THE CHILEANS '73

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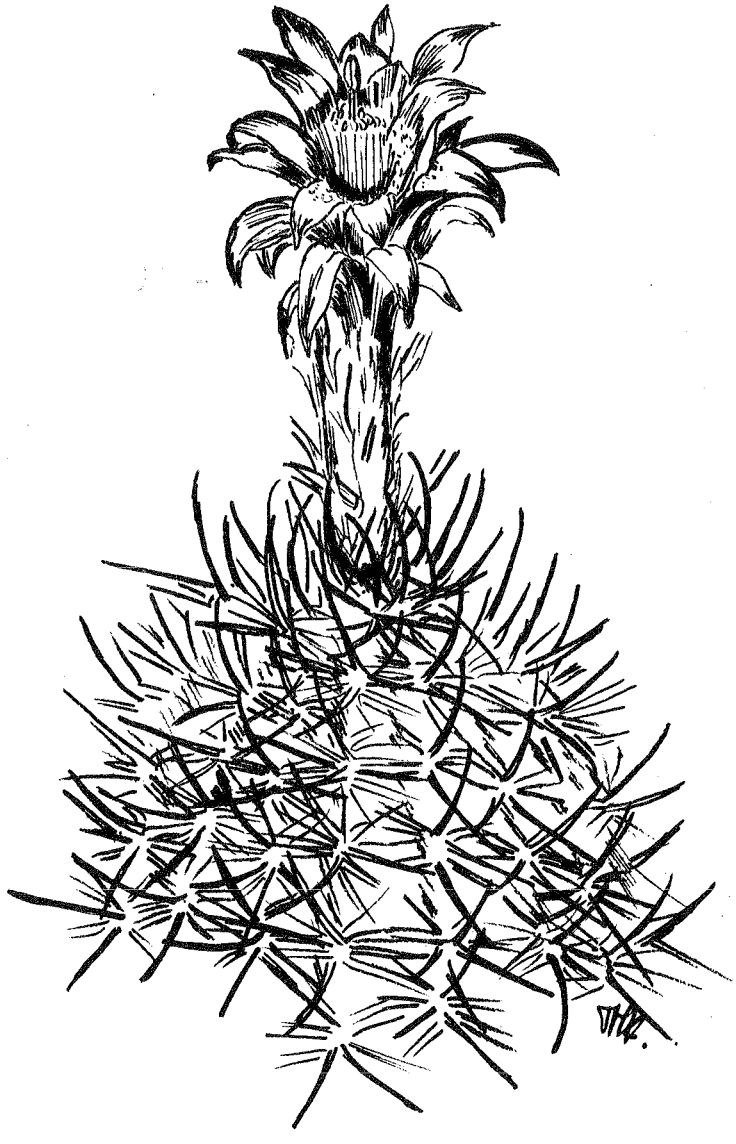
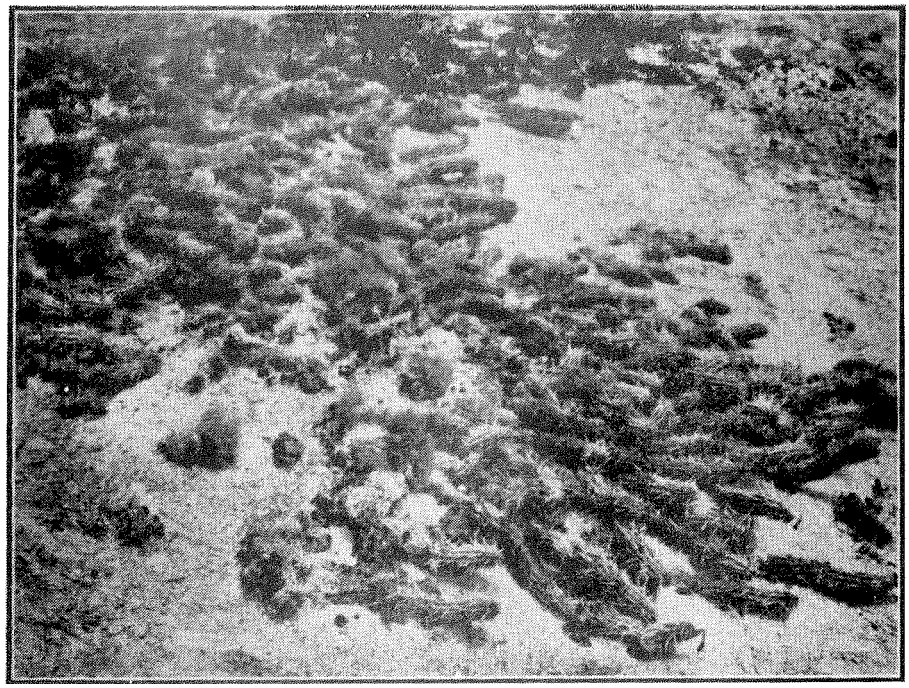


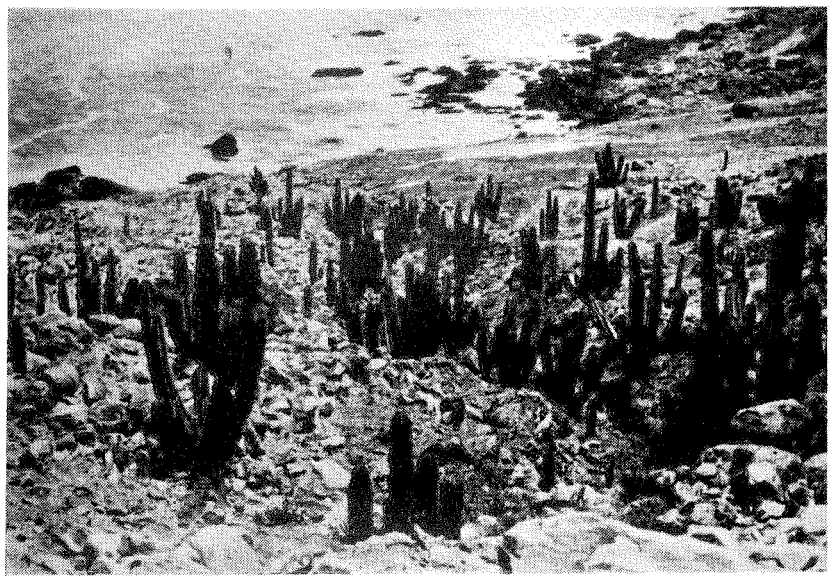
AREQUIPA RETTIGII

ACTUAL SIZE

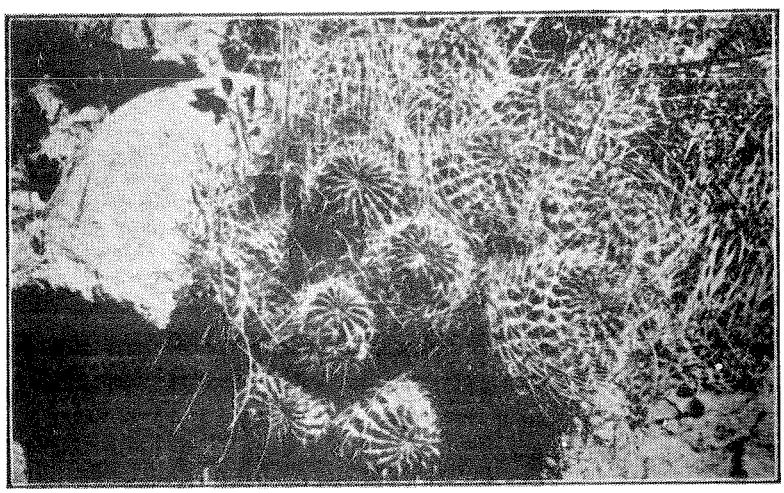
COLLECTION - Mrs. J. Hobart



Haageocereus decumbens



Neoraimondia arequipensis



Lobivia mistiensis

REFLECTIONS ON THE CACTUS VEGETATION OF PERU - 3. By Prof. Dr. Werner Rauh.

(Translated by H. Middleditch from "Cactus" (France) 11:51/52; 1956)

We continue our itinerary towards the south across the desert. Like a shot from a gun, the Panamerican Highway passes straight across the desolate landscape. The air shimmers, the heat is intolerable; but the swirling of the air, set up by the motion of the car, does not bring us any relief. Our eyes threaten to close, but we must not allow ourselves to become drowsy. Numerous wooden crosses, which are to be found alongside the road, with a rusty petrol-can and a lighted candle as foreground, remind us of the daily accidents and invite us to keep a sharper lookout. All at once, we see ahead, at the side of the road, great black "serpents", looming up from the sand. As we approach them, the "serpents" are revealed as creeping colonies of Haageocereus decumbens. These colonies were partially submerged in the sand and densely coated with lichens; rooted by the lower part over a length of some 2 meters, they form an important population here. The plant had already flowered and carried hairy wine-coloured fruits of a diameter of 2 cms. Backeberg found this species further to the south, at Mollendo, on the stony sand. It is odd that just the desert cacti are to be distinguished by their dwarf build. Later on, however, we came across a new species in the sandy desert of Trujillo in the north of Peru, which was characterised by the same creeping mode of growth.

In the hope of finding other plants as well, we struck deeper into the desert and indeed found a new species, a cactus of globular shape, which one might easily have overlooked, for it is buried in the sand and only its felted crown of yellow-brown colour is exposed. It belongs to the genus Islaya, very interesting from the point of view of the geography of the plants and described by Backeberg as being very closely related to Islaya mollendensis, found close to Mollendo. The body of these plants is spherical to begin with, becoming elongated with age and orientated in such a manner that the felted crown turns it back to the sea.

The columnar fruits of a length of 2 m (2 cm, surely ? - H.M.) carry the seeds in a little sack from which, once they are fully ripened, they fall quite readily. The following day, a little further to the south, close to Ocona, we came across another species of Islaya, Islaya minor, on a soil of tufa, covered with Cyanophyces, and deeply embedded in the sand. Both species have flowered in the Botanic Garden "Les Cedres".

At Atico the asphalted roadway came to an end - a road of "corrugated iron", dreadful and irritating, took us further on. Furthermore, we could travel only at night because the road was under repair. Without any doubt, more than one plant escaped our attention. It is only with difficulty that we are able to admire - under the feeble light of the moon - the gigantic examples of Neoraimondia macrostibus, which grow to the south of Atico and extend as far as the neighbourhood of the sea. Right up to a few kilometers from Arequipa, our harvest of cacti was pretty meagre. The road left the coast at Camara and climbed towards the interior of the country, stony plateaux almost bereft of vegetation. It is only to the east of Vitor that the landscape shows more life and colour. The red mountains which belong to the old primitive massif, are covered up to a height of 2,000 m by dunes of white sand which give the impression of freshly fallen snow.

By a twisting road we now approach the pass of Sierra de Caldera, which we cross by a tunnel. The view at the summit of the pass is indescribable. Far away below us, at a distance of 30 Km., is to be seen the town of Arequipa, surrounded by a green forest of Eucalyptus, by orchards, kitchen-gardens, and by dark green fields of alfalfa. As a back-drop there arises in a fairylike circle the snow-clad peaks of extinct volcanoes, up to a height of 6,000 m; one descries the neat pyramid of the Misti, to its left the serrated crest of the Chachani and to its right the lengthy chain of the Picchu-picchu and of the Ubinas. We remain quite a long time at top of the pass, our gaze turned towards the east; the greenery is a feast for our eyes, which have only had the yellow sand to look at for most of the time.

In the sandhills on the other side of the pass the cacti once again appear in great numbers. It is Browningia candelaris which sets the scene. Superb vintage specimens form a very ornamental and photogenic foreground, with the splendid silhouette of Misti for a background. In the beds of sand, Tephocactus sphaericus make up numerous clumps of new shoots, round, furnished with a multitude of spines. The fruits likewise are covered with spines, the points of which are bent backwards and downwards.

In the more rocky places we observe Haageocereus platinospinus, whose creeping stems are covered with spines in all directions. The pale colour of the young spines takes on a brown to brownish-black shade towards the tip. The central spines 2-4 in number, now and then extend 6 cm; they are either horizontal or inclined downwards and of a platinum grey colour. The flowers, whose petals are white in colour on the inside and wine colour on the outside, are carried on a 10 cm long tube. In association with Haageocereus platinospinus we find Arequipa weingartiana, whose stout columns have a diameter of 36 cm. After the little red flowers come the yellow fruits, which readily allow the seeds to fall out. We had collected at the same spot Erdisia meyenii, whose yellow-orange flowers are magnificent. The arrangement of this plant in colonies is explained by the formation of underground elongated offsets, an uncommon morphology which is not encountered in the other cactus species from Peru.

We only remained a few days in Aerquipa, that fine town where the sun "shines eternally". The hills and the picturesque surroundings drew us out of the town. The ascent of the 6,076 meters of the Chachani volcano particularly attached us. In front of it extended a countryside formed from cones of dead volanoes, flattened out, covered with thick brushwood of Franseria fruticosa, a little shrub of the Compositae. Between them stand, in great numbers, dense rows of Cereus weberbaueri; its chocolate coloured flowers appear during the time of the rains (actually), whilst Corryocactus brevistylus, which grows with them, only flowers during the dry season. Opuntia dimorpha, very abundant, proved to be a confounded nuisance for those who travel through this vegetation. Indeed its sharp glochid armour breaks off easily at a touch, piercing footwear and clinging to clothes, being carried about and scattered in this way. At 2,700 m altitude, we came across the genus Lobivia for the first time, its distribution is restricted to the high region of the Andes of Southern Peru. More specifically, it is Lobivia mistiensis, a plant of very deep green colour, reaching a diameter of 10 cm and a height of 20 cm; it is often to be found growing in compact hummocks. The spines curve upwards and may reach 5 cm in length, they are of a brownish colour in the young growth but become grey in old age. The flower petals are generally pinky orange and externally pale wine colour are, according to Backeberg's description, not radiating, but erect.

The region of the High Andes, properly speaking, is clothed by bushes of Lepidophyllum quadrangulare, a shrub of the Compositae, belonging to the species called "Tola bush"; this region appears to be scarce in cacti at Chachani. The genus Tephrocactus, restricted to the higher parts, is represented by Tephrocactus ignescens whose compact hummocks, bristling with spines of bronze colour, resemble, in the setting sun, a glowing ball.

Although our harvest of cacti on Chachani would not be very important, we have nevertheless found some very interesting species, which occur solely in the volcanic region of southern Peru.

(The photographs on the inside front cover were taken by Rauh during his visits to Peru; the top and bottom photos are from Cactus (France) and the centre photo is from Rauh's "Beitrag sur Kenntnis der Peruanischen Kakteenvegetation").

ECHINOPSIS MISTIENSIS sp. nov.

(Translated by H. Middleditch from Neue Kakteen 1931)

Body generally solitary, globular to somewhat coneshaped; ribs 25-30, narrow, 4-8mm high, indented above the aereoles; spines on the *import section 7-9 all radial, obliquely forward - or more or less horizontally - spreading, generally somewhat curved upwards, rough, thin awl-like, grey with darker tip, up to 5 cm long, the lowermost being much shorter, up to 2 cm long: spines in new growth pale grey or brown to blackish-ruby red. Flower unknown as yet.

*Editor's note - I puzzled over the words 'import section' and could not think what they could mean. H.M. tells me that the original German is 'import teil' i.e. 'import part' - an example of Backeberg's telegraphic style, meaning that part of the plant grown in the wild as opposed to further growth in cultivation.

ECHINOPSIS MISTIENSIS Werd. & Backbg.

From Fedde Rep XXX; 64, 1932.

Simplex, ± globosa; costae angustae, ca. 4-8 mm altae, supra areolas incisae; areolae juveniles lanuginosae; aculei omnes radiales, divaricati, ± verticem versus incurvati, apice brunei, tenues, subuliformes, ad 5 cm longi, infimus semper brevissimus, ad 2 cm longus; aculei omnes in statu juvenili vel ± ferruginei vel rubescentes vel nigri, dein cani, Flores adhuc ignoti.

South Peru on the Volcano Misti besides Arequipa, at about 3,500 m altitude.

This species is characteristic in its spination because of the lowermost, much shorter downward pointing spine; living material collected and imported into Germany by C. Backeberg.

Lobivia mistiensis (Werd. & Backbg.) Backbg. Comb. nov.

from B.f.K. 1934 - 12.

Solitary or forming clumps, spherical to cylindrical. Peculiar shining blue-greyish green. Areoles ca. 2 cm apart, usually with much white wool. Generally 9-10 irregularly arranged whitish grey to brown spines, interwoven, up to 5 cm long. Flowers numerous, large ca. 6 cm long, rosewood coloured paler within with red central stripe, petals spreading. Fruit ca. 2.5 cm diameter, yellow green. Seeds dull brownish black.

Volcano Misti and Chachani near Arequipa at ca. 3,800 m altitude.

Lobivia mistiensis (Werd & Backbg.) Backbg.

Translated by H. Middleditch from Die Cactaceae Vol III.

Solitary to clump-forming, globular to flat, but with larger swollen root; ribs ca. 25-30, narrow, 4-8 mm high, obliquely notched; areoles with thick white felt cushions, prominent, spines not clearly separated, up to ca. 9 and more, up to 5 cm long, at first brown to blackish - ruby red, later grey-white; flower up to 8 cm long; sepals slender-pointed; fruit 2.5 cm diam., globular, yellow-green. Seed matt brown-black.

Comments on L. mistiensis

..... from H. Middleditch

"The degree of deviation between the foregoing descriptions is quite remarkable in certain features. In 1931 and 1932 it is generally solitary, whilst by 1934 it had become clumping. The official Latin description of 1932 gives a more or less spherical body, in 1934 it is spherical to cylindrical, whilst in Die Cactaceae it is globular to flat.

"Although the initial description of this species gave it between 25 and 30 ribs, a close up photograph which accompanies the article by Rauh which is reproduced in this issue, shows a plant in its habitat location, having a head with but 16 ribs.

"Altogether one might consider it somewhat difficult to obtain a clear picture of the intended plant, purely from the four descriptions given for it by Backeberg."

..... from J. Hopkins

"The first description of this species appeared in 1931, the Latin diagnosis appearing in another publication in 1932.

"The flower size is given in B.f.K. as 6 cm long, elsewhere as 8 cm. Is this due to the degree of opening or is it simply variable? I suspect the former and hence the flower is very similar to L. pampana - slightly lighter in colour in the latter. Unfortunately I lack mature plants of either species so my comments are rather tentative!"

The PERUVIAN LOBIVIAS in GROUP 2 From J. Hopkins

The Peruvian Lobivias are represented by species in both seed groups 2 and 4 of the seed study (Chileans No. 23 p. 76). Within group 2 there is the distinctive section comprising the plants in Backeberg's Acantholobivia, confined to Peru and then only in a few widely scattered areas. The remainder of the group 2 Lobivia are divisible into further sections according to flower form (discussed briefly in Chileans No. 24 pp 158/159 viz: the pentlandii, maximilliana, westii, mistiensis, and caespitosa sections. The first four of these sections have representatives in Peru and the caespitosa section appears to be the Bolivian counterpart of the entirely Peruvian westii group. This article introduces some of the group 2 forms. Most of the habitat locations mentioned in this article can be found on the map in The Chileans No. 24 p. 140.

The diagnosis of the seed group 2 was given in The Chileans No. 23 p. 78 and further samples coming to hand since that was written allow this diagnosis to remain substantially unaltered. It does not seem possible to distinguish between the sections representing differing flower forms purely by seed inspection at present. But there are one or two features of the seeds which show tendencies in certain directions and with more authenticated material, it may be possible to subdivide the group by seed into sections.

Peruvian Lobivias belonging to seed group 2 are:-

mistiensis section	- L. mistiensis
	L. pampana R 446
	L. lauramarca R 424
westii section	- L. Lau 141, westii form
	- L. Lau 146, (L. intermedia Rausch ?)
maximiliana section	- L. maximiliana R 202, Lau 254
	- L. Lau 252
Acantholobivia section	- L. akersii R 387 (= oyonica)
	- L. incuiensis R 443
	- L. tegeleriana R. 394, R 395.
others	- L. simplex R 423
	- L. leptacantha R 422

These sections are based on flower forms and not on the seed. As can be seen from these divisions, the group 2 seed involves a very complex situation in Peru, let alone Bolivia and Argentina!

Lobivia incuiensis and L. tegeleriana were placed in the new genus Acantholobivia by Backeberg on account of their night flowering and self-fertile habit, together with the fact that the ovary and lower part of the flower tube are often set with areoles and spines. Rausch does not seem to recognise Backeberg's genus at he published L. akersii (syns. L. oyonica n.n., L. churinensis n.n.) as Lobivia. There is reasonable doubt that there is need to place them in a separate genus; self-fertile all three species certainly are, but the spiny ovary is found also in L. westii forms and, in any case, is not found in L. akersii. The night flowering habit is open to question as they seem to be day flowering in our collections. The three species are found in quite isolated, widespread localities, L. akersii in the Churin valley north of Lima, L. tegeleriana in the Mantaro valley and L. incuiensis further south in the area around Lake Parinacocha near Cora Cora.

An unusual feature ofgroup 2 seeds is that they are embedded in a stickier pulp than is normal with other Lobivias, but the westii and Acantholobivia sections have the stickiest pulp of all the Lobivias. This makes for a very slow release rate of seed from the fruit and may be an aid to dispersion of the seed. Does this imply that these species (mainly found in isolated areas) are recently evolved and are trying to cover more territory, or that these isolated groups are the remains of a once more widespread population now dying out because the sticky fruits prevent adequate seed dispersal?

The Acantholobivia flowers are some 3-4 cm long but less widely opening than most Lobivias, about $1\frac{1}{2}$-3 cm diameter. They are a brilliant orange-red (unusual for night flowers!) and possess the usual Lobivia characteristic of two sets of stamens. The tube is moderately hairy and as has been said usually spiny except in the case of L. akersii. The seed are on the small side of the group 2 range and invariably very shiny at first probably due to a thin layer of pulp on the seed.

The mistiensis group plant bodies are more or less globular, sometimes slightly caespitose with more or less continuous ribs. The scaly tubed flowers with numerous narrow, lanceolate petals separate them from the sparsely scaly tubed, more spathulate petalled L. pentlandii plants and put them close to the Bolivian L. caespitosa section. They are rather isolated from this section however and are probably associated more closely with L. charazanensis and L. cariquinensis which are quite close as far as the habitat locality goes. The latter two plants however seem to be transition species from L. maximiliana to L. pentlandii so that the mistiensis section may be a branch off to the westii section. This is supported by Rausch's view that L. intermedia from Chalhuanca is the intermediate form between L. lauramarca and L. westii.

The flower of L. lauramarca is not so long tubed as L. intermedia which possesses the typical long parallel sided tube of L. westii. The latter species also has the outer stamens fused together into a cylinder, a characteristic shared by L. intermedia but not by L. lauramarca. On the other hand, the perianth diameter of L. intermedia and L. lauramarca is more on a par with the mistiensis section but with fewer petals. L. westii has a wide perianth of rather uneven appearance.

The inter-relationship of these species is by no means obvious and their rather scattered habitats do not help matters. More field study and a much better knowledge of their distribution are needed before any firm conclusions can be drawn.

In summary, the group 2 plants from Peru show a considerable diversity in body and flower form and all fruits examined so far have been moderately to very sticky even when the seed is ripe.

FURTHER THOUGHTS ON LOBIVIA FLOWERS - from J. D. Donald.

Reverting once more to the notes by John Hopkins on Lobivia flowers, I would like to consider a further group within this genus.

It would now seem probable that the Knize L. cruciaureispina is the same as L. westii and I have had some correspondence with Knize about this - it appears that he was not familiar with the full description given by Paul Hutchison. Amongst the Lau plants collected from the Andahuaylas region are a number of forms of L. westii and of L. intermedia Rausch. Lau 141 exists in two forms, both have the long thin branching body of the original westii and both produce the long tubed orange flowers typical of the species - but one has areoles and spine cushions on the tube where the other has scales bearing axilliary bristles. The former produces bristly fruits and the latter hairy fruits. The original westii has only bristles and hairs in the scale axils.

Lau 206 has quite a different body, cactoid as opposed to the near cereoid of the type plant, but a virtually identical flower in form and colour as the type plant; this appears to be a form of L. intermedia. Another plant from the same area collected above Chalhuanca (distributed under Lau No. 210, a number also allocated to Weberbauerccereus longicomus from the Rio Crisnejas) is very similar but has a full red flower - possibly identical with Rausch's L. intermedia. Neither 206 nor 210 show areoles or spine cushions on the tube.

There must be a close relationship between L. westii and L. tegeleriana from their very similar floral tube armature and their geographical proximity but, even so, there are some important differences. The tube length of the "Acantholobivias" is considerably shorter than for the westii type, but with a similar diameter so that the tube length/breadth ratios are quite different. I would not have said that the flowers were particularly insignificant being at least 40 mm long and opening 20-30 mm across. Certainly all the six forms of "Acantholobivia" discovered to date are self-fertile in cultivation giving rise to very distinct fruits which do not dry out at maturity - the ripe seeds remaining in a very sticky pulp. If John Hopkins hypothesis on their need to be self-fertile is true, then why does this not also occur with Oroya which live under even more extreme diurnal variations? Acantholobivia flowers may open initially at night but they do not close much before midday and last for several days, much longer than the 48 hours or less for the average Lobivia flower. Lobivia oyonia Akers n.n. (note the correct spelling, very commonly rendered as "oyonica" in error) differs slightly not only in the white or very pale pink flower but in its slightly wider opening perianth and less pointed segments. I find that it flowers as a small plant much more easily than the other species.

The other group with long, fairly thick, tubes and narrow opening perianth, centred on L. caespitosa, poses some interesting tentative relationships with the pentlandii group. There appears to be little difference except in flower colour between L. caespitosa and L. hermanniana - both have cereoid rather than cactoid habit, this is showed by L. miniatiflora. The latter plant appears to be quite variable, for the original Ritter plant has a very scaly and quite naked tube but Lau 307 from inquisivi has a more hairy tube, both forms have a slightly wider opening perianth than caespitosa/hermanniana. Lau 962 is definitely L. caespitosa and Lau 1002 is L. hermanniann in the accepted sense.

Just as there appeared a cactoid and cereoid form of L. westii, so a similar situation exists with L. caespitosa. Walter Rausch has collected a globular form which is close to Lau's 310 collected at Santa Rosa, Ayopaya, Bolivia. It is just possible that these globular forms might be precocious juvenile forms of the more normal cereoid plants. Time will perhaps tell. L. mistiensis and L. pampana are both cactoid forms and as John Hopkins says they have wider perianths than caespitosa. There is possibly a relationship between mistiensis and pampana - a matter of altitude?

LOBIVIA LAURAMARCA Rauh & Backeberg sp. nov.

(Descr. Cact. Nov. 1956 p. 28)

Globosa, pallidiviridis, ad 5.5 cm diam., costis 12-15, aliquid tuberculatis; aculeis radialibus 6, pallidifuscus, superiore sursum curvato, ad 15mm longo, aciculari, brevioribus ad 4 mm longis, aculeo centrali deficiente; flore + infundibuliformis, ad 6 cm longo, 3.5 cm lato, phyllis perigonii interioribus rubris, faule alba. Peruvia australis, Hazienda lauramarca.

LOBIVIA LAURAMARCA Rauh & Backbg sp. nov.

(Translated from "Contribution to the Knowledge of Peruvian Cactus Vegetation", 1958 by H. Middleditch.

Plantes simplices vel parum ramosae, humile globosae, ca. 5.5 cm in diam. costis 12 - 15 in mamillas porrectas dissolutis; areolae pusillae, parum latus versus motae aculeis marginalbus 6 pallide fuscis, usque 1.5 cm longis, tenuibus flexibilious saepe caulem versus curvatis; aculeus centralis deest; flos inter costas insertus, se infundibuliformiter vel semiradialiter aperiens, usque 6 cm longus, 3.5 cm in diam., tubus floralis usque 4 cm longus, rubiginosus squamis bracteaneis lanceolato-acuminatis colore pallidorubri vini, in axiliis earum penicilli pilorum brevium albo-canorum; phylla perigonii interiora spathulata breviter mucronata apice latericea basim versus fere alba; stamina multo breviora quam phylla perigonii filamentis rosaceis et antheris luteis; stigmatibus pallide viridibus.

Body solitary or occasionally offsetting; depressed globular; about 5.5 cm diam., with 12-15 ribs divided into elongated tubercles; areoles small, located somewhat obliquely, with 6 pale brown, up to 1.5 cm long, slender, flexible, radial spines often curved away from the body; central spines absent; flower standing between the ribs, funneliform to half-rotate opening, up to 6 cm long, 3.5 cm in diam., tube up to 4 cm long, brownish-red with lanceolate tipped pale wine-red scales, in their axils wisps of short, grey-white hair; inner perianth leaves spatulate, short pointed tip brick-red, towards the base almost white, stamens much shorter than the perianth, with pink coloured filaments and yellow anthers; style with pale green stigma.

Discovery place: High Puna moor near the Hacienda Lauramarca, (Ocongate), 3,000 m, South Peru. Collection number K 144 (1954).

With regard to the flower form, L. lauramarca forms a transition between the species whose perianth is spread out flat-rotate and those of the "pentlandi" group, of which the inner perianth leaves (petals - H.M.) are erect.

Comments

..... from H. Middleditch

"What exactly does the diagnosis mean, I wonder, when it says that the flower "stands between the ribs"? It cannot arise from between the ribs, only from the areole, which is nearly on top of the rib. Is it described in this way because the areole is slightly skewed on the rib so that the bud, in arising from the upper end of the areole, rises up more or less alongside the rib - so when the flower tube is fully grown it looks as though it is standing between the ribs? This must mean that the flower is growing more or less vertically which is not the case on all Lobivia. For example, on L. pentlandii the flower grows more or less straight out sideways from the plant, in which case it does look as though it is growing from the top of the rib."

..... from J. R. Gooch

"Unfortunately I have not got this plant, nor am I familiar with it; it certainly seems strange to describe the flower as "standing between the ribs". However, the above comment would perhaps explain the situation, born out by the "areoles somewhat obliquely located" in the translation. Several plants in the Pentlandii group at least, exhibit this same characteristic, though it would not be so apparent on L. pentlandii itself."

LOBIVIA WESTII By P.C. Hutchison

(From the U.S. C. & S. J. XXVI. 1:1954)

Lobivia westii P. C. Hutchison sp. nov. Planta caespitosa caulibus elongatis diam. ad 6 cm 15-20 cm longis costis 16-18 crenatis acutis spinis radialibus 8 subaequaliter radiantibus adpressis vel suberectis 3-9 mm longis spina centrali unica rare duabus primo ad 2.5 cm demum leviter incurvata ad 4 cm longa; floribus tubiformibus-companulatis 6-7 cm longis diam. 4 cm tubo 4.0 - 4.5 cm longo diam. medio 6 mm squamis pluribus lanceolatis in quarum axilis tomento copioso instructis perianthii segmentibus cinnaborinus armeniacotinctis eis interloribus incurvatis vel conniventibus fulgente armeniacis marginibus carinisque flammeotinctis.

Plant caespitose, stems elongate, to 6 cm diam., 15 to 20 cm long, dark green, apex flattened or somewhat depressed, less spiny. Ribs 16 to 18, rarely somewhat spiralled, crenate, acute, 7 to 9 mm wide at base, separated by grooves up to 9mm deep. Areoles yellow-felted fading to grey, up to 4mm by 2.5mm. Spines straw coloured with brown tips or entirely brown fading to grey, radials usually 8, spreading sub-equally, adpressed to suberect, 3 to 9 mm long, centrals 1, rarely two, on younger growth up to 2.5 cm long, later to 4 cm, slightly incurved, second central if present much shorter. Flowers subapical, lateral, solitary, tubiform-campanulate, 6, to 7 cm long, 4 cm diam. across limb, tube at first grey-brown or brownish purple, later reddish purple, 4 to 4.5 cm long, 6 mm diam. at the middle, with a slightly swollen base 8 to 9 mm diam., with brown, green-tipped, lanceolate scales 2.5mm long with abundant grey wool in axils. Perianth segments orange, orange-yellow or orange-red tinged yellow. Outer segments lanceolate, recurved, waxy orange-pink shading to golden orange, 2 to 3 mm wide, 18 mm long; inner segments oblong-ovate, acute, apex entire or jagged, keeled, bright golden orange shaded on margins and keel with orange-red, incurved, 5 mm wide, 3 cm long. Stamens biseriate, filaments incurved, adnate part white, free part yellow, upper series inserted at tube apex, lower 3 to 4 mm adnate, upper 8 mm free, lower series inserted from 1 cm above ovary to within 5 mm of tube apex, 2 cm long, clasping style. Style 3.5 cm long, white below, pale yellow above, stigma lobes 6, 2 to 4 mm long, pale yellow. Fruit and seed unknown.

Peru, Dept. Apurimac, Coripacchi on the trail from Andahuaylas to Argonia, Nov. 5 1935, James West 3741, ex hort. University of California Botanical Garden No. 36, 1751 (UC-Holotype). The field-collected specimen of flowers only (West 3741) is also deposited at UC. I have seen additional living material of this species, collected by Harry Johnson at Andahuaylas, in the Johnson collection at Paramount, California.

Associated with Opuntia floccosa Salm-Dyck and an "Echinocactus sp." (probably an Echinopsis sp.) in open puna in a grassy area with occasional shrubs at an altitude of about 3,800 meters. Locally known as "pakunquis".

West collected both living plants and a unicate herbarium specimen but since the latter is fragmentary, material prepared from the living specimen at this botanical garden has been designated as the holotype. Additional specimens will eventually be made available to other herbaria from the living type plant and these specimens will be designated clonotypes.

Incurved to connivent inner perianth segments place in this new species in subgenus Eulobivia Backeberg (Cactaceae, Jahrb, der Deutsch. Kakt. - Ges. June 1942). Backeberg states (Some Results of Twenty Years of Cactus Research, Cac. & Suc. Jour. Amen. 23.3 : 1950) that in this subgenus "The flowers do not close until they wither". His meaning is not exactly clear. The flowers of L. westii remain fully open only a few hours each morning for two days. Before noon the inner segments become connivent over the style. The second day the flower colour darkens considerably and a withering flower gradually turns dark red. Attempts to set fruit on this species have failed over a period of three years, both in attempted selfing and in crosses with other species of Lobivia in cultivation here.

James West was the name adopted by Egon Victor Moritz Karl Maria, Prince of Ratibor and Corvey, Prince of Hohenlohe-Schillingsfurst, during his long stay in this country. West became known in the San Francisco Bay area as an authority on succulent plants and he designed many rock gardens in that area as well as the original cactus and succulent areas of this botanical garden. His early writings in the Cactus and Succulent Journal of America are models of prose which few have excelled. In all his writings his detailed knowledge of the pertinent botanical literature and of the horticulture of succulent plants is clearly evident.

From 1935 to 1937 West acted as a collector for the first University of California Botanical Garden Expedition to the Andes and he collected some 4000 numbers principally in Peru, Bolivia, Argentina, and Chile but also in Medico, Central America, Paraguay and Ecuador. In many instances he collected living material which has subsequently been grown here. His comprehensive field notes, excellent photographs and the detailed comments in his letters confirm other evidences of his broad botanical background. His extensive collections of Cactaceae, in particular, are extremely noteworthy, since no collection of equivalent size is known to me which is so thoroughly documented, especially in terms of data on habitat, associated species, morphology and variations.

Comments on L. westii

..... from J. Hopkins

"Several forms of L. westii are now to be found in collections. The plants collected by West and described above appear to be but a small sample of a widespread population. Lau has collected three different forms from the Andahuaylas area - Lau 141, 206 & 210. Lau 141 has a light green body in contrast to the dark green of West's plants. The spination is similar but the orange flower is longer and opens more widely - the pericarp also develops spines much like some specimens of Acantholobivia.

"I have seen one fruit of Lau 141 which was about 8 mm diameter and quite densely covered with spines about 5 mm long. The fruit pulp is very sticky in common with the Acantholobivias, the seeds being firmly embedded in it. Fresh seed therefore are covered with a thin film of this sticky pulp which gives them a shiny appearance. When it wears off the seeds are dull black and this explains the variations to be found in my diagnosis of seed group 2 in The Chileans No. 23 p. 78.

"Lau 206 has not flowered for me yet; the stem is dark green but the spination is much better developed, the radials being some 3-4 cm long. I understand from John Donald that the flower is orange and that Lau 210 has a red flower. The plants collected by Knize are mid green in colour and hence lie between Lau 141 and the original westii in this respect.

"Lau 146 from Chalhuanca is identical to Rausch's L. intermedia - yet another westii form but quite close to the original except for the red flower. I sectioned one of these flowers to find that the upper ring of stamens were fused together forming a cylindrical hymen some 9-10 mm long. This naturally produces a compact cylindrical bunch of stamens, a feature found in Lau 154

and some forms of the Bolivian L. caespitosa, and to a lesser extent in L. lauramarca, L. mistiensis, etc."

..... from H. Middleditch

"At our Brooksby weekend we were treated to a slide from John Hopkins of the flower of L. intermedia, with all the petals removed, exposing the upper stamens which were fused together into a tube. These fused stamens are a greenish white colour, the free parts yellow. It nothing else, I have discovered what adnate means - this particular term did not convey anything to me when I first read the diagnosis of L. westii; however, on finding the similarity between L. westii and the L. intermedia in respect of the fused stamens, I was induced to refer to Marshall & Woods' glossary of succulent plant terms, wherein I find that adnate means "grown together".

"It is surely most remarkable that this feature, so rare among the species of Lobivia, should be found to occur in the same geographical area as the flowers of Borzicactinae which have fused bases to the lowermost stamens. Are these Lobivias reacting to similar influences to those which have caused the Borzicactinae to develop their special "hummingbird flowers" ? And reacting in the same way ? And is this form of flower construction intended to offer some inducement to the humming bird to visit these Lobivia? But does not the absence of any reasonable amount of nectar in these Lobivia flowers - inadequate for the needs of a humming bird, it would appear - suggest that the adnate inner stamens is merely a form of mimicry? Is this particular Lobivia mimicking the tubular Borzicactinae flower with its restricted opening? Is this an adaption to survive in the face of a lack of alternative pollinators? Are these plants growing in one of Proctor & Yeo's regions with a "comparative dearth of highly developed flower visiting insects?" What sort of insects do exist at this sort of altitude?

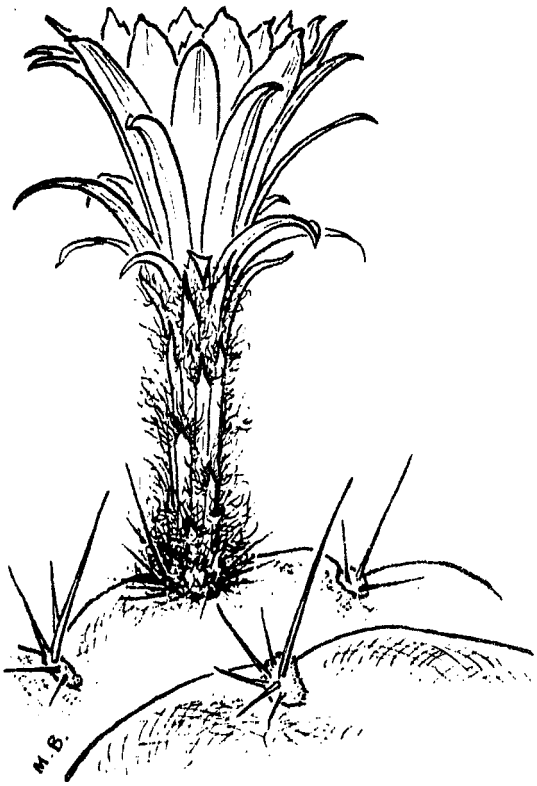
"Has this Lobivia extended its growing area until it has come into a region lacking suitable pollinating agents? But if that were so, how could it spread into the area in the first place? It is perhaps more likely that the Lobivias spread there in more hospitable times and is now adapting to suit a change in circumstances leading to a reduction in the insect pollinating population, necessitating increased reliance on humming birds for pollination? Do we have any evidence for any such change? Certainly there is ample evidence for a very long term and very marked drying of the climate within the dry band running from the Peruvian coast and north Chile, across south-western Bolivia and the high Andes of Argentina, down towards the Atlantic between the pampas grassland and Patagonia. The habitat location of L. westii is barely on the edge of this band, and hundreds of miles north of the Altiplano, which once boasted an inland sea where now only vast salt-crusted salars survive. To what, then, are we to attribute this peculiar feature of adnate stamens on L. westii and L. intermedia?

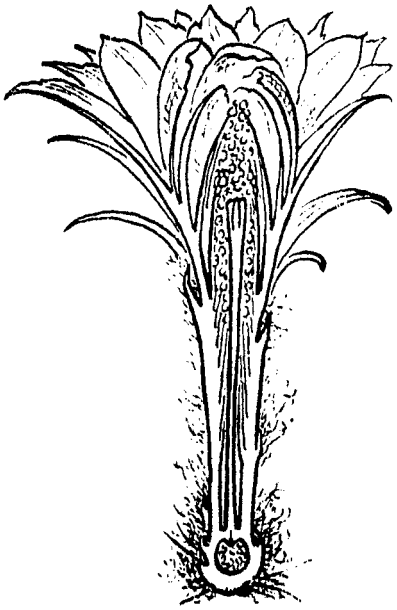
"In his article describing this Lobivia, Hutchison says that he does not see clearly what Backeberg meant by his phrase "The flowers do not close until they wither". Could Backeberg have meant that once the flowers have opened, they stay open day and night, sunlight or shadow, unlike many other cactus flowers which open, for example, in daytime only, or in sunshine only?

"It may be recollected that G.E.H. Bailey has already observed (Chileans No. 24 p. 160) that Lobivia westii is one of the few Lobivias whose flowers last for more than a day. This observation would appear to be compatible with that made by Backeberg, if the flowers do not close up at night time."

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

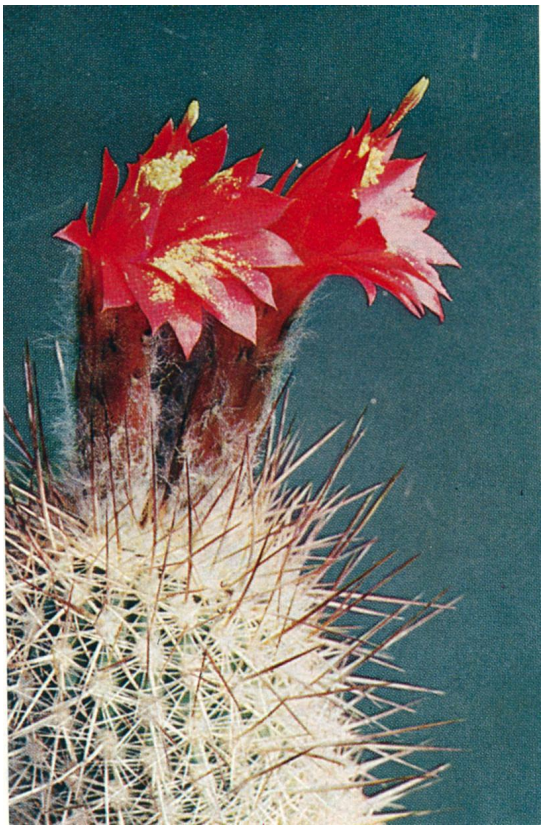
"I have been making notes on the Lobivia flowers which I have been able to inspect carefully this summer and my observations have included noting the position of the stigma, which is one of the things that varies considerably. Lobivia westii appears to be one extreme, with the stamens grouped around the exserted stigma, similar to the Borzicactinae."





LOBIVIA WESTII

U.S. C & S J XXVI. I. 1954



AREQUIPA RETTIGII

DIE KAKTEEN 1. X. 1967

. . . . further from H. Middleditch

"It is most interesting to have this quite independent suggestion of the Lobivia westii flower having certain external similarities with the Borzicactinae "humming bird" flowers. But if this flower is aimed at humming birds as the pollinating agent, why should it stay open at night, when there are no humming birds in flight? In the dark there will be only night-flying insects on the wing, is the flower trying to be all things to all pollinating agents, in an attempt to extend its distribution? Or simply because there is now a dearth of the original prime pollinating agent, due to changes in climate and vegation?".

Arequipa rettigii flowers From Mrs. J. M. Hobart

Although he now seems to have given up growing cacti, I used to find my occasional visit to Affleck's nursery at Lesmahagow quite rewarding, for his collection of plants had been grown mostly from Winter's seeds. His cactus green house was always full of interest, even if it could not be described as a show place. On one of my visits, during 1965, I obtained a plant of Arequipa rettigii, which he had raised from seed and I expect it would be about two or three years old at the time. It has grown steadily - if but slowly - for me in the meantime and in the late autumn of 1972 it put out a bud which did not open and aborted.

However, it managed to do much better in 1973 when it had reached a height of 14 cm and it was 7 cm in diameter - it was probably ten years of age by then I first noticed a bud developing in the crown on July 15th - it was just a tuft of whitish wool covered with grey and black hairs, very close indeed to the apex of the plant. The flower first opened on July 29th when the petals began to expand at about 1.30 p.m. and it was fully open by 5.30 p.m. Presumably it stayed open all night. The flower lasted until 4.30 p.m. on the third day when the petals closed up.

The flower was zygomorphic, the tube being more or less straight whilst the opening of the flower was at an angle to the tube. The sketch of the flower (on the cover - H.M.) is from an almost side view, but the opening of the flower is tilted towards the viewer. The flower was 80 mm total height of which the tube was 50 mm long and the flower opening was 38 mm across. The whole of the flower was red, shading from crimson to scarlet with shiny petals, the outer petals being reflexed and the inner ones more upright. The ovary and flower tube were sparsely clothed in spirally arranged scales with dark axilliary hairs. The long, pink style protruded above the petals, carrying lime green stigma lobes which were closed up together throughout the life of the flower. The filaments were scarlet, carrying yellow anthers which were heavy with pollen. The stamens were close to the style on the first day of the flower opening; on the second day, the stamens loosened from round the style and filled the throat, spilling some of the pollen on to the petals.

When it was obvious on the third afternoon that the flower was almost over, I took the plant indoors to cut off the flower and sliced it in two. A great deal of nectar escaped from the nectar chamber in the flower and ran over the table and the flower sections. It had to be blotted up before I could continue with photographing the two halves of the flower. The two flower sections were then put into a press and later embedded in resin.

Comments on Arequipa

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

"I have had a plant of Arequipa hempeliana for some ten years now and it came from Fearn at Abbey Brook nursery. It grows very slowly, less than $\frac{1}{2}$ an inch per year. For the past four years or

so it has flowered regularly, putting out up to half a dozen flowers in the season, but they only open one at a time. This year there was a new offset from the base, which grew to about 2" in length, which probably accounts for there only being a solitary flower in early summer, this season.

"The flower is scarlet red, about 3" long and about 1" across, with golden yellow anthers and pollen on deep red filaments, exserted to the height of the topmost petals and surrounding the style, with the green stigma slightly protruding. The flowers last about 2 days and do not appear to be self fertile."

..... from J. D. Donald

"Arequipas are normally much more shy in producing flowers than Matucana - usually only producing 2 or 3 per year as opposed to the 8-12 from the Matucanas. I have about six species and all flower - leucotricha from Chile does rather better than the others, flowering twice a year. The fruits of Arequipa are larger than those of Matucana, and become yellow or white at maturity; they are not so large as those produced by Oreocereus, Morawetzia, or Seticereus, but similar to Akersia in size. No doubt on fruits alone, someone would like to suggest a new classification!"

..... from H. Middleditch

"The accompanying colour print of an Arequipa in flower also shows the stigma lobes closed up together. Is the stigma always like this, I wonder, or do the stigma lobes open out briefly at some stage when the flower is open? Or do they only open if conditions are suitable - correct heat, or humidity, or both perhaps?"

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

"After I had detached the offset from my Arequipa hempeliana the plant did actually flower again, which was rather interesting, because is seemed that it was putting all its energy into producing the offset. Even at the end of November it had two further buds, but they are unlikely to flower with the weather being so cold now.

"This autumn I also had a couple of flowers on an imported Arequipa rettigii. I get the impression from these two species that the Arequipas are very good flowerers, with a long season, once they have started to bloom. The flowers seem to be all very similar that I have seen on the Borzicactinae, apparently to attract the humming bird. I find it rather interesting that the stigma is exserted 5-7mm beyond the stamens. It seems designed to stop self-pollination; the flowers appear not to be self-fertile, although I have a few seeds on a Matucana calliantha which I selfed."

..... further from H. Middleditch

"All Arequipa which I can recollect having seen, have been solitary plants. Is the offset referred to by George Bailey a rather unusual feature on Arequipa? It would be interesting to hear from any other of our members who have had experience in producing an offset on an Arequipa.

"In its normal habitat locality, on the western flanks of the Andes in northern Chile and southern Peru, above about 5,000 feet altitude, the light summer rains will only fall during a period of a few months, the only moisture available for the remainder of the year being morning dews. Does this plant flower all year round in its habitat, despite the limited rainy season; or does it just flower for a short period when the habitat conditions match those which George Bailey provides in his greenhouse? In that case, will the humming birds have to migrate elsewhere outside the flowering season?"

CLEISTOCACTUS BROOKEI sp. nov. By Prof. Martin Cardenas.

(From Cactus & Succulent Journal of America XXIV. 5:1952)

Erectus, columnaris, 40-50 cm altus. Ramae 3. 0-4.5 cm diam., temperato viridis. Costis 22-24, angustis, 3mm altis, 3 mm latis, transverso sulcatis. Areolis 3-4 mm spatio separatis, circularis, 2 mm diam, prominens, albo cinereis vel bruneis tomentosis.

Aculeis 25-30, vix distinguentis inter aculia marginalia aut centralia, divaricatis, tenuissime acicularibus, 4-10 mm long., innexis, paleari flavis.

Flores ex tercia superiore ramarum, manifeste zygomorphi, incurvatis, 5 cm long, atro ruberi. Ovario globosa, curvato, 12 mm diam., squamoso, squamis atro rubeis, apice purpureo instructo. Phylla perigoni exteriora, lanceolata, extra curvata, flavo aurantiaca, apice atro rubeo; interiora spathulata, flava. Stamina duplici seriali inserta; filamentis tenuissimis, albis, superne purpureis, antherae atro violae, Stylo gracili, 4.5 cm long., albo; ramis stigmaticis pilosis, 2.5 mm long., tenuis, viridiscentibus.

Fructo globoso 8-10 mm dia., purpureo, squamoso, albo piloso, superne dehiscente. Semina parva, 1.2 mm long., nigro.

Hab. in humidis petrosis.

Obs. Species collectorae Winifred M. Brooke dicata.

Erect, columnar plants, 40 to 50 cm tall. Branches 3 to 4.5 cm in diameter, light green. Ribs about 24, very narrow, 2 to 3 mm high and broad, sulcate with transverse furrows. Areoles 3 to 4 mm apart, circular, 2 mm in diameter, with light grey felt above and dark brown below. Spines not differentiated into radials and centrals, about 25 to 30, finely acicular, spreading, 4 to 10 mm long, straw yellow or greyish in colour. Top of stems covered with a tuft of light brown, fine, bristle-like spines. Flowers few in number, sometimes a single one from the top of the branches, arranged mostly in a vertical rows, clearly zygomorphic, S-shaped, 5 cm long, deep red. Ovary globose, curved, about 12mm in diameter, with short, red, mucronate scales which bear white silky hairs. Tube slightly flattened, about 1 cm broad at the base, then narrowing above; tube scales dark red, purplish tipped. Outer perianth segments lanceolate, bent outwards, deep red above, orange yellow below; inner segments spathulate, purplish white below, yellow above. Stamens in two rows; filaments very thin, white below, purplish above; anthers dark violet. Style 4.5 cm long, thin, white, greenish above; stigma lobes 5, hairy, light green, 2.5 mm long, thin.

Fruit globose, about 1 cm in diameter, purple with a few white hairs at the axilla of the scale, opening above. Seeds dark brown, 1.2 mm in diameter.

Bolivia. Province of Cordillera, Department of Santa Cruz, "Pozo No. 4", Camini, 900 m March 1949. A. Corro s.n. Herbarium Cardenasianum 4818 (Type). Cotype in U.S. National Herbanium. August 1949, Miss Winifred Brooke s.n. between Sudanez and Incahuasi, Province Her-Siles, Department Chuquisaca, Bolivia, 1,200 m. Inando.

This new species suggests none hitherto known in the genus Cleistocactus. By its habit, not considering the flower, it reminds one, particularly in its dense, finely acicular spines, of Cleistocactus straussii, but differs in its striking flowers, which are few in number, arranged in one row, and have the ovary unusually curved and a reduction of the nectar cavity.

Comments on Cleistocactus brookei

..... from H. Middleditch

"A reference to the map of Bolivia quickly places Camiri on the Rio Parapeti, not far from the border between the provinces of Santa Cruz and Chuquisaca. Quite close to the refinery at Camiri one finds 'Pozo' marked on the map - and at each of another five oil well sites along the Andean foothills in this part of Bolivia, one again finds the legend 'Pozos'. Prompted by this, a reference to the Spanish dictionary confirms 'Pozo' as meaning a well, so that the first location given by Cardenas for the growing place of C. brookei must be Oil Well No. 4 close to Camiri.

"The second growing place to which Cardenas refers is in the Province Hernando Siles - this being located between Yamparaez, Tarabuco and Sotomayor, to the west of Zudanez. This is apparently on ground drained to the upper reaches of the Rio Pilcomayo, which is entirely separated from the Rio Parapeti by a watershed which runs from their source in the Andes right down to the Chaco.

"These two places recorded by Cardenas are about one hundred miles apart and between them lies Tomina, which is the discovery location of Cleistocactus vulpis-caudae; this species is somewhat similar in appearance to C. brookei and the flowers are of a similar shape but differ in their colouring. Cardenas correctly observed that his C. brookei is like no other known species of Cleistocactus, for his diagnosis was published in 1952; the description of C. wendlandiorum by Backeberg followed in 1955 and of C. vulpis-caudae by Ritter in 1962. The flowers on all three species are quite similar in shape and quite distinctive, differing in shape from any previously known species of Cleistocactus. It may be thought somewhat remarkable that such a distinct flower should have escaped previous detection - but this very fact is a tribute to the unexplored nature of the parts of Bolivia in which these species were discovered. There is a tendency to accept that man has traversed the length and breadth of all parts of this world - and whilst this may well be so in a general sense, there are still patches of territory where man is still severely restricted to a few well-defined trails, whilst the great bulk of the area remains unexplored. Such places are the Caatinga in north-eastern Brazil, whose denser patches Buining refers to in his accounts of his travels there; the one-horse-wide pathways through the dry hard-wood thickets on the Sierra Ambato, described by Rausch in the account of his discovery of Gymno. tillianum; and the dry forest in the middle reaches of the river valleys of south-eastern Bolivia, where the Cleistocacti are found which are the subject of this article. Man must literally cut his way into these cactus-rich thickets; we must accept that, to a large measure, we still know only about what is to be found on the very edges of the trails in these regions. It is the growth and development of new highways, coupled with more intensive field exploration by Ritter, Cardenas, and Lau in the last twenty years, which has led to the emergence of so many new species of cacti from south-eastern Bolivia. As Brandt has already suggested, in discussing Parodia, we are even now hardly in a position to claim that nothing further remains to be discovered."

CLEISTOCACTUS WENDLANDIORUM Backbg. CLEISTOCACTUS BROOKEI Card.
By A. F. H. Buining.

(Translated by W. W. Atkinson from Succulenta 44.3:1965)

The South American continent has brought us a large number of cereoid species, which stay fairly small and will flower in our European collections while still young plants. The above plants both belong in this category.

Cleistocactus wendlandiorum was described by Backeberg in Kakteen und andere Sukkulenten 1955; 114-117. Amateurs often call it the "yellow straussii" because of the soft, creamy-yellow spination. Backeberg received a plant from Herr. K. Wendland of Wurzburg, who had got it from an uncle in South Bolivia, where it had been collected - alas without any indication of the finding place.

Another piece was said to have been given to Walther Haage, who called it C. straussii var. flavispinus. Haage says, however, that his specimen came from an amateur in Chile. Whatever the facts may have been, Backeberg eventually described the plant officially. I received my specimen from Backeberg, just before the war.

I had never seen a cactus which flowered so profusely, and for so long, as this Cleistocactus. Even in early spring, about April/May, the many buds begin to appear and soon the soft-yellow stem is adorned with a number of curiously formed reddish-orange coloured flowers. These appear continuously in series, and during one of the peaks of the flowering season, about June, I counted up to 50 flowers within a few days, on the plant. With remarkable regularity, flowers appear almost weekly till October, so that one is sometimes afraid that the new buds will go mouldy and thus infect the plant.

Alas, so far there have been no seeds, so propagation has been only by cuttings. The plant grows splendidly ungrafted, just as does Cleistocactus brookei, which was described by Professor Cardenas in the American "Cactus & Succulent Journal" 1952; 144.

Cleistocactus brookei is less attractively spined than wendlandiorum and is also less thick and tall. They both have the extraordinarily sharply angled flower tube, although brookei to a less extent. However, brookei flowers sparsely, and will therefore never be so popular as C. wendlandiorum. The flower of C. brookei is dark red.

Apart from these two species, Ritter has found a number of exceptionally beautiful Cleistocacti, and I will return to these on another occasion.

Comments on Cleistocacti wendlandiorum

..... from H. Middleditch

"On our first Cactus Tour to Holland, in 1963, we had the pleasure of paying a visit to Mhr. Buining to view his collection. This was housed partially in cold frames and partially in a semi-lean-to greenhouse; in the latter a number of large plants were growing in a central bed, where they had the benefit of a free root run. Amongst these, there was a five-foot columnar plant densely clothed with fine spines have a pale yellowish sheen - a plant which apparently none of the visiting party had seen previously. This, we were told, was Cleistocactus wendlandiorum, a relatively new and fairly uncommon species.

"At the base of this magnificent column, a fresh offset was growing, about five or six inches in length; Mhr. Buining took out his cutting knife and proceeded to remove this offset, which he then presented to me. Most regrettably, I did not realise at the time just how valuable was that particular piece of plant, for to judge by the above article, the parent plant must have been either the original plant which Buining received from Backeberg, or else a vegetative cutting from that self-same plant. At that time, I was so ill-informed on this plant that it even managed to acquire an incorrect label in my greenhouse, but that was put right by Curt Backeberg on his visit here during his tour around Britain.

"This particular cutting took some time to establish and even then did not grow too well, until I discovered that the secret was to ply it with water over the winter, all the way from September to April i.e. when it rains in its Bolivian habitat. After a couple of years of spectacular growth with this treatment - putting on about three inches per winter - it began to put out some flower buds in the autumn. These started off in the usual manner as a tuft of wool at the top of the areole; but shortly after the first sign of an orange colour appeared, the bud seemed to be growing upwards,

leaning only slightly away from the stem, and not outwards as I had expected. A close examination of the enlarging bud revealed that a very short position right next to the body was indeed growing straight outwards, this being followed by a very sharp bend so that most of the bud grew upwards; the top of the bud was also sharply curved so that the pointed tip faced away from the body of the plant. This gave the complete bud a swan neck shape. Once it exhibited this characteristic shape, the bud only occupied two or three more days in reaching full size, retaining the same shape and having a magnificent orange-yellow colour. The purple coloured anthers then appeared from the mouth of the flower. I found the whole flower most remarkably strange, since my acquaintance with Cleistocactus flowers up to that time had been confined to those standing more or less straight out from the stem.

"Two years later, after transplanting it into a larger pot, it produced a tremendous show of flowers over a period of three or four months; they appeared in groups of three, four or five at a time, but there was seldom two flowers open at one time, although they remained open for two or three days. The purple colour of the anthers was still visible not only weeks but sometimes months after the flower had withered. After each group had finished flowering, there would be an interval of a week or so then a further batch of buds would start to develop into flowers. All during the flowering period it was possible to see dozens of starter buds visible as thickened wool tufts up and down the stem. The flowers appeared from quite a length of stem, which probably represented three or four different years' growth.

"In the late summer of 1972, during a good spell of flowers, persistent attempts were made with a brush to cross-pollinate between two (and occasionally three) flowers on the plant, all with apparent lack of success. By autumn, resort was had to using pollen from the flowers still appearing on Winteria and eventually two flowers on C. wendlandiorum did set fruit. This fruit was yellowish-green, barely 1 cm broad and tall, furnished with numerous minute scales. The dried-up flower remains retained a broad, flat, base, so that the fruit was cylindrical in shape. Eventually the fruit opened by splitting around the base of the dried flower remains, which lifted slightly like a lid. The seed was embedded in a stiff, white pulp. From the absence of any reference to fruits in Backberg's diagnosis and the specific references in Buining's article, it would appear that the fruit was unknown to both these authors, so that I was especially pleased with this particular performance.

"At about this time, I also removed and sectioned a flower which clearly revealed the nectar chamber just below the bend in the tube, enclosed by a diaphragm formed by the enlarged bases of the primary stamens. I must admit that I also find it very difficult to comprehend how a humming bird can obtain the nectar from that particular shape of flower. An examination of the distribution of humming birds in Bolivia would suggest that several species are to be found in the region from whence this Cleistocactus comes, and the observation by D'Orbigny (in Chileans No. 5) would suggest that these birds are not confined to an altitude lower than that at which one would expect to find Cleistocactus growing.

"Although Backeberg quotes "apparently solitary" in his diagnosis for this species, nevertheless Mhr. Buining's plant was putting out an offset from the base of the parent stem, at the time of our visit. The main stem of his plant, from memory, was also greater than 3 cm in diameter - I would have been inclined to put it closer to 5-6 cm in diameter. It may be that Backeberg's description was based on material available to him at the time; but if he received the plant before the war and described it in 1955, one would have expected it to have grown a bit in between times. As Buining received his plant from Backeberg as a vegetative cutting, and my specimen in turn came as a cutting off Buining's plant, then in this case it is possible to tie down the additional data to the self-same plant. However, in days gone by, it would appear that this has not been the case with a number of plants, and so unexplained discrepancies have arisen between the original diagnosis and plants passing under that name in collections today."

..... from P. H. Sherville.

"Although I do not have one of these plants myself, I have seen a specimen in flower; the flowers are a bright yellow-orange about the same colour as Submatucana aurantiaca, so that I could not agree with Buining's "reddish-orange" description of the colour. I would also disagree with his description of "yellow strausii" for the plant I have seen looks like an ordinary strausii - somewhat less well endowed with spines, but the usual glassy-white colour. The flowers are certainly very "kinky" to use a modern idiom!"

..... from J. R. Gooch

"The picture of this plant in Haage's book shows a flower of a more yellowish colour than would be suggested by Buining's description of "reddish-orange" for the flower colour. But is this perhaps the effect of colour reproduction in the book? Or is the flower more yellow than orange, in fact?"

..... from R. Martin

"I first acquired my plant of C. flavispinus from our late colleague Mr. Stan Thomlinson of Sheffield, whom I understood was supposed to have originally received his plant from Backeberg as a cutting from the type plant. During a visit to him in 1968, he gave me an unrooted stem app. 20" long which he cut from his own very large specimen. I returned home and shared this with many close collectors, keeping only the uppermost end for myself which was roughly 3" long - all that was left!

"By the spring of 1973 this cutting had grown to some 12" in height and during the summer it put on a couple more inches, plus two new stems from the base which are at present in the region of 2" high. It certainly is a rapid grower, but having said that, I think that given enough roof room most of these plants grow pretty quickly plus the fact that I do water all my cerii quite generously.

"This plant puts on a most fantastic show of flowers - it starts to flower in early summer and goes on nearly to Christmas; it just doesn't seem to want to give up flowering. The flowers don't come at regular intervals but rather in spasms with several flowers budding up at a time and opening in quick succession; this is followed by a spell without flowers and then some more buds appear. The flowers don't seem to be restricted to any particular part of the stem, they appear right the way from the very tip down to the gravel - in fact, one of the flowers appeared out of the layer of gravel that covers the top of the soil.

"The flowers are an extraordinary shape - they seem to grow up alongside the stem rather than out of it. The flower is very attractive and the plant is very very showy when in bloom.

"Having recently seen a flowering plant of C. wendlandiorum in Harry Middleditch's collection, I must say that the appearance of both the plant and the flower is pretty well identical to my own C. flavispinus - so perhaps my plant should really be called Cleistocactus wendlandiorum."

..... from A. W. Johnson

"A year or two back I obtained a cutting of C. wendlandiorum from another member of the Scunthorpe Branch; this has now grown to a height of seven or eight inches and it flowered for the first time in 1972. The flowers come out quite differently on this plant to the way in which they appear on C. straussi for on wendlandiorum there is only one flower out at a time. However, I did have a Winteria aureispina out in flower at the same time as the wendlandiorum, so I crossed the two of them and set fruit on both plants."

..... from H. Watson

"Some years ago I acquired a small plant of C. wendlandiorum which I was given to understand had been grown from seed. It is now 14 or 15 inches high. At the suggestion of Harry Mann, Secretary of the N.C.S.S. Leicester Branch, I tried a different method of cultivation, giving it no water at all during the summer. This late September it has now flowered for the first time."

..... further from H. Middleditch

"The hand sketch of the flower of C. brookei which accompanies Cardenas's original description of this species in the U.S. Cactus Journal, shows a flower having almost exactly the same shape and characteristic construction as that of C. wendlandiorum. This is further confirmed by the two pictures which also appear with that description.

"On the other hand, the illustration of the supposed C. brookei flower which appears in Succulenta, accompanying the above article by Buining, seems to be quite different. Although the angle at which the photograph has been taken does not make it easy to assess the flower shape. nevertheless it is fairly clear that it has nothing like the same degree of zygomorphism - indeed, the flower would seem to be growing almost straight out from the stem. The areoles are also more widely spaced than on wendlandiorum and the spination far less dense; indeed, one tends to become rather suspicious that the plant is not a C. brookei matching Cardenas's description at all. However, it seems to be somewhat similar to a plant grown by T. Lavender, the original of which was identified as "C. brookei" by Backeberg during his visit to England. Could this be the originator of the mis-identification, here and on the continent?

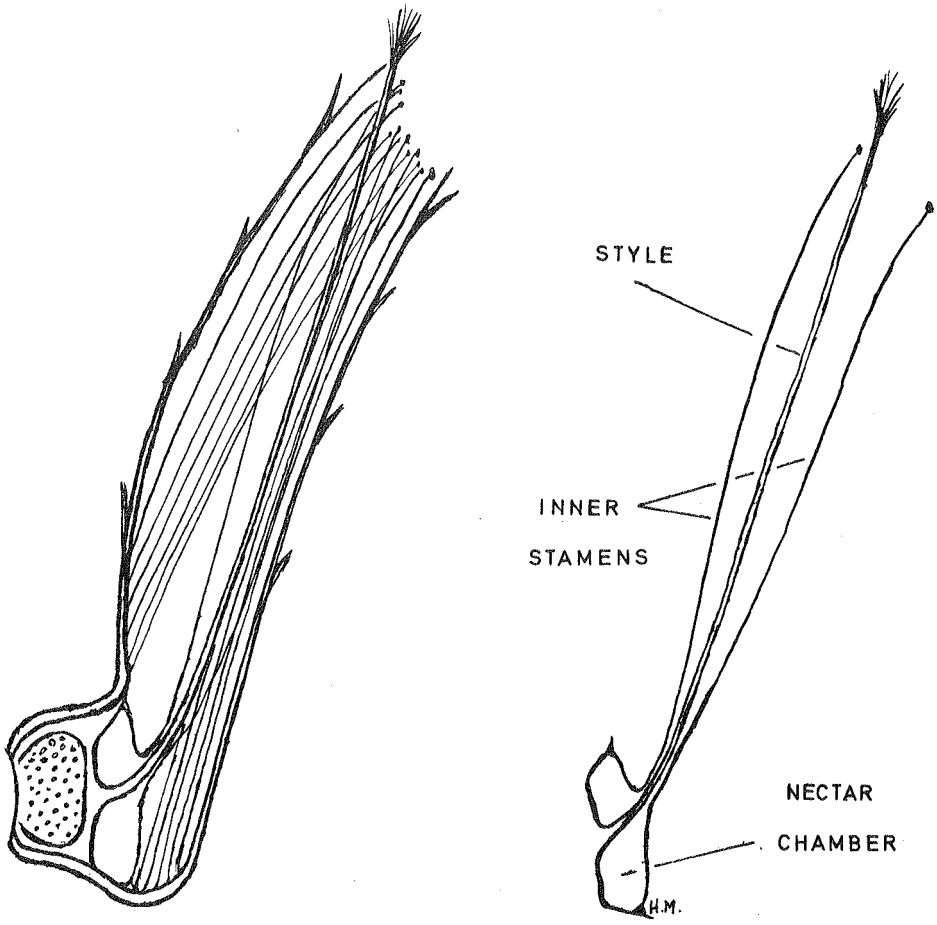
CLEISTOCACTUS VULPIS-CAUDA Ritter & Cullmann sp. nov.
By Friedrich Ritter & Willy Cullmann

(Translated by H. Middleditch from K.u.a.S. 13.3.62)

De rupibus dependens, a basi ramosus; rami 1-2 m longi, usque ad 5 cm crassi (Holotypus 3.5-4 cm); costae 18-22 (Holotypus 22), sulci leves inter mammillas; areolae 2 mm diametientes, 6.5 mm inter se distantes flavae vel fuscae tomentosae; usque ad 50 aculei piliformes, albescentes et rubri vulpis, usque ad 2 cm longi, regulariter 1-1 5 cm, vix distinguendi inter centrales et marginales; flores 6 cm longi, 1 cm crassi, tubo infracto sicut Cleistocactus wendlandiorum Backbg, de omnibus partibus remorum nascentes, zygomorphi; tubus sanguineus squamis rubidis, in axillis pilis albis minutis; filamenti principaliter ex basi et e fine superiore tubi, basaliter albi, supra rosei; antherae purpureae; stylus gracilis, albus, 55 mm longus; 5 stigmata alba 3.5 mm longa; fructus prope tesselatus, 9 mm longus, ruber deinde brunescens; semina 1 mm longa, nigra, verrucoso, hilo flavescente;

Patria: Province Tomina, Department Chuquisaca, Bolivia;
Friedrich Ritter collegit plantam sub No. FR 847

Plants branching from the base, stems 1 to 2 m long, vertically pendent from rocks, 2-5 cm diameter (holotype 3.5 to 4 cm), epidermis medium green, matt; ribs 18 to 22 (holotype 22) which are slightly notched horizontally between the areoles; areoles lie raised on the ribs, 6.5 mm apart, 2 mm diameter, with short woolly felt growing yellowish in spring but growing dark brown in autumn; the spines barely extend beyond the soft straight hairs up to 50 in number, the larger proportion projecting outwards, pointing upwards in the crown, flexible 1-1.5 cm long occasionally up to 2 cm, whitish to fox-red, centrals and radial spines not clearly distinguishable, the outermost paler, the inner ones darker and somewhat stronger, this spination growing paler in spring, in autumn the young stems are a silvery fox-red.



CLEISTOCACTUS WENDLANDIORUM

Flower Section App. x 1½.

Cleistocactus
wendlandiorum

BACKEBERG
Wunderwelt
Kakteen

The markedly zygomorphic flowers are of the same type as Cleistocactus wendlandiorum Backbg. or Cl. flavescens Otto, 6 cm long by 1 cm diameter; they are always pointed vertically upwards, that is towards the crown on plants artificially tied up straight, but towards the roots on plants growing vertically downwards and standing out at right angles on plants lying horizontally; they appear abundantly over the whole length of the stem, so abundantly that with cultivated specimens one can speak of continous flowering; ovary 7 mm diameter, red with greenish sheen with red scales, in whose axils minute white woolly hairs occur, the latter only discernible with a magnifying glass. Tube pale blood red with dark red scales, on which are tiny greenish points, and which carry white woolly hairs also discernible only with a magnifying glass, outermost flower petals deep dark red, inner pale red also sporadically orange with red margin and red tip, broad lanceolate with minute tips, up to 11 mm long and up to 4.5 mm broad; filaments almost all from the base of the tube and the uppermost part of the tube wall, only occasional ones also from the lower third of the tube wall, lower silky white, upper very deep rose, extending up beyond the longest flower petal by up to 5 mm; lowermost stamens fused together into a diaphragm and so form a closed nectar chamber; anthers dark purple with pale purple pollen, style white, about 55mm long without stigma; 5 spreading white stigma lobes 3.5 mm long, likewise extending up to 5 mm beyond the pointed tips of the flower petals.

Fruit initially red, becoming brown with increase in size to maturity, close to cubic shape, about 9 mm long; when it is ripe the dried up flower remains together with the base of the flower tube opens up like a lid; seed 1 mm long with slightly glossy black verrucose testa; the hilum with delicate yellowish fleecy tissue carries two nearly equally large openings, namely the micropyle and that of the more sunken funicular opening which is barely discernible.

Habitat: Province Tomina, Department Chuquisaca in Bolivia.

Collected by Friedrich Ritter under No. FR 847.

A cutting from the holotype was placed into the custody of the Zurich City Collection.

In regard to the systematic position of this plant, the following is to be noted; it stands in the closest relationship to Cleistocactus wendlandiorum Backbg. or Cleistocactus flavescens Otto. The flower is almost the same in structure, only fox-tail red and not so wide opening. The typical bend of almost 90° is always the same, regardless of whether the plant grows hanging naturally, is cultivated upright, or lies horizontal. We reviewed in extensive detail whether this plant should be regarded as a variety of the above-named species. Likewise a comparison with the description of Cleistocactus brookei by Cardenas in "Cactus & Succ. J. of America" 1952 showed, even if one discounts the absence of the nectar chamber in the sketch by Cardenas, a distinct variation from the preceding species e.g. the upright growth and a globular fruit. One specimen from seed off a plant of brookei cultivated by Cardenas, which Dr. Cullmann obtained from St. Pie in Asson, Southern France, displays the well-defined nectar chamber typical for the bent flower. But this latter plant is also of upright growth with only 2 cm diam. stems and has a looser and stronger spination than vulpis-cauda; also the flower tube is less markedly kinked, less fluted and has well exserted stamens and style. All comparisons thus brought us to the conclusion that the habit of the hanging plant with its fox-red hairy crown is thus separate from all the other Cleistocacti, so that one must give it the status of a separate species. We therefore name this vulpis-cauda viz: fox-tail.

Comments on Cleistocactus vulpis-cauda.

from H. Middleditch

"On our 1971 Cactus Tour we were able to pay a return visit to see Herr Krainz at the

City Succulent Collection at Zurich. Amongst the great many plants in that collection, he took particular care to draw our attention to a plant of this name, which I presume would have been the holotype referred to in the article above. We had that afternoon free but the weather was most unco-operative and the rain poured down, although one did not really need that as an excuse to browse a little further round that fine collection. Fortunately this particular plant was carrying one or two flowers and I was able to take a slide of them. Certainly there was no mistaking their bright red colour, quite distinct from the orange colour of the flowers of C. wendlandiorum.

"Ever since I came across a reference to the flowers on this species growing vertically upright, I have been puzzled by the colour phorograph of Cleisto. Vulpis-cauda in Backeberg's Kakteenlexikon, for it shows the flowers growing slightly downward from the horizontal. However, this mystery has been solved by the illustration accompanying the above article in the K.u.a.S., which shows Cullmann's plant in flower with the blooms standing in the expected upright position on a dependent stem. Evidently this particular photograph has been turned through 90° when printed in Backeberg's Kakteenlexikon and thus shows the flowers growing in what appears to be an unorthodox manner.

"The above article is accompanied in K.u.a.S. by a small sketch of a flower and flower section. However, the artist would appear to have used some artistic licence in depicting a generalised impression of the scales on the tube, rather than drawing the specific scales seen on a particular tube, since there is no systematic Fibonacci spiral apparent in the disposition of the scales as drawn.

"We are not aware of any collector in Britain who is the proud possessor of an example of this species."

.....from A. W. Mace

"I am happy to be able to tell you that I do have a plant of C. vulpis-caudae, which I obtained about three years ago as a small grafted piece from Uebelmann. I had not realised it was as scarce as you indicate, although I had not seen another plant. When it starts branching I will propagate it.

"The plant is now about 30 cm tall but started flowering at about half this size. The flowers are bent at the bottom ,if anything even more so than C. wendlandiorum. The flower runs parallel to the stem and then just curves over the top, to open. The plant usually has a fair number of flowers in a flush in the spring and then continues opening them in twos and threes throughout the summer. They have almost finished by the middle of October.

"Mrs. Lavender took a flower from the plant whilst it was at the judges course, to slice and press it."

.....from Mr. & Mrs. Lavender

"The flower from Tony Mace's plant was indeed very similar in shape to that found on C. wendlandiorum. When we sliced the flower in two, shortly after removing it from the plant, there was some nectar present, but nothing like as much as was present in the other Cleistocactus flower which we sliced, from our own plant.

"Could there be any difference in the amount of nectar present arising from the state of the flower development - or does the quantity decrease after the flower has passed its prime?"

.....from H. Middleditch

"Where would the nectar go to, I wonder, if it did reduce in quantity after the flower had passed its prime?"

..... from Mrs. A. Lavender

"Could the nectar be re-absorbed by the plant, just as some young buds which fail to develop are re-absorbed into the body of the plant?"

HUMMING BIRD FLOWERS By H. Middleditch

It would seem to be one of the elementary rules of nature that everything has a purpose. The height to which a flower grows, its size, shape and colour all have a specific purpose in mind. Elsewhere in this issue, Backeberg queries whether the flower of Cleistocactus wendlandiorum is a humming bird flower. Thereby he appears to accept that other Cleistocacti flowers are humming bird flowers.

But what do we mean by "Humming Bird flower"? Presumably the purpose of a humming bird flower is to attract a visit or visits from humming birds so that in the process of a visit the flower is pollinated. The characteristic impression of a humming bird is probably of this little creature hovering in front of a flower bloom. But does the bird actually visit the flower? Does it contribute to the pollination process? Is a humming bird likely to visit the flower of Cleistocactus wendlandiorum? Does it contribute to the pollination process?

A relatively small number of flowers apparently rely upon birds as the normal agent for effecting pollination. Although there are several sorts of birds which visit flowers, they represent a relatively small proportion of the world's bird population:-

Brush tongued parakeets in Australasia
Honeycreepers in Hawaii and Tropical America
Flowerpeckers in Asia and Australasia
Honeyeaters in Australasia
Sugarbirds in South Africa
Sunbirds in Africa, Asia and the Phillipines
Humming Birds in North and South America

Amongst this rather select group of birds, the humming birds exhibit the unusual characteristic of obtaining nectar from flowers whilst hovering on the wing, rather than when perching. To be able to hover, the bird requires to have a very high rate of wing beat and a specialised form of wing construction. The humming bird has an average wing beat of 28 per second, although some species have a wing beat rate as high as 75 per second. To put this in perspective, typical wing beat rates are:-

Large white butterfly	12 per sec
Dragonfly	38 per sec
Humming bird hawk moth	85 per sec
Hornet	100 per sec
Bumble Bee	130 per sec
Housefly	190 per sec
Hive Bee	250 per sec

The humming birds are amongst the smallest of all the birds. The smallest humming bird is but $2\frac{1}{4}$ inches long and the largest is $8\frac{1}{2}$ inches long (measured from tip of beak to tip of tail) Despite their relatively small size, the action of hovering requires the expenditure of energy at a very high rate. Because of this they have to spend a very large proportion of their day in feeding. It has been calculated that they eat about twice their body weight in insects and nectar every day, whereas most other birds need only 10% to 25% of their own weight per day in food The relatively small size of the bird means that the internal organs are limited in size and because of the high rate of energy transformation involved in the process of hovering, the

humming bird must have a very high rate of heartbeat, which is between 500 and 1200 per minute, depending upon their physical exertions. This rapid heart action again consumes energy at a high rate. However, since the intestinal tracts are relatively small for the amount of food that must be consumed and digested per day, the birds must seek and obtain a copious source of easily digestible food. An analysis of the contents of the stomachs of various humming birds shows little else but insects to be present; traces of nectar have never been found, because is passes straight into the intestine.

However, a study of humming birds both in nature and in captivity leaves no doubt as to how often they visit flowers to collect nectar. In captivity they feed from glass tubes containing a mixture of either sugar and water or honey and water. The birds dip their beaks into the opening in the tube and take up the fluid with their tongue, remaining hovering for several seconds whilst they are feeding. The long thin bill forms a narrow tube in which the forked tongue moves up and down, perhaps like a suction pump.

Most of the flowers which are visited by humming birds do not seem to have one special shape but they do have one feature in common - they do have an ample store of nectar to satisfy the enormous appetite for nectar possessed by these birds.

In many cactus flowers, such as Gymnocalycium, Notocactus, Sulcorebutia, or Neochilenia, we find nectar glands at the base of the receptacle close to the base of the stigma, forming a nectar chamber of fairly small volume. When these flowers are cut in two, nectar may be found on the surface of their nectar glands, but only in small amounts. This quantity of nectar would satisfy a visiting insect but would offer no inducement to regular visits from humming birds.

Other cactus flowers will be found to have a very much larger nectar chamber and when cutting them in half a prolific quantity of nectar will be released, as if the nectar chamber had been brim full of nectar. This amount of nectar would certainly attract visits from humming birds. In and around the Andes we find numerous cacti having flowers which are designed to attract humming birds to their store of nectar, such as Cleistocactus, Oreocereus, Arequipa, Matucana, Loxanthocereus, Seticereus, Borzicactus, and Clistanthocereus. It will be readily seen that this list comprises the Borzicactinae and Cleistocactus.

All these flowers have fairly long, slim tubes which are accessible to a hovering humming bird, but do not offer ready access to the nectar for perching birds or for birds with shorter or stouter beaks. This means that the flower is designed to attract and will only attract visits from humming birds; occasional visits by other birds are likely to go unrewarded by nectar - and such visits are likely to be rare because of the need to hover to gain access to the nectar. At the same time, the humming bird by the nature of its hovering mode of feeding and its consequent voracious appetite for nectar will be a regular visitor to these flowers which will be a reliable and prolific source of food for the birds. In visiting these flowers the bird will frequently acquire a dense coat of pollen over its head and beak and it thereby acts as the primary pollinating agent for those plants which bear flowers of this type. Thus we see that the plants and the humming bird are interdependent, one upon the other, as are all things in nature for the continuation ot their existence.

Although the flowers are protected by virtue of their construction from visits by birds other than humming birds, their store of nectar might be depleted by the visitations of insects which are small enough to enter the flower and climb down the tube. If the flower had no protection against loss of nectar in this way, it might well attract great numbers of insects which might be effective in pollinating the flowers but would reduce the flower's attraction for the humming birds on account of the depletion of the store of nectar.

If we look at a cross section of any flower of the Borzicactinae or Cleistocactus, we find that the lowermost stamens are all arranged in a similar manner - they project away from the inner wall of the flower tube out towards the base of the style. Not only do the base of the lowermost stamens

thereby roof over the nectar chamber, but (to a greater or lesser degree between the various species) the stamen bases are also fused together. The nectar chamber with its rich store of nectar is thereby almost totally enclosed by the diaphragm formed by the fused bases of the lowermost stamens, leaving but a small annular aperture between this diaphragm and the style, an aperture which is itself protected by the innermost stamens bundled closely together up against the style.

This makes it very difficult indeed for any insect to gain access to the store of nectar in the nectar chamber. Any insects which do manage to enter the nectar chamber are likely to become coated with sticky nectar and thereby have an even more difficult task in struggling out of the nectar chamber, through the small aperture between the diaphragm and the style, with its impeding filaments. It would seem that insects trapped in this manner do supplement the diet of the humming bird; some species of humming bird are known to rely more than others on insects to form part of their diet and humming birds kept in captivity do not thrive unless they are provided with a diet of both nectar substitute and flies.

It is difficult to see the reason for the sharp bend at the base of the flower tube which is so obvious in Cleistocactus wendlandiorum. It is perhaps to increase the effectiveness of the tube as an insect trap, for a vertical flower must surely be more difficult for an insect to climb and escape into the freedom of fresh air? But why the curve in the upper part of tube - what purpose does it serve?

A comparison between the beak length of various humming bird species and the length of the flower tube in this group of cactus flowers, suggests that even if the bird thrusts its head into the flower opening, the tip of the bill will not reach the nectar chamber. This would indicate that the nectar is extracted by the tongue, which is certainly very flexible and will either have to find its way through the maze of filaments protecting the slim opening between the diaphragm over the nectar chamber, or else puncture the diaphragm, to obtain access to the nectar.

In conclusion, it would appear that Backeberg was not correct when he suggested that the flower of Cleistocactus wendlandiorum was constructed more to hinder the humming bird than to help. Indeed, it will be seen that the flower even goes to the trouble of growing a roof over the nectar chamber in order to protect the store of nectar specially for the benefit of the humming bird.

Comments on humming bird flowers

..... from T. Lavender

"I can certainly confirm the copious amounts of nectar in the Cleistocactus nectar chamber. Recently we took a flower off one of our Cleistocacti to slice it in two and in making the cut, nectar really poured out - we wondered how there came to be so much."

..... from Mrs. J. McLeod

"Although it would be difficult for any bird other than a humming bird to obtain nectar from the flower in the normal way, could not the nectar be taken by a bird pecking at the base of the flower? I have seen bees on flowers in the garden which seem to be nibbling at the base of a flower as if they were intent upon robbing the nectar. Does this not happen to "humming bird flowers" too?

.....response from H. Middleditch

"I understand from reading the literature that some birds do make a practice of robbing "humming bird" flowers by pecking at the base of the flower; but one assumes that such activity must be on a limited scale, or else the humming bird would find it unrewarding to visit those cactus flowers and would gradually discontinue doing so, which would leave the flower without a prime pollinator and so jeopardise the continued existence of the species."

.....from Mrs. L. E. Macintosh

"I cannot think of any bird here equivalent to the humming bird, our nectar eating ones - the Tui and the Bell-bird - are larger than blackbirds and usually frequent the gum trees; even so they tear the flowers apart to get at the honey and I don't think the humming bird does that. I haven't seen a bumble bee for years and I guess I would have to go out of the district to find one; they are considered pests by the market gardeners - I believe they pierce the flowers from the outside to get at the nectar of some plants, particularly the broad beans and so ruin them for fruiting. Actually the home gardens are very lacking of any bees, they are all so busy in the orchards; my lemon tree was fertilised by wasps this spring, or I hope that was what they were busy at!"

.....by A. Rutgers (Birds of South America)

"Of the habits of the green-tailed trainbearer, Lesbia nuna, it is known that they use their rather short but very pointed bill to pierce flowers at the exact spot where nectar is to be found."

.....by Proctor & Yeo (The pollination of flowers)

"In all regions where there are nectar-feeding birds there is, however, a tendency for the birds to steal nectar by piercing the sides of tubular flowers of all sizes. Birds which are not regular nectar-feeders may sometimes steal nectar too, and this occurs even in Europe, the main genera being Sylvia (warblers) and Parus (titmice); in Britain the titmice attack America currant (Ribus sanguineum), gooseberry (R. grossularia) and cherry and almond (Prunus spp.)"

.....from Margaret H. Mitchell (Observations on Birds of South-eastern Brazil)

"The common humming bird Chlorostilbon aureoventris (D'Orbigny & Lafresnaye) was often to be seen in the garden of our house in Sao Paulo. I had several opportunities to watch this species feeding in the garden and noted on one occasion that it pierced flowers such as Snapdragon at the base rather than probing at the lip; although this is by no means a habit confined to this species, since at the same time a Brazilian Swallow-tail nearby was puncturing the large red furled flowers of sleeping Hibiscus (Malvaviscus grandiflorus) in the same way.

"The journey from Sao Paulo to Rio de Janeiro was often broken by an overnight stop at the Fazenda Santa Rosa near the edge of the Serra do Mar at an elevation of about 1,400 ft., not far from Ribareo das Lajes. Although the hills immediately surrounding the Fazenda are almost completely cleared of forest and are regularly burned over each year, small pockets of thick, low growth persist along stream beds, and the steeper slopes of the Serra are clothed with second-growth forest. This gives a varied terrain with a correspondingly varied avifauna. Burrowing Owls occupy holes in the hillside; here I saw quaint little humming birds, and small blue and green parrotlets. A Coral Vine (Russelia juncea) at the base of a tree close by attracted the humming birds and Brazilian Swallow-tails.

"A life-long ambition was fulfilled here at Lajes, that of seeing a tree full of humming birds. There were several old, very tall Eucalyptus trees in front of the house and one year in April my

presence there coincided with the peak of blossoming of these trees and one morning I counted at least seven species of Trochilidae feeding at the round, greenish-white, sweet-smelling flower heads.

"In this connection Dr. Pinto told me of an interesting observation that he had made. He had seen, side by side, a planting of Eucalyptus and an orange grove, both in bloom, both full of humming birds, but with different species in each grove. In other words the species were showing definite food preferences, those enjoying Eucalyptus flowers evidently not being fond of Orange blossoms."

GEOGRAPHICAL DISTRIBUTION of the ARRANGEMENTS for POLLINATION

(Abstracted from Schimper, Plant Geography, 1903)

The adaptions of plants to the animal kingdom form an extensive and largely investigated domain of oecology; there can be no doubt that differences in the animal world cause differences in the plant world.

By the investigation of K. Sprengel and Darwin, which have been so well supplemented by those of Fritz and Hermann Muller, and others, it has been definitely proved that many flowers require for their pollination the assistance of certain animals, sometimes insects, more rarely birds, and that they owe many of their peculiarities to this circumstance.

Numerous flowers are robbed and pollinated by the most varied visitors, as their pollen and nectar are offered freely to all, or are easily accessible. Other flowers are, in a greater or lesser degree, adapted to certain definite visitors, either because their allurements presuppose characteristic tastes, or the access to their nectar is only possible to visitors possessed of a certain bodily shape or of certain faculties. When adaptions of the latter kind are connected with animal forms of restricted distributions, the presence or absence of such adaptions is characteristic of the vegetation of definite districts.

The greatest interest is attached to the adaptions of flowers to pollination by birds (ornithophilous flowers), because birds that visit flowers are restricted to certain definite districts. Chiefly three classes of birds come thus under consideration - humming birds (Trochilidae), sun birds (Nectariniidae) and honey suckers (Meliphagidae), although individual birds of other families also play the part of pollinators.

Humming birds are restricted to America. Their importance as pollinators was first hypothetically mentioned by Delpino, but first proved in 1870 by Fritz Muller, who observed humming birds as pollinators on species of Combretum, Manettia, and Passiflora, in Santa Catherina. Th. Belt then wrote, as a result of careful observations in Nicaragua, the first complete descriptions of humming bird flowers:-

"Higher up the valley small flocks of birds might often be found amongst the trees; one green with red head (Calliste laviniae), another shining green with black head (Chlorophanes guatemalensis), and a third, beautiful black, blue and yellow with a yellow head (Calliste larvata). These and many others were certain to be found where the climbing Marcgravia umbellata expanded its curious flowers. The flower of this lofty climber are disposed in a circle, hanging downwards like an inverted candelabrum. From the centre of the circle of flowers, is suspended a number of pitcher like vessels, which, when the flower expands, in February and March, are filled with a sweetish liquid. This liquid attracts insects and the insects numerous insectivorous birds, including the species I have mentioned and many kinds of humming birds. The flowers are so disposed, with the stamens hanging downwards, that the birds, to get at the pitchers, must brush against them and thus convey the pollen from one plant to another."

The ornithophily of a species of Erythrina was also established by Belt:- " Many flowers, like the Marcgravia, are specially adapted to secure the aid of small birds, particularly humming birds, for this purpose. Amongst these the 'palosabre', a species of Erythrina, a small tree, bearing red flowers, that grew in this valley, often drew my attention. The tree blooms in February and is at the time leafless, so that the large red flowers are seen from a great distance. Each flower consists of a single long, rather fleshy petal, doubled over, flattened, and closed, excepting a small opening on one edge, where the stamens protrude. Only minute insects can find access to the flower, which secretes at the base a honey-like fluid. Two long-billed humming birds frequent it; one (Heliomaster pallidiceps) is rather rare; the other (Phaethormis longirostris) might be seen at any time when the tree was in bloom, by watching near it for a few minutes.

The share taken by humming birds in causing the peculiarites of many American flowers can be ascertained by careful and critical investigation on the spot. Undoubtedly the brilliantly coloured pollinators show a preference for red, especially for fiery-red colours; in regions where humming birds abound, for instance the Antilles, I have rarely seen a woody plant resplendent in the sun with the beauty of its red flowers without also being able to detect, with a little patience, humming birds on it. I vividly remember having seen, in Trinidad, Norantea guianensis resplendent with scarlet nectaries and with humming birds swarming round it. I have even observed these visitors on the peculiar, deep carmine flowers of Couroupita guianensis. In the garden of a house on the coast of Massachusetts, where I lived in the summer, every day I could see the single indigenous species of humming bird (Trochilus colubris) frequenting the deep carmine flowers of a shrub of Weigela. This preference for red does not, however, exclude visits to flowers that are differently coloured; for the flowers of the species of Marcgravia that I know are of a dull brownish colour."

THE HUMMING BIRD - From Wilson's North American Ornithology

The singularity of this little bird has induced many persons to attempt to raise them from the nest, and accustom them to the cage. Mr. Coffer, of Fairfax county,Virginia, raised and kept two (Trochilus colubris) for some months in a cage, supplying them with honey dissolved in water, on which they readily fed. As the sweetness of the liquid frequently brought small flies and gnats about the bags, the birds snapped and swallowed them with eagerness, so that these insects formed no inconsiderable part of their food.

This little bird is extremely susceptible of cold, and if long deprived of the animating influence of the sunbeams, droops and soon dies. A very beautiful male was brought to me this season (1809) which I put into a wire cage, and placed in a retired shaded part of the room. After fluttering about for some time, the weather being uncommonly cold, it clung to the wires, and hung in a seemingly torpid state for a whole forenoon. No motion whatever of the lungs could be perceived, on the closest inspection; though at other times this is remarkably observable; the eyes were shut, and when touched by the finger, it gave no signs of life or motion. I carried it out to the open air, and placed it directly in the rays of the sun, in a sheltered situation. In a few seconds, respiration became very apparent; the bird breathed faster and faster, opened its eyes, and began to look about, with as much seeming vivacity as ever. After it had completely recovered, I restored it to liberty; and it flew off to the withered top of a pear-tree, where it sat for some time dressing its disordered plumage, and then shot off like a rocket.

HUMMING BIRDS - The Naturalists Library, 1934

(Abstracted)

The food of the humming birds was always considered to be only the honey or sweet juices extracted from the nectaria of flowers; but later observations have proved that this alone was not sufficient to preserve even such small bodies; and when we compare the structure of the tongue with that of birds which use that member for darting suddenly out and catching up small unseen objects, we shall find considerable resemblance, and the adaption is further confirmed by the reality of their food being in a measure insectivorous. Audubon found even coleopterous insects (beetles - H.M.) in their stomach, and Wilson observes "I have seen the humming bird for half an hour at a time darting at those little groups of insects that dance in the air in a fine summer evening, retiring to an adjoining twig to rest, and renewing the attack with a dexterity that sets all other flycatchers at defiance." And in all the deep tubular flowers in which they so much delight, such as the different Daturae, the Bignonaceae, etc. I have no doubt that insects are as often withdrawn by their active and viscid tongue as any portion of the honey.

HUMMING BIRDS IN CHILE

(Abstracted from "The Birds of Chile" by A. W. Johnson)

Humming birds reach their greatest abundance and diversity in the heartland of South America. How such tiny, high energy expending birds can withstand the rigorous climatic conditions ruling even in summer time in the elevated reaches of the Andes close to the snow line, has long been a mystery. However, it is now known that they are able to do so thanks to a metabolic mechanism akin to, but at the same time different from, the hibernation of certain mammals.

The humming bird's flight is unique - it is the only bird that can remain stationary in the air or fly in any direction, upwards, downwards, forwards or backwards at will, a technique which it uses daily in gathering the energy-producing nectar (and some insects) from the flowers that are its sole source of food. High-speed photography has shown that when the birds are hovering motionless in the air the wings beat about 55 times per second, when in direct flight about 75 times, whilst during their spectacular courtship flights this speed may rise to as much as 200 times per second with the resulting increase in the "humming" noise which first becomes audible at about 60 to the second.

The green-backed Firecrown (Sephanoides sephanoides) is subject to considerable local migration according to the time of year and the relative abundance or scarcity of the flowers on which it feeds. As soon as spring arrives the greater part of the population moves from the coastal zone near Santiago to the watered valleys of the Andean foothills. After nesting, this population returns to the milder climate and winter blooming flowers of the Central Valley and the coastal regions with a consequent large increase in numbers in this part of the central provinces.

This abundance at certain times and sudden disappearance at others, coupled with the occasional discovery of the tiny birds hanging inert from twigs among thick foliage, gave rise to the firm belief among the country people that the humming birds escape the rigours of the winter season by choosing a protected nook and going into a state of torpor. In the first edition of our "Las Aves de Chile", written twenty years ago, we referred to this belief, but were imprudent enough to add that of course it had no basis in scientific fact. Later investigations, both here and abroad, have proved us wrong.

In the late 1940's, Mr. Augusto Roschi of the Biological Museum at Santa Teresa, Brazil, carried out extensive observations and experiments with several different species of humming birds. He showed conclusively that humming birds sleep at night, that sleep is induced by a drop in the ambient temperature of about 7°C, and that if the temperature continues to fall, the birds may or may not enter a state of torpor.

In all cases studied, Roschi found that a minimum drop of 7°C was required for the birds to enter this stage, that while in it they remained without movement of any kind and that its duration varied from 8 to 14 hours depending on outside temperatures. For this reason the torpid state tended to be more prolonged in winter than in summer. Some birds were taken in the hand for more than an hour and their wings, head and legs moved about with no more effect than the emission of a long, sonorous chirping note. Roschi also found that torpor is more readily induced in some species than in others. Other experiments showed that torpor comes more readily when the birds have been without food for some time.

Roschi came to the conclusion that torpor may occur at any time if the drop in temperature exceeds 7°C, that its duration is extremely variable, that it is strongly influenced by the food reserve factor and that the slowing down of the organic functions is more pronounced in those species where the higher metabolic rate consumes the food more rapidly.

We are now able to present evidence which, in our opinion, proves conclusively that the capacity to go into a state of torpor is also applicable to the green-backed Firecrown, the common humming bird of Chile, and this capacity is used to a highly variable degree in keeping with the not less variable climate and ecological conditions in which it lives.

Our evidence includes:-

1. On June 21st 1965 we were advised by Mr & Mrs. Rubensohn of Santiago that they had found a humming bird sitting motionless with its claws firmly wrapped round a twig of the honeysuckle growing over a wall in a protected corner of their garden. On our arrival at the house some time later, the bird was still sitting in the same place but had partially toppled over and was now half sitting and half hanging from the branch with the head and bill pointing downwards at an angle. It showed no signs of life, nor of decomposition.

In order to take photographs, it was necessary to pull away a large clump of abutillon (a species of Malvaceae), this humming bird's favourite source of food. Ten days later the bird was still there and in the same position so we decided to make arrangements with a really competent photographer, cut off the twig with the bird on it, take it inside the house and warm up the room until it came back to life and was ready to pose for its picture. These arrangements took several days, but by July 8th everything was ready, including a television camera. The humming bird must have got wind of this and objected to publicity for that same morning before we reached the house, it had taken its leave and departed.

The fact that at the same time that this particular humming bird was hanging inert in our friend's garden, others of the same species were flying in and out indicates that the period of torpor is very variable and explains why, in a given locality, some individuals may be seen all the year round.

2. Some years ago in the Andes of Santiago province, our colleague Dr. F. Behn was skiing along an escarpment covered with deep snow when he slipped and fell into a crevice, dislodging the snow and uncovering a section of the escarpment. As he started to climb out, he noticed an apparently dead humming bird in a cleft in the rock face. He put it into his pocket, intending to skin it and promptly forgot about it. After dinner in the ski-lodge, he happened to put his hand into his pocket, felt the bird, and took it out. To his amazement it came to life, flew around the room and out into the open.

In 1953 the experiments with warm climate humming birds in Brazil were followed by the discovery by C. P. Pearson of the University of California that the Andean Hillstar, Oreothrochilus estella, of the high Andes of Peru and northern Chile, goes into a state of torpor every evening, thus solving the problem of low night temperatures without having to repair to lower altitude to keep alive.

Working from the published discovery by E. C. Jaeger, also of California, that a Poor-will Nighthawk had remained in a state of torpor, akin to hibernation, for 88 days, C. P. Pearson decided to apply similar methods of study the case of the Andean Hillstar which he had found to spend the nights in caves or protected corners among the rocks in the Andes of sothern Peru (Tacna). Using thermometers and mirrors he was able to show that when the birds were hanging inert against the rock surfaces their body temperatures dropped from 39.5°C to 14.5°C or only 0.5°C above the ambient night temperatures. Shade temperatures during the day, on the other hand, averaged about 25°C. He could detect no heart-beat but on placing a mirror next to the bill he found that the bird's imperceptible breathing caused it to gradually cloud. The most remarkable feature of these experiments was that the birds went into this torpid state every night and next morning as soon as the sun had warmed up the air sufficiently, came to life again and went off to feed in other words this humming bird has developed a most effective solution to the problem of widely differing day and night temperatures. The most effective solution to the problem of widely differing day and night temperatures. The connection between this and the torpor as observed by us in the Green-backed Firecrown is obvious.

Comments

.....from H. Middleditch

"The author states that the presence of active humming birds in the same spot as one undergoing over two weeks of 'hibernation' indicates that the period of torpor is very variable I would have thought that there was an equally valid alternative explanation for this particular observation. The time of year at which this observation was made was the middle of winter in Santiago, at which time there may well be less plants in bloom than at other times of year; the total available food supply for the humming bird population would in consequence be somewhat diminished. On the basis of Roschi's evidence, quoted by Johnson, this situation is likely to lead to humming birds going into a state of torpor. Once the total number of active birds has fallen to a level which affords them all sufficient nourishment from the reduced food supply, a state of balance prevails. Birds reviving from torpor will commence to feed and, until the food supply increases once again, other birds will lack food and go into torpor in turn.

"To me, the most likely explanation of the observation made by the author would be that the number of birds in a state of torpor will inevitably vary inversely as the available food supply at any given time.

"It is unfortunate that the observations made by Pearson regarding a humming bird going into a nightly state of torpor do not quote the altitude at which these were made, so that it could then be compared with the habitat altitude for Matucana species and Oreocereus, which are considered to be humming bird flowers."

.....from A. Rutgers (Birds of South America)

"The seven species belonging to the genus Oreotrochilus live almost on the snowline throughout the Andes range. They are sedentary birds and possess remarkable powers of adapting themselves to a sudden fall in temperature or to the severe night frosts which prevail

at those heights irrespective of the season. During these cold periods they are, of course, unable to find food. Something like hibernation symptoms set in, with a reduction in metabolism and in body temperature, so that they become torpid. This usually happens only at night, and early in the morning the sun's rays will thaw the birds out within fifteen minutes. Oreotrochilus chimborazo jamesonii were found in the crater of the volcano Chimborazo between 11,500 and 14,700 feet.

"The Argentine red-tailed comet, Sappho sparganura sappho, is found in the Andes of south Bolivia and in the north and west of Argentina. There the nights can be very cold but the birds are able to sink into a state of torpidity from which they are aroused by the first rays of the sun."

HUMMING BIRDS AND THEIR FLOWERS By K. A. & V. Grant

(Abstracted)

In many regions of the American hemisphere there exists a class of flowers adapted for pollination by humming birds. These flowers possess various characteristics which serve to attract humming birds, provide them with deep-seated nectar, and deposit pollen on parts of their bodies where it can be transferred to the stigma of another flower of the same species. The nectar-seeking birds bring about flower pollination in such species, and pollination in turn is a critical stage in the process of plant reproduction.

The humming birds for their part are specialised for feeding on flowers. With their long bills, extensile tongues, and ability to hover on the wing, these birds have successfully invaded the ecological niche of flower-visiting insects.

We have then, as between humming birds and their flowers, a relationship of co-adaption involving partners which have attained a high level of specialisation.

Among birds, humming birds are unique in the structure of their wings and possess long slender bills and extensile tongues of an unusual structure. A wide range of variation exists in bill size and shape. Humming bird bills are slender and pointed, often straight, sometimes slightly curved or even sickle shaped. Bill lengths vary from extremely short (6mm in the Andean species Rhamphomicron microrhynchum) to extremely long, as in the sword-billed humming bird of Ecuador (Ensifera ensifera), which has a bill more than 12.5 cm long. Recent investigations on the structure of the Trochilid tongue reveal that it is not a hollow tube-like "sucking" organ as has been generally believed. Morphological studies of the tongue of Selasphorus sasin confirmed the earlier but largely overlooked work of Scharnke that the two parallel internal chambers of the tongue are not hollow tubes and do not even open to the outside as was earlier believed. The humming bird tongue forks distally and each half forms a membranous curled trough. This membranous layer is sometimes fimbriated, probably due to wear and tear. Capillary action apparently carries the nectar into the external troughs of the tongue, and when the tongue is retracted into the mouth, the nectar is swallowed in the usual way. Small insects may become entangled in the fimbriated tongue tip as the birds probe in flowers for nectar.

A particular association of floral features is commonly found in the western North American humming bird flowers. These are usually solitary or loosely clustered flowers borne in a pendant or more or less horizontal position at the tips of flexible pedicels. The flowers are thick-tissued, often red or red combined with yellow, and yield large quantities of nectar at the base of a long, stout, floral tube.

Pollinating efficiency is increased with the reduction of competition for nectar by non-pollinating flower visitors. The placement of nectar at the base of long floral tubes in humming bird flowers makes it mostly inaccessible to any but long-tongued insects. The chief competitors for the nectar of the day-blooming humming bird flowers are long-tongued bees and butterflies. Bees are attracted to flowers by their colours and odours. The frequent absence of floral fragrance and the

occurrence of red floal colours are feature of humming bird flowers which lack attraction to bees.

The nectar of these flowers, accessible to the humming bird which feed from a hovering position, is often made inaccessible to bees and butterflies, which must alight on flowers to feed. In flowers pollinated by bees or butterflies, landing platforms are often formed by the erect position and spreading petals of large radially symmetrical flowers, or the clustering of small flowers into heads, or by the conformation of the lower petals of bilaterally symmetrical flowers.

These alighting surfaces are eliminated in humming bird flowers through various floral modifications. Among those species with a radially symmetrical floral organisation, the landing platform may be eliminated by the pendant position of the flowers or by the recurving of the petals.

Flowers are commonly injured by birds which feed on them and the development of thick and strong tissued floral parts is associated with bird pollination. The inner floral organs of flowers visited by birds are also subject to injury. If bird flowers are surveyed the world over, a high percentage of them reveal some special means of ovule protection.

Pollen is often exposed in plants which bloom during a rainless season, but is protected from rain by various floral devices in plants that bloom in a rainy climate. We see examples of this rule in western American humming bird flowers. The corolla forms a roof over the pollen in Ipomopsis arizonica and in Penstemon barbatus which grow in regions of summer rain in the south-west. By comparison, related species of summer-dry areas in California either have exposed stamens as in Ipomopsis aggregata or lack a strongly developed corolla shield over the stamens as in Penstemon centranthifolius. Pollen protective mechanisms in humming bird flowers warrant further study.

Comments

.....from H. Middleditch

"Reverting to the opening remarks of the introductory review of humming bird flowers, that all aspects of nature have a purpose, one might well have enquired the purpose of the mode of petal opening on the Borzicactinae - why are only the outer petals reflexed? Why no reflexed petals on Cleistocacti? One comment by Grant & Grant would seem to afford an explanation of this form of flower - that the flower thereby offers no convenient landing platform for insects seeking nectar. On this account, we may perhaps regard Neoporteria as humming bird flowers, but not the rotate flowers with fairly wide opening petals to be found on Neochilenia, Chileorebutia, Horridocactus and Pyrrhocactus. It might also explain the observation by G. E. H. Bailey that only one flower appeared at a time on his Arequipa - more than one flower would provide an improved chance of landing place for insect nectar-seekers to gain access to the adjacent flower.

"If we now consider the Cleistocacti, these have numerous flowers on display at most flowering times, and not necessarily widely spaced along or round the stem. However, the petals on Cleistocacti flowers are even less reflexed than those on the Borzicactinae humming bird flowers. Does the reduced flower opening on Cleistocacti compensate for the increased number of flowers in bloom at one time, to balance out the protection against visitors other than humming birds being able to obtain nectar from the flowers?

"It is noted that Grant and Grant quote (from Ridgeway 1891) a bill length of 12.5 cm for the Ecuador sword-billed humming bird; by comparison, South American Birds, by C. Olrog, 1968, quotes a bill length of 105/119mm for this species. It would appear that a bill length range between 15 and 45 mm encompasses over 90% of humming bird species in South America, there being barely half a dozen species with bills longer than 50mm. One assumes that the sword-billed humming bird of Ecuador must be adapted to suit a particular long-tubed flower which requires a specially long bill - but not one of the Borzicactinae, surely? A comparison of average humming bird bill length of flower tube on the various Borzicactinae, would suggest that internal injury to the flower organs (referred to by Grant & Grant) might be avoided here by the flower tube being slightly longer than the bill. But this, of course, depends upon which humming bird species having a specific bill length feeds which Borzicactinae species. One feels inclined to echo the comment made in regard to pollination of Oreocereus (Chileans No. 25 p.5) that some bird-spotting in the high Andes would appear to be needed.

"The observations and comments made above upon the mode by which the humming bird takes up nectar with its tongue, does not appear to answer the question posed at our Brooksby '73 gathering, regarding the method used by the humming bird to reach the nectar, past the diaphragm closing the top of the nectar chamber which exists in most Borzicactinae and Cleistocacti flowers.

"Does the explanation for the bend in the tube of the Cleistocactus flower lie in the comment by Grant and Grant that "(most) bird flowers exhibit some special means of ovule protection". If a humming bird with a longish bill explores the sharply bent cleistocactus flower for nectar, and pushes its bill not only through the diaphragm covering the nectar chamber but several millimeters further, then it will only puncture the wall of the flower tube next to the very sharp bend in the tube. As Grant and Grant observe, this is a part of the design of the flower intended to protect the ovary from inadvertent damage from the bills of humming birds. But why should some Cleistocacti - like C. smaragdiflorus - have quite short, straight flowers, whilst others like C. wendlandiorum have a very sharp bend indeed, with all variations in between. Are the humming birds more clumsy where C. wendlandiorum grows than where any other Cleistocacti grow? Or is it because the habitat location of this latter species supports a greater variety of humming bird species with a greater variation in bill length?

BIRD POLLINATION of FLOWERS By Michael Proctor and Peter Yeo

(Abstracted)

There are no bird pollinated flowers in Europe, nor in Asia north of the Himalayas. Bird pollination is, however, common in some other temperate regions and in the tropics. In the tropics, in particular, the flowers are largely adapted to bird pollination, there being a comparative dearth of highly-developed flower visiting insects.

Bird pollination is known to occur up to a height of about 12,000 feet in the mountains of East Africa and South America, the birds migrating locally to these altitudes. In latitude, bird pollination extends from the southern tip of South America to Alaska.

Some of the adaptions seen in bird pollinated flowers are paralleled to those found in insect-pollinated flowers. Examples are: food supply, conspicuousness, guide marks, size, shape and positioning of flowers. Some of the bird flowers are extremely large, whilst the smallest are no longer than a bluebell. In relation to the size of flowers, large quantities of nectar are secreted, and this is thin - with only about 5% of sugar - and sometimes slimy.

Bird flowers are scentless, for birds have little or no sense of smell; they are, however, highly sensitive to colour. Red and orange are much more commonly found among bird-flowers than among flowers pollinated by insects, while reddish blue and violet, on the other hand, are rarer. There are two features of the colouring of bird flowers by which many of them can be

recognised; one is the prevalence of harsh colours and the other is the frequency of peculiar colour combinations - "parrot coloration", such as a mixture of green, yellow and scarlet - which are particularly common in the pineapple family and often extend to the bracts.

There are about three hundred species of humming birds and although the area which is richest in species is the northern part of the Andes, studies of their behaviour have been made mainly in Central and North America. In North America the humming birds are migratory and there are notable coincidences between the movements of the birds and the flowering periods of the plants they visit. K. Grant suggests that the uniform colouring of North American humming bird flowers is related to the migratory habits of the birds, which only have to seek red flowers on entering a new area with a different flora. The North American humming birds are all much alike in bill length, so that there is no question of plants specialising to suit particular types of humming bird. In tropical America, on the other hand, the birds vary in bill length, so there is opportunity here for specialisation, and as the birds are resident they learn to distinguish individual plant species. Consequently the humming bird flowers of this area are much less uniform.

Comments

.....from H. Middleditch

"Included in Grant and Grant's book are illustrations of various humming bird flowers, including two different species of Echinocereus; these display the green (stigma), red (petals) and yellow (throat) of the "parrot-like" colours indicated by Proctor & Yeo as attractive to humming birds. Do Echinocerei have a capacious nectary which is full of nectar, in cultivation? Grant & Grant also illustrate a flower of Brodiaea ida-maia, which has slim tubular flowers with a lengthy red tube with unopened sepals green on the outside which fully reflex to expose minute yellow petals - again the same colour combination. Taken off the plant, one might almost imagine them to be Cleistocactus flowers.

"Proctor & Yeo refer to birds being resident in tropical America, but do not make reference to other parts of South America, e.g. the high Andes, which lie largely within the tropics but lack a tropical climate. Do the birds migrate in the temperate climate of the high Andes as they do in temperate North America and Argentina? The description of the flora in Peru, provided by Weberbauer, which has appeared in previous issues of the Chileans, would suggest a far less rich flora and a far more restricted range of flowering times in the high Andes, compared with the year-round flowering corucopia of the Montana or Brazilian Highlands.

"Is the high Andes inhabited by a resident humming bird, or just by a bird of passage? If it is a resident humming bird, does it migrate with the flowering season of the Borzicactinae, so that it needs merely to seek out the long-tubed red flowers just like its North American counterpart? Is this why the flowers of the Borzicactinae are all rather similar, because they are attracting one species of humming bird; having only one bill length to match, then the flowers could be expected to be rather similar in length. Are they all similar in length? Do they exhibit the "parrot-like" colours of red, green and yellow? Have they all a generous store of nectar? Do the flowering seasons follow in step, to suit migrating birds resident in the high Andes, or do they more or less coincide, to suit only birds migrating from lower altitudes? Is there even a resident humming bird in the high Andes? Does its bill length match the tube length on the Borzicactinae flowers?"

..... from P. H. Sherville.

"I cannot really believe that Echinocerei are humming bird flowers; they certainly have large quantities of nectar but it is freely available to any visitor and also geographically I

would have thought that they would be isolated from the habitat locations of humming birds. I generally associate humming birds with the forested areas of Central America and northern provinces of South America. I would not imagine a creature as delicate as a humming bird surviving in the much harsher terrain generally associated with Echinocereus country, when there is precious little shelter or protection from predators. However, I may be wrong and will certainly section one or two Echinocerei flowers next season to find out what the nectar chamber is like and how much nectar it holds."

.....response from H. Middleditch

"It would appear that the humming bird is to be found over a remarkably wide range of latitude in the Americas, from Alaska to the Straits of Magellan. There is a very extensive pattern of migration of humming birds in North America, to higher altitudes and to more northerly latitudes in summer, and in winter they return to lower altitudes and more southerly latitudes. However, it does appear that some parts of North America have humming birds resident all year round. In South America there are humming birds both resident and migratory along the coastal lands of Chile and Peru, whilst the Argentinian Pampas supports humming birds during the summer months."

.....further from P. H. Sherville

"I would venture to suggest that the large inflorescences of many of the Bromelaid family with their long tubular flowers would probably be one of the flowers pollinated by humming birds. First, their flowers are externally similar to the Borzicactinae flowers and they are often brightly coloured reds and yellows. Secondly, they do occur in areas generally associated with many species of the humming bird family. Other possible plant families might include some members of the Gesneriaceae."

FRAILEA FRUITS from D. J. Lewis

In earlier issues of The Chileans there was some discussion regarding the number of seed per fruit on Fraileas; however, I would suggest that not too much weight should be given to the findings, for the number of seed formed depends on the number of ovules developed and receptive, plus the amount of ripe pollen liberated by the same or different plant.

Measurements have been taken of various seed pods on my Frailea plants. All the fruits carrying dead flower remains were larger, both in height and width, than those which lacked dead flower remains - and which had presumably lacked any open flower. In addition, two non-flowering fruits from F. cataphracta were of similar height but one was 7 mm in diameter and the other was 11 mm across.

Now I would like to point out a mistake which I made on the illustrations of Frailea seed (Chileans No. 15 p. 101). The seed of Frailea pygmaea is not like that shown, but follows the lines of F. phaeodisca which is of course related. So much of the seed which I was sent at that time for study purposes was wrongly named, that I did not get true seed of F. pygmaea until after the sheet had gone to the printers.

Seedwise I would still put Fraileas into three groups, but with a slight difference:-

Group 1	(a)	F. castanea (= asterioides)
		F. cataphracta
	(b)	F. pygmaea
		F. phaeodisca
Group 2		F. gracillima
		F. alacriportanus
		F. horstii

Group 3	F. pumilis
	F. grahliana
	F. pulcherrima
	F. schilinzkyana
	F. columbiana

In addition to these, the sample of seed I have for F. asperispina is of the pygmaea type, but I have not seen a plant of this species. Also the seed of F. uhligiana is similar to the pygmaea group, but with some affinities towards the seed of F. horstii.

I also seem to have two forms of F. schilinzkyana, the light bodies form and the dark bodies - the latter looks like a form of F. grahliana. Any comments?

What about a sort out with the aid of photographs? Let us see if we are all talking about the same plants !

Comments

..... from H. Middleditch

"The sketches of Frailea seed which appeared in Chileans No. 15 appear to depict quite marked differences among the various species in this genus. Possibly these different seed groups set out by David Lewis represent differing geographical distribution area, rather like the main seed groups in Gymnocalycium which are to be found in clearly marked areas of distribution, with little overlap. However, a reference to the Kakteenlexikon seems to indicate that there is very little degree of separation of the growing areas of the three groups of Frailea listed above by David Lewis. A more detailed knowledge of the precise extent of the distribution of each species, may lead to a revision of that conclusion.

"The final paragraph epitomises the problem that seems to be always with us - doubts as to the accuracy of some of our labels! Could we not also help in this by screening slides from various members during a discussion period at Brooksby on Fraileas ?"

..... from J. Forrest

"I have recently been able to add several new species of Frailea and many varieties to my collection. Many of these plants came under HU or KN numbers, the HU plants coming from Uebelmann and the KN plants from Uhlig. Many of these plants are alike and I am of the opinion that many of the names are synonymous, but only a few have flowered so it is not possible to say this definitely.

"Of my more established plants, nearly all of them flowered this year and produced both open and cleistogamous flowers on the same plants. So far all the flowers have proved to be yellow.

"From the fruits which set, it was obvious that fruits resulting from open flowers were larger and in some cases twice as large. On further examination I found that the seeds from both types of fruit were of equal size. But when I made a seed count I found that the number of seeds in a fruit formed from an open flower was considerably greater than the number in a fruit formed from a cleistogamous flower. In the case of F. alacriportana the count from a fruit of each type was 60 to 31. However, I also found that on some plants, fruits failed to set from open flowers but set from cleistogamous flowers. As yet I can see no reason for this.

"I have found that the flowers appear to open for approx. two hours during the early afternoon on any type of warm day.

"Regarding the fruit shape, there is some variation even on the same plants and my original notes were only a guide to the types of fruit shape which are generally found.

"Fruit colour I find varies according to the degree of ripeness of the fruit, going from green through red and brown until they become almost black.

"I am of the opinion that the type of flower (open or closed) is decided at the time the bud first forms. If the conditions at this time are right: warm, humid (plants wet) and ample ventilation, the bud formed will result in a flower which opens. If the conditions do not suit - plants dry, dull weather, the resulting flower is cleistagomous. Other views and observations on this would be very welcome."

..... from H. Middleditch

"This is the first occasion on which I can recollect reading any comment about open flowers on Frailea failing to set fruit. However, one or two of our members present at Brooksby in 1973 also reported a similar experience. Whilst we do not regard it as unusual if a flower in any other cactus genus fails to set fruit, presumably we do regard it with surprise in Frailea because we are used to an unopened flower setting fruit, and so take it for granted that an open flower is even more likely to set fruit. But is this a valid assumption?

..... from P. H. Sherville

"With regard to Frailea fruits, those Frailea which I have flowered i.e. the flower has opened, have yielded no seed at all; admittedly there was no conscious effort in pollinating the flowers. This applies to three plants where the flowers actually opened, F. asterioides, F. horstii and F. pullispina. These same plants have set fruit on unopened flowers which are quite small (about 5-6mm in diameter) and containing consistently between 11 and 18 seeds, all of which usually fail to germinate! I have also noted that many "buds" do not develop at all, they just shrivel and get washed off when the plants are hosed down. A fellow collector near here has had an opened flower on his F. asterioides and that set seed: 78 of them in one fruit! This fruit was two-thirds the size of the plant body, about 18-20 mm across. Both his plant and my own were bought together, as grafted seedlings from K. Uhlig about 1966. The F. horstii was about 18 months from seed when it opened its first flowers.

"There is one other feature with Frailea fruit that I have noticed with interest; an imported plant of F. phaeodisca from De Herdt carried a fruit and in this fruit there were some seeds and also some quite well-developed seedlings! I am wondering whether they may behave like Astrophytums in this respect, wherein the seed germinates in the fruit and if this out the seedlings die; then when one comes to sow these "seeds" quite unaware of preceding events, little or no germination is the result. This is a seemingly common complaint of Frailea and Astrophytum seeds and I suspect that a fair proportion of the "seed" offered for sale in these genera is little more than the seed case remnants, the actual germination having occurred in the fruit quite un-noticed by the vendor!"

..... from Mrs. J. Hobart

"One hot day in August, with the sun in a clear sky and the greenhouse thermometer standing at 94°F, two flowers opened together on my Frailea grahliana. When I went into the greenhouse at 2.00 p.m. they were wide open and they had closed again by 5.00 p.m. The yellow flowers were 3 cms in diameter, the petals were not shiny, the stamens were a darker yellow colour and the stigma lobes were spreading. Another flower opened on the same plant one week later when I forgot to ventilate the greenhouse and the temperature rose well above 100°F'. On that occasion the flower was slightly smaller; there was patchy cloud about in the afternoon and the flower had closed by 4.00 p.m. All three set fruit, the smallest containing 48 seeds, the other two contained 37 and 44 seeds respectively.

"Frailea alacriportana set fruit cleistogamously; three fruit contained 37, 100, and 135 seeds respectively. These were sown straight from the seed pod after being given an hour's soaking in Cheshunt solution and they germinated embarrassingly well.

"Frailea pumila set two fruits cleistogamously, yielding 77 & 35 seeds; these were treated as above and also germinated very well."

.....from T. Lavender

"We have had open flowers on both F. columbiana and F. schilinzkyana, which opened out completely in bright sunshine so the petals were virtually flat against the body of the plant. One day in August we found them both open at about 4.30 p.m. although there had been bright sunshine earlier in the day, it was hazy and overcast at this time, but very warm and humid. The flowers closed at about 6.00 p.m."

..... from P. G. Waterman

"I have also had experience of Frailеas opening their flowers and yet failing to set fruit. F. columbiana seems to be a very reliable plant for flowers - it has opened its flowers every year now for several years."

..... from S. Innes (N.Z.)

"When I came back from my summer holidays on February 1st I noticed to my surprise that a Frailea K. 1112 had an open flower. This species had been flowering most of the summer but none of the buds had ever actually opened. The weather had been particularly hot and dry over the whole country, and none of the plants had been watered for over two weeks. It was quite a coincidence then, when I heard of another grower in this country who had exactly the same experience under the same conditions. She had come back from her holidays to find that this same Frailea, neglected for three weeks, had a fully opened pale yellow flower. In both cases the plants were exposed to hot, sunny, dry conditions. It therefore seems to me that not only heat but also dryness is necessary before Frailea buds will open."

(Previous comments and observations on Frailea fruits and seed counts appeared in Chileans No. 16 p. 59 & No. 18 pp 158 et seq.)

We have a slide of F. grahliana in flower in the slide library: any further slides of Frailea in flower or fruit would be very welcome - A. W. C.

GARDEN GOSSIP - By a Lady (From the "Gardener's Chronicle" for July 24th 1880)

Among the flowers which most frequently attract the attention of Swiss travellers are the yellow violet (Viola biflora) and the alpine Linaria (Linaria alpina). They are frequently found growing together for they like the same situation and their colours harmonise so well together that we cannot do better than imitate Nature by putting them side by side in our alpine garden.

This is the first year in which I have succeeded in getting these two flowers in blossom at the same time, although they do so in their native home. Before last year the Violet was always over before the Linaria was out. Last year the Violet was very late in appearing above ground, and as the Linaria blossomed early I made sure of having both out at once, but to my great disappointment I waited in vain for the bright yellow blossoms of the Violet to appear. The leaves were unusually large and coarse and in searching among them for the chance of hidden flowers, I found to my surprise that fruit was already set, although no blossoms had shown themselves.

Generally the petalless blossoms which set fruit are rather later than the yellow flowers; now this year the yellow violet was out on April 10th and now on June 3rd the yellow blossoms appear to be over while the tiny green ones which set fruit abound. So it seems as if the wet season of last year retarded the violet till after the proper time for the yellow flowers, while the fruit bearing ones appeared as usual, only as it blossoms much later in many parts of Switzerland than it does in England, this interpretation falls to the ground. Perhaps the absence of sun was the true cause. I was told by a friend that the Dog Violet behaved the same way last year, the coloured blossoms being but few, while fruit was unusually abundant.

These two plants are very easy to establish by seed; indeed my garden abounds with self-sown seedlings of both.

Comments on flowerless fruits

.....from G. J. Swales

"Both Viola and Frailea are to my way of thinking examples of plants with the ability to produce cleistogamous flowers. Cleistogamous flowers are always a supplementary development, no species has all its flowers cleistogamous. For example, many aquatics which normally would have raised the flower above the water surface, produce cleistogamous ones instead if a sudden flood raises the level at a late stage of development. Plants such as Viola and Oxalis (Violet & Wood sorrel) normally flower in early spring in woodland or hedgebank when the leaf cover is minimal. However, they can produce flowers in the later, summer months (when the leaf cover is dense and light intensity low) which are cleistogamous. Such flowers in viola, which normally has five petals and five stamens, may show variation in part numbers and size. Petals may be reduced or completely missing, stamen number may be as low as two.

"Cleistogamous flowers are usually insignificant, short stalked and hidden by foliage leaves of the plant. Oxalis may even produce such flowers underground! The quantity of pollen produced is usually small (no fear of losses) and often the anthers do not even open. In the Red Deadnettle for example, the pollen germinates within the closed anther and the pollen tube has to first find the stigma before continuing growth down to the ovule in the usual way.

"It would thus appear that cleistogamy tends to be a response to adverse conditions - a second best process when the primary one has failed or been prevented from going to completion.

"A normal flower may not be pollinated and thus sets no seed. Sometimes the ovary shrivels and dies with the petals under these circumstances (e.g. apple tree); on other kinds of plants the fruit may develop to varying degrees and raise false hopes as to seed being inside. When eventually they appear to be ripe, no seed is found within. The best example of this is a cucumber - the fruit we eat contains no fertile seed, but develops almost completely. If the grower is careless and allows male flowers to mature then seed is set and the cucumber looks more like a skinny marrow and is usually unmarketable. It should be noted that you cannot have fruitless flowers in hermaphrodite flowers - only flowers with infertile ovaries or fruits. On the other hand, you can have more or less flowerless fruits as described above. i.e. cleistogamous ones. I see that Jack Forrest observes that cleistogamous flowers set seed and the open ones not. This is simply because cleistogamous flowers avoid all the hazards of insect pollination and have a very high probability of successful fertilisation. Plants in our climate, shut up in greenhouses and living most unnatural lives very obviously have the dice very much loaded against them when normal flowers are produced.

"The view expressed in Jack Forrest's penultimate paragraph seems to me to be the correct one, though I am not too certain as to when the 'decision' as it were, is made regarding the formation of either cleistogamous or normal flowers. It could be quite late, as in the case of the water plants mentioned above."

SOME NEWLY IMPORTED SULCOREBUTIA By A. W. Craig

In the autumn of 1971 I was fortunate in being able to obtain a selection of imported Sulcorebutia from Sargant. All the plants had been collected in habitat by Lau, the majority being identified solely by the collectors' field number. Several of these plants were only available in small numbers and I was probably fortunate in obtaining examples of these at the time.

Among this batch there were two plants of Lau 387 which is probably the least like any other Sulcorebutia that I have seen. One plant had evidently had the growing point damaged in habitat or the top part may have been eaten off by a browsing animal, for it had produced a pair of new growing heads which were tall and slender - both about 10 to 12 mm in diameter and some 35 mm high. On the habitat growth the tubercles hardly projected beyond the general body curvature and the spination on the areoles was very short indeed. Only the topmost 7 to 8 mm of both heads were green on receipt, on which the areoles carried spines some 2 mm long; the greater part of the plant was a pale earthy-brown colour with very shallow grooves dividing into areoles but completely devoid of spines. Presumably all but the green tops of this plant would have been buried in the soil or sand in habitat. Perhaps it was pulled down into the ground during a drought, or the earth could have been banked up around it by wind or water.

Each of these two heads has now produced three or four small offsets part-way up the stem, the largest offset being 10 mm long and 5 mm in diameter. These offsets stand out sideways from the parent stem and are somewhat club-shaped, with a very thin neck tapering gradually from the base. Despite their very small size, minute roots have started to form at the base of each offset. It is only to be expected that such offsets would become detached easily in the wild - which might explain the early onset of root formation.

The small slender stems with the miniature areoles and spines are somewhat reminiscent of own-rooted Chileorebutias; with the addition of these tiny horizontal club-shaped offsets the plant looks altogether different to any other Sulcorebutia I have seen.

The second plant received under this number has one main head, almost globular in shape, being slightly taller than it is broad. Only the lowermost part is of a pale brown colour, most of the body being green. The tubercles are rather less flattened than those on the specimen aforementioned but this could be due to the difference in turgidity between the two plants. Since become established, it has grown two offsets and these are very similar in character to the offsets on the other plant received under this number - again being markedly elongated, with a thin tapering neck, and standing nearly straight out sideways from the parent body. Had it not been for the similarity of these offsets, I would have been suspicious that I had received two different species under the same collection number.

Under the designation Lau 338 came two plants of Sulco. flavissima, each about 45mm diameter, flattened depressed globular in form. The spines are of a yellowish hue - from which I presume this species acquired its name - somewhat flattened, outward projecting and curved back a little towards the body, 6 to 7 mm long. A number of the areoles have a central spine - indeed a few of the older areoles have two and occasionally up to four centrals. These are quite straight whereas the radials are all curved.

Under the field number Lau 377 came a plant named as S. flavissima form. This was 70 mm in diameter, which is quite large for a Sulcorebutia, indeed it is probably the largest plant of Sulcorebutia I have either seen or acquired to date (other than Lau 977 which came in as S. hoffmanniana but which appears to be a Lobivia). There were up to 30 spines on the older areoles, not so clearly pectinate as in the type - almost straight and straw coloured, darkening at the tips.

There were also two plants of Lau 974 which were named S. menessessii but I was given to understand by D. Sargant that two of these plants had also gone to John Donald who gave it as his opinion that they should have been called S. haseltoniana. The tubercles were quite

prominent and were formed into nearly vertical ribs. The areoles were about 10-12mm apart along the ribs and this wide separation was probably the most outstanding feature of these plants. There were 16 ribs and the areole was placed on the upper part of each tubercle. A quite distinct groove or slot ran from the top of each areole, slanting off to the right into the groove between adjacent ribs. The top of the areole appeared to terminate inside this slot. Most areoles carry seven spines, the two uppermost being the longest + 20 mm long; many areoles also carried an upward pointing central spine - although it did appear to be possible that this was a migrated radial spine. The two plants received under this number show a remarkable difference in outward appearance - in spine colour, length, and shape particularly.

One of these plants has now produced a yellow flower which is about 2.5 cm high and 2.5 cm diameter which I suppose is fairly large for a Sulcorebutia. Four of the outer petals carried a streaky patch of red colour near the tips. The funneliform tube was the same colour as that of the flower petals and it carried reddish brown scales with a blunt top and a tiny pointed tip. There is some new spine growth in the very centre of the crown, the uppermost new spines being bicoloured with the top half dark brown in colour, the bottom half a pale lime green. The second plant of Lau 974 has a similar coloration on the new spines and the bud on this plant is a dark purply red in colour.

With its slightly yellowish-green body and the appearance of the spination somewhat similar to S. brachyantha and xanthoantha, came a plant of Lau 314. A careful examination of the tubercle formation suggested that these were arranged in counter-rotating spirals like Parodia and many Neochilenia. The spiral ratio was found to be 13:8 and a check on a seedling S. brachyantha also showed a similar spiral count. Since the import has become established it has produced a small offset of about 3 mm in diameter and this tiny offset has already put out two rootlets. This season this plant produced a bud from that part of the body which seems to have been buried in the earth when in habitat - there were old areoles still visible on this part of the body but no spines remained there.

Another plant originally believed to be S. taratensis, Lau 313, with a chocolate green growing centre - the epidermis becoming more green about the vicinity of the shoulder. There were practically no spines on the areoles on the earthern-coloured lower two-thirds of the body, which suggested that this part had been buried in the ground in habitat. Each areole carried 12 or 14 spines, the top pair of opposing spines being some 10-15 mm long; sometimes the second opposing pair were also nearly as long but the remaining spines are generally 6 mm long. The spines had a slight pinky tinge, but some new spines close to the growing point were chestnut brown in colour. The spines were closely adpressed to the body but there were a few random long spines less adpressed. The tubercles were found to be arranged in spiral form and the spiral count was 13:8. Although the plant must have grown for some years in the wild and remained quite solitary, it has started to put out some offsets after only a few months in cultivation.

A small grafted seedling of this species also had 12 or 14 spines per areole, but the spiral ratio was 8:5. This seedling flowered this season starting with a bud very dark brown in colour with a reddish tinge. The flower had an almost white stigma and the petals were deep rose pink.

From Puccha in the Province of Mizque comes SH 335 which has an elongated, slightly club shaped body, 4 cm high, 2 cm broad, displaying fairly prominent tubercles. Each areole carries spreading white radials, 3 mm long, and one outwardly projecting central spine about d to 10 mm long, again chalky white, with occasional darkening at the tip. It is quite different from any other Sulcorebutia that I have seen - it will be very interesting to see if it flowers.

Sulcorebutia SH 315 with approx. 12 spines per areole and some 3-4mm long, is also growing new longer spines from the areoles near the shoulder of the plant - chestnut colour with a dark brown tip. These do not seem to be true radials but they do not lie as close to the body as do the other spines and they also point slightly upwards and outwards. These new, long, spines arise from

about the centre of the areole - indeed some areoles display two central spines. The body of this plant is suffused with a reddish purple tinge.

On my cultivated plant of S. tiraquensis there appeared a nice array of flowers this spring - flowers which are different in shape to all the other species of Sulcorebutia which I have flowered so far; the buds were quite rounded and very bright green in colour. Just prior to the flower opening it exhibited a very marked "belisha beacon" shape, with orange-red petals curled almost into a spherical shape, on a slightly tapered green tube. My S. mentosa also has round headed buds and looks as if it, too, will have a "belisha beacon" like flower.

All my imports appear to have become established and are now showing some signs of growth. I find it most surprising to see the frequency with which these plants put out new offsets so soon after becoming established especially as they show no signs of having carried any offsets prior to receipt. I have also found other cultivated Sulcorebutia seem to produce offsets from a previously solitary plant shortly after I have degrafted them and got them away growing on their own roots. I would be interested to know if any other growers have had this experience, and whether any cause can be suggested.

..... from W. Withers

"Although we may look upon Sulcorebutia as a plant which is most often solitary, need this be so in their habitat? I have received from Uhlig a S. crispata which had nine heads, each one about 20-30 mm across, making a nice-looking clump. This plant has flowered for me, the flowers being pale crimson (carmine) in colour, about 3 cm broad and some 4 cm high."

PARODIA - THE ECHINUS GROUP - Some further comments from F. H. Brandt

I have been waiting for the comments on the first stage of my Parodia notes in order to be able to respond immediately; in the meantime I have busied myself with studies of Parodia, especially with the seeds of the genus.

First of all I will comment on the species mentioned in the Chileans No. 24 and start by posing the question - What is Parodia comosa Ritt? In the first catalogue from the firm Winter (Ritter's sister) for the year 1954, there was offered for the first time FR 111 as Paraodia gigantea var., from near La Paz. At that time, then, it was a very large plant, hence the name gigantea. At the same time FR 120 was offered as gigantea var., having brown spines, white when old, buds reddish, flowers yellow. Could this perhaps be borealis?

In the 1956 Winter catalogue we again find FR 111 "On steep rock walls of the La Paz river, dark yellow flowers, long red fruits". In both the 1957 and 1958 catalogues this entry was repeated - there were no further references to the data given in 1954.

In 1959 we find FR 111 given as P. comosa Ritt. sp. nov., elongated crown, few ribs, on steep rock walls. And then in 1962 Ritter first describes his P. comosa.

If one compares these numbers from different years, it is immediately apparent that the FR 111 offered in 1954 was described as gigantea and must have referred at that time to a very large plant. In 1956 however the number FR 111 was certainly retained but there was nothing more to be found about a 'large plant'. And here for the first time red fruits were spoken of.

Thus the plants have red fruits from 1956 onwards but they are no longer offered as gigantea var., as it was in 1954. Thus, although the FR 111 designation was retained, would it now concern two different plant species? I have the var. gigantea of Ritter FR 111 which I bought from Holland at the end of 1959 and at that time the seedling was already some years old. Today I still have this Parodia FR 111 var. gigantea in my collection and it now has a

height of 36 cm. This P. gigantea, however, has no red fruits but resembles rather P. echinus. According to the seeds the plant belongs to the series "Brachysperma".

I also have in my collection comosa's found later by Ritter and they are quite distinct plants that I cannot distinguish from P. miguillensis Card. Lau has now brought in miguillensis as imports and these plants are like those I have from Cardenas. I have still to investigate the seeds to see whether these are similar to the comosa's.

Thus I would see this group as follows: Parodia miguillensis Card. is the same as the P. comosa Ritt. of the years 1956-62, whereas the FR gigantea of 1954 is the same as P. echinus Ritt.

I have received seeds of P. comosa from friends and they are the same as P. borealis; I also got seed of borealis from De Herdt. I have seeds of P. echinus from one of my plants and it unquestionably belongs to "Brachysperma". Thus it appears that in his 8 years of collecting FR 111, Ritter has collected various species, but has sold all of them under the one field number FR 111.

In his field-note of 1954 there is the remark 'gigantea' and so he has appended this largeness to the description in 1962 without noticing that he is here dealing with quite different plants. It is a curious thing, but we now wrangle over what is "comosa". I have placed the FR 111 of 1956 (gigantea) in my collection as P. echinus; Parodia comosa Ritt. as a synonym of P. miguillensis Card. - both with red fruit. Cardenas described his miguillensis in 1961, but Ritter his P. comosa first in 1962, a year later than Cardenas. I have not seen the fruits of P. borealis but the seed that I have are Obtextosphermae.

So one may arrange this group as follows:

Parodia ayopayana Card.
- miguillensis Card (= comosa Ritt.)
- borealis Ritt.
- mairanana Card.

From the seeds one can put P. mairanana only in the Obtextospermae. In 1970 Cardenas described yet another Parodia - pseudoayopayana Card. (New Bolivian Cactaceae, Part XIII C. & S. J. 1970 No. 4). Lau has imported similar plants as ayopayana. I have examined the seed and send you a drawing. But it still leaves open to question whether it is pseudoayopayana. Ritter has also described an ayopayana var. elata Ritt. So we now have three names. Perhaps it is for that reason the seeds do not always compare? Perhaps there are different ayopayanas and sometimes we obtain the seed of one sort and sometimes the seed of a second or even a third sort?

My Parodias flower and grow well this season; I am now photographing the flowers, for it is the only way to keep good records.

Comments

..... from R. Moreton

"Regarding these further observations from F. H. Brandt, the mix-up over what is FR 111 is typical of what one finds whenever one looks a little more than superficially into such matters. I despair of ever reaching a definitive solution to them. I started getting Ritter's seeds in 1959 and to me P. comosa and P. echinus of that period are scarcely distinguishable. I also had "P. gigantea" from A. Schenkel's seed and that looks the same as well. P. miguillensis from Lau is of the same general appearance, but has finer spines and the plants are more slender. But of course they may have been young plants. Without further field work I do not see how the matter can be resolved.

"As for the fruits, I do not believe that the long pink form is constant - P. comosa can produce typical Parodia fruits as well. As Brand implies, it would be nice to have seeds of what Ritter intended as P. comosa and P. echinus, for comparison. To my mind the differences between P. comosa,

echinus and miguillensis are insufficient for species status unless they really do belong in different seed groups.

"Having just referred to the description of P. echinus in the Kakteenlexikon, I see that it is said to have fruits "pink up to 6 mm". The typical small Parodia fruit go brown and papery so quickly that it seems strange to see them described as "pink".

"Incidentally, on the size of Lau's imported P. miguillensis; I see that this species is supposed to be only 6 cm tall, so the ones from Lau must have been fully grown. But I do not go much by how big a plant will get in cultivation. Charlie Glass says that several Mamms get much bigger in cultivation than they do in the wild."

..... from P. H. Sherville

"I have plants under the names of both P. echinus and P. ayopayana and they are both similar in body morphology. The P. echinus was from Winter (Ritter's) seed in the 1962/63 season and bears the number FR 747. This plant is now about $2\frac{1}{2}$ - 3" in diameter and about 6" high; it is a very untidy plant and certainly corresponded to Brandt's photograph of P. miguillensis when it was younger. The flowers are also very similar, but may be lighter yellow (towards the Weingartia colour range) depending on the season of flowering - darkest in spring and summer and lighest in late autumn. There is one difference between Brandt's photograph of P. miguillensis and my own plant, which may be a function of the maturity of the plant, in that my P. echinus produces thick tufts of white wool and light brown bristles at the flowering areoles; these are persistent and give the plant the appearance of having a cephalium.

"I have not set fruits on P. echinus - it seems peculiarly reluctant to do so, but is now producing offsets, although most of these have gone black and rotted off so far.

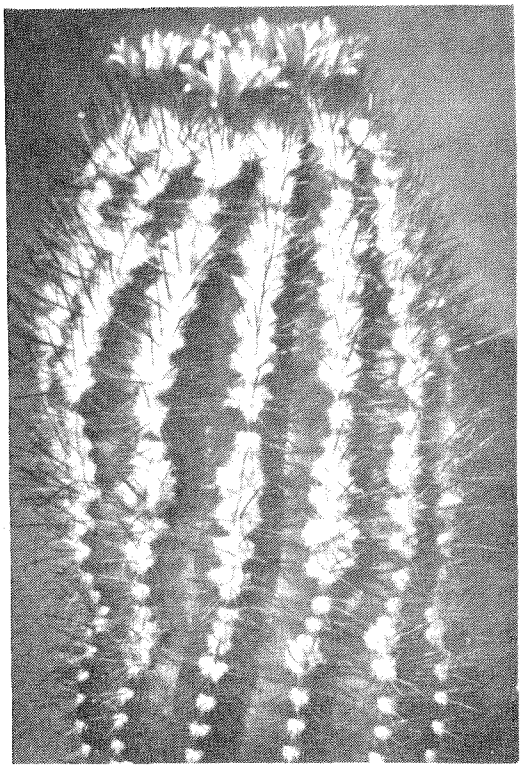
"My plant of P. ayopayana came from Uhlig many years ago and clearly resembles P. echinus even to the tufts of wool and bristles, but they are not so persistent as on P. echinus and not so profuse - this particular plant does not flower well for me. It is a much smaller plant and the stem is not so glossy - it is quite a shade paler and matt textured - more a greyish green. However, despite its paucity of flowers it does produce these much sought after long pink fruits, every bit resembling those on Islaya and Wigginsia! I see that Roger Moreton thinks that 6 cm might be an exaggeration for the fruit size - well 6 cm is about 2 3/8" and the fruits borne by my plant were about $1\frac{3}{4}$" long which is certainly approaching that order of size - perhaps 6 cm is not a misprint then?

"These elongated fruits are in complete contrast to the normal Parodia fruit i.e. a dry paper cell usually more or less spherical and ranging generally between about 5 and 10 mm in diameter. The fruits on P. ayopayana are fleshy with a wall thickness approaching 1 mm and generally attain about 14-16 mm girth at maximum, which is near the top of the fruit i.e. near the flower remains. I did not succeed in getting any seed in these fruits but that is another matter!

"A local collector also has a plant of P. ayopayana which produces these long fruits, but the origin of this plant is unknown; the body of his plant is more like the photo of Brandt's Parodia miguillensis i.e. a glossy green."

..... from H. Middleditch

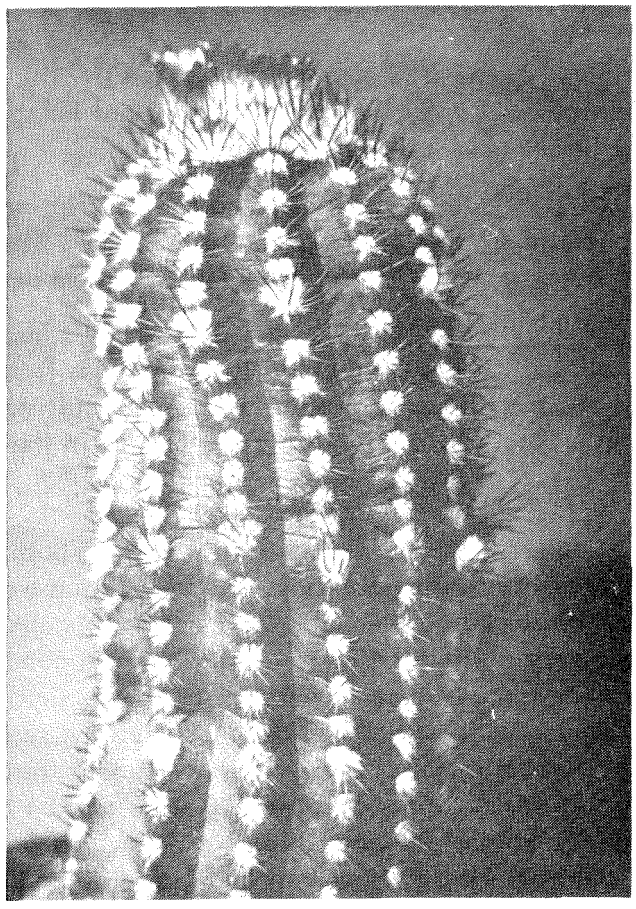
"In his description of his collecting trip which had as an objective, obtaining plants of Parodia echinus, Lau refers (Chileans No. 19 p. 230) to "the similar Parodia comosa or miguillensis. Both plants are the same ....." Now the official description of P. comosa (Chileans No. 24 p. 163) Ritter quotes "Body length 30 cm and more." But I note that Roger Moreton refers to P. miguillensis "is supposed to be only 6 cm tall". There would seem to be



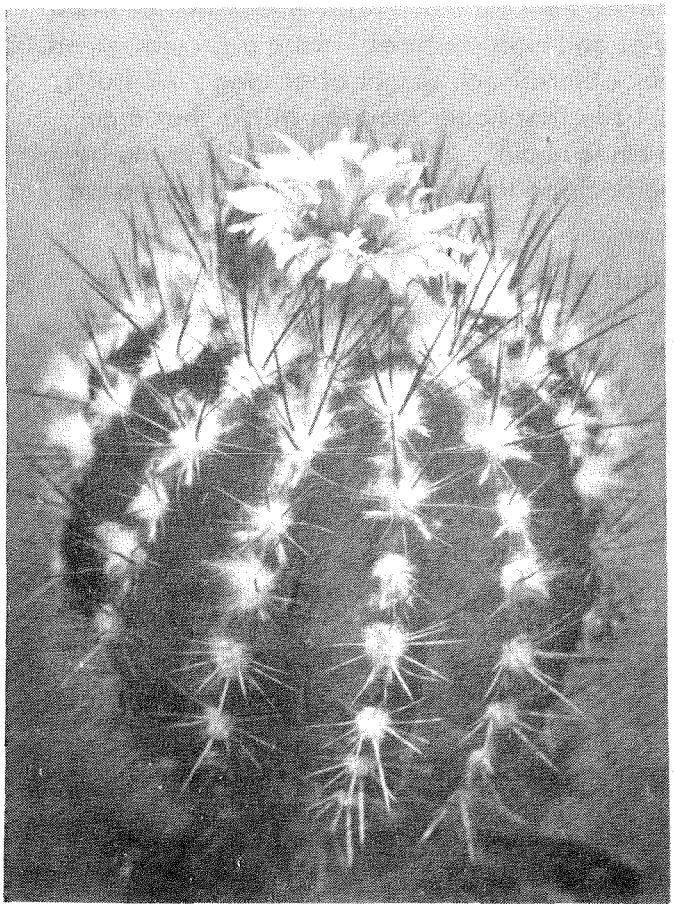
PARODIA GIGANTEA

F.R.111

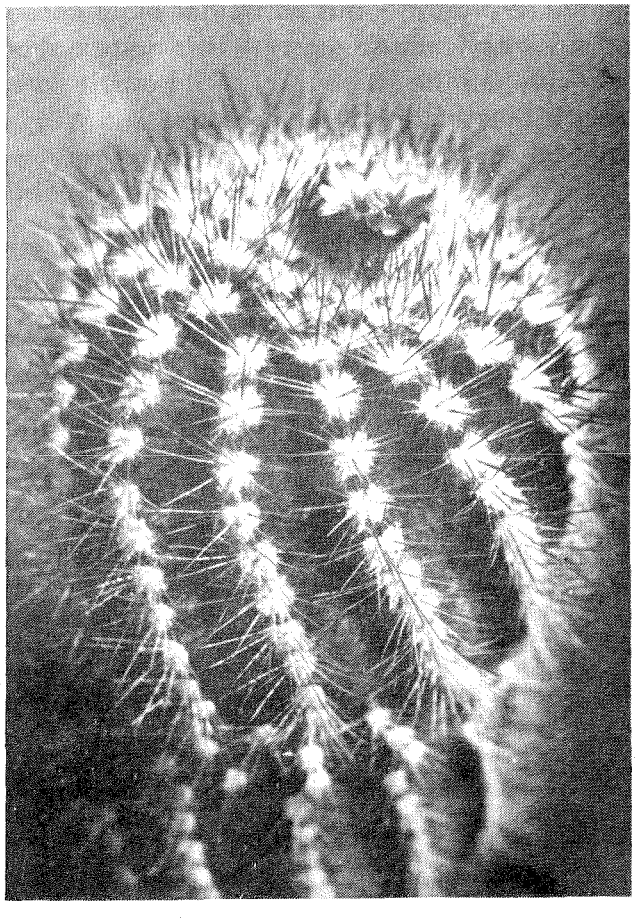
Photos & Collection — F. H. Brandt



PARODIA ECHINUS



PARODIA AYOPAYANA



PARODIA BOREALIS

some degree of incompatability between these various observations.

"The seed sketches accompanying these notes are from F. H. Brandt and the seeds of P. muguillensis and of P. pseudoayopayana (supplied as P. ayopayana) are both from Lau. Taken with the official description of P. ayopayana, with Buxbaum's drawing of the seed of this species (Chileans No. 24 p. 166) and with Brandt's drawings of the seed of P. comosa and borealis (Chileans No. 24 p. 165) it would appear that the section Obtextosperma of the genus Parodia comprises:

Parodia ayopayana
borealis
comosa
miguillensis

which leaves out P. echinus with its elongated seed.

"Do all four of these species have the elongating pink fruits, as indicated by Buxbaum (Chileans No. 23 pp 110-111)? But if we have pink elongating fruits with round seeds having an aril membrane over the testa, or typical Parodia fruits containing elongated seeds, then presumably there is no problem?"

..... from D. J. Lewis

"May I say that the grouping of Parodia seed which I did was on similar lines to Buxbaum's work, in that the groups were based on seed shape, hence the terminology used. This does not necessarily mean that the plants are closely related, but only that the seed shape is similar. There are many characteristics to consider besides the seed shape that could split the plants into different groups - or even subgroups.

"I have had a large quantity of P. miguillensis seed recently. It is the same as that drawn by Brandt in Chileans No. 24 except there is much less of a funicular point on the strophiole. The seed is matt black with the suggestion of a testa covering of a lighter colour."

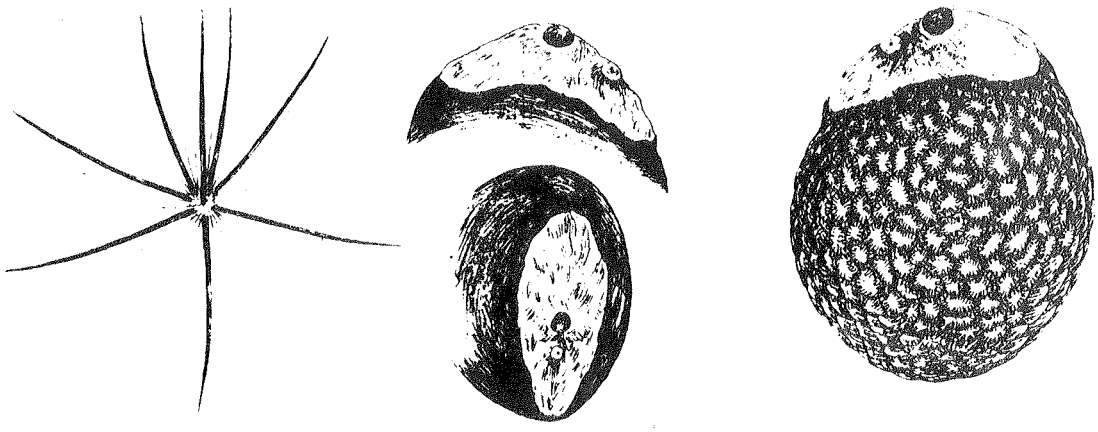
PARODIA AYOPAYANA Cardenas sp. nov. By Prof. Martin Cardenas

(From the Cactus & Succulent Journal of America)

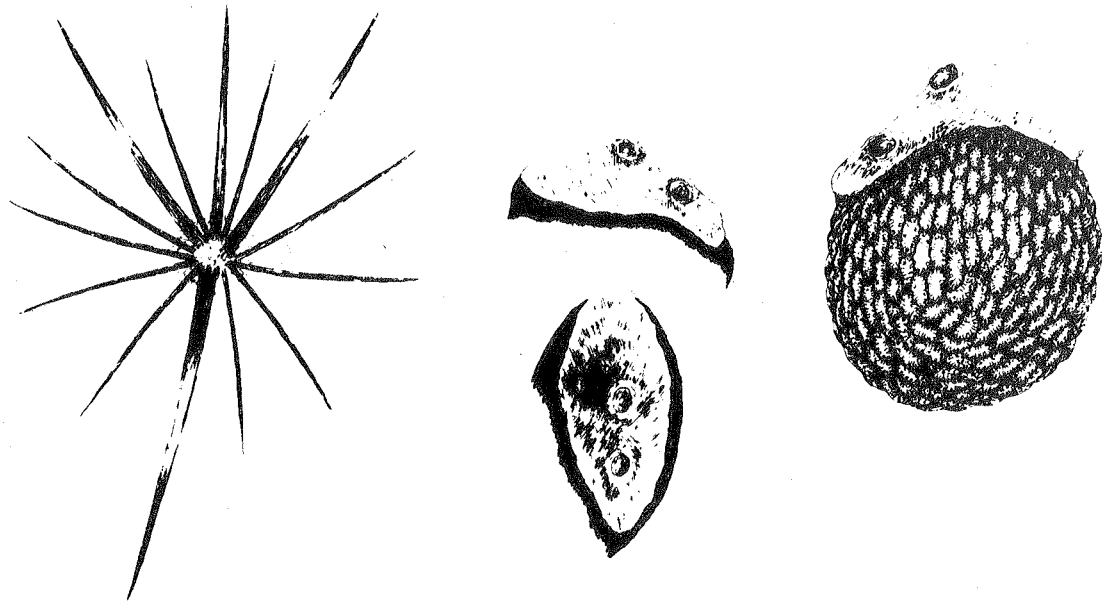
Caulis globosus raro caespitosus, 6-8 cm altus, 6-9 cm latus, laete virides. Costae ca. 11 aliquid acutae at tuberculatae, 2 cm altae, basi 2 cm latae. Areolae 12 mm inter se diantes, ellipticae vel orbiculares, 9 mm diam., primum albe deinde cinerei tomentosae. Aculei radiales 10-11 horizontaliter adpressi, aciculares fere pectinate 1.2 - 2 cm long., albescentes. Aculei centrales 4 radiantes, temperato, bruneis vel albescentes a basim increassati, 3 - 3.5 cm long. Flores 3 aut pluris ex apice lanati caulis, 3 cm long. Ovarium globosum, 6 mm diam. temperato flavum, squamis minutulus instructum. Tubus companulato-infundibuliformis, aureis, squamis 5 mm long., flavis, apice bruneo in axilis lanam albidam praeditus. Phylla perigonii interiora lanceolata, aurea. Stamina ex fundus usque dimidia tubus disposita. Filamenta aurea. Antherae flavida temperatae. Stylus 21 mm long., aliquid stamina superantes, aureus, superne striatus Stigmata 11 ramis, 3 mm long., aureis praedita. Fructus 1-4 cm long. (in specimena a me viso), superne tubulosus et cavus, rubrus, copiosa lana obtectus. Semina atro-brunescentia globosa subtiliter granosa, 0.6 mm diam., hilo semigloboso.

Bolivia, Department of Cochabama, Province of Ayopaya, Puente Pilatos, on way from Morachata to Independencia, 2,700 m, October 1949, Martin Cardenas 4398 (Type in Cardenas Herbarium); cotype in U.S. National Herbarium).

Simple, rarely caespitose, globose, 6-8 cm high, 6-9 cm broad, fresh green. Ribs 11, rather acute, slightly tuberculate, 2 cm high and 2 cm wide at their base. Areoles 12 mm apart,



Parodia miguillensis



Parodia pseudoayopayana

Parodia echinus

9 mm diameter, ellipsoid or circular; upper ones densely white-felted, lower ones grey-felted. Radial spines 10-11, horizontally appressed, acicular (somewhat pectinate in the large elliptical areoles), whitish, about 1.2 - 2 cm long. Central spines 4, spreading, subulate, light brown or whitish, swollen at their bases. Upper central spine 3 - 3.5 cm long directed towards the top of the stem, the remaining 3 centrals spreading, 3 cm long. Flowers 3 or more from the slightly depressed top of stem covered by a dense white wool cushion. Each flower about 3 cm long, with orange wool on the ovary and white wool on the upper section. Ovary light yellow, 6 mm diameter, with traces of minute tubercles. Flower tube constricted above the ovary, golden yellow, with scales about 5 mm long, yellow, brownish, acute tipped, and bearing white hairs in their axils. Stamens inserted from the bottom of the tube to the midlength of the tube. Filaments golden yellow, anthers light yellow. Style about 21 mm long, slightly longer than stamens, striate on its upper two thirds. Stigma lobes 11, about 3 mm long, golden yellow. Fruits 1-4 cm long (on the specimens I have examined), not juicy, hollow above, reddish, bearing the remains of the dry flower, almost entirely covered by white hairs. Seeds black or brownish, globose, 0.6 mm diameter, finely granulate; hilum covered by a large aerenchymatic cushion.

This new species is distinguished by the long tubular red fruits. Puente Pilatos, the type locality, is the most northerly station for the genus Parodia in Bolivia, 17° south latitude.

Comments on P. ayopayana

..... from H. Middleditch

"The above description by Cardenas quotes seed size as "0.6 mm, globular". This would seem to match the sketch prepared by Buxbaum and reproduced in Chileans No. 24, of the seed of this species, but would not quite seem to match the seed sketch for P. ayopayana from F. H. Brandt in the same issue (pp 165-166). In the current issue appear further notes from F. H. Brandt concerning the Parodia echinus group, accompanying which is a photograph of "Parodia ayopayana" - showing a plant appreciably taller than it is broad. But Cardenas describes the plant as globular and this statement is born out by the dimensions of the body which he also quotes. Thus we appear to have:

a) An elongated plant called Parodia ayopayana by Brandt when it should be globular to match the official description.

b) An elongated seed shown by Brandt as from P. ayopayana (Chileans No. 24 p. 165), whereas the official diagnosis quotes a round seed.

c) Seed and plants collected by Lau, described as ayopayana by him, the seed of which matches the official description of ayopayana, but which is called pseudoayopayana by Brandt in his sketch, which appears in this issue.

From this appraisal, should we wonder if the illustration from Brandt of P. ayopayana (appearing in this issue) is correctly named?"

ALL THOSE TERRIBLE NAMES

From time to time we find appearing in the Cactus literature a plant with which we may be familiar, but under a new name. At such times the reader may pause to wonder why anyone has felt it necessary to change the name of a plant - especially might this thought occur to a collector interested in South American cacti, where changes of name have probably taken place to a greater extent than with all the rest of the succulent plants put together. I can recollect

being asked by one collector how this situation can come about. Let us consider why it does happen.

How does any plant acquire a name in the first place? It acquires a name simply because someone decided to give it a name. In practice that someone could be anyone - you or I, even. Since 1935, in order to validate a new plant name, it has been necessary to comply with the International Code for Botanical Nomenclature. This requires a description of the plant to be given in Latin and also a specimen of the plant to be deposited in a recognised herbarium - such as Kew or the Linz Botanic Gardens. Prior to that year, a new plant name could be published without meeting even these basic requirements.

Very few - if any - of the name changes which we meet amongst the South American cacti affect the specific names. The changes that do occur mostly affect the generic name. No accepted standard exists for the establishment of a generic name, comparable to that now required for validating a specific name. This affords unlimited freedom for any amateur or professional botanist to publish any name or change of name that suits his fancy. Thus if one author happens to think that two existing genera would look better in his eyes as only one genus, he is quite entitled to publish a revision of one of the generic names.

Thus we have Donald and Rowley proposing to roll all the Neoporterianae (Neochilenia, Chileorebutia, Pyrrhocactus, Horridocactus, and even Islaya) into the one genus, Neoporteria. The American author Kimnach has proposed the combination under the one generic name Borzicactus of such equally well known genera as Oreocereus, Matucana, Seticereus, Arequipa and Loxanthocereus. Buxbaum has proposed to unite Notocactus, Eriocactus, Brazilicactus, and Malacocarpus under the one name of Notocactus. Some years ago a proposal appeared for uniting Tephrocactus, Cylindropuntia, and one or two other closely related general into the common genus Opuntia.

On the other hand, we have Buxbaum splitting the genus Monvillea into two separate genera, Monvillea and Praecereus; also taking from the genus Coleocephalocerus certain species and changing their generic name to Buiningia.

In every case the authors concerned put forward reasons for making these changes, which appear to them to be perfectly justified, although the same view may not be held by other authorities. Thus some writers will refer to certain plants under the new title, with which they are in agreement, whilst other authors continue to use the previous name which they presumably consider is more appropriate. This in turn leads to a similar situation in commercial circles, where one plant may be found in a nurseryman's catalogue described under one name and the same plant will appear under a different generic name in another catalogue.

You may perhaps have gained an impression that this business of changing names amongst the South American cacti is one that has only afflicted us in more recent years. However, this is far from the case, for the process of changing names amongst the South American cacti has been with us now for well over a century. That this situation can exist for such a long period of time brings us right back to the question that was posed in the first place - how does this come about? To find the answer to this question we must consider why it has not occurred with African succulents and the other American cacti to anything like the same extent.

Collectors who travelled in South Africa at the end of the 17th century were able to traverse great tracts of countryside with precious little impediment in the shape of difficult topography or a hostile political climate. Later collectors in Africa and North America were similarly blessed and although the political climate in Mexico was rather unstable, it did not seriously impede collecting activities. Thus, in these parts of the world, collectors were able to survey large tracts of country, selecting specimens more or less at will from the different locations. At quite an early date, therefore, a fairly clear picture emerged of the degree of diversity which existed in nature, both from the specimens collected in the wild and grown on in cultivation and also from the information which was provided by field collectors of the extent of the distribution of each form.

A man-made pattern of genera was laid out, using this information; subsequent collecting, cultivating, and studious activities have yielded very little material which has conflicted with this generic pattern laid down many years ago. One may perhaps cite the establishment of the genera Utahia and Coloradoa as the exception which proves the rule, but the overall generic scene was changed but slightly by this introduction. This merely serves to emphasise the stability of the nomenclature of the North American cacti in comparison with that of the South American cacti.

The picture which we have of the collection and cultivation of South American cacti is one which is constantly changing as new patches of ground are examined, or as previously traversed ground is worked over again even more thoroughly. The extent of the knowledge of the range of variation of plants in nature thus continues to change as apparently new information comes to light and so the appreciation of that information by authorities on the subject also changes. Why it is, then, that new varieties of plants can still be found in South America? The answer to that question is to be found in a combination of circumstances, firstly the unstable political climate and secondly the natural topography, vegetation, and climate of the continent.

The unstable political climate made it difficult for any collector to establish an uninterrupted pattern of exploration which would have enabled him to have covered ground in a systematic manner at the most suitable time of year. Any collecting trip would inevitably be subject to man-made delays and hazards. Then, in addition, the topography and vegetation combine to produce natural obstructions to transport and travel to a very much greater extent than is found in cactus country in Africa or North America: so much so that it becomes exceedingly difficult for a collector to cover a large territory so systematically as to be able to say that he has obtained a truly representative selection of plants from those parts. Finally, we have the climate - over a large part of the cactus country in South America this comprises very distinctive wet and dry seasons. In the wet season when the plants are growing well, the trails are almost impassable to wheeled vehicles and in the dry season when the trails are in better order, many plants have shrunk down to the level and colour of the earth so that they can be very difficult to discern.

These conditions help to explain why there tends to be a fairly continual addition to our store of information on South American cacti, and, as our store of information fills out and changes, so does our appreciation of that information. It is from this changing picture that the changes of name arise. But the basic cause of it all is the nature of the South American continent - its topography, its vegetation and its climate. Because these indirectly have such an influence on our plant names as well as a direct influence on the plants themselves, we have devoted some part of the Chileans to providing information on their nature and influence.

In all this, it might be borne in mind that whatever changes may take place in the name, the plants themselves are still the same ones we have always known. Thus it would seem unnecessary to give too much attention to name changes for their own sake, but perhaps giving such changes sufficient attention to be able to keep abreast of them, more particularly seeking out the nature of the plant features which has led to the proposals for the change of name. H. M.

Comments

..... from G. H. Swales

"I would be inclined to agree that few of the name changes which occur among the South American cacti affect the species name, rather is it the generic names which suffer the changes. Perhaps this is because there is a general tendency to regard a species as a natural unit, whereas any type of collective name above a species (genus, tribe, family) will inevitably be a matter of opinion).

"The older botanists would tend to utilise morphological features in order to segregate a natural species, working on the basis that plants of one species are more like each other morphologically than any other plant. More modern lines of thought are to regard as a species a population of plants which exhibit on average a cohesive set of similarities, distinguishable from the next species population. Both these approaches tend to use natural characters as a means of assessing a natural unit.

"Above species level there would not appear to be self-evident natural groupings - any grouping is simply a made selection of discrete species which can exhibit varying degrees of relationship. Thus taxa above the level of species generally attempt to show natural relationships as opposed to showing differences at species level.

"When a botanist is sorting out species the process is one of dividing, whereas when dealing with genera and above, it is one of grouping. Some authors would, of course, even regard determination of species as one of grouping."

GYMNOCALYCIUM MIHANOVICHII v. FRIEDRICHII f. RUBRA: 'HIBOTAN' By W. de Cocker.

(Translated by H. Middleditch from Dodonaeus No. 2 1966)

The mutation (illustrated in the 'Dodonaeus' Journal) forms a veritable focus of attraction in all those collections where it was until recent years considered a rarity. But it has been propagated by vegetative methods on such a scale that it is, at present, obtainable by anyone.

It originated from Japan where, for many generations, they have devoted much ingenuity to breeding plants and animals in rich and bizarre colours.

Our information that cacti are the object of particular attention in this field, comes from a communication of Mr. Hajime Oku to the I.O.S. Congress at Kiel in 1959. It was repeated in the September - October 'Succulentarium Japonica' of the same year under the title 'Propagation and distribution of richly coloured plants in Japan'.

After an introduction devoted to the history of this form of culture, the author described and commented upon the actual methods and recent productions in the field of cacti. The Japanese interest themselves much more in the striated forms than in plants of a single shade (if typically coloured) or in those which are just variegated.

They start off by seeking out the variations or mutations of colour and graft a portion exhibiting this variation of colour on an outsize stock. When the scion has grown sufficiently or its offsets are sufficiently advanced, one removes the most colourful part which is grafted anew on a stock affording rapid growth such as, for example, upon Echinopsis. And one continues in this fashion until reaching the desired contrast. Then when the stock has reached a diameter of 5 to 10 mm, one sets it on a more permanent stock - most commonly M. geometrizans.

The colourful cacti from Japan are divisible into four groups 1. White variegations 2. Yellow variegations 3. Pink variegations and 4. Purple variegations. It is amongst the third group that one finds Gymno. quehlianum, Solisia pectinata and our Gymno mihanovichii which had been observed in 1935 in pink colour.

The Japanese E. Watanabe is the originator of the quite exceptional red mutation which concerns us here and whose history can be summarised as follows. This grower had observed that the Gymnocalycium mihanovichii v. friedrichii contained more of the red pigment than most other plants with which he was familiar and he decided upon an extensive speculative cultivation in the hope of obtaining a form which would be entirely red. In 1937 he ordered 300 seeds from the firm of H. Winter in Germany and, after lengthy propagation, he had available in 1947 about 10,000 seeds which produced for him two seedlings of this clear red mutation, totally free of green

chlorophyll. He very fortunately realised that they could not survive any great length of time because red chlorophyll alone is not capable of assimilation and he grafted them straight away - less than two weeks after they germinated - on the miracle stock of the Japanese; Hylocereus guatemalensis, which is completely ignored in our part of the world.

It is true that I doubt whether this tropical columnar growing plant would acclimatise in our cold and humid winter (unless we are not bothered about the expense of heating). It is not for the same reason that Peireskiopsis, another marvellous grafting stock, has been virtually abandoned?

But to come back to our Gymnocalycium hibotan. After having grafted, regrafted, and further regrafted these two plants, many times, one had indeed a red cactus, named 'Hibotan' or 'Hibotan Nishiki'. Bearing in mind that it is in a condition completely lacking green chlorophyll, it is well suited by grafting it on an outside stock and this would also provide more certainty than an average size one of the scion producing an abundance of offsets. It is in this condition that it is distributed throughout the world.

The 'Hibotan Nishiki' is different in appearance and make-up and contains more of the green chlorophyll and can therefore survive without being grafted. Its appearance is very gay since, in addition to the red colour of the 'Hibotan' it is also variegated in yellow, green, and blue. It is far less widespread than the other and does not exist, as far as I am aware, in Belgium.

The communication of Mr. Hajime Oku was illustrated by colour slides which enraptured all the collectors of curiosities and a plate from one of these forms the cover illustration of the Japanese Journal 'Shaboten-Sha' for May 1964 - although, according to our ideas, it would be the last page of the book.

The Japanese author recommended Trichocereus spachianus or Myrtillocactus geometrizans as a grafting stock and indicated moreover that the more the plant is given full sun the more well-developed is the red tint.

Our friend Mr. A. van Eynde, professional cactus grower, confirms that the plant will flower on Myrtillocactus geometrizans and supports this with a photograph taken in his collection of one of his plants in flower.

Comments

..... from F. Wass

"My plant of G. mihanovichii v. rubra is grafted on to a slender three-ribbed stock which may be Hylocereus. It produced quite a few flowers during the later summer months."

(We also hear from P. Bennett that he has been successful in flowering his specimen of this plant last year).

WHAT FLOWERED in 1971 in the BOTANIC GARDENS? - Slide lecture reported by Gerhard Mallinger.

(Translated by K. Wood-Allum from the G.O.K. Newsletter for March '72)

The Linz Botanic Gardens was the theme of our meeting. The 'Boss', curator Stephan Schatzl had been busy photographing in 1971 and was able to show members of a large number of beautiful slides never seen before.

Herr Schatzl began with a number of orchids and then followed slides of novelties and 'old acquaintances'. I will confine myself to describing the first group - i.e. the novelties.

Gymnocalycium tillianum, a further red flowering species grows together with Gymno. leptanthemum at its site. A plant of Gymno. denudatum-delaetii is looked after as an article of great value by the Linz Botanic Garden. Until now only one example of this species has existed in the City Collection at Zurich.

Acanthocalycium chionanthum with white flower and brown ring of hair. According to Rausch, A. thionanthum, glaucum and aurantiacum are varieties of this species which originates from Salta in Argentina.

Notocactus horstii, named after the collector Leopold Horst, flowers with an orange-red bloom. Notocactus acutus from Brazil and the quite recently recollected Notocactus werdermannianus from Uruguay, both yellow-flowering, were to be seen.

Lobivia larae, collected again by Rausch, Lobivia pojoensis and Lobivia oxyalabastra, the latter with hatchet-like tubercles and Lobivia dobeana from Catamarca represent this genus. Lobivia aurea var. guinesensis was discovered by Rausch as a further variety of the Lobivia aurea group in San Luis, Argentina. The varieties calochrysea, fallax and leucomella also belong to this group.

The last group of slides in Herr Schatzl's lecture were of Sulcorebutia. Herr Schatzl has already collected a considerable number of this genus for the type collection at the Linz Botanical Gardens. Sulcorebutia steinbachii with its varieties gracilior, cochabambensis, totorensis and tiraquensis. Sulcorebutia krahnii with yellow flower, Sulcorebutia flavissima, named on account of its yellow spines, with violet pink flowers. S. rauschii, with variable body colour from whitish green to reddish violet and magenta flowers. Sulcorebutia markusii, variable in spination and flower colour (dull red to magenta), S. candiae with yellow flower and larger body, S. canigueralii with bicoloured flowers (red, yellow throat) and comb-like adpressed spines, finally S. verticillacantha to the species-complex of which belong the varieites minima (bright magenta), sucrensis and vasquesiana (with golden yellow spination), Sulco. kruegeri with golden yellow flowers, and the varieties hoffmanniana and glomerispina with its purple-red flowers, completed the slide sequence.

FORTHCOMING TOPICS

We should be pleased to hear from any readers who have a plant of Notocactus aciculatus; or who are able to section any flower of Borzicactinae (Matucana, Oreocereus, Seticereus, Loxanthocereus etc), Cleistocactus, or even Echinocereus, to observe the quantity of nectar present; or have grown Gymno griseo-pallidum or G. pseudo-malacocarpus.

LITERATURE

We should be pleased to hear from any readers having, or having access to, any book giving an account of D'Orbigny's travels in South America.

BACK NUMBERS

A number of our readers are still waiting for back numbers which were ordered many months ago. The delay in supply arose from the loss of printing plates in the post and the problems involved in preparing fresh originals. This delay will unfortunately be even further extended by the current difficulties facing industry of all descriptions in the U.K. Outstanding orders will be despatched as soon as reprints come to hand.

MINI DICTIONARY

During the course of 1974 we expect to publish a mini-dictionary in German-English for Backeberg's Kakteenlexikon. This is not intended to cover the introduction to the body of the book nor to each genus, since these parts require some knowledge of German grammar and construction for their translation. However, most of the descriptions of each species of cactus which appear in Kakteenlexikon follow a relatively simple pattern of words and a glossary of terms such as that now offered should enable most readers to produce an acceptable translation of any species, for their own use. No guarantee is given that every single word from the 404 pages of species description will be covered, but several test dips at random into the Kakteenlexikon have (so far) brought no omission to light.

A Special Appeal for Seed - from J. Hopkins

It is becoming increasingly apparent from comments in the literature, that many species of cacti are being threatened with extermination in the wild state, by every increasing commercial exploitation. As lovers of these fascinating plants, we owe it to ourselves and particularly to future generations to ensure that wild populations are not wiped out by our own greed. It is appreciated that in cases of genuine study of these plants, it is desirable to have authentic material, but how many of the imported plants to be found in our collections are truly the subject of intensive study? Very few, I suspect.

I appeal to all of you who possess two or more habitat plants of the same species to endeavour to produce true seed on them and then to make the seed or seedlings available to interested collectors. Only in this way will it be possible to satisfy future demand for true plants without further endangering the remaining wild plants.

I would be happy to distribute any spare seed through the seed pool, even if it is only available in quite small quantities.

(Should you have any seedlings to spare which have been grown from seed off imported plants, please advise A. W. Craig who is empowered to negotiate a price and will offer them to members.)

CAN YOU HELP?

..... The slide Librarian would like to acknowledge the donations of surplus slide mounts of the latest slim type by Agfa - but he would be very happy to receive any more, for remounting our slide library slides.

..... H. Middleditch requests the loan of those 1967/68 copies of the Belgian/Dutch I.T.S.L. Journal (International Tijdschrift voor Succulenteenliefhebbers) which carried a 3 part article by W. Krahn on "Boliviaanse Cactus Reise".

..... A member would like to purchase a second hand copy of "Cactus culture based on Biology" by Buxbaum.

..... Mrs. M. B. Levitsky enquires "Do any Chileans readers know anything about Discocactus HU 325? Or about Eulychnia sp. 76 - this had no initials before the number; it was purchased in Berkeley (USA) so may have been collected by Paul Hutchison.

STUDY GROUPS / ROUND ROBINS

Cleistocacti	T. Lavender, 62 Finchale Avenue, Billingham, Teesside TS23 2EB.
Copiapoa	D.J. Lewis, 80 Pencisley Road, Llandaff, Cardiff CF5 1DQ.
Epiphytes	A. J. S. McMillan, 5 Oakfield Road, Bristol BS8 2AJ.
Frailea	J. Forrest, Beechfield House, Meikle Earnock Road, Hamilton, Scotland.
Gymnocalycium	G. J. Swales, 5 Hillcrest, Middle Herrington, Sunderland, Co. Durham.
Lobivia	J. Hopkins, 25 Crossefield Road, Cheadle Hulme, Cheadle, Cheshire SK8 5PD.
Matucana/Borzicactinae	W. W. Atkinson, 12 Court Road, Tunbridge Wells, Kent.
Melocactus/Discocactus	Mrs. L. Teare, 7 Birkinshaw Avenue, Tranmere, Adelaide, South Australis, 5073, Australia.
Neoporterianae	D. Rushforth, 8 Broadfield Road, Knowle, Bristol 4.
Notocactinae	K. H. Halstead, Little Firtrees, Wellington Close, Dibden Purlieu, Southampton.
Parodia	A. Johnston, 11 Malvern Road, Scunthorpe, Lincs.
Photographing Cacti	A. W. Craig, Davela, Forest Lane, Kirk Levington, Nr. Yarm, Yorks.
Sulcorebutia	W. G. Sykes, 10 Ashley Close, Thornton Cleveleys, Lancs FY5 5EG.
Trichocereus	N. T. Hann, 5 Lake Road, Shirley, Croydon, Surrey CR0 8DS

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