darker anthers. Style columnar, faintly yellowish with seven linear collateral stigma lobes not surpassing the stamens.

Comments

. . . . from H. Middleditch

For many years I have seen Lobivias in various collections which conform with the above description and I have called them Lobivia pentlandii – obviously in error. As John Hopkins says in his review of this group of Lobivias, the situation was not improved by Backeberg's publication of a hybrid description containing features from both pentlandii and maximilliana. Having received an observation from Roger Moreton that the flower of L. maximilliana is reminiscent of a Neoporteria, I find this to be a very handy distinguishing characteristic. Certainly the almost tubular form of the inner petals petals, the reflexed, slender outer petals, together with the petal colour running from yellow at the base to flame-red at the tips, is very similar to Neoporteria. This inevitably leads to the thought that a similar flower form is designed for a similar purpose; does the flower on L. maximilliana have a capacious nectar chamber like the Neoporteria flower?

. . . . from J. Hopkins

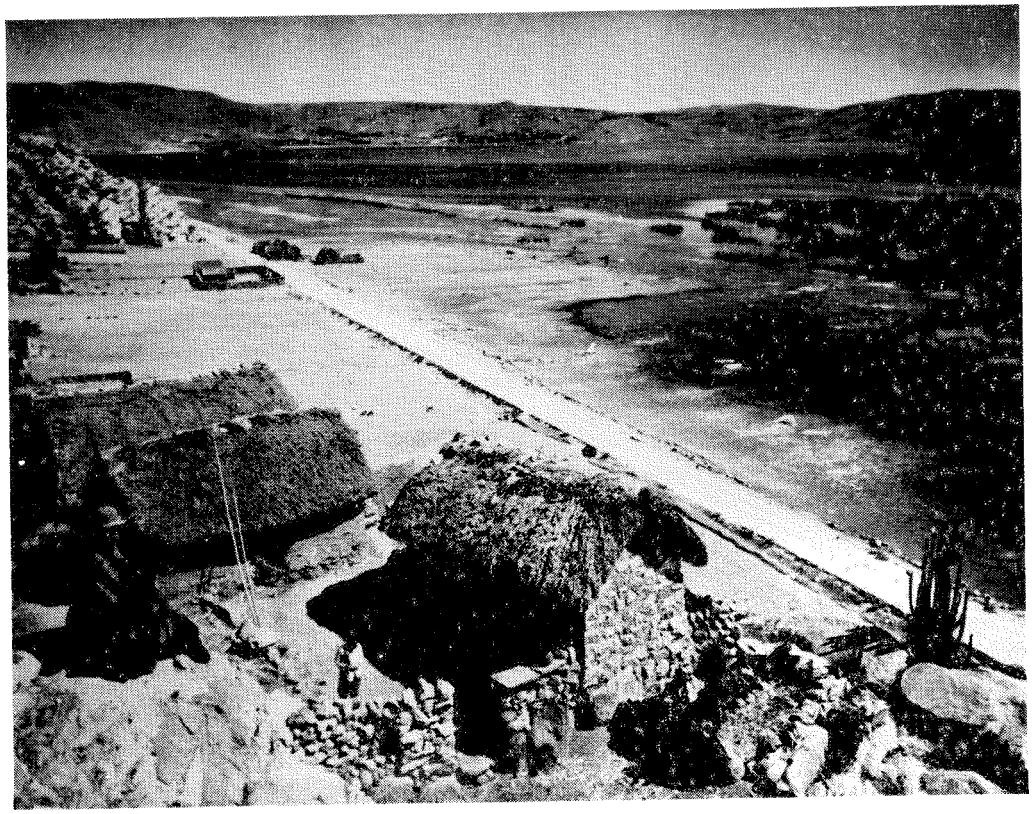
The only notes I can find on L. maximilliana flower sections refer to one plant only. When the flower was sliced some nectar was present as it seems to be in all of the Lobivia flowers possessing the ring of upper stamens fused together into a cylinder.

. . . . from J.R. Gooch

I have sectioned several flowers of L. maximilliana this season to try and ascertain if they contained any nectar. Each time the very fleshy flower tube was cut it seemed to exude juice in liberal quantities and I was unsure whether I was looking at juice or nectar. At my fourth attempt I remembered the obvious and dabbed my tongue on the juice and have assumed from its very sweet taste that the flowers must contain nectar. I know people have asked about other plants, what nectar is present each day of opening, but at the time my L. maximilliana were in flower the blooms were only lasting a single day.

On the shore of
Lake Titicaca

POHL & ZEPP
Latin America

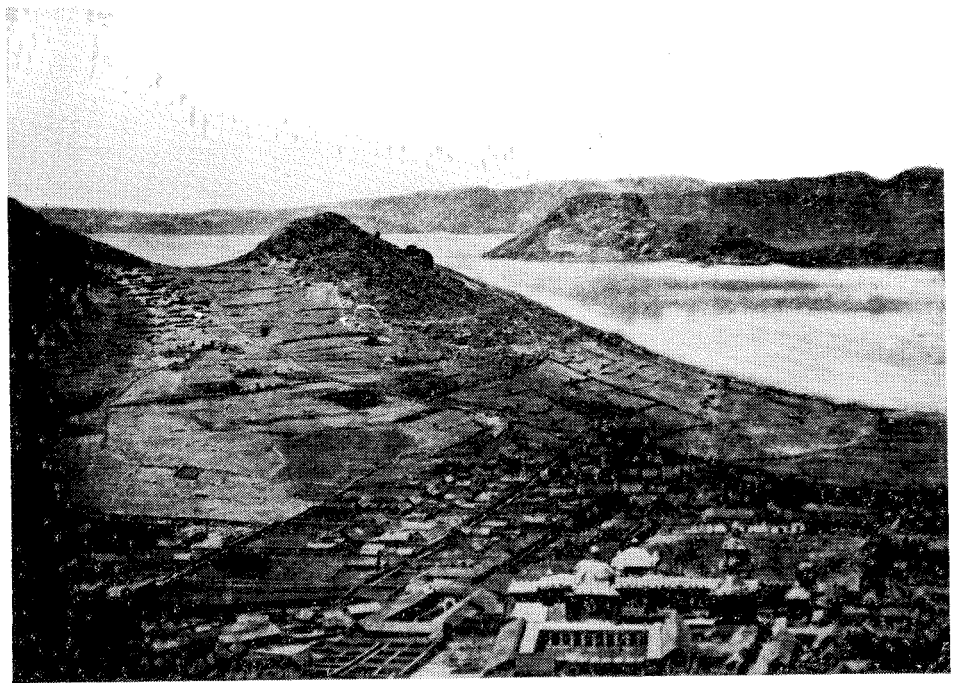


TIQUINA
Lake Titicaca

JAMES - Latin America

COPACABANA
Lake Titicaca

McKELLAR - A pleasure pilgrim in South America



LOBIVIA PENTLANDII

CURTIS'S BOTANICAL MAGAZINE 1844

GYMNOCALYCIUM ARTIGAS

CACTUS FRANCE 6.29.1951

ECHINOCACTUS PENTLANDII Hooker Curtis's Botanical Magazine Vol 70 1844

Globosus vertice umbilicato sub-12-costatus glaucus, costis elevatis remote crenatis, sinubus acutis, areolis distantibus albolanatis, aculeis subvalidis aequalibus paululum arcuatis stellatum patentibus rufo-fuscus, floribus lateralibus sparsis solitariis, tubo calycino squamosos, squamis ciliato-pilosis, petalis sepalisque rufescenti-roseis lanceolatis mucronatis.

Plant nearly globose, sessile, about 2 inches across, depressed and umbilicate at the top, deeply marked with about 12 furrows, which are sharp in their sinuses, and as many prominent, obtuse ribs, of a glaucous-green tint. Ribs lobed, or remotely crenate, distantly beset with pulvericuli or little woolly tufts or areolae, from which rise about 6, slightly curved, spreading, rather stout spines, each half an inch long, or a little more. The flowers are large in proportion to the size of the plant, and spring from the sides upon the ribs, solitary, but 3 or 4 are expanded on one specimen at the same time. Calyx-tube green, becoming yellow above, and beset with small, pilose, and ciliated scales; limb of the calyx yellow-red upwards and within. Petals deep rose colour. Stamens numerous, nearly white.

GYMNOCALYCIUM ARTIGAS Herter By G. Herter

Translated from Cactus (France) 6.29:1951 by H. Middleditch
(Original: Revista Sud-Americana de Botanica June 1950/April 1951)

During a study trip undertaken in September 1947, in the basin of the Rio Negro, the river which separates north and south of the Republic of Uruguay, I discovered a number of specimens of a cactus which I quoted at first as Gymnocalycium netrelianum (Monv.) Br. & R. It is close to the little village of Blanquillo (Department of Durazno) where this plant grows, in the clefts of the horizontal beds of red sandstone, situated at about 150 m above sea level. The largest specimens flowered shortly afterwards at Montevideo, this same year 1947. At the request of my colleague J. Calle of Paris, I entrusted to Dr. Soulaire, at that time a doctor on a French ship which put in to Montevideo in January 1948, half of the collection, all the specimens which had flowered in the previous summer, to be distributed to various interested people in France. I have heard nothing more of this collection.

A precise indentification was not possible at that time. I provisionally accepted the name of G. netrelianum, but with the idea that it might be a matter of a species not yet described. Neither the description nor the illustrations of the species of Gymnocalycium published up to now coincide altogether with the plant from Blanquillo.

The species of Gymnocalycium native to the territory of Uruguay, Viz: G. denudatum (Lk & Otto) Pfeiff., G. hyptiacanthum (Lem) Br. & R., G. monvillei (Lem) Br. & R., and G. multiflorum (Hook) Br. & R., all have according to the literature, flowers white or slightly green or pink, whilst the flowers of our plant are of a bright yellow colour. The species described with yellow flowers, viz G. leeanum (Hook) Br. & R., and G. netrelianum (Monv.) Br. & R., differ in their spine count; the first has up to 11, the second 5 to 7, whilst in the case of the plant from Blanquillo, I have found from 3 to 5, rarely six. Gymnocalycium leeanum is also distinguishable by its pale yellow or cream coloured flowers and by the erect central spine, which is absent in our plant as in G. netrelianum. This latter species has a globular shape and smooth spines, whilst the plant from Blanquillo is altogether flattened and the spines quite rough. In addition, G. leeanum and G. netrelianum are of a grey-blue colour (glaucous according to Britton & Rose) which is not so in the case of the species from Blanquillo.

Among the species described at the commencement of this century by Arechevaleta, G. uruguayense (Ar.) Br. & R. from the Paso de los Toros, a village located in the same basin of the Rio Negro which yielded up my plant, differs from the latter by its white flowers (pinkish according to Britton and Rose) and because it has only three spines. Gymnocalycium melanocarpum (Ar.) Br. & R., from Paysandu, in the basin of the Rio Uruguay, differs from it through having ten to twelve spines and by the blackish colour of its fruits.

I have since studied the literature on this subject and I have come to the conclusion that this species is a new one to botany. This is also the view of my cactus colleague Mr. Krainz, at Zurich. I give below the description of the fine plant which I name in memory of General Artigas, founder of the Uruguayan nation.

Gymnocalycium artigas Herter sp. nov.

Body globular when young, then becoming conical or sub-cylindrical, strongly depressed, 6-8 cm diam., 2-3 cm high without the underground sub-napiform parts, green colour (neither glaucous nor greenish-grey). Ribs at first 6 to 8, later 10, large, glabrous, with distinct tubercles, semi-globular, humped or nearly hexagonal, sub-confluent, irregularly arranged in vertical lines. Spine 3-5, rarely 6, radial or sub-pectinate, pretty hard but flexible, not sharp, flattened, unequal, 1 to 2 cm long. Plant monoecious. Large flowers, singly or commonly in threes or fours together, 5 cm long and broad. Outer sepals scale-like, green, furnished with a red central stripe, the smallest 5 mm by 5 mm, interior petals larger, citron yellow, shiny, 6-8 mm broad, 30-40 mm long. White stigma lobes, bunched together in male plants, spread out in the female plant. Yellow anthers.

Habitat: Uruguay Dept. Durazno, Blanquillo, in rocks at 150 m altitude, IX, 1947 Herter (H.H. 99.773) type specimen grown at Montevideo, in flower X 1947. Plantae Uruguayenses exsiccatae 1722a.

The photograph published by F. Muller Melchers in Sukkulentekunde 1.27.1947 under the name of G. uruguayense does not depict the species of Arechavaletai, but that of G. artigas. It is reproduced here by courtesy of Mr. Krainz who has kindly loaned us the block.

From my harvest of 1947, there remains with me 50 young plants which had not attained maturity; 19 of these examples flowered at the beginning of the summer of 1948 and 18 of these same plants in the following summer. The observations which follow refer to these specimens. The remainder of the collection, as well as the flowers, fruits, and seeds, were distributed between various colleagues and published in my "Plantae Uruguayenses exsiccatae".

In analysing the flowers of our Gymnocalycium, what first caught my attention was their sexual dimorphism. The flowers have all the organs of both sexes, but they are not hermaphrodites, at least in the physical sense of the word. In a certain number amongst them (half or less) only the female organs are viable, and in the others only the male organs. The organs which are sterile appear thinner than normal, the stigma lobes remaining bunched together and not rising up to the level of the anthers, as do the normal stigma lobes. The sterile anthers are smaller than the normal ones. Only the flowers with normal female organs yield fruits, in such a way that one may speak of female and male flowers, at least in the physical sense. And as the male and female flowers originate on different plants, one may also speak of feminine and masculine plants.

Schumann has observed that in certain species the stigma lobes are conjoined, in others spread out, apparently without recognising the possibility of sexual dimorphism. The conjoined stigma lobes of the first sort are not viable, those of the second form are normal stigma lobes. It would be interesting to confirm as much in the cactus family, as in other plant families, this form of sexual dimorphism or "pseudohermaphrodism" which avoids self-pollination, without materially altering the appearance of the flower; an adaption which could be advantageous for the plant in its pollination by insects or birds.

In the first summer, 1948, the 19 plants which flowered produced 47 flowers altogether; in the second summer 1949-50 one of these plants did not succeed in flowering and from the other 18 there came 44 flowers, which gives an average of 2.5 flowers per plant in the first summer and 2.3 in the second. The flowers were open on average during 5.2 days in the first summer and 5.3 days in the second. Flowering began on October 21st and continued without a break up to November 12th, that is to say for 23 days. After a lapse of 22 days flowering recommenced on the 5th December to cease finally on the 7th day, the 11th December. In the second summer, flowering began only on the 1st November and continued uninterrruptedly until November 25th, that is to say for 25 days. After a lapse of 6 days flowers reappeared on December 2nd to end on the 5th of the same month and after a further lapse of 3 days a third flowering period of four days followed, from the 9th to 11th December, and eventually after a final lapse of 39 days, a fourth period of flowering followed for two days only, the 20th and 21st January 1950.

In the first summer the plants flowered for a total of 30 days, in the second for 34. The flowering of our Gymnocalycium is in consequence quite precocious and occurs between the spring equinox and the summer solstice. The flowers are usually open from 4 to 6 hours each day, from 10 to 11 o'clock in the morning up to 3 or 4 o'clock in the afternoon, depending upon the weather. They open but slightly when the days are cold, cloudy, or with a lot of wind and stay entirely closed when it rains. The appearance of the flowers has usually been weaker the second summer rather than stronger as one might have anticipated, since the plants had not yet reached maturity. The reason for it has been the unfavourable weather of the second summer, as a result of which the growth was retarded on account of low temperatures, the excessive humidity and the strong winds in the spring. For the same reason, the flowering period of our Gymnocalyciums was also retarded.

As in 1948 and again in 1949, only male flowers appeared initially (respectively 8 and 11) followed by male and female flowers together, and the last flowers were again male flowers (2 & 3). Of the 19 plants which flowered, 10 produced male flowers exclusively and the remainder, female flowers. The number of male and female flowers were 23 and 24 in the first summer. In the second summer 18 of the 19 plants flowered; 9 produced male flowers and the other 9 plants female flowers once again. This time the number of male and female flowers was 26 and 18. Combining these observations for the two summers, we have a total of 50 masculine flowers on 10 plants for both times and of 41 female flowers on 9 plants for both occasions, which gives an average of 2.5 flowers for the male plants and 2.3 flowers for the female plants.

The number of male plants was in consequence slightly larger than that of the female plants, whilst by comparison the production of flowers was less in the female plants than in the male plants. I artificially pollinated the flowers in 1948, distributing pollen on the stigmas each day with my brush, with the result that all the 23 female flowers yielded viable fruit. The following summer I did not touch the flowers at all; the result was that only 8 fruits appeared from the 18 female flowers.

The fruits are of ovoid shape, of 8 to 15 mm in diameter and 10 to 18 mm in length, of an olive green colour. They ripen up to the end of the year, opening longitudinally by two vents, occasionally 3, which run from the base nearly as far as the top and free numerous seeds (round about 100), polyhedral, black, about 2mm in diameter. The seeds were embedded in a spongy mass of pinkish colour and of insipid flavour, at least to my palate, but very sought after by the snails and ants who may contribute, together with the rain, in the distribution of the species. The seeds of

1948 germinated 80%, according to the letter from my colleague Callas dated November 25th 1949, this information coming from Mr. J. Gastaud, of Roquebrune-Cap Martin, who sowed the seeds.

The publication of this present study, based upon the observations made at Montevideo, was completed by the bibliographic studies in Europe on the occasion of a fresh visit undertaken during an Official Mission for the Government of Uruguay during February 1950.

Gymnocalycium artigas Herter spec. nov. Rev. Sudam. de Botan. Vol X No.1.

Corpus juventute subglobosum, postea obconicum vel subcylindricum, valde depressum, diam. 6-8 cm, alt. 2-3 cm (partibus subterraneis subrapiformibus exclusis), laete obscure viride (non glaucum nec griseo-viride). Costae primum 6-8, postea ad 10, majusculae, glabrae, tuberculis distinctis, semiglobosis vel mamosis seu obtuse hexaedricis, subconfluentibus, in sereis verticales subirreulariter dispositis. Aculei 3-5, rariter 6, radiates vel subpectinati, setosi, subduri vel flexiles, non pungentes, corpori adpressi, inaequales, 1-2 cm long.. Plantae monoicae. Flores majusculi, singuli vel plures, saepius terni vel quaterni, ca. 5 cm long. et lat. Tepala externa squamiformia, viridia, medio rufovittata, minora ca. 5 x 5 mm, paulatim in tepala interna, majora, lucida, citrina, 6-8 mm lat., 3-4 cm long. transeuntia. Stigmata nivea, in plantis masculinis unitae, in femineis patentes. Antherae vitellinae.

Habitat: Uruguay, Departmento de Durazno. Blanquillo, in saxosis, 150 m s/m, IX, 1947, Herter HH 99773 (Typus), cult. in Montevideo, fl. X. 1947, Pl. ur. exs. 1722a.

Comments on G. artigas

. . . . from H. Middleditch

It is remarkable how easily a misimpression of some particular characteristic of a species can become quite firmly implanted in one's mind and only when it becomes necessary to refer back to the literature does the misconception come to light. For some time now I have tended to group the Gymnocalyciums from Uruguay and the adjacent part of Brazil into three categories – the Yellow flowered sorts, the white-flowered denudatum and the superficially similar horstii/buenekeri. So I was quite surprised when I read that Herter quoted G. uruguayense with white or pinkish flowers; but when I looked up the entry against this species in Backeberg's Kakteenlexikon, I find that he quotes pale lilac (or elderberry) to white for the flower colour. So I then go back to Sukkulentkunde I, the 1947 yearbook of the Swiss Cactus Society, to have a look at the original photograph of G. artigas, later reproduced by Herter. Indeed the plants are described there as G. uruguayense with yellow flowers, so that Herter would seem to be justified in suggesting that they would be better given a specific name. The photograph in Sukkulentkunde was taken by F.C. Mueller-Melchers and the title to the photograph states that it was taken at the natural habitat at Paso Valegas. In the accompanying article, the same author states that they came from Tacuarembo Province; this is immediately north of the Province Durazno quoted by Herter as his finding place for G. artigas. But an enquiry to our member in Uruguay for a more precise location for Paso Valegas brought the reply that it had not been possible to locate any place or feature of this name, despite enquiries at a number of local police stations.

YELLOW FLOWERED GYMNOCALYCIUMS FROM URUGUAY Comments from Members

. . . . from Mrs. McIntosh, N.Z.

I was very pleased to see the photo of my Gymno. which you printed in No 17; unfortunately I now think that it is in fact Gymno. leeanum and not G. guerkeanum! And here lies a story. Even though this plant has always worn a G. guerkeanum label, it always worried me by being different; however I felt that this could have been so with it being female – the plants for comparison being males. But last season a small offset was taken from the plant in question, grafted, and as it grew two centrals appeared from each areole, plus the 7 radials. By the end of the growing season it had settled down to one central only per areole. This season it is merrily on its way again without any centrals at all!

At the time the offset was grafted, I also grafted offsets from G. leeanum and G. netrelianum; neither of these parents showed any centrals. The grafted offset from G. leeanum grew one central per areole and this season there is only an occasional one showing. Gymno. netrelianum offset did not produce any centrals at all. Borg says that G. leenum has centrals, none for netrelianum or guerkeanum. I feel less guilty about my incorrect name when I look at the sketch of Mr. Lavender's plant for that also has the central spine that my G. leeanum showed – perhaps his plant is also wrongly named and both plants should in fact be G. leeanum?

At present I have flowering G. guerkeanum, leeanum, hyptiacanthum, netrelianum and artigas. One would have to be an expert to find a difference (which I definitely am not) but with minute examination here is what I have found; flower colour all the same, lime green on opening, fading to greenish yellow, all have petals in three rows. G. guerkeanum and artigas have a distinct point on the tip of the petal and a tube less than ½" high. The other three species have narrower and more feathery edged petals without a point on the tip, and a slightly longer tube. All show the "pseudohermaphroditism" as I have already explained. G. artigas is a very nice plant, now just over 1" across at 18 months old; it has been producing one flower after another for the last six weeks – it always starts off with three buds but only one develops and the other two disappear. Then the cycle starts up again and another three buds appear, and so on.

I hope that you can follow this, it may do a little to sort out some of the difficulties of identification — there is no difficulty as far as my observations go up to 2 years of age, for seedlings of each one are quite different. After that they grow alike and it is anyone's guess telling them apart!

. . . . from H. Middleditch

It is very nice to hear how the illustration accompanying the article by Gerhard Frank in our No. 17 Journal has proved of value to a collector on the other side of the world. I should have very much liked to have known what stock Mrs. McIntosh used for grafting her offsets; it does seem possible that some stocks can lead to a scion producing central spines when they are normally absent. I also wonder if there were any more offsets left on the plants and if these, too, exhibited the same tendency to produce central spines when in their first two years; if they did not, one would tend to be suspicious that the centrals could be attributed to the influence of the grafting stock.

G. netrelianum was described by Monville in 1853, without a type locality nor even a country to define its distribution; Gymno. guerkeanum was until quite recently mistakenly believed to emanate from Bolivia — neither its precise type locality nor its area of distribution are known at all. Even G. leeanum is given a type locality of 'Argentina' (an area roughly equivalent to that of the whole of western Europe). The original authors have left posterity with very little chance of pinning down accurately the plants that they intended to carry these names!

Reference to Britton and Rose, Vol III p. 156 reveals a sketch of G. leeanum, reproduced from Curtis's Botanical Magazine No. 71 of 1845, which accompanied Hooker's original diagnosis. This does indeed show central spines, but they are quite straight and stand out from the body of the plant — porrect, as Britton and Rose say in their description of the species. To the best of my belief this type of central spine — that is, standing straight out from the body — is hardly typical of the yellow flowered Gymnocalcium and I feel it is unlikely that a yellow flowered Gymno with straight, porrect, centrals, is to be found in collections in this country. One is in consequence left wondering whether the original illustrator has perhaps let his imagination run away with him.

. . . . from C. Webb

I have no imported plants of the so-called Uruguayan group so cannot write with authority on these species. Indeed, many plants I have obtained from local and continental sources are not at all what they are named, some not even in the right seed group. Recent acquisitions of G. artigas and G. uruguayense are examples of this problem, the latter being a typical Gran Chaco plant! However, one or two points about G. Frank's paper worry me a little. I am not happy that he states ". . . . with the exception of G. uruguayense, G. artigas & G. schroederianum, flower and seed diagnosis and type localities do not exist for the species mentioned . . . ." and yet despite this lack of factual information he is prepared to make a decision on their proper place and lump them all into one or two species viz: G. leeanum and G. uruguayense. I have talked to other collectors who do possess imported specimens of the Uruguayan group and it seems that the pseudohemaphroditism referred to by Gerhart Frank is not in fact general throughout this group.

Like most Gymnocalycium enthusiasts, I believe that we do have far too many 'specific' names and this Uruguayan group is no exception. However, I feel even greater confusion amongst ordinary growers would ensure if we had too much variety occuring under one specific name. Therefore we either keep more specific names to identify the clearly recognisable forms, or we erect new combinations giving varietal status to these. In view of the recent increase of new discoveries and the consequently greater volume of material for study, perhaps it is unwise to move too fast just yet. Whilst it is highly desirable to be able to recognise relationships readily from the names we put on our plants, it is also desirable to be able to use the names on the labels as a means of identification and this aspect is lost if the name appears on a large number of widely different looking plants.

. . . . and further from H. Middleditch

I find myself in sympathy with the final comment expressed above; we have on the one hand the professional or amateur botanists who apply the recognised academic criteria to the subject of nomenclature, that is, the naming of cacti plants; in so doing they very properly take into account the natural variation which occurs in a population over its natural habitat. On the other hand, we have the amateur collectors, who grow their plants for interest and enjoyment and who prefer to have a name which can be used to define a plant with not too much variation in the compass of those plants to which the name is applied. This approach can be taken to excess, by the establishment of numerous genera or by using exceedingly fine distinctions for the establishment of new species. Discounting these aberrations, there would seem much to be said (from the point of view of our own readers, for example) for adopting the approach to nomenclature set out in the final paragraph of the preceeding comments.

One characteristic of this Uruguayan group of Gymnocalyciums which would not seem to have been the subject of comment, concerns the fruits. During our Continental Tour in 1969 we were very kindly invited to visit three collectors in the small village of Oberklingen in Western Germany. There we saw a plant of G. leeanum carrying fruits of just the same shape as those on the illustration from Mrs. McIntosh; a few days later we visited the Linz Botanic Gardens and then Dr. Schutz in Brno in Czechoslovakia and at both these collections we found Gymno. uruguayense in fruit; the shape of the fruit differed from that exhibited in the illustration of G. guerkeanum in No. 17 of our Journal, in lacking the conical tapered upper part; it was, indeed, almost barrel shaped, perhaps about 15 mm in diameter and 18 to 20 mm in

height, including the bluntly tapering base. The fruit was of similar shape in both collections and also of similar colour, being deep rich green.

It does seem probable that more or less globular shaped fruits are typical of the Uruguayan section of the Macrosemineae.

. . . . from G.E.H. Bailey

In a previous issue of the Chileans, there was mention of stoloniferous growths on some of the Uruguayan Gymnos. I noticed recently that my Gymno. artigas had been pushed slightly out of the compost on one side, where there were several pups emerging. So I de-potted it and carefully removed the compost. In typical Gymno style, the body was flat-bottomed, except that there were depressions in it near the pups. They had, apparently, emerged from the lowest areoles, which were, of course, near the middle of the base, from which the roots came. They had pushed their way outwards, developing quite lengthy umbilical cords to their place of origin. There was so much root that I could not pose the plant for a photo.

. . . . from Mr. & Mrs. P. Collins

We have noticed a definite scent with the flowers of the yellow-flowering Uruguayan Gymnos of the leeanum-artigas-uruguayense complex.

NEOPORTERIA PSEUDOLANICEPS n.n. From R. Mottram

The sketch on the front cover, which is drawn to scale, is of a plant about 16 cm high which is in the Whitestone collection; it was originally raised from seed supplied by New Mexico Cactus Research in 1972. Unfortunately it was the only surviving example, so it is not possible to describe the degree of variability within the scope of this name. To the best of my knowledge, this name has only appeared in the New Mexico Cactus Research lists since November 1971, without locality or field number. The name itself refers to the similarities to N. laniceps, described in 1963 by Ritter under the name N. planiceps (Taxon 12:34, 1963), but later changed to N. laniceps in a correction published in Succulenta 1966:36. In point of fact, N. laniceps is so variable in its stem and spination that one would be hard pressed to find any reason for separating N. pseudolaniceps on morphological grounds. Moreover, the close affinities with N. villosa (Monv.) Berg and its varieties atrispinosa (Backbg.) Don. & Row. and cephalophora (Backbg.) Don. & Row. cannot be overlooked.

The main difference appears to be in the very large areoles of N. pseudolaniceps, which are some 1.0 – 1.3 cm long in our example, compared with up to 5 mm long in typical N. laniceps. In fact these areoles are much more like those seen on some examples of N. rapifera, and likewise exhibit a high degree of floriferousness. Flowers may appear two or more together at one areole, or they may be produced from the same areole for many years before they finally become sterile. In this respect, the areoles remind me very much of the densely felted areoles in the flowering region of Lophocereus schottii, and it seems that this kind of semi-cephaloid areole occurs randomly in the family by convergence. Spines reduced to bristles also fits into a common pattern, although the reasons for these is obscure.

All the Neoporteria of the villosa group appear to be self-compatible, but fruit is not always produced, presumably because of lack of contact between the stigma lobes and anthers. On the plant in question, 5 out of 6 fruits gathered contained no seed, while the other had 9 seeds plus 3 germinated seedlings (endogenous vivipary). The beauty of these Neoporterias is the long succession of flowers produced throughout the winter when there is little else of interest. Cultivation presents no special problems, although in peat-based mixtures we have had the occasional plant suffering basal rot.

. . . . from A.F.H. Buining, Succulenta 50.2.1971 & 50.4.1971

(Travelling northwards along the coast of Chile, between Huasco and Copiapo). One day when on the main road again, we came before long right up to some cliffs where iron ore outcropped over a very large area. Here there grew Pyrrhocactus huascensis, Thelocephala napina, Neoporteria villosa and Copiapoa fiedleriana. It was of interest that we found many Neoporteria villosa on the different hilltops, some with really stiff black spines as well as others with softer bristly spines. In some places I found obviously younger plants in deep crevices in the rocks with only soft bristles, to even almost hairlike spination, a speaking likeness to Backeberg's Neoporteria cephalophora. There were growing immediately alongside them, the typical Neoporteria villosa with stout spines, so that only one species is involved here. From there Ritter pointed out the road leading to where Pyrrhocactus crispus (syn. Neochilenia nigriscoparia Bckg.) would, with difficulty, be found.

After much hesitation, during which Ritter frequently got out of the truck and walked a long way off in the soft sand to orientate himself, we eventually came to the spot where he had found the handsome Neoporteria laniceps years ago on a hill. An extremely rare plant, which varies in its length, hardness and colour of spination even then. It is only to be reached with an extremely risky climb. Not far from there occurred handsome clumps of Copiapoa carrizalensis. Further on was the finding place of Neoporteria sociabilis.

. . . . from R. Ferryman

I too have a plant with this name, of unknown origin. I have only ever seen the name on New Mexico seed lists and I am of the opinion that it is just their catalogue name. Neoporteria laniceps Ritt. is the northern extension of the Neoporteria villosa complex which to my mind encompasses Backeberg's N. atrispinosa and cephalophora. The variation of spine strength of villosa and laniceps range from hair like to stiff. Seedlings usually exhibit the hair like spination; how long this lasts I do not know but I still have a seedling N. laniceps which is now 8 to 10 years old and still has the hairlike spination. Also my plant of N. pseudolaniceps which is approx. 8 years old still has hairlike spines.

The Lau collected N. laniceps in my collection are striking because of the large tuberous root with a narrow neck. This is something I have never seen mentioned in descriptions of N. villosa; I do not have Monvilles description but I have those of Schumann, Britton & Rose, and Backeberg. My imported plants of N. villosa from Lau were without any tap root. My plants of N. laniceps fit Ritter's description fairly well although one of the Lau imports has a body diameter in excess of 7 cm, whereas Ritter quotes 4 cm for this size. The flowers are very similar on both N. villosa and N. laniceps, being around 2 to 3 cm high. A very old grafted N. villosa, now just over 14" high and seemingly dichotomous, carries flowers for almost twelve months of the year, with slightly larger flowers some 3 to 3.5 cm high. All plants of this complex flower freely and from a very small size. I set fruit on both species this year, N. laniceps Lau 868 x Lau 868 and N. villosa Lau 844 x Lau 844. Both are typical Neoporteria fruit. Roy Mottram's drawing corresponds reasonably to my plants, although mine appear to be much more densely spined, they have slightly spiralled ribs and the body does taper downwards to the base of the plant. There are also chinlike areoles which are probably more prominent than those on the drawing.

The habitat of N. villosa is generally regarded as Huasco; Knize quotes north of Huasco for this species as KK 31. The habitat location for both N. atrispinosa and N. cephalophora is Huasco. Ritter quotes Totoral Bajo for the habitat of N. laniceps and Lau quotes Carrizal Bajo, almost midway between Huasco and Totoral Bajo.

. . . . from A.W. Craig

I have two plants of N. laniceps and to me the most obvious thing about the spination is the black centrals and the white hair-like bristly radial spines, giving a salt-and-pepper effect.

. . . . from G. Charles

My plant of N. laniceps is a seedling obtained from Southfields nursery in 1977. It has produced very tiny flowers indeed, quite possibly the smallest I have seen on a Neoporteria.

. . . . from P. Goodson

My plant of N. laniceps has produced a number of flowers which do not quite grow up to the height of the spines.

. . . . from H. Middleditch

It would appear that N. laniceps can be distinguished from N. villosa/atrispinosa/cephalophora by the smaller flowers and by the thickened rootstock having a narrow neck joining it to the body of the plant. Also the geographical location is further north at a place isolated by a distance over which plants have not been found, or do not grow. What distinguishes Neoporteria sociabilis from this group of plants? Just the green body and the absence of a thickened rootstock? As N. sociabilis is also reported by Ritter from Totoral Bajo, does N. laniceps come from a spot less favoured by the mists and more exposed to the rays of the sun, whilst N. sociabilis comes from a spot more favoured by the mists and on a slope less directly exposed to the sun? What distinguishes N. sociabilis v. napina Ritter, with its thickened rootstock, which emanates from Carrizalillo, from Lau 868 found at Carrizal Bajo and accepted in commerce as N. laniceps? Anything?

NEOPORTERIA PLANICEPS sp. nov. Ritter By F. Ritter Taxon XII.1.1963

Corpus ad 20 cm longum, 3-4 cm diam., radice rapacea magna, lutea, apice angustata; costae juveniles in tubercula solutae, adultae 13-17, crenatae, tuberculis superne planis, breviter mentiformibus, areolis 2-4 mm longis, 2 mm latis, 2-5 mm inter se remotis, albis; spinae 25-50, capillaceae, curvatea vel crispae, centrales 2-4 cm longae, brunneae vel atrae, radiales pallidiores; flores 28 mm longi; tepala 12 mm longa, 2 mm lata, carminata; tubus floralis albo-floccosus et setis nonnullis capillaceis, mollibus, luteolis vestitus; stamina fundo tubi inserta; stylus albus, stigmatibus 7, pallide luteis; fructus cupaeformis, albo-floccosus et setis nonnullis albis tenuibus obsitus; semina pallide nigra, verruculosa.

Habitat: Totoral Bajo, north Chile; scarce there. Collected as FR 483.

(From the Latin) Body up to 20 cm long, 3-4 cm diam., with a huge turnip-like swollen root; young ribs divided into tubercles, older ribs 13-17, crenate, tubercles flattened above, with a short chin, areoles 2-4 mm long. 2mm broad, 2-5 mm apart, white; spines 25-50, hair like, curved to wavy and twisted, centrals 2-4 cm long, brown to dull black, radials paler; flowers 28 mm long; tepals 12 mm long, 2 mm broad, carmine; flower tube furnished with white wool and some pliant, hair like pale yellow bristles; stamens inserted at the base of the tube; style white, 7 pale yellow stigma lobes; cask-shaped fruit, covered with white wool and some slender white bristles; seeds glossy black, covered with small wart-like protuberances.

NEOPORTERIA LANICEPS Ritter By Friedrich Ritter Translated from Succulenta 45.3:1966 by H. Middleditch

The Latin diagnosis of this plant was published in Taxon 12;1963. A printing error altered the name N. laniceps into N. planiceps. It is obvious that the name planiceps is a printing error, considering that the plant in its latter years carries a completely woolly and bristly crown.

Plant: a lively green in the shade, becoming browned in the sun, 3-4 cms thick, later becoming elongated up to about 20 cm long, hard, crown depressed; large yellowish tap-root with narrow neck.

Ribs: in young plants sharply resolved into tubercles, later clearly 13-17 spiralled ribs, deeply indented; outside of the tubercles flat, with a chin directed sharply upwards behind the areole; tubercles of young plants about 2.5 mm long, of old ones up to 1.5 mm long and ca. 2.5 mm broad, no broader towards the base of the plant.

Areoles: sunken in the flat face of the tubercles, 2-4 mm long, about 2 mm broad, 2-5 mm apart, with white felt.

Spines: formed as stouter or finer hairs, which are more or less curved or curled; central spines several, brown to black, somewhat stouter than the radial spines, 2-4 cm long; radial spines only slightly shorter, paler or grey, similarly coloured, all standing out together as a tuft and 20-50 each areole; on the areoles of older plants the radial spines often look like an outstanding bunch of soft wool.

Flowers: from the crown, appearing very freely; one must however bear in mind that this species flowers in winter and conforming to the climate on the coast of Chile in the winter needs moist air; at the habitat it is cold but frostfree in the winter; flower 28 mm long, open for several days both by day and night, scentless; corolla 20 mm diameter.

Ovary: green, spherical, 4.5 mm diam., with very small red scales with thick white flock-like wool in the axils.

Nectar Chamber: 2 mm long, dishlike at the bottom and 3 mm wide, narrowed towards the top by the wall growing thicker towards the inside, so that at the top it almost closes the nectar chamber against the style, amply filled with nectar, distinctly waisted externally.

Flower Tube: slender funneliform above the nectar chamber, 10 mm long, 5 mm wide above, reddish externally with a few pointed red scales with flocks of white wool and a few soft, hairlike, yellowish twisting bristles, in the axils.

Stamens: stand upright, white, all more or less the same length; inserted only in the lowermost half of the flowertube; anthers pale yellow, reaching as far as about one-third the height of the petals; pollen white.

Style: white, 21 mm long, of which more than 1 mm is represented by the 7 outspread stigma lobes which terminate in a point and stand in the flower opening.

Fruit: deep carmine red, about 12 mm long, 7 mm thick, barrel shaped; covered like the ovary and on the upper side as well with a few fine, soft, curved, white spines; pericarpel markedly narrowed, flower remains attached, an opening at the base.

Seed: 7 mm long (misprint for 0.7 mm? — H.M.), 0.7 mm wide, 0.5 mm thick, strongly arched at the rear, somewhat narrowed towards the bottom, truncated; testa dull, black, with extremely fine flat protuberances; hilum white at the bottom, small, roundish.

System: allied with Neoporteria villosa. Holotype: in the herbarium of the University of Utrecht. This species was found by me in January 1956 and has my field number FR 483.

ARE ALL MATUCANAS "HUMMING BIRD FLOWERS"? By H. Middleditch

The Chileans discussion on humming bird flowers was opened at our 1973 National Gathering, making use of slides brought by members to illustrate the typical characteristics of the humming bird flower. An opportunity was taken a few months later, on the occasion of a local Chileans get-together in the north-east, to remove two or three flowers from plants of Matucana and slice them in order to examine their internal construction. With every expectation of the "prolific amounts of nectar" being present in this instance, anticipated from member's observations on slicing other humming bird flowers, suitable precautions were taken by slicing the flowers concerned over a thick wad of newspaper. But — practically no nectar was present! Indeed, what was more, the nectar chambers revealed by slicing the flowers were far smaller than had been expected from seeing the slides of sliced flowers from Borzicactus and Cleistocactus which had been screened at Brooksby.

The most noticeable exception in this respect was the flower of Matucana paucicostata, which had a very slim tube, possibly about 4 mm across. When this flower was removed from the plant and cut into two halves, it was virtually impossible to observe either an enclosed nectar chamber or the presence of any discernable quantity of nectar. The thickness of the walls of the tube and the body of the style, together occupied most of the 4 mm breadth of the tube, and left a very slim annular space indeed around the style. This would not seem to provide the basic characteristic of a "humming bird flower", i.e. a copious source of nectar for the visitor; it would appear to be fairly well agreed between the various authors quoted in Chileans No. 27 that a typical humming bir flower should contain sufficient nectar to reward a humming bird for its visit.

Within the pages of Rauh's book which describes the cactus vegetation of Peru, there are photographs of a few sliced flowers of Arequipa and Matucana, together with one sketch. These all depict a nectar chamber of a more restricted capacity than appears to be possessed by other Loxanthocerei such as Seticereus or Borzicactus. Also included in Rauh's book are photographs of sliced flowers of Oreocereus, which exhibit a somewhat larger nectar chamber than those in the Matucana and Arequipa, but not as capacious as those of the Borzicactus or Loxanthocereus.

The information available regarding the habitat location of the various Loxanthocerei would appear to zone them to some degree altitudinally, as follows:—

Loxanthocereus — From about sea level upwards on coastal hills, but much higher in valleys, up to 3,300 m.
Seticereus — In valleys from 800 to 2,000 m.
Morawetzia — In valleys at about 2,000 m.
Borzicactus & Clistanthocereus — In valleys between 2,000 and 3,000 m.
Arequipa — Hillsides around 2,400 m.
Matucana — Upper valleys and Tola heath from 2,400 to 4,150 m.
Oreocereus — Tola heath around 4,200 m.

In very general terms, therefore, the Loxanthocerei growing in the lowlands and valleys appear to produce flowers having a fairly capacious nectar chamber, whereas those Loxanthocerei growing on the Tola heath appear to have flowers with nectar chambers of somewhat less capacity. Does this mean that the Matucana and Arequipa do not have "humming bird flowers"? Does this in turn mean that they must be pollinated either by bees or some other insects? Do bees or butterflies even exist at these high altitudes in the Andes? And if they do exist there, do they have a tongue or proboscis long enough to reach down the flower tube as far as the nectar?

There does seem to be very little information on insect populations which are to be found in the Andes of Peru and Bolivia. It is not too difficult to find out something about the various birds which inhabit this region, but in the absence of some information about their natural diet — and also without an indication of the relative numbers in which these birds may occur, the actual presence of insectivorous birds without qualifying data affords only a moderate guide to the prescence or absence of relative abundance of insects.

However, it is possible to identify with some degree of certainty those humming birds which live in the same region of the Andes as that occupied by the Loxanthocerei — that is, from the borders of Peru and Ecuador in the north, to the borders of Bolivia and Argentina in the south. The humming bird which is to be found at the highest altitudes of the Andes is the Andean Hillstar, Oreotrochilus estella. It is indeed no accident of nomenclature that in the high mountains we find both Oreocereus and Oreotrochilus. This species of humming bird is found in the high Andes throughout the whole length of Peru and Bolivia and into N.W. Argentina. It is the most common humming bird to be found in the Puna; in the very north of Chile it occurs from 10,000 ft upwards to 14,000 ft altitude. Being essentially a bird of the Tola Heath, it is recorded as being "rare" in the Province of Lima, which extends from the coast up the western slope of the Andes as far as the peaks of the Western Cordilleras. This bird has a length of beak of 20.5 mm.

A closely related species, Oreotrochilus leucopleurus, occurs from Antofagasta to southern Chile and also on the Argentinian side of this stretch of the Andes. It is to be found exclusively on the mountains there from 5,000/6,000 ft altitude upwards as far as the snow line, which will be about 10,000/12,000 ft. in these latitudes. This area of distribution would appear to include the finding places of Denmoza and of many Lobivia. This bird has a beak length of 18.7 mm.

The largest member of the humming bird family (the Trochilidae) is Patagonia gigas, the Giant Hummingbird, which measures almost 8" (216 mm) from the tip of its beak to the end of its tail and of this the length of the beak is 34.5 mm according to Johnson and 46 mm according to Olrog. This bird is found around the altitude of 10,000 to 12,000 ft from Ecuador, through Peru and Bolivia to northern Chile and N.W. Argentina. Hughes reports it as "common in the rainy-green belt" in Arequipa Province, which matches the immediate foregoing altitude band. In the Province of Lima, Koepcke reports that the bird is "common above 1,500 m". Rutgers, in his commentary on Gould's plates, states that specimens have been caught in Bolivia at altitudes between 11,500 and 14,700 ft. He also says that the bird migrates between its winter home in the tropic of Cancer (i.e. Mexico) and breeds at 40°S. i.e. in southern Chile. However, Johnson states that the Patagonia gigas which is a resident of Chile, is a different form or variety of the bird to that found in Peru; further that the Chilean variety nests in Chile and leaves in September. He suggests that it winters on the Argentinian side of the Andes, but puts forward no proof of this postulation.

On the lower slopes of the Peruvian Andes is to be found the Oasis humming bird, Rhodopsis vesper, which has a beak length of 39.0 mm. In Peru and northernmost Chile, this is one of the common birds of the coastal lands, up to about 10,000 ft altitude. A closely allied variety is to be found in the Atacama in northern Chile.

Besides these principal species, other humming birds also reside in this region. Restricted to the western Andes of central Peru is the Peruvian Sheartail, Thaumastra cora. This bird inhabits the coastal regions and the lower Andean slopes; it is only seen occasionally as far south as Arequipa Province. The Black Metaltail, Metallura Phoebe, has a somewhat wider distribution from central Peru to Bolivia and northernmost Chile. It is to be found principally between 6,500 — 10,000 ft altitude. The beak length is 23 mm. Distributed over the western parts of Peru and Ecuador is the Purple-collared Woodstar, Myrtis fanny; it occupies the coastal hills and the western slopes of the Andes. It is a resident in

Arequipa Province, where it visits the flowers of Hibiscus, Lantana, Bougainvillea, hollyhock, and heliotrope in the maritime regions and also Caesalpina tinctora. The Bronze tailed Comet, Polyonymus caroli, is almost entirely confined in its distribution range to the Peruvian Andes, reaching as far south as Arequipa and Cuzco. It is usually found above 4,500 ft. altitude, in shrubby parts or wooded country. The beak is 15 mm long. The Sparkling violet-ear (Colibri coruscans) is widely spread through the Andes of Venezuela, Columbia, Ecuador, much of Peru and into Bolivia, although it is not known from S.W. Peru. It is commonly met with in Peru at over 6,000 ft altitude but will come down to the coast in the winter. The length of the beak is 30 mm.

Although the forested eastern slopes of the Andes boast almost a hundred different species of humming bird, it will be evident that, in comparison, these eight resident humming birds of the high Andes and their western slopes, are few by comparison. If we compare the main vegetation bands in this region of the Andes with the altitudinal distribution of these different species of humming bird, a fair degree of correlation will be found to exist. In the coastal Lomas and lower slopes is to be found the Oasis humming bird; then comes the barren desert strip crossed only by the green streaks of the river valleys. Next comes the herb-poor zone of columnar cacti and then the rainy-green belt, apparently the province of the Giant humming bird; and finally the Tola Heath, where the Andean Hillstar resides. Putting together the information on cactus species distribution and humming bird records, the following relationships emerge:—

Altitude band	**Vegetation**	**Typical Succulent Plants**	**Humming Birds**
Up to 600 m	Patchy Lomas	Loxanthocereus Haageocereus	Rhodopsis vesper Myrtis fanny Thaumastra cora
Up to 1,500 m	Desert, with green valleys	Seticereus Loxanthocereus Haageocereus	Rhodopsis vesper Myrtis fanny Thaumastra cora
1,500 – 3,000 m	Herb poor with columnar cacti.	Borzicactus Clistanthocereus Morawetzia Loxanthocereus Haageocereus	Patagonia gigas Metallura phoebe Colibri coruscans Polyonymus caroli
2,400 – 3,000 m	Herb poor with columnar cacti	Arequipa Matucana	Patagonia gigas Metallura phoebe Colibri coruscans Polyonymus caroli
3,000 – 3,800 m	Rainy green grassland	Matucana Arequipa Lobivia	Patagonia gigas Metallura phoebe Colibri coruscans Polyonymus caroli
3,700 – 4,100 m	Puna	Bromeliceae	
3,800 – 4,500 m	Puna	Oroya Oreocereus	Oreotrochilus estella
4,500 m up to snow line	Tola Heath	Tephrocactus	Oreotrochilus estella

This correlation covers the humming birds which are to be found in the Andes of Peru, Bolivia, and immediately adjacent parts of Chile and Argentina, which is the distribution area of the Loxanthocerei. From this table, it would appear that there should be no lack of pollinators for any "humming bird flowers" in the Matucana-Arequipa zone – or indeed for any mesophytic humming bird flowers growing between the coast and the snow-line.

It is not too difficult to imagine the fairly short bill of the Bronze-tailed Comet being appropriate to the dumpy Oroya flowers, nor the long bill of the Giant humming bird suiting the more lengthy Clistanthocereus or Borzicactus flowers. But if the Matucana and Arequipa flowers are visited by humming birds, for which species of bird are their flower lengths suitable? And why should they offer the birds a less copious reward of nectar?

The accounts of several cactus collectors would suggest that these various cactus blooms appear during a somewhat limited flowering season. Other writers refer to the short-lived vegetation of the coastal Lomas, which is at its height in September, the foggiest month on the coast. The valleys will have little water in the river beds at this time, but

with the melting of snow from the mountain peaks in Spring the flow of water will increase; the rivers will continue to carry ample water in summer when the rainfall on the high slopes brings forth the rainy-green vegetation. In the Puna, most plants will flower in this moist season – that is, between January and March, whilst the Puya will flower near the end of the dry season (October to December).

The flowering season in the coastal Lomas occurs over a decidedly limited period, whereas flowering in the valleys and higher zones is collectively spread over a greater proportion of the year. One might therefore have expected the flowers of the Lomas to be attended by a host of insects and various migrant humming birds, since the valleys and Tola would be dry and chill at that time of winter. However, the evidence available would tend to suggest that although there is some migration of humming birds towards the coast in winter – that is, in the flowering season of the Lomas – this appears to be only on a limited scale. In general terms the humming birds in the tropics would seem to reside all year round within a specific – albeit broad – altitude band.

If the Lomas and the valleys had a brief flowering season amidst a limited humming bird population, there could be stiff competition among the Flora for attention from pollinators; a copious store of nectar in attractive red tubes might have been a means of attaining this objective. Should the Matucana and Arequipa flower at a season when few other humming bird flowers are in bloom then the humming birds would effectively be in competition for the nectar. With more assured pollination, a less prolific source of nectar and even a shorter, non-red flower (Matucana myriacantha) might suffice to draw a visit from a pollinator. But the available evidence on flowering times makes this a somewhat tenuous idea.

So we are still left with the unanswered question, why do Matucana and Arequipa have a poor store of nectar in comparison with Loxanthocerei from lower altitudes? Why do they have a relatively shorter flower than the longest-billed Peruvian humming bird, Patagonia gigas, which is most common in the growing areas of these plants? Does this particular humming bird species prefer to visit the Bromeliaceae whilst some other agent pollinates the Matucana – and if so, what agent? Are the Matucana and Arequipa really humming bird flowers? Are there any other insects at those altitudes, and are their tongues long enough to probe down these flower tubes to reach the nectar?

Comments on Matucana – bird flowers?

. . . . from Mrs. L.E. McIntosh

Bisecting the flowers of this group was most enlightening. Seticereus icosagonus grows outside in my garden and now has many branches – only in the middle of winter is it without flowers. I took one or two flowers from this plant, bisected them, and made some observations and measurements with the use of a powerful lens. The nectar chamber was found to be completely filled with nectar – it measured 4 mm wide and 2 mm deep, completely closed in with a quite thick roof formed by the stamens clustered round the stigma.

I missed the early flowers on the white spined Matucanas but they are sure to flower again later in the summer. A flower from Submatucana celendinensis had a nectar chamber which measured 3 mm by 3 mm inside the walls, once again completely closed in, with stamens round the stigma and also growing from the side of the flower tube. Submatucana intertexta was similar but with a chamber 2 mm by 2 mm; the birds would have to pierce the chamber roof to get at the nectar. Once again the chambers were full of nectar.

Since making the above notes I have been most busy slicing more of the Borzicactinae flowers. In all of them to date the nectar chambers have not varied in size or shape from the flowers I first measured. There has, however, been less nectar in some recent ones, which I put down to the severe drought we are experiencing as the plants are garden grown.

. . . . from J. Hopkins

On the subject of pollinating agents for Lobivias, I have to admit that although having sectioned quite a number of flowers I have not come across any with any noticeable amount of nectar or a pronounced nectary for that matter. With little incentive for birds to visit the flowers this must only leave insects and wind.

There is one exception with the birds and that is the Honeycreepers (Coerebidae) which apparently feed on pollen as well as the nectar of flowers and are found in tropical and temperate Andean zones. The Golden-collared Honeycreeper is found in Peru among other places – Huanuco and Cuzco. They don't seem to be much further south than this. There appear to be quite a large family of insect eaters found up to the snow-line, notably the Spinetails (family Furnaridae) specifically quoted as living in "arid cactus lands" and "scrub covered hillsides and grasslands" up to the snow line. (A guide to the Birds of South America – Schauensee). Thus there must be insects there!

The idea of wind pollination is not without attractions as many of the cactus species grow in quite localised patches and it may help to explain why there are few natural hybrids among the Lobivia spp. for example – but here I know nothing about flowering times and am just going on the fact that the further two populations are apart, the less likely is the wind pollination to be a success.

. . . . from "South America" by Prof. Jean Dorst

Few reptiles are to be found in the cold region of the Peruvian highlands: in fact the Peruvian altiplano can boast of only two species: a non-venomous snake and a lizard of the iguana group, Liolaemus multiformis, exhibiting an incredible polymorphism in colour and pattern. The very harshest of habitats is not shunned by this creature, although it

prefers to make its home upon slopes with favourable exposures, often as high as 16,000 ft. Here it either digs burrows or occupies a small depression. Tiny leaves and buds, butterflies, spiders, and flies compose its menu. A largely vegetarian diet tides these lizards over the dry season when insects are rare.

The hummingbirds have a remarkable facility for adaptation which has permitted several species of this group of tiny birds to colonise the plateaux as high as sixteen feet. Despite their wide distribution on the high plateaux, these birds shun the cold open pampas and seek instead those slopes where sunshine prevails, or sheltered gullies with bushy vegetation. As a group, hummingbirds are known to have a mixed diet of insects and the nectar of various blossoms. They are particularly fond of Loasa, thick tufts of herbaceous plants armoured with stinging hairs and producing a scarlet-red flower laden with nectar. But on the high plateaus, where flowers are rare, the humming bird's diet consists almost exclusively of insects. Besides the giant of the group, Patagonia gigas, usually found in the temperate zones, the most common humming birds are the Hillstars or Oreotrochilus.

. . . . further from H. Middleditch

Well now, butterflies up at that altitude! And how do they survive the night temperatures, I wonder? What with insect eating birds, insect eating lizards, and insect eating spiders, there must surely be a fair selection of insects around. Understandably, they could be present only for a season – Dorst suggests that they are absent from the highlands for the dry season which is also the cold winter season. Will there be any bees up at these heights? And what sort of butterflies will there be and how long are their tongues?

. . . . from F.H . Brandt

To your question about insects in Peru. Everywhere plants grow, insects also occur, and naturally butterflies as well! 2,000 m is no great height in this respect! I have collected butterflies in Persia as far as 4,000 m altitude and in Afghanistan I have found butterflies at up to 5,000 m altitude – to be found wherever plants grew. 5% of the butterflies and moths were abroad by day and the remaining % in the night – so these were not seen. I have noticed that flowers in red and yellow colours were those mostly visited by day, the white ones however in the night. Perhaps it is the same with some cacti whose flower colour is most often white, "Echinopsis", which are mainly night flowering. On the other hand the Parodia are true day flowering and here the colour is yellow and red! Wherever cacti grow, there must certainly be sufficient insects to visit the flowers and pollinate them. If it is a matter of cacti from Peru with white flowers, these would be visited by insects in the night and so they themselves would not be seen. Besides butterflies and moths there would be other different insects which would be able to come and pollinate the flowers in question.

. . . . from H.G. Dyar "Results of the Yale Peruvian Expedition of 1911 – Lepidotera" Proc. U.S. Nat. Mus. Vol 45 1913

Cotahuasi – 9,000 ft. October: Phulia altivolans, Mesembreuxoa fasicola, Cobubatha rilla.

Chuquibamba – 10,000 ft. October: Tatochile theodice, Tatochile macrodice, Teriocolias pacis, Pyrameis carye, Euptychia leguia-limai, Cyclyrius alticola, Porosagrostis propriens.

Vilcabamba – 10,000 ft. August: Argopteron xicca, Lycophotia albiorbis, Epirrhoe diltilla.

Cuzco – 11,500 ft. July: Colias lesbia, Junonia vestina, Timetes chiron, Pyrameis carye, Thymelicus athemon, Hyssia elaeochroa, Hemihyalea melas, Ardonissa adscitina, Atrytone mella, Hylephila isonira, Hylephila lima. November: Saturniodes orios.

Coropuna – 14,500 ft. October: Tatochile theodice, Phulia altivolans, Phulia nannophyes, Colias euxanthe, Lycaena zachacina, Lycaena alticola, Lycaena koa, Cyclyrius alticola, Thanaos funeralis, Hesperia notata, Hylephila isonira, Lerodea gracia, Altimaenas tapina, Uthesisa ornatrix, Metalepsis cerphiphila.

Coropuna – 16,000/17,000 ft. October: Andina coropunae.

. . . . from "Plant Hunters in the Andes", by T.H. Goodspeed

By contrast with Lima, where we saw almost no flies – and this was true of a number of towns on the northern coast of Peru – the high country both near and far from human habitation was alive with them.

. . . . further from H. Middleditch

I seem to recollect that the flowers on my Matucana paucicostata had not closed up when I have been into the greenhouse late in the evening; is this just an odd failure to close up at night, or do other Matucana keep their flowers open at night? If a flower remains open during the night, it can only be because it expects to be visited by a pollinating agent at that time – but humming birds do not fly by night. So what flying insect does the Matucana expect to attract during the hours of darkness?

. . . . from A.W. Craig

I would certainly think that a great many Matucana flowers stay open all night; in my own collection I have seen flowers on the following species open in the dark, well on in the late evening:– myriacantha, weberbaueri, aurantiaca, madisoniorum, calliantha, breviflora, and herzogiana.

. . . . from G.J. Swales

The colour print of Arequipa rettigii in Chileans No. 27 p. shows an open flower with the lower petals reflexed so that they lie almost horizontally. In this form they would indeed constitute a convenient landing platform for a visiting insect. In this photograph one can see what appears to be a small pile of pollen lying on this landing platform where it could be eaten by a visiting insect. Quite a number of insects will be able to make a good meal out of pollen. Perhaps their tongues are not long enough to reach down to the nectar and if the flower had not shed some of its pollen on to this convenient platform, the visiting insect might try to scramble up the open flower to reach the pollen on the anthers.

. . . . further from Mrs. L.E. McIntosh

Yes indeed! Oreocereus, Loxanthocereus, and other kinds of the Borzicactus group and some Cleistocacti do have a landing platform on which pollen collects. I had not thought of it as such, but even when the tube is not zygomorphic, the lower petals always droop down to form a platform; even Denmoza had a small one. I often use pollen off this pile for I have always felt that it must be truly ripe. Looking back, that could account for the antics of the bumble bee I noticed on the Trichocereus flower. He walked over this platform but never entered the flower, appearing to me as if he was afaraid; possibly he was actually scooping up this loose pollen. He spent all of an hour between six flowers.

The width and the length of flower tubes do vary on Matucana. I find M. aurantiaca having a very much fatter one than any others and M. ritteri the thinnest. The flowers vary in size depending on the time of the season; with me spring flowers are small and the autumn flowers are the best and biggest. I havn't yet decided which is their natural season for they seem to pop out flowers at any old time. At the moment M. robusta (offset from plant grown from Ritter seed) and hystrix (first flowering, grown from Lau seed) are both in flower. There doesn't seem to be any difference in the flowers and very minor differences in the body. Cutting up the flowers, I find that they do not contain nectar, but the chamber is there with a closed top. These plants haven't received any water for a month now, being winter – they must require to be in growth to produce nectar, I suppose.

. . . . from A.W. Mace

Yes, I certainly find that the Borzicactinae group flowers open continuously although I find that they are often widest open in the early evening. This is certainly true of Matucana. Other plants in this group whose flowers remain open wide include Akersia, Bolivicereus,sand Hildewinteria. My Akersia has flowered for the last two years, with 3-4 flowers each time. The plant has very much the habit of Seticereus – hanging over – the flowers produced from the upper side, semi-erect, with extra bristles in the flowering areoles.

. . . . from R. Martin.

Yes indeed, I have had an opportunity to see my flowering plants of Loxanthocereus gracilis, L. faustianus and Seticereus icosogonus at night and the flowers do stay open then as in the daylight. Of this there is no doubt in my opinion.

SOIL ANALYSIS AND FEEDING By R. Rolfe

The article by Ernst Zecher in Chileans No. 23 gave us some very useful information regarding the nutriments to be found in a selection of soils in which cacti grow in the wild. As they stand, the figures provided by Zecher give us an analysis of the soil samples which he brought back with him from various spots in South America, but to be of practical use to the grower in this country they need to be expressed in another way. That is, how many ounces, or spoonfuls, or whatever, of each fertiliser do we add to our soil mix in order to produce a result which resembles the soil found in habitat?

The figures given by Zecher in his table on p. 114 of Chileans No. 23 are in gm of mineral per 100 gm of soil or in gm of mineral per Kg of soil. Now for repotting my plants I mix up two hundredweight of soil at a time, so I decided to work out what weight of mineral fertiliser I ought to have in my 2 cwt mix to make it comparable with Zecher's sample soils. This involved converting from metric proportions to imperial units, and also converting from the minerals given in Zecher's analysis to the equivalent amounts of commercial fertiliser. For these conversion caluculations I used an electronic calculator set to four figure accuracy (twelve being possible). Certain assumptions had to be made, in particular the nitrogen and phosphorus pentoxide (P_2O_5) content of dried blood and superphosphate respectively. The table below gives the summary of my results to the nearest tenth of an ounce: I do not believe that greater accuracy is justified.

The following conversion factors were used:–

1. One Kg = 2.205 lbs and ∴ 2 cwt - 101.6 Kg. and 1 gm = 0.002205 lb.
2. Potassium sulphate contains 54% K_2O, although it must be remembered that in aqueous solution potassium sulphate merely provides potassium ions (K^+) and sulphate ions (SO_4^{--}), no free K_2O is formed.
3. Magnesium sulphate, usually obtained as the heptahydrate ($MgSO_4.7H_2O$) contains 9.85% Mg^{++}; these ions are formed on dissolving the crystals (Epsom salts) in water.

4. Ferrous suphate, as the heptahydrate contains 20.9% Fe, in aqueous solution Fe^{++} ions are formed.
5. Manganese sulphate, as the heptahydrate contains 20.6% Mn, in aqueous solution Mn^{++} ions are formed.
6. Dried blood contains on average 14% N.
7. Superphosphate contains on average 18% P_2O_5.

(The figures for 6 & 7 were obtained from p.50 of Everyday Gardening, edited by C.E. Pearson; I have not been able to verify these figures independently).

Zecher's Sample	Ounces in 2 cwt of soil					
	Dried Blood	Super phosphate	K_2SO_4	$MgSO_4.7H_2O$	$FeSO_4.7H_2O$	$MnSO_4.7H_2O$
P1	1.5	8.4	2.0	14.9	8.9	4.6
P2	0.6	7.2	1.1	14.6	1.7	3.6
P3	0.5	4.6	0.8	13.1	7.5	5.1
P5	1.1	2.4	2.0	13.8	11.7	4.9
P7	1.5	2.8	1.1	13.4	10.1	5.3
P8	0.5	4.6	2.0	12.7	0.9	1.5
P9	0.9	3.2	0.8	12.4	8.1	2.5
P10	0.3	1.0	1.0	12.7	3.9	0.6
P11	0.4	9.8	1.0	12.0	2.7	0.9
A1	0.3	3.2	0.7	9.5	0.7	0.5
A2	0.3	3.2	1.3	10.2	1.2	1.1
A3	0.3	6.0	0.3	12.4	0.7	1.6
A4	0.3	6.0	1.5	9.5	0.5	1.6
B1	0.6	2.4	1.7	9.1	1.4	1.6
B2	1.0	1.6	1.1	9.8	1.1	2.0
B4	0.3	2.6	0.5	12.4	0.3	2.3

Now Zecher's original article does not treat magnesium as one of the principal elements (which it would appear to be, from his own figures) but merely mentions N, P & K. Nor does he highlight the fact that iron and manganese are present in appreciable quantities, even when the soils are low in the three principal elements mentioned (e.g. B2, B4). Now I find it fairly economical to purchase ready-mixed John Innes compost, so the question is, should I use John Innes No. 1, No. 2, or No. 3 as the basis for my own soil compost to approximate to the minerals and proportions found in habitat by Zecher? From the book "Everyday Gardening" edited by C.E. Pearson and published by Ward Lock, one finds a recipe for John Innes seed compost (J.I. No. 1) on page 67. To each bushel of a mixture of 7 parts sterilised loam, 3 parts moss peat and 2 parts coarse sand, is added 4 oz. of J.I. base and ¾oz. ground limestone or chalk. And the J.I. base consists of:—

2 parts by weight of superphosphate (18% P_2O_5)
2 parts by weight hoof & horn (14% N, as dried blood)
1 part by weight of potassium sulphate (54% K_2O)

From experience I find that my 2 cwt of soil mix is approximately 24 gallons, and I have found an old conversion table giving 1 bushel = 8 gallons; hence 2 cwt ≡ 3 bushels and since 2 cwt J.I. No. 1 requires 12 oz. J.I. base, the latter represents

4.8 oz. superphosphate
4.8 oz. dried blood (substitute for hoof & horn)
2.4 oz. potassium sulphate

We can now compare these proportions of minerals in a John Innes No. 1 compost with those found in an equivalent 2 cwt of soil found close to cacti in habitat – see table above. From this comparison two points become immediately obvious. Firstly, cacti grow in a soil containing little nitrogen; and secondly, the Magnesium (Mg^{++}) content

always exceeds the potash content (as K_2O), at least in the samples shown. Furthermore, in the cases of P1, P2, P11, A3, & A4 the superphosphate content approaches or exceeds that found in a John Innes No. 2 soil. However, Zecher has made the point that our plants must grow, not starve, and I follow that view.

I therefore use a J.I. No. 3 soil along with extra Irish moss peat and grit (1/8" to ¼" diameter), plus about 1 lb potassium sulphate, 1 lb superphosphate and 2½ lb magnesium sulphate per 2 cwt mix. The results so far are very encouraging, with better growth, both quicker and sturdier and more flowers. I'll have to consider adding extra ferrous sulphate and manganese sulphate to see if that improves it even further. Although these amounts may seem rather large we must remember that under greenhouse conditions the nutrients can be readily leached from our soil. In habitat the plants can usually spread their roots reaching fresh nutrients.

There is one further point which has occurred to me concerning spine formation. It is usually argued that the lower intensity of sunlight in the U.K. results in weaker spine formation. Is there not a possibility that deficiencies in the nutrients available to the plants may also play a part in the question of whether good spines are formed or not? After all, if the correct nutrients are not available, no matter how intense the sunlight, no spines can be formed. Except perhaps at the expense of another part of the plant body.

My own views are that magnesium is an essential element to cacti, and not just for the production of chlorophyll. The metabolism of cacti may well depend on magnesium to a greater extent than thought previously. Furthermore, iron and manganese may be of importance, and when I can obtain the necessary chemicals I shall endeavour to investigate their action on cacti.

Comments on compost

. . . . from H. Middleditch

The writer suggests that a cactus plant needs certain special minerals if it is going to be able to grow spines — but how do we know this? Do we know sufficient (or anything) about the constituent chemicals of cactus spines to state whether Iron, Magnesium, Manganese, Phosphate, or any other mineral actually occurs in them? I would have thought that the determination of the constituent elements in a cactus spine should not prove too much of a problem; perhaps grinding one or two spines to powder and heating the powder until it was luminous would enable a spectographic analysis to be carried out? Perhaps we would find that darker spines had an iron constituent and the paler spines had not?

The writer also tells us that there was an encouraging response from his plants to his mineral-rich soil mix. Did he perhaps keep a reasonable number of plants in his previous soil mix as a statistical control, in order to ensure that it was not a better summer season, or his more regular attention to the watering, which was responsible for an improvement? Or even his new greenhouse with glass rather than the previous semi-transparent plastic?

Having been indoctrinated by various cactus collectors with the idea of providing adequate minerals in the soil mix, of late I have been adding a generous helping of superphosphate to my usual soil mix; I would estimate my usual mixture amounts to about two gallons in bulk and to this I add a desertspoonful of superphosphate. My wife's cookery book tells me that one rounded tablespoonful of cornflower weighs one ounce; and one ounce in two gallons equals twelve ounces in two hundredweight which turns out to be not far off the figure calculated by Dick Rolfe. Always assuming that cornflower and superphosphate have a comparable specific gravity. However, it looks as though I should be far more generous than I have been previously with the potash and that some epsom salts would not come in amiss. If I did so I might even manage to get my Notocacti to grow.

. . . . from G.E.H. Bailey

I would like to revert to the article by Dr. Schutz in Chileans No. 24 where (p. 153) it is stated that ". . . trace elements should be in gelatine form". I suspect that this is an error of translation — possibly arising from the double translation. It should read "chelated" form. Most metallic phosphates are insoluble in water, and these particular forms of the metallic trace elements do not interact with any phosphates present, so that the trace elements are immediately available. If you use the more common forms i.e: Iron and Manganese sulphates, they will throw an insoluble precipitate in the presence of any phosphates, which must be present in any nutrient solution for soilless cultivation.

Now, with regard to a soil mix. In the first place, I think you have to be very careful with soil in pots, because an excess of any mineral can be fatal, while a lack of any particular element is not always so drastic. For that reason, I would be extremely careful in applying the chelated forms of Iron and manganese (I believe Murphy sell this form as "sequestrenes"). In the spring, I usually give a weak feed, or rather, drink, of sulphates of iron 2 pts, magnesium (Epsom salts) 4 pts, manganese 1 pt. Any phosphates in the compost, or applied later, will turn them into almost insoluble phosphates, so they will be available to the plants only in very small quantities, which is probably how they are available in nature.

. . . . response from R. Rolfe

The observation about chelated minerals is quite correct. Nature being what it is, if you mix say sodium phosphate (water soluble) with an iron sulphate (water soluble) the insoluble iron phosphate precipitates out of solution, leaving a solution of sodium sulphate.

As plants can only absorb substances in aqueous solution then any soluble phosphates in the soil can interact with the trace elements, yielding insoluble phosphates, thus depriving the plant of these elements (such as iron or manganese). The situation is not quite as straightforward as it might seem, however, as there is always an equilibrium between the solution of sodium sulphate and iron phosphate as mentioned above. There will always be a trace of iron in solution and as this is used by the plant, the iron phosphates would dissociate at a comparable rate so as to maintain the equilibrium.

However, when iron or manganese are used in the form of chelated compounds, the metal ions are effectively surrounded by an organic molecule (the chelating compound) and protected from the allure of the phosphate ion. Being water soluble, these chelates can be absorbed by a plant, they would then break down within the plant tissue to yield the necessary trace elements. G.E.H. Bailey is therefore correct in his comment, but iron sulphate or manganese sulphate may be used in slightly larger quantities than necessary in order to provide the trace metal ions.

. . . . further from H. Middleditch

I cannot imagine that nature takes the trouble to provide the minerals in the soil in chelated form; yet the figures given by Zecher indicate that his samples of cactus soils contained a fair amount of phosphates; would this not produce insoluble phosphates from the trace elements in the presence of water? Or is this nature's method of restricting the availability of minerals to what the plant can safely digest, by virtue of the equilibrium between the soluble and insoluble compounds?

. . . . further from G.E.H. Bailey

Having studied carefully the soil analyses published in Chileans No. 23, I find it rather striking that only in three instances was there any calcium in the soil, while there was quite a high level of magnesium. I wonder if Mg takes the place of Ca in the harder parts of cacti? In addition, there was quite a lot of iron and manganese. The water here is hard and for my normal watering I add to it Potassium monohydrogen phosphate K_2HPO_4 and nitric acid; occasionally I also add sulphate of Magnesium, rather less Iron and a little Manganese. All my green plants are showing visibly deeper colour near the crown, while those of other colours mostly appear deeper; in most cases the spines are longer, stouter, and brighter in colour. Of course, it could be partly the wonderful sunshine we get now we have moved to this island, but I shall certainly continue with occasional feeds of Mg, Fe, and Mn.

. . . . from R.B. Ivimey-Cook

For some time I have suspected that spine colour was related to mineral nutrients, but without any evidence at all! However, I get the impression that your author is relating the size and development of spines to mineral nutrient uptake. This I would expect to be so only to the extent that the normal growth of a plant depends on a mineral nutrients. I doubt if these are ever limiting — what is more likely to be limiting is their availability especially in dry compost, since all minerals have to be taken up in solution. The occasional production of poor spines at areoles is more likely to be a direct result of poor growth for some reason, when the tubercular (areolar) meristem was cut off at the apex. If this meristem was rather small, or growing slowly, a poor areolar meristem might have been produced, not really capable of producing good spines. It is the same, or similar, situation which tends to give pyramidal plants — too much elongation with insufficient apical growth to take it up. Often the result of poor light intensity and too much heat. Light intensity seems to be the key here — good spines are often produced on plants growing outside — though its mode of action is obscure to say the least.

As regards analysing spines, this can be done quite easily by any standard plant analysis method.

. . . . from P.H. Sherville

A point of interest which arose from a discussion between Chilean members at a meeting at Phil Allcock's, concerned the use of Epsom salts $MgSO_4$. Five of the members present had watered with a solution of Epsom salts and all agreed that the plants were more robust and with better spination — and also the plants were found to be more resistent to pestilence and disease. I checked with the local horticultural Research Station and they report that $MgSO_4$ has no inherent insecticidal or fungicidal qualities, so one can only assume that these effects result from the plants generally improved stamina and health. With regard to dosage, two said that they gave just one small dose at the start of the season — at the rate of one teaspoonful to a gallon. The other three gave a further application at the end of the season, believing that it was beneficial in ripening the plants for the winter.

. . . . further from D. Rolfe

I would readily confirm my view that Epsom salts is a useful source of Magnesium for plants. Quite large quantities can be used — I use 2½ lbs in 2 cwts of soil; if my memory is correct, only about 7% of the Epsom salts is Magnesium.

The presence of other minerals in addition to the sulphates and phosphates, effectively alters the equilibrium point of the reacting ions. As the plants only take up nutrient in aqueous solution, the presence of different minerals, or an excess, will effect which mineral is taken up in quantity. Naturally if (say) a surplus of phosphate is present, it will react with (say) Manganese and reduce the amount of that ion in solution. However, it will not reduce the

quantity of potash and nitrate in solution. Thus putting extra potash, magnesium sulphate, and (say) bone meal into a mix will not only alter the equilibrium position of ions in solution but also provide ions (e.g. potash) which are not affected by excess of phosphate. Basically it is only the heavy metals such as iron and manganese which form very insoluble phosphates, and even these provide a trace of metallic ions in solution.

I have a pan of Mammillaria bocasana seedlings which developed yellow tubercles. These reverted to green after about 2 months of spraying and watering with a solution of Epsom salts – about one teaspoonful to one pint of water. My own soil mix also contains a fairly large quantity of $MgSO_4$ and I believe from the evidence available that Epsom salts will lead to improved growth in our plants. I might add that I intend adding ferrous sulphate (a source of iron) to soil mixtures in future, but first I must obtain some.

LOSING FLOWER BUDS ON OROYA

In an earlier issue of the Chileans, one or two members wrote about the problem of aborting buds on their Oroyas and in this connection H. Ewald observes that "Oroya buds will abort if the plant is watered when the buds are present, up to a certain size, after which it is O.K. to water".

Suffering this particular problem is G.E.H. Bailey who tells the Chileans that "My two Oroyas showed lashings of buds in spring last year, but they all aborted and I did not get a single flower. They were watered very carefully and did not at any time dry out. The only possible line on the reason for this that I can find is an illustration in Buxbaum's "Cactus culture" showing Oroyas at the University of California Botanic Garden, planted at the foot of pretty hefty rocks and probably indicating a semi shade situation, which I decided to try with one of the pair the following year.

By the time the next season came round I had four plants of Oroya so I placed two of them in semi-shade and two in full sun. One of each pair was an O. gibbosa which showed plenty of buds in both positions, but the one in full sun aborted all four buds, while the one in semi-shade had eleven flowers. In mountainous, or even rocky country, quite a lot of plants must be growing in half-shade, even on the sunny side of a valley."

And from New Zealand Mrs. L.E. MacIntosh observes "I wonder if I have found the answer to the die-back of Oroya flowers? Last season I transfered mine to the sunniest part of the glasshouse, they get every ray of sun from sun-up to sun-set and no shading. Usually I let them go bone dry in winter, but because of the baking they were getting with the hot winter sun we have here, I started watering them just after mid winter. They have been a mass of flower and not one bud aborted; they are grafted plants. Another plant on its own roots which was just an offset taken from another plant five years ago, did not get the early watering, budded up for the first time, but aborted every one; it also receives some shade, being only about 3" tall against the others in 8" pots."

A rather interesting experience is recounted by Mrs. L. Teare, from Adelaide, Australia: "My experience with Oroya may help other collectors. I think I did tell you that in order to get my Oroya to flower I left them outside under the shelter of the roof of the glasshouse. They were in full sun and the only watering they had was very light, only the rain blown by the wind against the house and that does not happen very often. Anyway, a month ago my Oroya accolone came into bud; I grew this particular plant from seed and it is now 7 cm in diameter. All the flowers opened, with very thick sepals pulpy green at the base, red near the top, and three rows of lanceolate petals. Two-thirds of the length of the petals was a deep pink, almost red, and the lower part cream. The stamens are in a tight bunch within the inner petals – they really are in the shape of a cone. The stamens are the same height as the petals. The flower did not open wide as the spines prevent this happening.

At the same time a smaller Oroya citriflora, about 5 cm in diameter, put out four yellow buds. A collector anxious to see an Oroya in flower came to have a look at it and I pulled the citriflora out from its place, and then of course with talking I forgot to put it back. During the night we had a downpour and the following day when I remembered the plant, all the buds had completely disappeared. In fact if some one else had not also seen them you might have wondered if I had been seeing things – you just could not see there had been any buds there at all. A fellow collector who lives in the hills, where it is much colder, has flowered Oroya at the same time as mine and he did not water his either!

And further comments

.... from J. Arrowsmith

My Neoporteria litoralis is a 4½" high plant which has never produced a single flower up till now. This year the buds started to form earlier in the year, but the plant appeared to abort them. I would like to know what causes this, maybe the plant requires some heat or more light.

.... from J. Hopkins

I have a very good crop of flowers from my Lobivias, but I have been disappointed with the number of bud abortions. I have not been at all sparing with the water but we have had a spell of dull weather. It would seem that some combination of water and dull light may be important the some critical stage of the bud development. If it is the water that matters most then it is a wonder that the species survive at all in habitat – they surely cannot receive anything like the watering they have had from me!

. . . . from G. Charles

I notice that some of my Notocactus, when growing very quickly with ample watering, tend to abort buds to convert them to offsets.

. . . . from J. Klavins

Some of the buds on my Weingartia cummingii abort every year, yet on other Weingartia not at all. The Weingartia cummingii this year developed two buds together on many of the areoles and none of them aborted. One bud grew much faster, flowered, and only then did the next bud on the areole start to grow and flower. The only buds that aborted were the single buds – probably about 50% of these solitary buds aborted.

. . . . from A. Johnston

Parodia ocampoi v. compressa seems to be a bit of an outcast to me. It doesn't look quite like any of the other Parodias in my collection. My particular plant is an import from Uhlig. I have flowered it but it seems to be one of the few Parodias that produces buds that do not develop. It is late in the year in flowering, which may be significant. I still have not flowered Parodia columnaris; I have had buds but they have always aborted. The plant was old when I got it, by the look of the lower part of the body. There is a bud on Matucana hystrix again but this has produced buds for the last two years and they have just dried up.

. . . . from P.H. Sherville

My Arequipa produced four buds very late in the year and I expect there was not sufficient light to get them to grow and open. However, they stayed on the plant all the winter – one bud opened in January, one in March and it aborted the other two.

. . . . from J. Yorke

This has been a marvellous year for flowers, a number of plants flowering for the first time; Trichocereus pachanoi tried hard to get into the act but aborted when the bud had reached a length of 4 inches.

. . . . from B. Chudleigh

My imported Oroyas are now well established; I have eight in four pairs per species growing under a bad leak in the greenhouse and get soaked frequently all winter but thrive in temperatures dropping to an occasional freezing or slightly below, but only for a few hours as frosty mornings are always sunny and temperatures are rising by 8.00 a.m. quite quickly. Flowering is no problem; flowers are produced in small numbers for many weeks once plants are mature, with occasional flushes of up to a dozen flowers open simultaneously. Pollination is difficult, the mass of stamens and the narrow opening to the stigma means that most of the pollen on the brush gets wiped off – there must be a special natural pollinating agent. Plants occasionally self-fertilise.

. . . . from R. Ferryman

My problem is not that of buds aborting but of how to get buds in the first place. All my flowering plants are seed raised – but I have never flowered any of my imports. Oroya peruviana flowers for me regularly, it is some 12 cm in diameter and has produced about 25 flowers this year and there are at least twelve more to come; a smaller plant of this species produced four buds, of which one aborted. Several other seed raised plants from 7 cm across have produced two to four flowers and there are still a couple yet to flower. All plants are grown in full sun and watered at the same time and rate as most other plants, the technique of most water in spring & autumn.

The best examples of flowering Oroyas I have seen have been on the continent, there they are grown in full sun and are grafted. Grafting usually means that the plant is able to take moisture all the time, drawing from the stock's reserves. The fact that my plants are still producing buds whilst I am at the height of my watering programme would indicate for me at least there is no need to withold water to allow the buds to develop. Habitat slides I have seen do not indicate very much shading; indeed I have felt our levels of light intensity to be the major factor for not flowering these plants.

IMPRESSIONS OF URUGUAY From Mr. & Mrs. P. Collins

We had a marvellous time in Uruguay and would happily have stayed there longer, had it been possible. The people we met – complete strangers to us, as well as our contacts – were kindness itself and could not have been more helpful. We spent about a week wandering around to the west of Tacuarembo, crossing the border into Salto department and returning along Ruta 31. That part of the trip was a real adventure, not without its worrying moments, and we saw a great deal of the country (possibly more than most Uruguayans) but were able to find very few cacti. The reason was that the fierceness of the sun and the scarcity of rivers in the hills (plenty in the valleys of course) made water shortage a real problem, particularly as nearly all our food was dehydrated. In a part of the country where you may walk all day without seeing a single person, vehicle, or house, being without water could have had serious consequences, so we simply could not afford to make the necessary detours up into the hills to look for cacti. Of course, January is their dryest month and this one had been particularly so; it is possible, therefore, that the conditions would be easier in, say, October or March,

but we think a vehicle is probably a necessity to carry out a proper exploration of this area. However, being armed with information about one particular locality we did find a very interesting population of Gymnocalycium uruguayense at Valle Eden, south-west of Tacuarembo.

Having returned to the south, we spent 4 days exploring Punta Ballena, east from Montevideo, near the town of Maldonado, which has a very rich cactus flora – G. leeanum (as understood locally), several Wigginsia spp., Notocactus scopa, N. ottonis, N. tabularis and N. concinnus/apricus as well as the ubiquitous Opuntia aurantiaca and Cereus peruvianus. Along with other natural Flora, the cacti are being eradicated where an extensive area of this pleasant headland is being developed for private dwellings. We are able to gain access to a large area inland from Punta Ballena which is now a National Park and not normally open to the public, where the cacti were in excellent condition and have a good chance of survival.

The last part of the trip was spent at Santa Teresa, in Rocha Department, but here we spent only a few days actually cactus hunting; the projected survey fell through due to the non-arrival of the U.S. contingent. We were lucky enough to meet a Brazilian botanist who took us (together with a botanist from Montevideo – one of our contacts) in his car one morning for a botanising trip along Ruta 16 which circumnavigates the Laguna Negra. Here we found a Frailea (claimed to be F. pulcherrima – although the status of that taxon is itself open to question) and a distinctive-looking plant which the botanist from Montevideo declared (with jubilation) to be Wigginsia langsdorffi. In the same locality there was a large area almost entirely populated by palms – a well-known local feature. Whilst we were on this camp site we did have a problem with our tent (not a serious one) and we were absolutely amazed at the number of people on the campsite who came up to offer help – perfect strangers whom we did not know. We were even proffered some items to take with us just in case we happened to need them in case a similar problem arose again before we left for home. It was an astonishing comparison to our experiences in Peru. There seemed to be more Brazilians and Argentinians than Uruguayans on this particular camp site. We had a great deal of help from the Brazilian botanist over what was possibly our biggest problem, which we met the moment we stepped ashore in Uruguay. Having already been out to Peru on two separate occasions, we had had no particular difficulty in carrying on a conversation in Spanish, but initially we found the Uruguayan mode of speech quite unintelligible. Our Brazilian acquaintance took a great deal of trouble not only to speak fairly slowly and clearly to us (rather than the express rate usually used by many residents) but even to repeat himself when it was clear that we were not quite able to follow him. We gained so much from this few days' conversation that on our return to Montevideo we could not only comprehend much of what was said to us, we were even able to make ourselves understood in reply!

During the time we were actually in Montevideo we made two trips to the Cerro de Montevideo (the "mountain" from which Montevideo gets its name) where we found Wigginsias and Frailea pygmaea, some of the latter being superb specimens.

In all we took over 300 colour slides and more than 170 black and white photos which, after pruning, will probably boil down to about 250 slides and something over 100 monochrome prints.

THE 1977 CHILEANS AUTUMN GATHERING

Reported by P.H. Sherville

For the second time this year twenty-odd fellow Chileans assembled in the pleasant Leicestershire countryside to discuss some of the problems arising from a study of their cacti. We were especially fortunate in being able to welcome John Chalet from Switzerland into the fold for this event, at relatively short notice, as our visiting speaker. His reception and conveyance to and from Gatwick had only been possible through the timely help of a number of our readers in the south-east. Our visitor had been to Argentine, Bolivia and Peru and came to show us some slides taken along that, by now, well beaten trail from Lima up the Rimac valley to Matucana and beyond. However, that was for later in the weekend and after the evening meal on Friday, we sat down for what turned out to be a long evening's discussion which finally terminated in the early hours of Saturday morning!

The topic which opened the weekend concerned a less happier aspect of our hobby. One or two members had experienced difficulties in obtaining imported plants from continental nurseries; only after personal approaches had been made to two nurserymen did it transpire that business was not welcome from Britain owing to some U.K. customers having failed to pay for plants or seeds despatched.

The evening then continued on the much brighter note usually associated with the "Brooksby weekends". A selection of close-up slides were shown by Harry Middleditch, using the techniques developed from discussions at previous Gatherings. Most of the slides were of sliced flowers or flower parts, using two projectors and screens. The first to be considered were Acanthocalycium, with a comparison of flower sections of A. violaceum and A. glaucum; it was readily observed that the style of A. glaucum was considerably taller than that of A. violaceum and stamen arrangement also differed. The flowers were quite distinctively different possibly indicating different pollinating agents and members were asked to photograph flower slices of other species for comparison at a future Gathering. Further slides were shown of sliced flowers of Akersia and Loxanthocereus, where an attempt had been made to photograph the nectar chamber, but these had not always been successful. The concave base of one nectar chamber held a clear reflection of the photographer and, his greenhouse roof – even the camera could be discerned in the reflection! Many slides had been taken of stigma lobes in an attempt to find out if the papillose stigma surface exhibited specific characteristics in a genus, but these attempts had been

almost totally defeated by a combination of focussing problems and the presence of layers of pollen on the surface of the stigma. After a selection of Gymnocalycium flower sections, the slides ended with a close-up look at a flowering spike of Peperomia, where the flower had been reduced to one mushroom-like stigma and two (sometimes three) stamens, all barely 1 mm high, and a complete absence of petals. When the speaker referred to this as an advanced flower, the discussion which commenced at the Spring meeting on what really is an "advanced" flower immediately re-erupted. It was not until about 2.00 a.m. that the protagonists dispersed. If the precept is accepted that apetaly and a reduction in other flower parts is an advanced form of flower, then this Peperomia flower represented about the most advanced flower construction that was feasible and the question was posed whether there was evidence of any cacti flowers that are currently heading towards this, or similar, construction in evolutionary terms.

Later on Saturday morning i.e. after breakfast we reconvened to listen to Jack Forrest enlighten us about that little known genus of miniature plants, Frailea. It was suggested that we now have many more species of Frailea than is commonly supposed, largely arising from Buining's collecting trips in Brazil. There are now some 42 named species, with a further 15 described varieties and another 15 undescribed HU numbers. A perusal of the available literature dealing with this genus had revealed that most Fraileas occur in their habitat at between about 100 and 300 meters in altitude, generally on soils of a slightly acid nature (pH 6.5 or 7.0). The plants are usually embedded in the soil, which is itself relatively shallow; rarely does it exceed about one foot in depth. These shallow soils are formed by erosion of the surrounding rocks plus accumulation of humus; many Fraileas grow on these weathered rocks as well as in the shallow soils surrounding them, often in the company of grasses. The distribution of this genus ranges through Uruguay and into Southern Brazil, especially Rio Grade do Sol province. Within this geographical region, the climate is fairly uniform and equable with relatively high average temperatures throughout the year. Rainfall, too, is distributed throughout the year with no really dry season.

Turning to experiences of cultivating these plants, the speaker now waters them throughout the year and has experienced very much better growth, with less incidence of losses. Contemporary with the practice of a year-round watering programme, there had been a significant fall in the number of cleistogamous flowers produced; every single species which flowered had consistently opened some of its flowers at some time during the season. The speaker had come to the conclusion that at the time the bud forms, it is already determined whether the flower will or will not be cleistogamous. It appeared that moisture was the greatest influence on whether a flower opened or not, and dry plants tended to produce a predominance of cleistogamous flowers, whilst those plants which received a good watering when the buds were forming often opened their flowers fully. Another myth to be dispelled was that Fraileas were short-lived plants; with proper cultivation they would live as long as any other genera, and slides were shown and plants brought for display of 20 year olds raised from seed. Germination from "own seed" was normally excellent, a sand and peat mixture being used as compost, the seedling trays never being allowed to become bone dry; together with regular liquid feeding, this seemed to produce consistently good results. The plants never achieve large proportions and a sizeable collection could be accomodated in only a few square feet of staging space, many plants being quite happy in 3" pots. The flowers were normally yellow, and vary considerably in size, but not during the life of any one flower. They tend to close up partially at night and often last for 3-4 days. The east Paraguayan F. friedrichii exhibited a particularly large variation in flower size from one to another. Frailea HU 332 produces a tap-root, whilst most of the others are fibrous rooted. Those Frailea flowers which do open, do not always set seed, but when they did, they often produced more than the cleistogamous flowers. This was followed by a selection of slides of Frailea, mostly in flower, together with a map on the blackboard giving the habitat location for many species.

To take us up to the tea break, Harry Middleditch delivered a short dissertation on close-up photography; following proposals made much earlier by John Hopkins, Geoff Swales, and Jeff Bagnall, he had obtained a tele-lens, the standard lens being reversed and fitted on to the tele-lens and extension tubes used between the tele-lens and the camera. Inadequate tripod rigidity was now a problem and there had been a reappearance of the small dot of light in the centre of some slides. The general opinion at this time was this light spot was caused by internal reflections in the extension system. So far, it had not been possible to obtain a short-focus cine-camera lens with iris which could be adapted to mount on the front of the tele-lens.

After the tea break, Graham Charles discussed the problem of identification surrounding plants bearing the names Notocactus linkii and Notocactus megapotamicus. There were variations in epidermis colour, some plants being darkish green and others almost yellowish-green; there were also variations in rib spacing and spination, which created quite different visual impressions. On some plants, spines interlaced from areoles of adjacent ribs while on other plants spines did not approach those from areoles on the adjacent ribs. Care was required here not to attribute too much importance to an imported plant with overlapping spines which had not yet become fully turgid. Yet another variation was in flower size, which was consistently smaller on some plants compared with others. The stigma lobes were clear yellow on some specimens, other plants had stigma lobes with a pink marking or infusion and yet other plants produced almost clear pink stigma lobes. Labels for N. linkii or N. megapotamicus were attached to plants having various combinations of all these features and Graham Charles posed the question, which name really should go with which plants? Harry Middleditch then produced a summary of the original descriptions for both species (which was to be published in a future issue of The Chileans)

together with photographs of both sorts. These demonstrated the great similarity between the two species, but plants imported in the last year or two as N. megapotamicus, presumably collected by Warras in Brazil, hardly seemed to fit within the compass of either name.

After lunch Pip Smart took us through the Rebutia group of plants. In his experience the individual species were very variable in their appearance according to their immediate environment. Contrary to popular belief, Rebutias are not particularly easy to grow, being quite intolerant of over-feeding. The speaker also felt that, contrary again to popular opinion, Rebutias do not readily hybridise. Rebutia as a genus can be split into two major groups or sub-genera, Rebutia and Aylostera. The Rebutia group are to be found in Salta Province in north-west Argentina at an average altitude of between 4500 and 8500 feet (1400 to 2600 metres). Aylostera are distributed over a greater habitat area and are generally to be found at somewhat higher elevations, between 6500 to 11500 feet (2000 to 35000 metres). The Digitorebutia really ascend heigher and are usually found in the zone of 9000 to 13000 feet (2700 to 4000 m.). Naked flower tubes and a free style are characteristic of Rebutia sensu Schumann whilst in Aylostera the flower tubes tend to be both hairy and bristly. Also in Aylostera the style is normally united for some of its length with the tube; the actual length of this solid axis being very variable i.e. from only 2-3 mm up to about half to two-thirds of the length of the style. Examples of this range were shown by slides of sliced flowers of a range of species. In addition there were examples of individuals which bridged otherwise distinctive boundaries and Rebutia marsoneri has some characteristics of Mediorebutia, and also Rebutia violaciflora has links to Mediolobivia sensu Don. & Buining. The Digitorebutia tend to have bulbous bases to their spines, whilst Cylindrobutia tend to be tap-rooted e.g. C. einsteinii and Lau 476/477. Rebutia pygmae has a green style, which is a little uncommon in this group. A broad selection of species were shown in flower, on slides.

After tea on the Saturday, Geoff Swales presented us with more insight into seed studies largely orientated around his favourite genus, Gymnocalycium. The speaker now had access to an electron miscroscope and although magnifications of up to 120,000 times are often achievable, it had quickly become apparent that a much more appropriate magnification for making seed comparisons was at around 400 times. Brief details were given of the procedure for preparing the seed for examination in an electron microscope. The seed is carefully cleaned and all loose debris removed from the surface; it is then secured by a special glue to an aluminium grid, which will be inserted into the vacuum chamber of the microscope ready for examination. Prior to that, however, the seed has to be rendered opaque to an electron beam, and in order to achieve this, the whole assembly of grid plus seed is placed into a vacuum chamber and a very thin film of gold is evaporated on to the surface. This gold film is only a few hundred atoms thick and therefore does not obscure any of the surface details. Having prepared the seed for examination, the grid complete with specimen is inserted into the microscope chamber and the air within is pumped out, so that the whole is under vacuum. The electron scan is activated and the resulting picture is displayed on a T.V. type screen and may be photographed from this. A number of photographs taken by this method of the surface of Gymnocalycium seeds were displayed with this talk. The speaker stressed that these represented the initial stage of the study, which was concerned to no mean extent in establishing which feature or features were of importance, since much finer detail could now be seen compared with previous examinations of seed with an optical microscope. During the course of the general discussion, a question was raised concerning the slide of some Trichomosemineae seed shown by Francis Fuschillo, where some of the seeds had been partially damaged with a portion of the hilum broken away; this had revealed what appeared to be a continuation of the brown testa underneath the hilum. The speaker pointed out that the testa coat of the seed in fact continued under the hilum so that it forms a complete protective coating for the seed, pierced only at the micropyle, there being no break in the testa at the funiculus.

Following on from here was our guest speaker from Switzerland, who conducted us round his collection, on slides. He began by describing his greenhouse, which consisted of a series of corrugated plastic sheets bent in to the form of an arch, and secured at each end on the floor by a steel angle running the length of the house. The P.V.C. sheet used will admit more U.V. light than glass, but less infra-red. The major snag with P.V.C. is that it degenerates after a few years and requires replacement at about 8-9 year intervals. Inside the greenhouse we saw a collection of a general nature, with many genera represented, most plants being rooted directly into a soil bed of about 40 cms depth. There were a number of interesting Melocacti, Pilosocereus, Notocactus, Cleistocactus, and an interesting plant of Neobinghamia Kz 290.

To round off the evening, Harry Middleditch gave a talk on the genus Cleistocactus. Taking body habit alone, the speaker had found great difficulty in using this to establish the identity of a species, although there were notable exceptions such as Cleistocactus straussii or Cl. wendlandiorum which possessed a distinctive appearance. It was suggested that Cl. micropetalis which exhibited a few, short, yellow spines at each areole could also be recognised by body habit, and probably Cl. candelilla as well, with its very slim stem and a "black eye" at the centre of each areole. A fairly good selection of Cleistocactus species were displayed on the speaker's table and although virtually every plant had a label, the speaker indicated that he had found it impossible to check the correctness of most of the names. The distribution range of Cleistocacti was shown by means of a map, the "S" shaped flowers of Cl. chacoanus and Cl. baumanii being found in the lowlands of the Chaco in Paraguay, Bolivia, and Argentina, whilst Cl. santacruzensis with similar flowers was found on the adjacent foothills of the Andes. The genus ranges over an extensive habitat stretching from Central Peru, through Bolivia, well into north-western Argentina, the plants occuring in valleys in the eastern Andes. There is a particularly strong and species-rich contingent in Bolivia around the dissected eastern perimeter of the Altiplano. One 15" high plant on the table

looked just like Cleistocactus straussii, but a slide showed that it had a scarlet flower about half the size of the flower on Cl. straussii – this was Cleistocactus albisetus. A selection then followed of slides of various Cleistocactus flowers, most of them with sliced flower sections to show the nectar chamber, almost all species showing a closed nectar chamber of similar proportions.

To finish this evening (or, more accurately, morning's) discussion, various slides were shown which had been brought along by members to show an interesting plant in flower or to raise a query or point for discussion.

Sunday morning saw our guest from Switzerland speaking to us again, but this time with the much awaited habitat slides which had been taken on one of his two trips to South America. On this occasion the start was from Lima, taking us on the, by now, fairly familiar route up the valley to Chosica and on to Matucana. From there onwards, though, we were on unfamiliar territory, as we were taken ever higher up to La Oroya and on to Tarma. The intention to travel yet further inland to San Ramon was frustrated by a landslide having breached the road, so the road was taken to the south, to Huancaya and Huancavelica on to the River Pisco valley. At the Ticlio Pass between Matucana and Oroya the road was at 4834 metres (15,869 feet); the River Mantaro was joined at 3,700 metres whilst the road from that valley over to the Pisco valley crossed the Abro Cochas at 4,200 m; speeds of 10-15 m.p.h. were considered good on the prevailing quality of roads. In the first section of the trip, ascending the Rimac and Eulalia valleys, the slides were shown by own Swiss guest on one screen whilst the second projector showed us the slides taken by Phil & Mel Collins during their own visit to this region. Soon after leaving Chosica, we were treated to slides of Haageocereus acranthus, Melocactus peruvianus, and a Neoraimondia. Continuing upwards, we saw slides of Loxanthocerei, and also Espostoas, which occurred as individual plants standing about 40-50 m apart. At around 2400 m Matucana haynei was seen and it was noted by comparison with Phil and Mel Collins' slides that young plants of M. haynei and M. yanganucensis were rather similar in appearance. Our visitor had concluded that these plants were to be found on the north side of the valley only and this was in line with the observation made by John Medway and by Phil and Mel Collins when comparing slides of this locality at a previous Chileans meeting. Our speaker's visit had taken place in September when plants of Haageocerei, Loxanthocerei, and Matucana were still to be seen in flower.

To the west of La Oroya a halt was made in a temperature of 3°C where Tephrocactus atroviridis and T. floccosus were to be seen; these plants reappeared from time to time as far as Abra Cocha. On the eastern side of the pass, at a lower altitude and at a temperature of 20°C in the sun, scattered plants of Oroya were seen, on a moderate slope, in company with stunted grass and scattered limestone rocks, with a scarp of limestone outcrop at the top of the rise. Some of these Oroya had yellow spination, some red, some bicoloured, so that a collector who wished to do so could erect as many names as there were versions of spine colour, as our visitor pointed out. Now on towards Tarma, where at 3550 m and some 2-3 km from the town, Trichocereus tarmaensis were to be seen. Along the road to San Ramon, stands of conifers now appeared, whilst Lobivia tegeleriana and also some Tillandsias appeared with the herbaceous vegetation. Continuing on towards Rioja, some 20 km from Tarma, Oroya acollana was seen, although very sparsely distributed there; one slide of two plants growing side by side in the straggly grass showed one with almost white spines and the other with red-black spines.

The slides taken on the following day had a sky covered with heavy clouds, heavy snow having fallen overnight down to about 4,200 m. Tephrocactus floccosus was to be seen on the south-east facing slopes. In the Mantaro valley, Opuntias and Erdisias were seen at Pichicaya at 3030 m together with a Trichocereus with long white spines; also seen here was a Cleistocactus, possibly Cl. pungens or FR 664 (pycnacanthus), extending down-valley to around 2700 m. Only four hours drive from the snows above, Opuntia tunicata was seen in the warm valley in a temperature of 20°C. Above Mayoc, at 2600 m, Azureocereus nobilis was to be found, although there were no small plants to be seen; the Azureocerei were growing in company with trees and large shrubs (Acacia), together with another cereiform cactus, though to be a Gymnocereus, of which only one specimen was found. At this point, the Rio Mantaro had cut for itself a smaller version of the Grande Canyon into the Andes.

Now on the ascent out of the Mantaro valley, on the road leading to Ayacucho, two forms of Oroya were seen, which the speaker felt were probably O. laxiareolata and a form of O. gibbosa; snow could be seen lying on the hillsides rising above this habitat. Over the pass and on to the Pacific side of the range, where we had slides of Lobivia wrightiana, with Trichocereus peruvianus and some shrubs growing nearby. At almost 4000 m altitude we saw some oxen ploughing and maize was being cultivated, at a temperature of 8°C. Near Huancavelica we saw Matucana cereoides in flower, further Matucana species being seen at 3200 m on the descent of the Pisco valley; here, too, were some cereoid specimens of Borzicactinae, together with examples of Weberbauerocereus rauhii which reached 3 m in height. During the further descent of the Pisco valley a rich number and variety of cacti were encountered, including Armatocereus, Loxanthocereus piscoensis, and Mila densiseta; by about 1800 m Neoraimondia had appeared, together with Haageocereus, further examples of Weberbauerocereus rauhii, other species of Weberbauerocereus and various shrubs. At 1300 m a different species of Haageocereus was found and then at 500 m Neoraimondia re-appeared, together with Armatocereus procerus. On the sandy areas near the coast the Armatocereus were still in evidence, this time in company with wild cotton plants; between Ica and Nazca the Armatocereus were to be seen growing with palms and cycads, on sandy patches at 600 m altitude.

After a fast return to Lima along the coastal highway there came a flight to Arequipa, from where runs were made into the surrounding territory in company with some members of the University of Arequipa. The first run was some 50 km towards the east, to Vitor and here were found Tephrocactus sphaericus and also Arequipa rettigii, the latter having both red and yellow fruits, all opening with a basal pore. Also to be seen were Haageocereus platinispinus, Neoraimondia, Browningia – which produced their flowers on the sunny side only, Arequipa erectocylindrica, Weberbauerocereus weberbauerii, Corryocactus, and another Weberbauerocereus at 2,600 m. At 3,300 m, Tephrocactus sphaericus was again to be seen and at this location it appeared to exhibit both red and yellow flowers on the same plant. At a mere 180 m altitude, near the coast, some Islayas were to be seen; between Arequipa and Mollendo, not far from Punta Islay, they occurred again on otherwise bare sandy slopes, the adjacent gentle sandy slope being carpeted with a Lomas or meadow of spring annuals in flower. The bright green foliage with red and white flowers gave way to bare sand as cleanly as if it had been cut out of a pattern with a pair of scissors. A few km further along the coast, at Matarani, a Pygmaeocereus was found near to sea level, together with more Islaya and patches of Haageocereus decumbens. Trichocereus cephalomacrostibus was seen growing both above and below the fog zone. This section of the trip was completed with some slides of Browningia at various stages in its growth, from a single spiny stem, through new offsets from the growing point, finally to a candelabra with long, sweeping, top branches – most of these shots having the twin snow-covered cones of Misti and Chachani on the horizon.

After lunch on Sunday, Geoff Swales examined a number of plants from the Microsemineae group of Gymnocalycium which are to be found in southern Bolivia. The Microsemineae was one of the seed groups established by Fric for this genus and contains all the Gymnocalycium with very small seeds; however, this group can be divided up into sections by careful examination of the seeds. Although G. saglione is found in southern Bolivia, it does not belong to this particular seed section. There were also quite a number of plants in collections which bore the name G. eytianum, which were in fact G. tudae; the true G. eytianum does belong to this seed section, which also takes in G. zegarrae, comarapense, millaresii, lagunillasense, pflanzii and marquezii. Gymnocalycium zegarrae was normally readily distinguished from the others by its pale green body, paler spines, and distinct seeds. The electron microscope photograph of the surface of the seed showed scattered pitting of the surface, a feature not present in certain other seeds from this group examined to date. Within this section, the species complex around G. marquezii and G. millaresii has flowers whose colour changes daily, starting out with a peachy hue, fading to pink and ending up nearly white. Most of these exhibit a deeper colouration in the throat, which often verges on red. Some plants within this group develop quite a heavy spination.

A short item then came from Paul Sherville, who explained that he had been giving a talk at Ipswich concerning the stamens overtaking the stigma in Matucana flowers and commented that it would be interesting to see if this also occurred in Oreocereus. One cactophile then present stated that their Oreocereus fossulatus had flowered and promised to look closely at the 1977 flowers. This promise was not only kept but a set of slides were taken at various stages in the life of the flower, which were then put up on the screen. These showed that whilst there was a change in stamen/style lengths, at no time did the stamens succeed in overtaking the stigma.

To round off yet another Brooksby weekend, Harry Middleditch laid out a selection of Copiapoa on the speaker's table, selecting from these a number of species such as C. cinerea, C. krainziana, and C. hypogea which could be identified without any problem. Next to be lined up were four plants which could easily have been three different species, but in fact all four arrived with the label C. grandiflora; none of them looked as though they could have been given another name. Next to be considered was a globular plant with central spines of a gingery brown colour which were standing straight out from the body, this plant had come from Knize as Copiapoa dura. Most plants seen under this name to date possessed very strong black spines, curving back to the body and with few ribs, yet the original description by Ritter definitely stated "brown" spines. These latter examples served to illustrate some of the problems involved in correct naming of Copiapoas; apart from the fairly distinctive species, the speaker suggested that it was not so much a question of differences between species, but of getting two plants of Copiapoa which looked alike! Isolation of plant populations in individual valleys could bring about ecotypical variants comparable with the isolation of Notocacti into patches on individual hill tops, or of Eriocacti in rocky patches in the midst of jungle.

The meeting finished soon after 4 p.m., which in itself is no mean accomplishment, as those who are fortunate enough to be able to attend the Brooksby sessions will realise. Whilst our visiting speaker was conveyed towards his departure airport, a handful of stalwarts, not to be outdone, continued discussions until the early evening.

Comments

. . . . from G. Charles

Although I have only been to the last three Brooksby meetings, I find that discussions have stimulated me to make many more observations on my plants than I would have done before. Much information also becomes available which is not found in books or other Journals. If the size of these gatherings was to be increased significantly, then the pleasant and fruitful interchange of information would probably be impaired. I am, however, concerned that the scarcity of new participants could lead to a very isolated view, lacking new ideas and experiences from outside. At present, the limitting factor on observations is the pool of plants in the collections of regular participants. Contributions from others with good collections could bring to light new topics and information.

Attracting new participants could be made difficult by the gap between the level of many National Society Meetings and the Chileans Gathering. At my first Chileans meeting I found it difficult to follow some of the discussions; many of the members present on that occasion had been to previous meetings and had the advantage of having listened to prior discussions and so were able to pick up the subject where they had left off the time before. Anyone coming to this Brooksby meeting for the first time could well have found this year's Gathering on stigma exsertion, for example, very difficult to comprehend, although study of the Journal beforehand could have helped. Not only is the gap of knowledge between regular participants at the Chileans Gathering and up-to-now non-participants rather wide, I feel that the same applies to potential new Chilean members. When the Chileans first started it provided fairly general information which was not readily available in contemporary cactus journals, so that cactophiles picking up a copy of the Chileans would read information that added directly to their existing knowledge. But now, many articles in The Chileans build upon what has appeared in previous issues and a potential new Chileans member looking at a recent Chileans Journal could find a very wide gap between the information he or she has gleaned from other contemporary English language Journals and that which appears in the Chileans. This could well put off growers, who have a very nice selection of S. American plants and may provide valuable comments and observations which could be of benefit to all members, from becoming a Chileans member. What can be done to encourage such collectors to join the Chileans, without repeating in current journals what has gone before? The inclusion of a certain amount of material of universal interest, such as propagation, cultivation, etc., could possibly help, as would references to earlier articles where relevent. What can be done to help new faces at the Brooksby weekend to understand all that has led up to current discussions, without putting before regular attenders information with which they are already fairly familiar? The latter could perhaps be helped by publicising the proposed subjects in good time before the meeting, together with references to relevant articles in the Chileans Journal.

The Chileans relies on its membership in order to exist on a sound financial footing, and although a large membership would be unmanageable, an effort to regain lost members or gain new members could only be good. We must be careful not to become so specialised that what we offer appeals to fewer and fewer cactophiles.

. . . . from J.M. Chalet, Switzerland

I have already talked to a lot of my friends about the marvellous weekend at Brooksby, which I thoroughly enjoyed. Could you please thank all those friends who helped me to come to Brooksby and to return to Gatwick.

. . . . from R. Mottram

Graham Charles makes a valid observation that must be of concern to us, but on the other hand I feel sure that the range and scope of the Chileans Meetings has a long way to go yet before it exhausts the abilities of the existing participants to provide stimulating new ideas and observations. One way of introducing new discussions without increasing the attendance to an unwieldy number would be for individual study groups to hold their own meetings, so that some of the members taking part in those meetings would participate in the Gathering at Brooksby. Such group meetings would find their own level for discussion in much the same way as the seminars at Brooksby do. One general point which seems relevant here, is that the actual number of people sufficiently interested in South American cacti to undertake the journey to, or accept the cost of, the weekend event is very small. I am not sure that all and sundry would find the discussions equally as interesting as we do!

When I started to attend the Chileans meetings some 2 years or so back, I must confess to just a little cynicism and even resentment that I hadn't been invited before. Perhaps we all have to go through this phase but it was not long before I realised that this was not the usual sort of staid, empire-building organisation where politics take precedence over the common objectives. I have been amazed and relieved to see the Chileans grow and mature in those two years in a most impressive way. For seemingly amateur constituents it has become a very professional body. For instance, I fully expected at the outset that the average member would be fully indoctrinated in Backebergian taxonomy and reluctant to change. Not so. The Chileans thrives on change. It is the one forum where new concepts can be discussed openly without ridicule and where you can happily have a good beef about the establishment without censorship. Now I'll get off my soap-box and return to Brooksby '77.

I thought that the habitat slides shown by John Chalet were particularly valuable, especially the stands of flowering Oroyas, and the very good pictures of Arequipa fruit, which I had never seen before. Regarding the matter of payment for continental orders, I feel that this could get a bit out of proportion. In my experience I have been paid by an overseas customer without my even knowing – if it is a Bank transfer, my Bank sometimes shows the figures under the wrong heading and fails to send me the necessary notification of the transaction.

The scanning electron miscroscope photographs of Gymnocalycium seed were particularly interesting. Some appear to have straightforward tuberculate structure with inter-cellular pits, but most have some measure of ribbon-like material organised into various patterns. The interpretation of this ribbon-like material has yet to be made, and personally I felt that it represented an arrilus layer. Geoff Swales will hopefully throw some light on this in due course. It is of significance not only in Gymnocalycium but also in other genera.

. . . . from H. Middleditch

Apropos the foregoing comments relating to the shortcomings of Banks, I have had two experiences of overseas payments, one to a Bank in Brussels and the other to a Bank in Stuttgart, where the intended recipient of the money wrote to say that the Bank to whom the money had been transferred stated categorically that they had not received it. Only after I had adamantly persisted in stating that the money had been transferred from the U.K. to the Bank concerned, did the Continental Banks finally admit that they did indeed have the money.

It may be as well to place on record that members may be invited to a local Chileans' Meeting held at a member's home, but when it comes to the Autumn weekend, then each individual member who participates invites themselves to the event, for the very simple reason that nobody else will do it.

. . . . from Mrs. A. Lavender

It is all very well to say that there are notices about the Autumn weekend meetings in The Chileans, but not everyone reads every bit of the articles and notices in The Chileans. Two or three members have complained to me that the arrangements for the autumn weekend are like a secret society and only those "in the know" get to go there. You and I know that this is a quite mistaken impression and that if they read the notices or wrote enquiring about the event then they would be just as well acquainted as anyone else who hears in the normal course of events – but nevertheless this does not alter the fact that several members do hold this view. I think that there should be a quite prominent notice in The Chileans concerning the next Weekend event and then none of the members can claim that they were not made aware of it.

. . . . from P.A. Smart

Like Graham Charles and Roy Mottram, I am a recent newcomer to the Chilean weekend events although contact with others who attended regularly had prepared me for the occasion. The level of the discussions is most stimulatingly high but I feel that it is well within the grasp of any keen student of our plants. This is surely the result of putting together some twenty keen cactophiles and letting them put forward the results of their studies, and must stay this way if the Chileans is to continue to make progress. Above all, everyone who attends is a keen studier of cacti and able to add particular knowledge of at least one genus to the discussions. Certainly it is the keen collector who is likely to participate in the weekend. Early morning sessions, some ten to fifteen major discussion topics varying in length from half an hour to several hours, hundreds of slides and plants, and thousands of words, are not the fare for those with weak appetites! The suggestions of nepotism are, I feel, a little overstressed as surely the number attending the weekend will be limited by the discussion menu. However, I would support Roy Mottram's suggestion that the discussion topics should be published as early as possible so that participants can "read up" on them. Although the idea of holding prior study group meetings is interesting, I doubt if it is a practical proposition.

The void in levels between "normal" Journals and the Chileans must be a serious problem. I am sure that it puts off many potential members. As the Chileans is a study group it is surely inevitable that the level of its Journal will continue to rise. Any attempt to bring down our level to attract new members would defeat the very aims of the Chileans. It seems unlikely that the other Society Journals will raise the pathetically low level of their texts within the foreseeable future. So what do we do? I feel that Graham Charles has the answer. A fresh look at such techniques as seed raising, producing true seed, new methods (and old) of propagation and similar topics would surely be of interest to all. Short articles on newly described plants, new descriptions and translations are of interest to everyone. They might stimulate more members into putting their views onto paper.

. . . . from A. Yellin

I had long awaited Chileans No. 34 but was quite disappointed by the contents. The journal has lost its touch with the masses of cactophiles. It seems to have become a vehicle for several experts to conduct their erudite conversations with one another, in print. Give me discussions of habitats, climates, weather condition, soils, etc. Give me more descriptions of new plants. How about articles on specific techniques of pollinating our plants? I could do without the long discussions of the Annual Meeting. What truly is accomplished by printing the almost verbatim discussion?

. . .. from M.J. Boote

I don't agree with the suggestion that too much space is being devoted to the reporting of the discussions at the Gatherings – far from it. If anything, I think they could possibly be expanded, perhaps by the presentation of papers by each speaker, using the original notes, suitably enlarged. For many and various reasons, a lot of people cannot get to these events. For that reason alone, I feel that the reports are essential. What more useful purpose could be served by deleting the reports? My only criticism is that personally I feel the need for more illustrations. No doubt it has been said many times before, but a thousand words cannot convey what a good picture or line drawing can.

. . . . postscript from G.J. Swales

Since the Chileans weekend I have been able to consult Cardenas's original description of G. eytianum and he points out that in this plant the flower tube is relatively long compared with that found in other Bolivian Microsemineae and that the flower lacks the red throat of the other species. He also describes the seed as "brown . . . . not shiny", whereas the true Bolivian Microsemineae have rich dark brown, brilliantly glossy seeds, considerably smaller than the 1 – 1.2 mm across

quoted for G. eytianum. The illustrations of this plant which I have to hand (De Herdt's catalogue, K.u.a.S. for Feb. 1958, Kaus for March 1960) and plants in my own and other collections clearly indicate that under the single name we are dealing with two different kinds of plants, one belonging to the Microsemineae and the other to the Muscosemineae. John Donald, in the N.C.S.S. Journal Dec. 1971, placed the plant within the Microsemineae as a variety of G. pflanzii, but I gather that he was not completely happy about the identity of the plant himself. Having studied the original description, I must confess that I am now of the opinion that G. eytianum, with its longer flower tube, lack of a red throat and larger dull brown seeds must be considered as belonging to the Muscosemineae and probably close to, if not synonymous with, G. tudae. Imported plants under the name G. eytianum showing the short tubed, red throated flowers and which produce minute brown glossy seeds should be regarded as forms of G. pflanzii.

COMMENTS & QUERIES FROM MEMBERS

. . . . from D.W. Whiteley

The remarks in The Chileans regarding a dearth of information about cacti habitat – on soil structure of ph, weather, ecology and associated flora – and that a real natural history approach is never adopted towards cacti, is not really true. It is just that it is done by a different group of scientists than those that get involved in taxonomy and so they publish their reports in a different range of journals – certainly not very often in "succulent" literature. I have been amazed how much we miss. The scientists in the ecological fields seem to publish quite a lot on our plants but this is not in "succulent" publications but in their own journals like Science, Oecologia, Andina, Nature, Plant Physiology, Kosmos, Umschau in Wissenschaft und Technik., Ber. d. Deutschen Botan. Gessel., etc. In the cactaceae we can almost draw upon two groups of influence and research – that of taxonomy which seems to have excluded the professional botanist and have become the province of amateurs like Ritter, Backeberg, Knize, Donald, Buining, etc., and that of ecology that almost never sees amateurs indulging in it but has always been the province of the professional. It is not unexpected that never the twain shall meet, and that only amateurs provide the taxonomic succulent literature and only professionals provide the ecological and botanical literature, even when it deals with succulents.

. . . . from Mrs. L. Teare (Adelaide)

Do you know where to get seeds of Helianthocereus guatemalensis which I should like to grow and use as grafting stock for other young seedlings?

In No. 28 of the Chileans, Stephanocereus leucostele is discussed. I have a plant about 30 cm (12") high. No one mentions at what stage the plant develops cephalium; furthermore my own plant on its own roots has a rather thin trunk compared with the ones in the habitat photographs. Do you know if it is a plant that needs to be grown in a bed to have a cephalium, or will it do this in a pot? I keep mine in the unheated greenhouse and so far it has done quite well, as we get so many sunny days even in winter that the pots remain warm through a cold night – say 8 to 10°C.

. . . . from I. le Page

I note in Chileans No. 28 that some members have difficulty in growing Stephanocereus leucostele; my own small seedling of this plant shows a marked reluctance to grow in the summer but begins growth about September – is it a short-day growing plant? I have it in the propagator at the moment at a temperature of about 55–60°F; it has made a small amount of growth but I think it would benefit from even higher winter temperatures and a little water. Similarly a sowing of Micranthocereus auri-azureus and M. violaciflorus showed a marked reluctance to grow in summer but show signs of fresh growth now – so they now sit on my kitchen windowsill with all the West Indian melocacti and receive a little water now and then. I suppose I shall be reporting their demise in my next note!

. . . . from R. Ferryman

I obtained an unrooted top cutting of Stephanocereus leucostele from Jumanery ex Waras. This plant rooted fairly easily and was bedded out soon afterwards. I did not use a hot bed to root it, but the greenhouse it is kept in rarely goes below 55°F – it has been known to fall to 45°F for a couple of nights but generally the Brazilian cephaloids seem to be doing well. The Stephanocereus has not moved an inch but produced flowers last summer – confirmation that is was still alive. Whilst we may think the 55°–60°F which I keep them at is nice and warm, Eddie Waras thought that they were freezing when he saw these plants under similar conditions at Jumanery and was very concerned for their well being!

THE CHILEANS 1979 AUTUMN GATHERING

It is intended to hold this event over September 7th-9th 1979 at Brooksby Agricultural College. A 1" to the mile floor map of Chile will be used to locate Copiapoa. There will be a discussion of Notocacti of the rutilans/alosyphon/orthacanthus/herteri/rauschii/mueller-melchersii/mueller-moelleri/buiningii/mammulosus group. Invitations are going out to two overseas speakers. We also hope to hear how our own members fared on their trip to Sucre in late 1978. Any enquiries (with S.A.E. please) to Mrs. M. Collins, 11 Tudor Gardens, Upminster, Essex RM14 3DE.

STUDY GROUPS/REFERENCE COLLECTIONS

Cleistocacti	T. Lavender, 62 Finchdale Avenue, Billingham, Cleveland, TS23 2EB.
Copiapoa	E.W. Bentley, Northside, Crosspark Hill, Oakford, Tiverton, Devon.
Frailea	J. Forrest, Beechfield House, Meikle Earnock Road, Hamilton, Scotland.
Gymnocalycium	G.J. Swales, 5 Hillcrest, Middle Herrington, Sunderland, Tyne & Wear.
Lobivia	J. Hopkins, Primrose Cottage, Monks Lane, Audlem, Cheshire, CW3 0HP.
Matucana/Borzicactinae	P.H. Sherville, 51 Park Road, Enfield, Middlesex, EN3 6SR.
Melocactus/Discocactus	J. Arnold, 11 Greenbank Drive, Middlebank, Lincoln, LN6 7LQ.
Neoporterianae	R. Ferryman, Nichelia, The Street, Stonham Aspal, Suffolk, IP14 6AH.
Notocactinae	G.J. Charles, 23 Burnham Road, Great Barr, Birmingham, B44 8HU.
Opuntia/Tephrocacti	J.W. Bagnall, 22 Perlethorpe Avenue, Mansfield, Notts.
Parodia	A. Johnston, 11 Malvern Road, Scunthorpe, Lincs.
Photographing Cacti	A.W. Craig, Davela, Forest Lane, Kirklevington, Nr. Yarm, Yorks.
Rebutia	P. Smart, 5 Tomlinson Avenue, Gotham, Nottingham, NG11 0JU.
Sulcorebutia & Weingartia	J.R. Gooch, 51 Bourn Avenue, Hillingdon, UB8 3AR.
Trichocereus	N.T. Hann, 5 Lake Road, Shirley, Croydon, Surrey, CR0 8DS.

THE CHILEANS

Organiser	H. Middleditch, 5 Lyons Avenue, Hetton-le-Hole, Co. Durham, England, DH5 0HS.
Treasurer	R.L. Purves, 19 Brocks Drive, Fairlands, Guildford, Surrey, GU3 3ND.
Membership Secretary and Back Numbers	Mrs. A. Lavender, 62 Finchale Avenue, Billingham, Cleveland, TS23 2EB.
Seed Exchange	J. Hopkins, Primrose Cottage, Monks Lane, Audlem, Cheshire, CW3 0HP.
Slide Librarian	A.W. Craig, Davela, Forest Lane, Kirklevington, Nr. Yarm, Yorks.

CONTENTS